SCIENCE INTEGRITY KNOWLEDGE

FINAL REPORT

Identification of Ecological Effects of Air Emissions Associated with Electricity Generation: A Literature Search

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Prepared For: **Clean Air Strategic Alliance**
10035 108 Street NW, Floor 10
Edmonton, Alberta T5J 3E1

Attention: Michelle Riopel, Project Manager

736 8th Avenue SW, Calgary, AB, Canada T2P 1H4
Tel: 403-237-0275 ▪ Fax: 403-237-0295 ▪ www.intrinsik.com

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Table of Contents

List of Figures

List of Tables

Identification of Ecological Effects of Air Emissions Associated with Electricity Generation: A Literature Search

1.0 INTRODUCTION

The Clean Air Strategic Alliance (CASA) is a non-profit organization comprised of stakeholders from government, non-government and industry groups. CASA has been tasked to develop a framework for the management of air emissions from the electricity sector in Alberta (CASA 2003). The overall goal of the emissions management framework is to ensure continuous improvement and keep the framework relevant. As a result, CASA conducts a literature review on ecological effects based on a five-year frequency, with the last ecological review completed in 2008 (Swanson 2008). The Health and Ecological Assessment Task (HEAT) Group from CASA is leading the review to compile new information on ecological effects or impacts of air emissions associated with electricity generation in Alberta.

Electricity generation in Alberta is predominantly from coal (52.5%) and natural gas (37.35%) power plants. Other types of electrical generation include wind, hydro, biomass and other (e.g., fuel oil and waste heat), as shown in Figure 1 (Alberta Energy 2014).

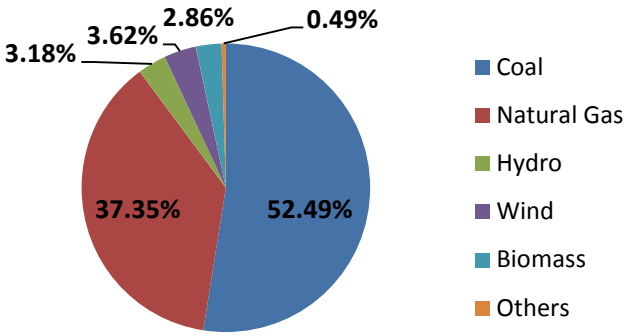

Figure 1 Electricity Generation Types in Alberta

Of the five main generation types, air emissions are produced as a result of combustion from coal, natural gas and biomass. Air emissions associated with hydroelectricity and wind are negligible because there is no combustion. Ecological effects associated with construction or other operation sources (e.g., mine, transport) were outside the scope of this study. Therefore the focus of the literature review was on coal, natural gas, and biomass electrical generation.

All literature searches were restricted to materials published in English between January 1, 2008 and December 31, 2013. While efforts were made to rank papers on the basis of relevance, no attempts were made to critically evaluate the papers or scientific methods.

2.0 OBJECTIVE AND SCOPE

The objective of the assessment is to provide the CASA with a report of studies from white and grey literature regarding adverse ecological (includes biota[a] and abiota[b]) effects from substances known to be emitted to air from electrical generation (i.e., power plants). In order to meet these objectives, the subsequent tasks were followed:

1. **Pollutant Inventory:** Develop an inventory of substances known to be emitted to air from power plants that generate electricity (Appendix A). This pollutant inventory was used to evaluate whether or not pollutants identified in the studies are relevant to electrical power generation and air emissions.
2. **Search Terms and Search Engines:** Develop an initial inventory or matrix of search terms used to search the white and grey literature. The literature search will be clearly documented and consist of Internet (e.g., Google) and academic search engines (e.g., Web of Science).
3. **Evaluation and Categorization:** In cooperation with the HEAT group, Intrinsik developed a series of terms to categorize or qualify each relevant study. Appendix B presents the qualitative criteria that were developed *a priori* and these qualifiers were worked into an electronic database using a Microsoft Access format. Each study that was entered into the database was evaluated using a relevance ranking method. Further details are presented in Section 3.5.
4. **Literature Search and Review:** Based on the pollutant inventory, search terms and evaluation criteria, conduct the literature search and qualify each relevant study. The literature search included a review of the abstract and title only. Studies are identified as relevant for entry into the database if the study focus was on substances included in the pollutant inventory, associated with electrical power generation or ecological effects from air emissions.
5. **Report:** Document the process used to identify the literature related to adverse ecological effects and report the findings.

3.0 METHODOLOGY

3.1 Search Strategy

3.1.1 Pollutant Inventory

The pollutant inventory is based on fuel types relevant to power generating facilities in Alberta (coal, natural gas and biomass). The list of substances is not limited to stack emissions, but includes other sources such as fugitive emissions (e.g., dust). The air emission inventory is primarily based on the US EPA AP 42 list of air pollutant emission factors (US EPA 1995). Consultation with the HEAT Group, previous reports (CASA 2003; Swanson 2008), National Pollutant Release Inventory (NPRI) and literature searches were also used as sources to compile a pollutant inventory (Appendix A). Substances in the pollutant inventory include the chemicals identified in the emission management framework (CASA 2003). Any new substances identified in the chemical inventory will be identified for the HEAT Group.

[a] The plant and animal life in an ecosystem.
[b] Non-living chemical and physical factors in an ecosystem (examples include soil, water, air, temperature).

The priority substances identified by the HEAT Group are as follows: nitrogen oxides (NO_x), sulfur oxides (SO_x), mercury, and particulate matter (PM). As a result of these substances being identified as priority, targeted searches were performed for those four pollutants and these priority pollutants were entered as qualifiers for each study in the database. The pollutant inventory was used to identify if a study, specifically inorganic or organic substances, was relevant to the HEAT group. Section 3.3 describes the database and how individual pollutants can be searched for using the database.

3.1.2 Search Engines

All literature searches were restricted to materials published in English between January 1, 2008 and December 31, 2013. White literature has been searched using Science Direct and Web of Science. Additional searches were conducted by a professional document service, Documents Delivered Inc. (DDI), using primarily Web of Science.

Grey literature was searched using the Internet search engine Google. However, some grey literature was discovered through Web of Science searches, particularly conference proceedings. Specific searches were performed on the websites of government and non-government environmental organizations. In order to remain consistent with the previous five year review (Swanson 2008), the same list of organizations and websites will be used for a targeted grey literature search (Table 1).

Table 1 Organizations for targeted grey literature searches (Swanson 2008)

Agency or Group	Country	Website
Air Impacts[c]	Global	www.airimpacts.org
Alberta Environment	Canada	www.environment.gov.ab.ca
Alberta Health and Wellness	Canada	www.health.gov.ab.ca
Agency for Toxic Substances and Disease Registry (ATSDR)	USA	www.atsdr.cdc.gov
Brookhaven National Laboratory	USA	www.bnl.gov
Clean Air Task Force (CATF)	USA	www.catf.us
Commission for Environmental Cooperation	Canada/Mexico/USA	www.cec.org
Electric Power Research Initiative	USA	www.epri.com
Environment Canada	Canada	www.ec.gc.ca
Environmental Integrity Project	USA	www.environmentalintegrity.org
Environmental Protection Agency	USA	www.epa.gov
European Commission – Environment	European Union	www.ec.europa.eu/environment
Geological Survey of Canada	Canada	www.gsc.nrcan.gc.ca
Government of British Columbia	Canada	www.gov.bc.ca
Government of Saskatchewan	Canada	www.gov.sk.ca
Greenpeace Canada	Canada	www.greenpeace.ca
Health Canada	Canada	www.hc-sc.gc.ca
Health Effects Institute (HEI)	USA	www.healtheffects.org
International Joint Commission	Canada/USA	www.ijc.org
National Energy Technology Laboratory	USA	www.netl.doe.gov
New York State Energy Research and Development Authority	USA	www.nyserda.org
Ontario Clean Air Alliance	Canada	www.cleanairalliance.org

[c] The organization “Air Impacts” does not appear to exist anymore (May, 2014).

Agency or Group	Country	Website
Ontario Power Generation	Canada	www.opg.com
Sustainable Energy and Economic Development Coalition	USA	www.seedcoalition.org
United Nations Economic Development	Global	www.unep.org
World Health Organization	Global	www.who.int
World Resources Initiative	USA	www.wri.org

Due to the volume of grey literature available, the database should not be considered a complete listing of resources. Instead, it is a selection of the most highly accessible and relevant material available online.

3.1.3 Search Terms

Various search terms were compiled, with searches being refined based on results. A preliminary inventory of search terms was created and is presented below in Table 2. A list of terms to exclude also was developed based on initial search results. As the detailed search results show (Section 4.0), not every term was used in the search.

Table 2 Preliminary list of search terms

Major	Minor
Facility	Power generation
	Electricity/electrical generation
	Thermal electricity
	Coal-fired power plant
	Fossil fuel power plant
Fuel Type	Coal
	Natural gas
	Biomass
Receptor	Environment
	Ecological
	Plant/vegetation/tree/forest
	Flora
	Fauna
	Bird/Avian
	Wildlife/Mammals
	Invertebrates
	Benthic invertebrates
	Microbes
	Temperature
	Soil
	pH
	Sediment
	Air
	Water/lake/river/rain

Major	Minor
	Fish
	Lichen/moss
	Ecosystem
	Amphibians
Chemical	Nitrogen dioxide/NO2
	Sulfur/Sulphur dioxide/SO2
	Mercury/Hg
	Particulate matter/PM
	Metals/Trace elements
	Polycyclic aromatic hydrocarbons (PAH)
	Volatile organic compounds (VOC)
General	Pollution
	Environment impact
	Environment pollution
	Air emission
	Fugitive emission
	Emission
	Air pollution
	Deposition
	Air quality
Exclude	Human
	Wind
	Hydro
	Geothermal
	Solar
	Greenhouse
	Cost
	Economic
	Car/automotive/vehicle
	Carbon capture
	Nuclear
	Radionuclides

3.2 Database Development

A computer database was created using Microsoft Access to log each of the relevant studies based on a review of the title and abstract. Each relevant study was logged into the database to document all the titles, abstracts and full reference information that was obtained based on the search terms. With guidance from the HEAT group, categories were developed to catalogue each study according to key areas of interest. The cataloging of each study into relevant groupings allows for a simple and straight-forward search of the database in order to retrieve articles of interest. A full list of the categories is available in Appendix B.

The abstract of each study was reviewed to determine overall relevance and a ranking assigned based on the criteria outlined in Section 3.4. A qualifier for the relevancy ranking has been integrated into the digital database, which allows for the database to be searched based on study relevance. In terms of the pollutant inventory, only the following categories were identified in the database:

1. NO_x
2. SO_2
3. Mercury
4. PM
5. Inorganics
6. Organics

The pollutant inventory presented in Appendix A was used to identify if an organic or inorganic pollutant was associated with electrical generation.

3.3 Database Description and Search Strategy

The Microsoft Access database has been designed with a welcome screen (Figure 2) giving the user the following options:

1. Input/edit form
2. View records (one record at a time)
3. View all records
4. Export database to Excel format
5. Export database to portable document format (PDF)
6. Report bibliography in PDF

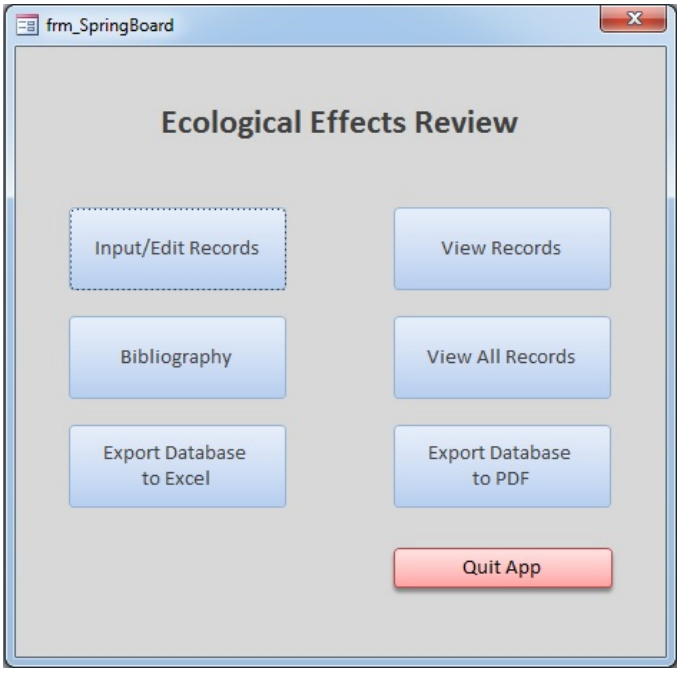

Figure 2 Screen capture of the welcome screen of the Microsoft Access database

The input form (Figure 3) contains all of the categories listed in Appendix B and allows for the user to add new articles into the database, delete, or modify existing records. The input form should only be used for data entry. Records can be viewed, one at a time, in the "View

Records" feature (Figure 4). To navigate between records, "next" and "previous" buttons are used.

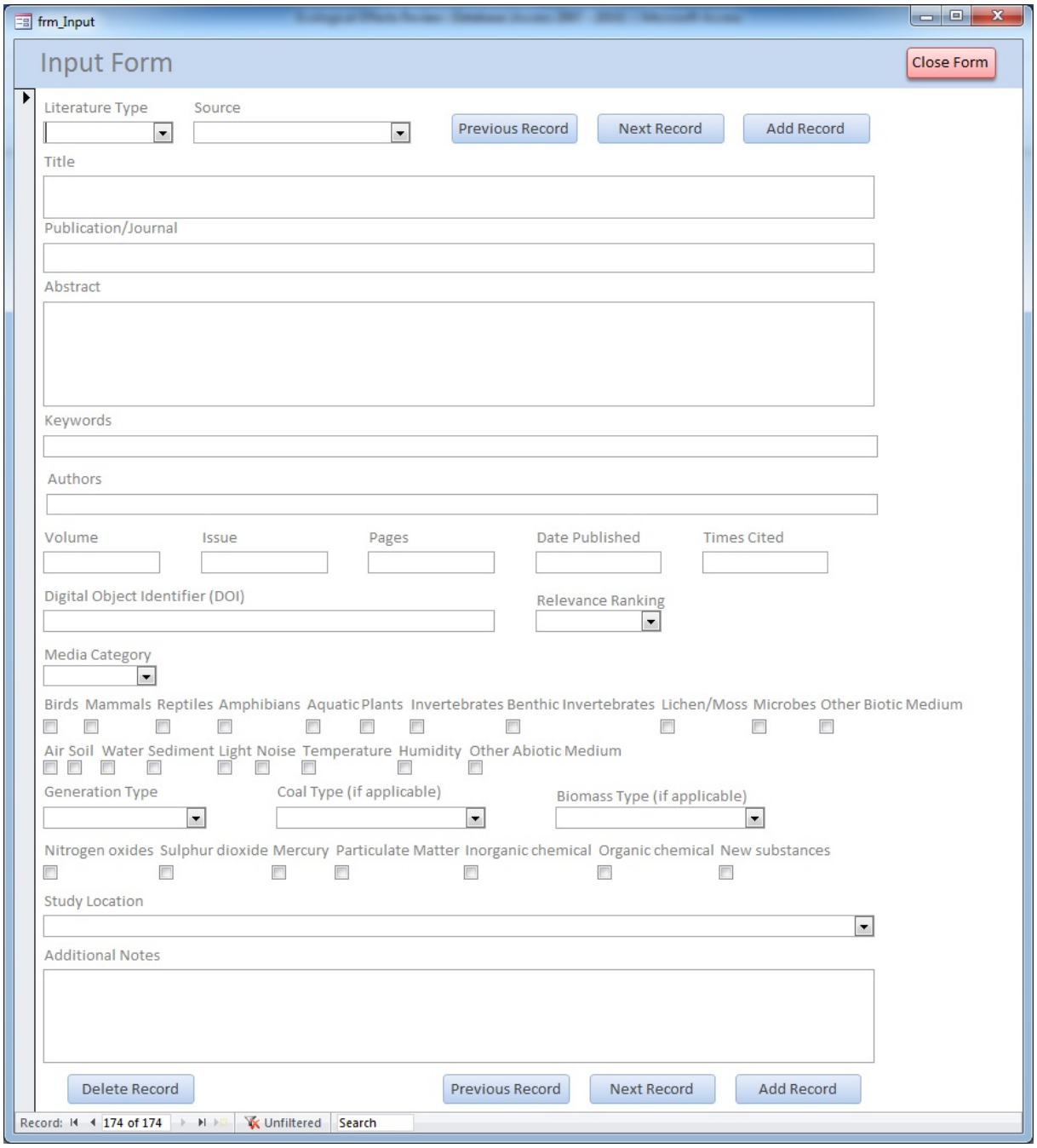

Figure 3 Screen capture of the input form in the Microsoft Access database

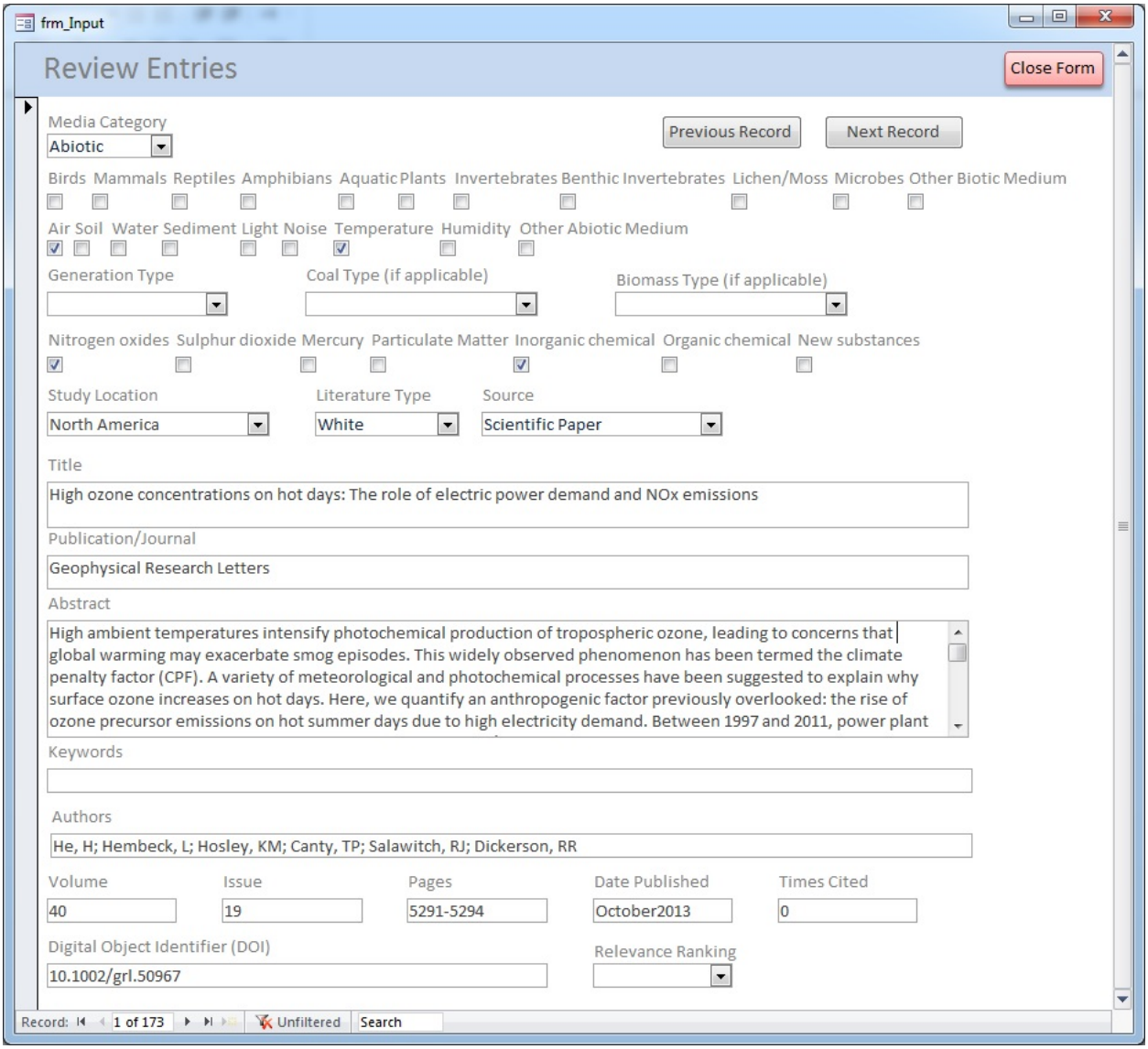

Figure 4 Screen capture of the view record screen in the Microsoft Access database

The entire database can be also viewed as one continuous list of records by clicking on the "View All Records" button in Figure 2. It is from this view that the database can be searched. Once "View All Records" has been selected, the database can be searched using the computer mouse by right clicking on a specific field or category and selecting the "Text Filters" option (Figure 5). Any text can be searched within a category by selecting one of the search functions as follows:

- Equals
- Does not equal
- Begins with
- Does not begin with
- Contains
- Does not contain
- Ends with
- Does not end with

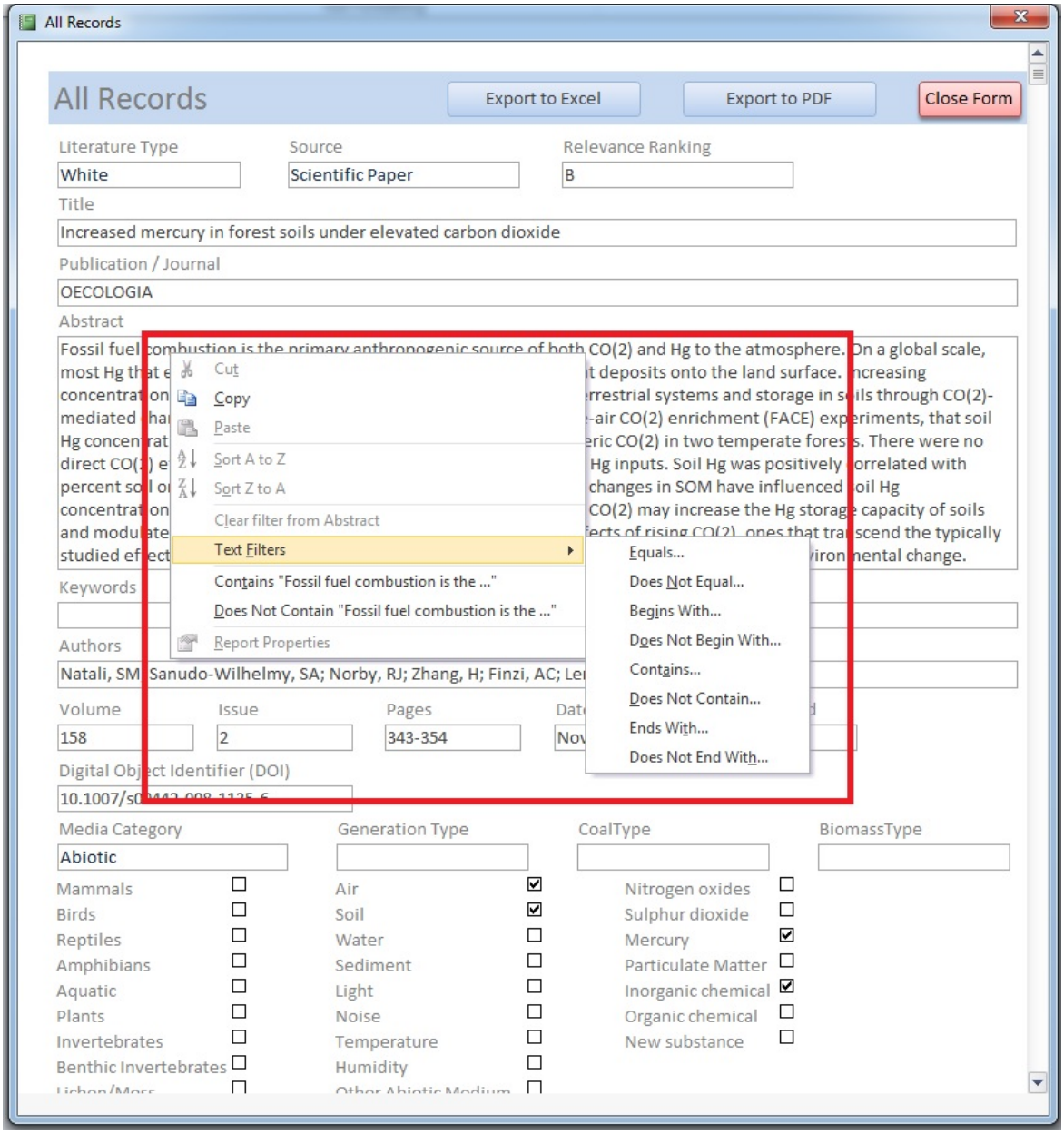

Figure 5 Screen capture of "View All Records" search options in the Microsoft Access database

For example if one would like to find an author (e.g., Wei), then perform the following:

1. Open the view all records form
2. Click inside the authors field and right click
3. From the menu select “Text Filters” and then select “Contains” from the subsequent menu
4. Enter the search term “Wei” and press enter.

The view all records form will refresh to list all records in the database with the text “Wei” in the authors field. To conduct another search simply right click the Authors field again and click “Clear filter from Authors”.

Each of the check-box categories can also be search by right-clicking with the computer mouse (Figure 6). A different list of options will appear:

- Is 0
- Is not 0
- Is selected
- Is not selected

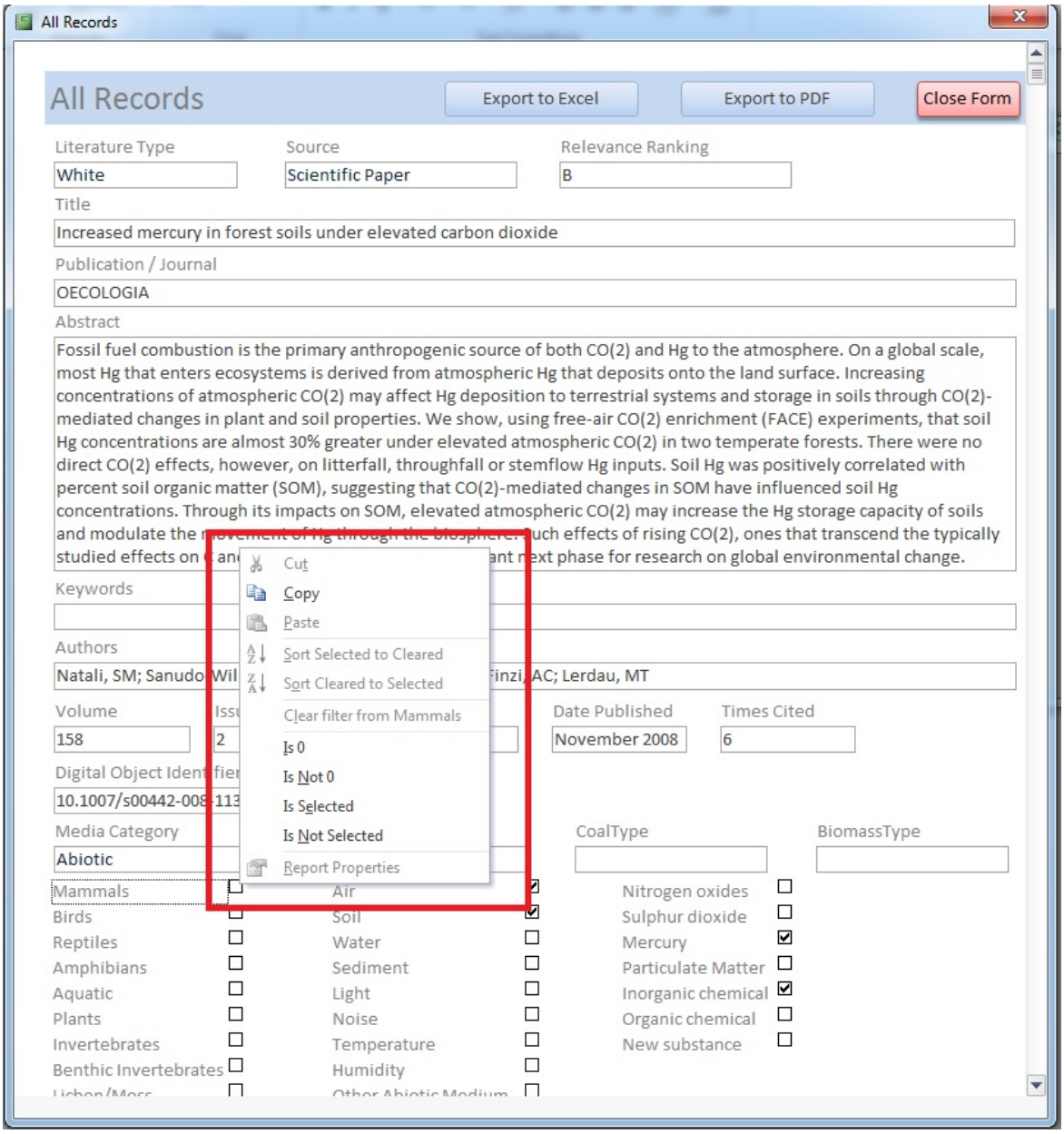

Figure 6 Screen capture of the "View All Records" search function of check boxes

For example if one would like to find all articles referencing a specific chemical (e.g., Nitrogen oxides), then perform the following:

1. Open the “View All Records” form
2. Right click the check box next to “Nitrogen oxides”
3. From the menu select “Is Selected”

The view all records form will refresh to list all records in the database with the check box "Nitrogen oxides" selected. To conduct another search simply right click the Nitrogen oxides box again and click on "Clear filter from Nitrogen oxides". Multiple filters can be applied simultaneously. For example, once the "Nitrogen oxides" filter has been applied, one can filter a second time for plants by repeating the same right-click steps, and so forth for the other pollutants and/or receptors of interest.

Alternatively, the entire database can be exported in an Excel format or PDF for searching and sharing by selecting buttons presented on the welcome screen. The PDF report will generate a document several hundred pages in length.

3.4 Study Review

Intrinsik reviewed each title and abstract of the studies obtained from the literature search. Studies were entered into the database based on the following:

- Study focused on ecological effects from air pollution
- Study focused on priority pollutants or pollutants listed in Appendix A

Studies may have been included that do not fulfill both criterion. In those circumstances, the relevance evaluation scheme (detailed below) serves to prioritize studies that do fulfill both the above criterion. When in doubt, articles were included in the database. In cases where a chemical was not on the pollutant inventory in Appendix A, the abstract was reviewed for an ecological effect that may be attributable to a new substance. If that was the case, the study was included in the database. Additionally, in some cases the pollutant was not specified in the abstract, but rather referred to in general terms, such as "air pollutant". These articles were included based on other information contained in the abstract, with the expectation that the specific pollutant will be described in the body of the article.

An effort was made to exclude studies that reported solely the measurement and/or monitoring of pollutant concentrations. Studies that focused on human receptors were not included in the database, nor were studies on power plant life cycle assessment, policy cost analysis, carbon capture and storage, or clean coal technology.

3.5 Relevance Evaluation Scheme

The objective of the evaluation scheme is to score each study based on relevance to the HEAT Group and provide a means for prioritizing relevant studies. The relevancy evaluation was integrated into the Microsoft Access electronic database.

The relevance evaluation scheme has a number of benefits including the following:

- Builds consistency in evaluating study relevance;
- Provides transparency in evaluation and decision making;
- Database allows easy access to key studies; and
- Identifies keys studies for the HEAT Group.

The objective of the ranking scheme is to identify key elements that relate study relevance to electrical generation and ecological effects. The evaluation scheme was used to determine the relevance of studies based on a series of simple yes/no questions. Although complex evaluation schemes are available (Breton *et al.* 2009; Hobbs *et al.* 2005), Intrinsik used a relatively simple evaluation matrix based on key elements and series of questions that are pertinent to electrical generation, ecological effects and the HEAT Group.

The relevance ranking was scored based on a series of three questions that focus on particular aspects that are relevant to electrical generation and ecological effects. The questions are as follows:

1. Study focused on chemical(s) or abiotic factor(s) that are known to be associated with electrical generation. This could be a new or existing substance that is known to be associated with electrical generation.
2. Study focused on electrical generation.
3. Study focused on ecological effects.

A study that answers yes to all three questions is scored a relevance ranking of "A" and a study that answers yes to two questions is scored a relevance ranking of "B". Finally, a study that answers yes to one question is scored a relevance ranking of "C". A summary to describe the relevancy rankings is shown in Table 3.

Table 3 Relevance Ranking Elements

Rank	Description
A	High level of relevance to electrical generation and ecological effects (i.e., Answer "Yes" to all three questions).
B	Medium level of relevance to electrical generation and ecological effects (i.e., Answer "Yes" to two out of three questions).
C	Low level of relevance to electrical generation and ecological effects (i.e., Answer "Yes" to one out three questions).

The aim is to provide an open and transparent ranking and scoring system that prioritizes or adds more weight to the information that the HEAT Group considers most relevant to electrical generation and ecological effects.

Finally, professional judgement will be used to determine if the study is of high quality and relevance to the Task Group. Therefore, the evaluation scheme would contain the option for the reviewer to provide a detailed comment and overall score of the study based on their expert judgement.

3.6 Quality Assurance and Quality Control

Once the database was complete, several quality control steps were followed. The database was searched for duplicate entries, with duplicates subsequently being deleted. Entries were searched for common errors, such as missed filed entries. Due to the simplicity of the entry and ranking system, no re-evaluation of relevancy rankings was undertaken to assess between-operator variation.

4.0 RESULTS AND DISCUSSION

4.1 Search Based on Science Direct

White literature searches were conducted by Intrinsik using Science Direct (SD). The results of SD searches were exported into Bibtex format and reviewed using JabRef reference software. The format of the export included all of the referencing information, however abstracts were not included. Upon review of article titles, an article was flagged if deemed of potential interest to the scope of the study. Once an article was flagged, the abstract was retrieved using the

article's digital object identifier (DOI). By this method, it was possible to track exactly how many abstracts were read. The abstract was then read and deemed relevant (or not) depending on the following two criteria:

1) Is there an ecological effect?
2) Are the chemical(s) relevant to power generation air emissions in Alberta[d]?

An effort was made to exclude articles that focused solely on measuring and/or monitoring emissions. If there was any doubt as to an article's relevance, it was included in the database. The search terms and results of the SD searches are shown in Table 4.

Table 4 Results of Intrinsik Science Direct literature searches

Search Terms	Hits	Abstracts read	Relevant Hits	% Relevant
thermal electric* AND environment* AND NOT solar	76	22	0	0.0%
mercury AND electric* generation AND environment* AND NOT human AND NOT diesel	251	51	0	0.0%
particulate matter AND electric* generation AND environment* AND NOT humans AND NOT diesel	172	8	0	0.0%
ecolog* effect AND electric* AND biomass OR coal OR natural gas AND NOT wind AND NOT solar	242	11	2	0.8%
coal-fired power plant AND ecolog* effect	66	6	2	3.0%
ecolog* effect AND electric* generation AND NOT wind	37	0	0	0.0%
ecologic* effects AND power generation	158	6	1	0.6%
ecolog* effects AND electric* generation	4	0	0	0.0%
sul-ur oxide AND electric* generation AND environment AND NOT human AND NOT diesel	63	10	0	0.0%
nitrogen oxide AND electric* generation AND environment AND NOT human AND NOT diesel	249	18	2	0.8%
environment* effect AND electric* generation AND NOT wind AND NOT solar Or coal Or natural gas OR biomass	57	2	1	1.8%
KW search: electric* generation AND environment*	9	0	0	0.0%
environment* effect AND electric* generation AND NOT wind AND NOT solar	273	15	1	0.4%
electric* emission AND environment*	13	0	0	0.0%
environment* effect AND thermal electric*	93	2	0	0.0%
Total	**1763**	**151**	**9**	**0.5%**

4.2 Search Based on Documents Delivered Inc.

A professional document retrieval service, Documents Delivered Inc. (DDI), was utilized to perform an extensive and comprehensive literature search. DDI searched Web of Science (WoS) and exported the search results (including title and abstract) into Microsoft Word format. Intrinsik reviewed the search results and input relevant articles into the Microsoft Access database. The search terms used and results of their preliminary search are shown in Table 5.

[d] Chemicals relevant to Alberta were determined based on the electricity generation types currently active in the province that produce air emissions (coal, gas, biomass).

Table 5 Results of preliminary DDI Web of Science literature search

Search Terms	Hits	Relevant Hits	% Relevant
TOPIC: ((((electric* power generation (plants OR facilities)) AND (pollution OR polluting OR emission*)) NOT (wind OR solar OR nuclear)))	2,065	4 [1]	0.2%

[1] One relevant hit was a comment on another published article. The original article was sought out and included the database.

Although a large number of documents were revealed by the preliminary literature search, much of the information was determined to be of little, if any, relevance to the objectives of the work based on a cursory review of the article titles and/or abstracts. More specifically, the preliminary search results provided very little information specific to the ecological effects of thermal electrical generation.

Subsequent searches performed by DDI yielded more than 20,000 records. The search was refined to produce a manageable number of records. The search terms used as part of the refinement process are shown in Table 6. The results of these searches were not saved for review.

Table 6 Search terms from DDI Web of Science refinement searches

Search Terms
TOPIC: (particulate matter in air) AND TOPIC: (ecological effects)
TITLE: (particulate matter in air) AND TOPIC: (environmental effects)
TOPIC: ("particulate matter in air") AND TOPIC: (environmental effects)
TOPIC: (particulate matter in air) AND TOPIC: (environmental)
TOPIC: (particulate matter in air) AND TOPIC: (environmental effects)
TOPIC: (particulate matter in air) AND TOPIC: (environment* effect*)
TOPIC: ("Nitrogen Dioxide" in air OR "NO2" in air) AND TOPIC: (environmental effects)
TOPIC: ("Nitrogen Dioxide" OR "NO2") AND TOPIC: (environmental effects)

Using the list of search terms in Table 2 and the refinement process in Table 6, DDI repeated the literature search. DDI searched WoS and exported the search results into Microsoft Word format. Intrinsik reviewed the search results and input relevant articles into the Microsoft Access database. A full list of DDI search terms and results is shown in Table 7. The studies presented in Table 7 provided the majority of the studies that were included in the ecological review database.

Table 7 Results of DDI Web of Science comprehensive searches

Search Order	Search Terms	Hits	Relevant Hits	% Relevant
1	TOPIC: (particulate matter in air) AND TOPIC: (environmental effects)	725	50	6.9%
2	TOPIC: (airborne AND "particulate matter" NOT cigarette NOT indoor) AND TOPIC: (environment* effect*)	438	29	6.6%
3	TOPIC: (("Nitrogen dioxide" OR "NO2") AND "environment* effect*" AND pollutant*)	22	3	13.6%
4	TOPIC: ("Nitrogen dioxide emission*" OR "NO2	18	2	11.1%

Search Order	Search Terms	Hits	Relevant Hits	% Relevant
	emission*") AND TOPIC: (environment* effect*)			
5	TOPIC: (("Nitrogen dioxide" OR "NO2") AND Airborne NOT Indoor) AND TOPIC: (environment* effect*) NOT TOPIC: ("particulate matter")	24	2	8.3%
6	TOPIC: (("Sulfur dioxide" OR "SO2" OR "Sulphur Dioxide") AND air) AND TOPIC: (environment* effect*) NOT TOPIC: ("particulate matter") NOT TOPIC:("Nitrogen Dioxide" OR "NO2")	656	66	10.1%
7	TOPIC: ((Mercur* OR Hg+ OR Hg+2 OR Hg2+)) AND TOPIC: (air) NOT TOPIC: (water) AND TOPIC: (environment* effect*)	302	15	5.0%
Final	TOPIC: (("particulate matter" OR "nitrogen dioxide" OR NO2 OR "sulfur dioxide" OR "sulphur dioxide" OR SO2 OR Mercur* OR Hg+ OR Hg+2 OR Hg2+) AND air) AND TOPIC: (ecolog*) NOT TOPIC: (water)	630	154	24.4%
Total		**2,815**	**321**	**11.4%**

4.3 Grey Literature Search

As mentioned previously, due to the sheer volume of grey literature available, the database should not be considered a complete listing of all grey literature. Instead it is a selection of the most highly accessible and relevant material available online.

The aim of using the organizations listed in Table 1 was to remain consistent with the previous five year literature review conducted in 2008. However, many of the organizations listed in Table 1 appeared to focus primarily on human health effects and did not provide much information regarding environmental effects. One of the organizations on the list (Air Impacts) does not seem to exist anymore.

When searching on the specific websites, two methods were followed:

1. Find a “reports” or “publications” page on the website and browse by year, if possible.
2. Use their search bar. This was often limited, i.e., could not generate a specific search.
    - Terms used in searching specific websites included:
        - Environmental effects of thermal power plants
        - Environmental effects of coal-fired power plants
        - Environmental effects of natural gas power plants
        - Environmental effects of biomass power plants
        - Mercury + effect
        - SO2/sulphur/sulfur dioxide + effect
        - NOx/NO2/nitrogen dioxide + effect
        - Particulate matter + effect

Of the websites listed in Table 1, only the following organizations yielded studies for input into the database:

- Electric Power Research Initiative
- US EPA
- Health Effect Institute
- European Commission (not the link from 2008, but their general "bookstore" was searched)
- NY State Energy Research and Development Authority

While Intrinsik searched the same list as Swanson (2008) in order to remain consistent, future five-year reviews may not find this to be a fruitful use of time. A targeted search of only the above five organizations is recommended.

Many of the documents found from those websites were white literature publications from that organization. Of the literature in the database, 39 (11%) is grey literature. The types of grey literature included in the database can be broken down as shown in Table 8. Note that the conference proceedings, the single letter, and many of the "other" records were actually discovered in the DDI WoS search.

Table 8 Types of grey literature

Source	Number of articles
Conference proceeding	11
Letter	1
Government report	11
Non-government report	6
Other [1]	10
Total	**39**

[1] "Other" is most commonly books or individual chapters from books.

Google was the only Internet search engine used for a general grey literature search. There is a function in the "Tools" bar which allows the user to customize a date range. The same list of search terms mentioned above was used in the Google search. Incorporating the term "thermal" into the search resulted in a large number of hits related to solar power.

As with the target organizational grey literature search, the Google search yielded more white literature than grey literature, even though Google Scholar was not used. Two limitations of the Internet grey literature search are that much of the information posted was either: 1) not dated; or 2) was too broad in scope for the objectives of this review (i.e., not a specific receptor or end point, but a general report on the harmfulness of a pollutant). The most prevalent topics in the grey literature (and not relevant to this search) included: costs of climate policy, market analysis, strategic energy analysis, greenhouse gas policy costs, greenhouse gas emissions, emissions predictions, climate/energy policy, water and fish, guidance documents for implementing government criterion, human health effects, environmental stewardship and management, clean coal technology, emissions guidelines, codes of practice, and life cycle analysis.

4.4 Summary of Ecological Effects

The number of articles per pollutant included in the database is shown in Table 9. SO_2 and PM were the most frequently studied pollutants followed by NO_x, then mercury. Apart from the priority pollutants, inorganics were studied with relatively high frequency.

Table 9 Number of articles per chemical included in the database

Substance	Number of articles
NO_x	71
SO_2	129
Mercury	64
Particulate Matter	123
Organics	37
VOCs	15
PAHs	17
Inorganics	87
New Substances	2
Not Specified	26
Total	**539** [1]

[1] Note: This number is higher than the total number of records in the database because some articles refer to more than one pollutant.

The database contains a total of 345 entries, and in general, there are no major trends in the research findings. The disjointed nature of the research over the past five years can been seen in the variety of receptors and endpoints described in the sections below.

4.4.1 Nitrogen Oxides (NO_x)

Table 10 presents the number of NO_x articles discovered for each of the abiotic and biotic receptor categories. The most common biotic receptors discussed in the articles were plants, while air and soil were the most common abiotic receptors.

Table 10 Number of NO_x Articles per Endpoint Included in the Database

	Receptor	Number of Articles
Abiotic	Air	17
	Soil	11
	Water	7
	Sediment	0
	Light	0
	Noise	1
	Temperature	4
	Humidity	0
	Other	6
Total Abiotic		20
Biotic	Birds	1
	Mammals	4
	Reptiles	0
	Amphibians	0
	Aquatic	2
	Plants	30

	Receptor	Number of Articles
	Invertebrates	0
	Benthic Invertebrates	0
	Lichen/Moss	9
	Microbes	4
	Other	0
Total Biotic		41
Both		10

Research on NO_x within the past five years primarily reported ecological effects on biotic receptors (72% of studies). Research focused on two main areas: 1) reactive nitrogen species in the atmosphere, and 2) effects on plants from exposure to NO_x. Research on reactive nitrogen species primarily reported on the formation and distribution of ozone and the partitioning of NO_x species in the atmosphere. The reported ecological effects include the following:

Abiotic Effects
- Increased acid precipitation
- Decreased air, water, and soil quality
- Increased ozone and hydroxyl radical formation in the atmosphere

Biotic Effects
- Altered oil content and fatty acid profile in seeds of plants
- Pulmonary effects in mice
- Increased oxidative stress and antioxidant system activity
- Restricted pollen production and viability
- Reduced maximum oxygen uptake in catfish
- Altered plant characteristics
    - Leaf colour, plant yield, species diversity, leaf shape, chlorophyll concentration and fluorescence, morphological characteristics, stomatal resistance, specific leaf area, leaf fluctuating asymmetry, drop contact angle, and membrane leakage
- Altered lichen community characteristics
    - Species diversity, lichen cover, recolonization of lichens
- DNA mutations, marker genes

4.4.1.1 Abiotic Effects of NO_x

Research primarily reported abiotic effects of NO_x on air. Neuman *et al.* (2013) and Hamer *et al. (*2008) found that NO_x had an effect on the formation of ozone. Two other studies noted an effect of NO_x emissions on the formation of atmospheric hydroxyl radicals (OH) (Stevens *et al.* 2013; Sarwar *et al.* 2009).

A number of studies linked NO_x emissions to acid precipitation, affecting soil, water, and the built landscape (Lajtha and Jones 2013; Yang *et al.* 2011; Grigal 2012; European Environment Agency 2011; Luong *et al.* 2013; Driscoll 2013a). Driscoll (2013a,b) stated that acidic deposition alters forest soil and impairs the water quality of lakes and streams. Pokale (2012) found that soil strata, structures, and buildings get affected due to corrosive reactions.

Mast and Ely (2013) found that emission reductions at two coal-fired power plants, which include NO_x emissions, had a beneficial effect on air and water quality in a nearby wilderness area.

4.4.1.2 Biotic Effects of NO_x

Research primarily reported biotic effects of NO_x on plants. A number of studies noted an effect of NO_x on chlorophyll in plants (Wuytack *et al.* 2013a; Zakharov *et al.* 2012; Chen *et al.* 2010; Sharma and Tripathi 2009; Bignal *et al.* 2008).

Other altered plant parameters included leaf characteristics and foliar response (Wuytack *et al.* 2013a; Soltuzu *et al.* 2012), antioxidant system (Wuytack *et al.* 2013b; Chen *et al.* 2010), pollen production (Jochner *et al.* 2013), pollen viability (Gottardini *et al.* 2008), nitrogen uptake (Vallano and Sparks 2013; Beppu *et al.* 2010; Bignal *et al.* 2008) and genetic response (Kondo *et al.* 2008).

Kondo *et al.* (2008) examined plant genes that are responsive to airborne NO_2. A study by Liska (2012) described re-colonization of a formerly vanishing species of nitrophytic lichens with increased nitrogen emissions.

Thermal power plant emissions, which include NO_x, were found to cause respiratory and related ailments to the animal kingdom, and to affect photosynthesis and nutrient balance in plants (Pokale 2012). Accordingly, Iqbal *et al.* (2011) found that the emissions from a thermal power plant decreased the oil content and fatty acid profile within seed oils of two medicinal herbs, possibly affecting their therapeutic properties. Environmental Bioindicators Foundation, Inc. and Pandion Systems, Inc. (2009) concluded that electricity generation using coal and natural gas affects wildlife, with resulting acid deposition being one of the most significant stressors. More specifically, coal as an electricity generation source was found to be the largest contributor of risks to wildlife (Environmental Bioindicators Foundation, Inc. and Pandion Systems, Inc. 2009).

Effects of NO_x on mammals were sparse and varied, and often could not be attributed to NO_x alone. Nitrogen dioxide (NO_2), among other pollutants, was found to have pulmonary effects on mice (Matsumoto *et al.* 2010). In another study, nitrite (NO_2^-) was found to reduce maximum oxygen uptake in striped catfish (Lefevre *et al.* 2012).

4.4.2 Sulphur Dioxide (SO_2)

Table 11 presents the number of SO_2 articles discovered for each of the abiotic and biotic receptor categories. The most common biotic receptors discussed in the articles were plants and mammals, followed by air and soil effects in the abiotic category.

Table 11 Number of SO_2 Articles per Endpoint Included in the Database

	Receptor	Number of Articles
Abiotic	Air	20
	Soil	10
	Water	9
	Sediment	0
	Light	0
	Noise	0
	Temperature	5
	Humidity	0
	Other	4

Total Abiotic		21
Biotic	Birds	0
	Mammals	19
	Reptiles	0
	Amphibians	0
	Aquatic	3
	Plants	66
	Invertebrates	1
	Benthic Invertebrates	0
	Lichen/Moss	17
	Microbes	4
	Other	3
Total Biotic		96
Both		11

Research on sulphur dioxide (SO_2) within the past five years primarily reported ecological effects on biotic receptors. The reported ecological effects include the following:

Abiotic Effects
- Acid precipitation
- Interactions with aerosols
- Decreased visibility
- Effects on global climate

Biotic Effects
- Altered pollen fertility, germination, protein content
- Chlorophyll measurements, fluorescence, content
- Carbon fixation ability
- Stomatal resistance and conductance
- Growth rate
- Ascorbic acid content
- Anatomical and morphological leaf characteristics
    - Leaf area, cuticle thickness, width of lower epidermic cell, drop contact angle
- Enzyme activity
- Species diversity
    - Plants, lichens, and bacteria
    - Abundance of species tolerant to certain pollutants
    - Trends in diversity with changing air pollution composition
- Incidental felling
- Electron transport rate
    - Photosynthetic efficiency
- Sugar content
- Reproductive effort as measured by fruit production
- Changes in epicuticular waxes

4.4.2.1 Abiotic Effects of SO_2

Research primarily reported abiotic effects of SO_2 on air. The varied effects included precipitation, acidification, interactions with aerosols, and impacts to visibility and the global

climate (Hauck 2008; Jeong and Park 2008; Kajino *et al.* 2008; Zvereva *et al.* 2008; Brewer and Moore 2009; Zhao *et al.* 2009; European Environment Agency 2011; Yang *et al*. 2011; Begu 2013; Betha 2013; Lajtha and Jones 2013; Driscoll 2013ab; Mast and Ely 2013; Stevens et al. 2013).

4.4.2.2 Biotic Effects of SO_2

Research primarily reported biotic effects of SO_2 on plants. Generally, plant research focused on biomonitoring, species diversity, and abundance (Kohler *et al.* 2008; Batzias and Siontorou 2009; Bernini *et al.* 2009; Sharma and Tripathi 2009; Brunialti *et al.* 2010; Jaques and Legge 2012; Begu 2013; Petkovsek 2013; Silva *et al.* 2013). Many articles focused on lichens as biological indicators of air pollution (Bednarova 2008; Kohler *et al.* 2008; Petkovsek *et al.* 2008; Vasiliu-Oromulu *et al.* 2008; Bernini *et al.* 2009; Brunialti *et al.* 2010; Stavishenko 2010; Petkovsek 2013; Silva *et al.* 2013). Another main area of focus was on air pollution impacts to conifers, with the species Norway Spruce being of particular concern (Bednarova 2008; Petkovsek *et al.* 2008; Sitkova *et al.* 2010; Tesar *et al.* 2011; Hauck *et al.* 2012; Rydval and Wilson 2012; Staszewski *et al.* 2012; Bashalkhanov *et al.* 2013; Petkovsek 2013) and contribution to apoptosis induced by SO_2 (Wei *et al.* 2013).

In terms of research on mammals, the primary focus was on rats and mice with respect to cancer and inhalation studies (Xie *et al.* 2009; Bai and Meng 2010; Qin and Meng 2010). Studies with beef cows exposed to emissions from the oil and natural gas industry focused on reproductive endpoints including calf abortions, stillbirths, immune function, and mortality (Waldner 2008abc; Bechtel *et al.* 2009bc; Waldner 2009; Waldner and Clark 2009).

4.4.3 Mercury

Table 12 presents the number of mercury articles discovered for each of the abiotic and biotic receptor categories. The most common biotic receptors discussed in the articles were plants and lichen/moss, followed by the air and soil effects in the abiotic category.

Table 12 Number of Mercury Articles per Endpoint Included in the Database

	Receptor	Number of Articles
Abiotic	Air	16
	Soil	7
	Water	3
	Sediment	0
	Light	1
	Noise	1
	Temperature	1
	Humidity	0
	Other	7
Total Abiotic		13
Biotic	Birds	4
	Mammals	6
	Reptiles	0
	Amphibians	0
	Aquatic	2

	Receptor	Number of Articles
	Plants	18
	Invertebrates	2
	Benthic Invertebrates	1
	Lichen/Moss	8
	Microbes	3
	Other	10
Total Biotic		35
Both		16

Research on mercury within the past five years primarily reported ecological effects on biotic receptors. The reported ecological effects include the following:

Abiotic Effects
- Measuring and monitoring in the atmosphere
    - Transport, distribution, cycling, and speciation

Biotic Effects
- Bioaccumulation
- Tissue concentrations and necrosis in small birds and mammals
- Bioavailability
- Changes in proteins of photosynthetic pathway in lichens
    - Suggestive of photosynthesis being a target of mercury
- Community diversity
- Growth dilution
- Plan mechanism of uptake
- Kidney effects in fish

4.4.3.1 Abiotic Effects of Mercury

Research primarily reported abiotic effects of mercury on air. The focus was mainly on measuring and monitoring, rather than true effects on ecological receptors (Gorbi *et al.* 2008; De Temmerman *et al.* 2009; Sims *et al.* 2009; Fernandez *et al.* 2011; Rucandio *et al.* 2011; Cui *et al.* 2013; Koz *et al.* 2013; Lodenius 2013; Niu *et al.* 2013). Several articles looked at the atmospheric transport, distribution, cycling, and speciation of gaseous elemental mercury (Sunderland *et al.* 2009; Holmes *et al.* 2010; Pirrone *et al.* 2010; Larose *et al.* 2011; Stern *et al.* 2012).

Another focus was on the means by which atmospheric distribution impacts the food chain/web in remote areas such as the Arctic (Larose *et al.* 2011; Rimmer *et al.* 2010; Braune 2012; Fisher *et al.* 2012; Stern *et al.* 2012; Van Dam *et al.* 2013). However, there were more papers related directly to coal-fired power plants than for any of the other priority pollutants (Environmental Bioindicators Foundation, Inc. and Pandion Systems, Inc. 2009; Stamper *et al.* 2009; Electric Power Research Institute 2013; Koz *et al.* 2013).

4.4.3.2 Biotic Effects of Mercury

Research primarily reported biotic effects of mercury on plants. The focus of the research was mainly on bioaccumulation (De Temmerman *et al.* 2009; Stamenkovic and Gustin 2009; Rucandio *et al.* 2011; Nicolardi *et al.* 2012; Tabatchnick *et al.* 2012; Niu *et al.* 2013).

4.4.4 Particulate Matter (PM)

Table 13 presents the number of PM articles discovered for each of the abiotic and biotic receptor categories. The most common biotic receptors discussed in the articles were mammals and plants, with the abiotic category focusing on air effects.

Table 13 Number of Particulate Matter Articles per Endpoint Included in the Database

	Receptor	Number of Articles
Abiotic	Air	23
	Soil	6
	Water	1
	Sediment	0
	Light	0
	Noise	1
	Temperature	2
	Humidity	1
	Other	4
Total Abiotic		22
Biotic	Birds	0
	Mammals	45
	Reptiles	0
	Amphibians	0
	Aquatic	0
	Plants	35
	Invertebrates	0
	Benthic Invertebrates	0
	Lichen/Moss	4
	Microbes	18
	Other	3
Total Biotic		89
Both		11

Research on PM within the past five years primarily reported ecological effects on biotic receptors. PM was seldom a research topic on its own; only 15 papers report solely on PM. Most research that covered PM also included the other three priority pollutants. An additional area of study was to measure PAH and/or metal content in PM, thus PM was used as a monitoring tool for other pollutants, rather than a cause-effect response of ecological receptors to PM specifically. As PM was often grouped with other priority pollutants, it proved difficult to separate out the ecological effects specific to PM solely from reading the abstracts. The reported ecological effects include the following:

Abiotic Effects

- Reduced visibility and light extinction
- Reduced water quality
- Air environmental pollution events

    - Reduced air quality, acid rain, damage to ozonosphere, global warming, photochemical smog, and urban coal smog
- Weather and climate effects
- Altered built landscape
    - Damage to architectural limestone
    - Decreased performance of photovoltaic panels

Biotic Effects
- Ability of plants to remove PM
    - Altered hair and wax cover
- Plant foliar anomalies, including content of antioxidants and enzymes
- Reduction in plant seed germination
- Reduction in plant photosynthesis
    - Decrease in chlorophyll and chlorophyll fluorescence
- Altered plant carbohydrate (including sugars) and amino acid content
- Changes in chemical composition of plant seed oils
- Altered reproductive effort in plants
- Plant stomatal resistance
- Leaf fluctuating asymmetry
- Plant cuticle rupture
- Lipid peroxidation
- Increase in size and frequency of epidermal cells and stomata
- Magnetic properties of leaves
- Formation of shoots, flowers, and leaves
- Cattle immune system function
- Cardiopulmonary effects in mammals
    - Heart rate and heart rate variability
- Altered mammalian immune response
    - Increased pro-inflammatory cytokines
    - Dendritic cell activation
- Reproductive effects
    - Altered enzyme levels in testis of male rat
    - Pregnancy outcomes in female mice
        - Altered umbilical cord morphology
        - Low birth weight in offspring
- Decreased glutathione antioxidant in mice
- Oxidative damage to hamster DNA
- Impairments in spatial learning and memory in mice
- Mutagenicity in bacteria

4.4.4.1 Abiotic Effects of PM

Research primarily reported abiotic effects of PM on air. PM was found to be associated with reduced visibility (Deng *et al.* 2012; Brewer and Moore 2009), reduced air quality (Madureira *et al.* 2012), and potential effects on water quality (Nelson 2013). The potential impacts of PM were found to be both local and regional in nature, including acid rain, damage to ozonosphere, global warming, photochemical smog (Jamil *et al.* 2013), as well as possible effects on weather and climate (Morgan *et al.* 2013).

PM was found to have effects on other abiotic media as well, contributing to the soiling process of architectural limestone (Urosevic *et al.* 2012) and decreasing the energy performance of photovoltaic panels (Kaldellis *et al.* 2011).

4.4.4.2 Biotic Effects of PM

Research primarily reported biotic effects of PM on mammals. Most of the effects reported on mammals, mainly mice and rats, have been cardiopulmonary in nature. Several studies specifically found effects of PM on heart rate and/or heart rate variability (Farraj *et al.* 2011; Pham *et al.* 2009; Howden *et al.* 2013). Other studies have found effects more specific to the lungs, such as that by Czovek *et al.* (2012), wherein red sludge dust had reached the respiratory tract of rats and induced inflammation around the alveoli and pulmonary vasculature. Chan *et al.* (2013) and Konga *et al.* (2009) also observed effects on the lung, namely parenchymal toxicity in the lungs of neonatal rats and damage to the lung mitochondrial membrane in mice, respectively.

Eight studies are suggestive of PM playing a role in inflammation (an immune response), particularly through an increase in the production of cytokines (Pirela *et al.* 2013;Park *et al.* 2011; Fonken *et al.* 2011; Halatek *et al.* 2011). More specifically, PM was found to be associated with an increase in pro-inflammatory cytokines, such as tumour necrosis factor alpha (Tapanainen *et al.* 2012; Gerlofs-Nijland *et al.* 2010) in a number of tissues, such as those within the pulmonary system (Pirela *et al.* 2013), digestive system (Kish *et al.* 2013), and in epithelial cells (Musah *et al.* 2012).

Effects on the male and female reproductive systems were also observed. PM was found to influence steroidogenic enzymes in the testis of the male rat (Yamagishi *et al.* 2012). In female mice, Veras *et al.* (2012) found that ambient PM affected umbilical cord morphology, as well as birth weight of offspring. In an earlier study, it was found that reproductive and pregnancy outcomes in mice were affected, even if exposure occurred only before conception. In this study, females exhibited changes in the length of the estrus cycle and extended estrus (Veras *et al.* 2009).

Several studies, such as those by Pirela *et al.* (2013) and Farraj *et al.* (2011), have observed particle size-dependent and/or dose-dependent effects of PM. Halatek *et al.* (2011) found that the coarse fractions of PM were less potent than the fine fractions of PM when it came to effects on the inflammatory response in lungs of rats. Park *et al.* (2011) found that pro-inflammatory cytokines were increased in a dose-dependent manner in mice exposed to $PM_{2.5}$.

The effects of PM on plants could not be attributed solely to PM, as PM was often just one component in a mixture of other chemicals, such as sulfur dioxide and nitrogen oxides.

Air pollution containing PM had varied effects on the seeds of plants, such as a significant reduction in seed germination in corn (Anwar *et al.* 2013), and alterations in the oil contents and fatty acid proportions in seed oils of two medicinal herbs (Iqbal *et al.* 2011).

The effects of PM on the plants themselves were also varied. Pavlik *et al.* (2012) found that changes in amino acid profiles and gas-exchange parameters showed a linear dependence on PM. Popek *et al.* (2013) found a positive correlation between in-wax PM and amount of waxes, but not between amount of waxes and amount of total PM or of any size fraction.

Other effects that were seen included: foliar anomalies, reduction of protein content in foliar tissues, and a decrease in the amount of chlorophyll and total carbohydrate in foliar tissues, which indicated a reduction in photosynthesis (Saha and Padhy 2011). A decrease in leaf pigments (chlorophyll a, chlorophyll b, and carotenoids) was also observed by Sharma and Tripathi (2009) in plants exposed to power plant emissions, including PM. Kuki *et al.* (2008) found that reproduction, as measured by fruit production, was affected by emissions that included iron ore dust. Rekha *et al.* (2011) found that not only does fly ash emitted from power

plant get deposited on the foliar canopy, thereby affecting the normal growth of plants, but that fluctuations in foliar elemental concentrations create significant imbalances in plant metabolism due to the synergistic effect of air pollutants.

In terms of the effects of PM on microbes, the Ames Salmonella/microsome mutagenicity assay (also known as the salmonella test or Ames test) was used in a number of studies wherein PM was consistently found to be mutagenic (Piekarska 2010; Traversi *et al*. 2009; Coronas *et al.* 2008; de Brito *et al.* 2013; Singla *et al.* 2012; de Andrade *et al*. 2011; Cohn *et al.* 2011; Kaffer *et al*. 2012; Traversi *et al.* 2008; Umbuzeiro *et al.* 2008).

4.4.5 Organic Chemicals

Organic chemicals included in the category are primarily volatile organic carbons (VOCs) and polycyclic aromatic hydrocarbons (PAHs). While these chemicals are not part of the CASA priority pollutant list, they are listed on the US EPA's AP42 list as being associated with thermal power generation. Articles included in the database include the following topics with relation to organic chemicals:

- PAHs
    - Mutagenic effects on bacteria
    - Source determination
    - Effects on cattle immune system
- VOCs
    - Reactions with reactive nitrogen
    - Effects on cattle immune system
    - Effects on neonatal calves
- Ratio of organic/inorganic sulphur

Of the 37 organic chemical articles reported in the past five years, 30 focused on biotic effects. 3 on abiotic effects, and 4 on both.

4.4.5.1 Abiotic Effects of Organics

Most of the organic chemical articles concentrated on PAHs. These articles focused on PAH impacts from combustion activities in urban air (ex. Brazil and Argentina) (Carreras *et al.* 2013; Rainho *et al.* 2013).

4.4.5.2 Biotic Effects of Organics

A popular area of research explored the mutagenicity of PAHs to bacteria (Jung *et al.* 2012; de Rainho *et al.* 2013; Kato *et al.* 2013; Rainho *et al.* 2013; Westphal *et al.* 2013).

Comparable to studies mentioned previously, articles with beef cows exposed to emissions (both PAHs and VOCs) from the oil and natural gas industry focused on reproductive endpoints including calf abortions, stillbirths, immune function, and mortality (Waldner 2008abc; Bechtel *et al.,* 2009ab; Waldner 2009; Waldner and Clark 2009).

Other articles varied, but topics included biomonitoring, evaluating threats to species at risk, and plant growth (Legge 2009; Kylin *et al.* 2011; Jaques and Legge 2012; Zhang *et al.* 2012).

4.4.6 Inorganic Chemicals

Inorganic chemicals include: metals, ozone, carbon dioxide, and "acid gases". While these chemicals are not part of the CASA priority pollutant list, they are listed on the US EPA's AP42 list as being associated with thermal power generation. More often than not, papers reporting on metals include mercury, and thus have already been flagged to inclusion into the database. The same can be applied to ozone and NO_x. Topics in this category also reported more information on measuring and monitoring, rather than ecological effects. Other topics that were covered on inorganic chemicals include:

- Reactive nitrogen
- Global N cycle
- Photochemical products from reactions with NO_x
- Nitrate to ozone
- Ozone depletion events
- Air mass transport
- Testing suitability of plant species as biomonitoring species
- Atmospheric transport

Of the 87 articles reporting inorganic chemicals in the past five years, 60 focused on biotic effects, 19 on abiotic effects, and 8 on both.

4.4.6.1 Abiotic Effects of Inorganics

Research primarily reported abiotic effects of inorganic chemicals on air. Article topics varied, but included precipitation, acidification, interactions with particulate matter, and impacts to visibility and the global climate (Jeong and Park 2008; Kajino *et al.* 2008; Brewer and Moore 2009; Zverev 2009; European Environment Agency 2011; Yang *et al.* 2011; Driscoll 2013ab).

4.4.6.2 Biotic Effects of Inorganics

Research primarily reported biotic effects of inorganic chemicals on plants. Generally, plant research mainly focused on biomonitoring, species diversity and abundance (Zhang *et al.* 2008; Kohler *et al.* 2008; Sims *et al.* 2009; Zverev 2009; Fernandez *et al.* 2011; Wuytack *et al.* 2011; Jaques and Legge 2012; Koz *et al.* 2013; Xu *et al.* 2013).

Similar to studies previously mentioned (SO_2 and organic chemicals), articles with beef cows exposed to emissions from the oil and natural gas industry focused on reproductive endpoints including calf abortions, stillbirths, immune function, and mortality (Waldner, 2008abc; Bechtel *et al.,* 2009;Waldner, 2009;Waldner & Clark 2009).

4.4.7 New Substances

Two papers were identified as discussing new substances or reaction processes. Those papers are:

> Tiwary *et al.* 2011. *Aerosol loading in an urban environment from a biofuel based CHP plant: assessment and mitigation*. Procedia Environmental Sciences, 4, 71-75.

The authors conducted a preliminary dispersion modeling exercise for biomass combustion in the United Kingdom. They reported on the possibility of secondary aerosol generation from photochemical interactions between precursor emissions and local transport emissions.

Mauldin, RL *et al.*, 2012. *A new atmospherically relevant oxidant of sulphur dioxide.* Nature, 488 (7410), 193.

The authors describe a stabilized Criegee intermediate (a carbonyl oxide with two free-radical sites) that has a significant capacity to oxidize sulphur dioxide and potentially other trace gases. This compound is thought to enhance the reactivity of the atmosphere.

5.0 LIMITATIONS AND UNCERTAINTY

Every reasonable effort was made to capture all the relevant studies from white and grey literature regarding adverse ecological (including biota and abiota) effects from substances known to be emitted to air from electrical generation. The review was limited by the requirement to develop search terms that yielded a reasonable number of studies that could be reviewed within the scheduled timeframe of the project. Broad based search terms simply yielded hundreds of thousands of hits that would have been impossible to review within the timeframe of the project. The use of broad based search terms, such as those presented in Table 5, demonstrated how less than 1% of the hits were relevant to the objectives of this study. However, if the search terms were too specific, no hits were returned. A more focused search strategy was used for the priority pollutants, which yielded a much higher frequency (i.e., >10%) of relevant studies (see Table 7).

The limitations of the ecological review are that the database contains the title and abstract information for each study, and yet makes no determination of the study quality in terms of scientific rigor or testing protocols. It is important to note that this work was a literature *search*, and not a literature *review* and no full text articles were read, evaluated, or otherwise assessed.

There is the uncertainty that not all white and grey literature was captured in the ecological review, but given the use of academic search engines (e.g., Web of Science) and a professional documents service (i.e., DDI), Intrinsik is confident that the literature search is comprehensive and no innovative studies within the past five years were overlooked.

6.0 SUMMARY AND CONCLUSIONS

The broad scope the literature search resulted in the review of over 6,775 titles and abstracts, of which only 345 (5%) were determined to be of relevance. This literature search may be considered more of a triage tool to pull out the most relevant information pertaining to the ecological effects of air emissions associated with electricity generation from 2008 to 2013. Combined with the interactive database, this literature search outlines the most relevant research within the past five years.

As a consequence of the broad scope of the search terms (Table 2), there was a broad spread of research topics that were reviewed and entered into the database. There were no obvious or prevalent trends in the research overall, with many articles reporting a wide range of receptors and endpoints. The literature search did highlight that the bulk of research pertaining to abiotic ecological effects of air emissions in the past five years has focused on air and soil for priority pollutants. In addition, biotic ecological effects have focused on plants for NO_x, SO_2, and mercury, while mammals were the most common receptors for PM. In terms of the priority pollutants, these two receptor groups (i.e., plants and mammals) were the most frequently mentioned and researched. Two new substances were reported (secondary aerosols and a

Criegee intermediate) that had abiotic receptors with respect to increased atmospheric reactivity.

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APPENDIX A – POLLUTANT INVENTORY

Table A-1 Pollutant Inventory

	COAL	NATURAL GAS	HYDRO	WIND	BIOMASS	OTHER
Organics						
1,1,1-Trichloroethane	✓					✓
2,4-Dinitrotoluene	✓					
2-Chloroacetophenone	✓					
2-Methylnaphthalene		✓				
3-Methylchloranthrene		✓				
5-Methyl chrysene	✓					
7,12-Dimethylbenz(a)anthracene		✓				
Acenaphthene	✓	✓				✓
Acenaphthylene	✓	✓				✓
Acetaldehyde	✓					
Acetophenone	✓					
Acrolein	✓					
Anthracene	✓	✓				✓
Benz(a)anthracene		✓				✓
Benzene	✓	✓				✓
Benzo(a)anthracene	✓					
Benzo(a)pyrene	✓	✓				
Benzo(b)fluoranthene		✓				
Benzo(b,j,k)fluoranthene	✓					
Benzo(b,k)fluoranthene						✓
Benzo(g,h,i)perylene	✓	✓				✓
Benzo(k)fluoranthene		✓				
Benzyl chloride	✓					
Biphenyl	✓					
Bis(2-ethylhexyl)phthalate	✓					
Bromoform	✓					
Butane		✓				
Carbon disulfide	✓					
Chlorobenzene	✓					
Chloroform	✓					
Chrysene	✓	✓				✓
Cumene	✓					
Cyanide	✓					
Dibenzo(a,h)anthracene		✓				✓
Dichlorobenzene		✓				
Dimethyl sulfate	✓					

	COAL	NATURAL GAS	HYDRO	WIND	BIOMASS	OTHER
Ethane		✓				
Ethyl benzene	✓					✓
Ethyl chloride	✓					
Ethylene dibromide	✓					
Ethylene dichloride	✓					
Fluoranthene	✓	✓				✓
Fluorene	✓	✓				✓
Formaldehyde	✓	✓				
Hexane	✓	✓				
Indeno(1,2,3-cd)pyrene	✓	✓				✓
Isophorone	✓					
Methyl bromide	✓					
Methyl chloride	✓					
Methyl ethyl ketone	✓					
Methyl hydrazine	✓					
Methyl methacrylate	✓					
Methyl tert butyl ether	✓					
Methylene chloride	✓					
Naphthalene	✓	✓				✓
Octachlorodibenzodioxin						✓
Pentane		✓				
Phenanthrene	✓	✓				✓
Phenol	✓					
Propane		✓				
Propionaldehyde	✓					
Pyrene	✓	✓				✓
Styrene	✓					
Tetrachloroethylene	✓					
Toluene	✓	✓				✓
Vinyl acetate	✓					
Xylenes	✓					✓
Metals						
Antimony	✓					✓
Arsenic	✓	✓				✓
Barium		✓				✓
Beryllium	✓	✓				✓
Cadmium	✓	✓				✓
Chromium	✓	✓				

	COAL	NATURAL GAS	HYDRO	WIND	BIOMASS	OTHER
Chromium (VI)	✓					✓
Cobalt	✓	✓				✓
Copper		✓				✓
Fluoride						✓
Lead	✓	✓				✓
Magnesium	✓					
Manganese	✓	✓				✓
Mercury	✓	✓				✓
Molybdenum		✓				✓
Nickel	✓	✓				✓
Phosphorous						✓
Selenium	✓	✓				✓
Vanadium		✓				✓
Zinc		✓				✓
Criteria Air Contaminants						
Carbon dioxide	✓	✓			✓	✓
Carbon monoxide	✓					✓
Nitrous oxide	✓	✓				✓
Nitrogen oxides	✓				✓	✓
Particulate matter	✓	✓				✓
Sulfur oxides	✓	✓			✓	✓
Other						
Hydrogen chloride (gas)	✓					
Hydrogen fluoride (gas)	✓					
Methane	✓	✓				
Polychlorinated dibenzofurans	✓					
Polychlorinated dibenzo-p-dioxins	✓					

Appendix B – Qualitative Criteria

The database has been designed such that each study can be qualified with the following descriptors:

1. White or grey literature
   If grey literature then the study will be characterized as follows:
   a. Government report
   b. Non-government report
   c. Industry report
   d. Environmental Impact Assessment (EIA)
   e. Hearing
   f. Conference proceedings
   g. Thesis
   h. Fact sheet
   i. Letter
   j. Opinion piece
   k. Other
2. Focus will be divided into the following categories:
   a. Abiotic
   b. Biotic
   c. Both
3. Biotic categories are defined as follows:
   a. Birds
   b. Mammals
   c. Amphibians
   d. Aquatic
   e. Reptiles
   f. Plants
   g. Invertebrates
   h. Benthic invertebrates
   i. Lichen/moss
   j. Microbes
   k. Other
4. Abiotic categories are defined as follows:
   a. Air
   b. Soil
   c. Water
   d. Sediment
   e. Light
   f. Noise
   g. Temperature
   h. Humidity
   i. Other
5. Generation type will be qualified as follows:
   a. Coal
      i. Lignite coal
      ii. Subbituminous coal
      iii. Bituminous coal
      iv. Anthracite coal
   b. Natural Gas
   c. Biomass (Option to include solid waste or garbage)
   d. Other
6. Facility type will be defined if possible
7. Pollutant will be described as follows:

    a. Nitrogen oxides
    b. Sulphur dioxide
    c. Particulate matter
    d. Mercury
    e. Inorganic chemical
    f. Organic chemical
    g. New substance
8. Title
9. Author
10. Abstract
11. Source
12. Volume
13. Issue
14. Pages
15. Date
16. Total times cited
17. Digital Object Identifier (DOI)
18. Study Location
    a. Alberta
    b. Canada
    c. North America
    d. International
    e. Not specified
19. Comments

Appendix C – Bibliography

Bibliography

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Amos, HM; Jacob, DJ; Holmes, CD; Fisher, JA; Wang, Q; Yantosca, RM; Corbitt, ES; Galarneau, E; Rutter, AP; Gustin, MS; Steffen, A; Schauer, JJ; Graydon, JA; St Louis, VL; Talbot, RW; Edgerton, ES; Zhang, Y; Sunderland, EM	2012	Gas-particle partitioning of atmospheric Hg(II) and its effect on global mercury deposition	ATMOSPHERIC CHEMISTRY AND PHYSICS	12	1	591-603	10.5194/acp-12-591-2012
Anwar, K; Ejaz, S; Ashraf, M; Altaf, I; Anjum, AA	2013	Cytotoxic, phytotoxic, and mutagenic appraisal to ascertain toxicological potential of particulate matter emitted from automobiles	Environmental Science and Pollution Research	20	7	4817-4830	
Arvind Mishra; Siddiqui, K. A.; Shukla, C. P.	2010	Plant biomass, productivity and characterization of species diversity under the effect of gaseous emission	Plant Archives	10	2	741-744	
Assadi, A; Pirbalouti, AG; Malekpoor, F; Teimori, N; Assadi, L	2011	Impact of air pollution on physiological and morphological characteristics of Eucalyptus camaldulensis Den.	JOURNAL OF FOOD AGRICULTURE & ENVIRONMENT	9	2	676-679	
Astel, A; Astel, K; Biziuk, M	2008	PCA and multidimensional visualization techniques united to aid in the bioindication of elements from transplanted Sphagnum Palustre moss exposed in the Gdansk city area	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	15	1	41-50	10.1065/espr2007.05.422

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Astorga Bustillos, F. R.; Sosa Cerecedo, M.; Herrera Peraza, E. F.; Moreno Lopez, M. V.; Tena Vega, M.; Campos Trujillo, A.	2011	Pinus halepensis Mill. as environmental pollution indicator in an urban industrial zone	Ciencia Forestal en Mexico	2	7	79-86	
Avdonina, A.M.	2011	Ecology of the terrestrial and freshwater tardigrades (Tardigrada): autecological aspect	Zoologiya Bespozvonochnykh	8	1	11-22	
Bai, JL; Meng, ZQ	2010	Effect of Sulfur Dioxide on Expression of Proto-oncogenes and Tumor Suppressor Genes from Rats	ENVIRONMENTAL TOXICOLOGY	25	3	272-283	10.1002/tox.20495
Bashalkhanov, S; Eckert, AJ; Rajora, OP	2013	Genetic signatures of natural selection in response to air pollution in red spruce (Picea rubens, Pinaceae)	MOLECULAR ECOLOGY	22	23	5877-5889	10.1111/mec.12546
Batzias, FA; Siontorou, CG	2009	Measuring Uncertainty in Lichen Biomonitoring of Atmospheric Pollution: The Case of SO2	IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT	58	9	3207-3220	10.1109/TIM.2009.2017162
Bechtel, DG; Waldner, CL; Wickstrom, M	2009	Associations Between Immune Function in Yearling Beef Cattle and Airborne Polycyclic Aromatic Hydrocarbons and PM1.0 Near Oil and Natural Gas Field Facilities	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	64	SI	47-58	
Bechtel, DG; Waldner, CL; Wickstrom, M	2009	Associations Between In Utero Exposure to Airborne Emissions From Oil and Gas Production and Processing Facilities and Immune System Outcomes in Neonatal Beef Calves	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	64	1	59-71	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Bechtel, DG; Waldner, CL; Wickstrom, M	2009	Associations Between Immune Function in Yearling Beef Cattle and Airborne Emissions of Sulfur Dioxide, Hydrogen Sulfide, and VOCs From Oil and Natura Gas Facilities	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	64	SI	73-86	
Bednarova, E.	2008	Effect of changes in immission characteristics on the amount of epicuticular waxes in spruce (Picea abies/L./Karst.) growing in montane regions	Beskydy	1		19-22	
Begu, A.	2009	Contributions to the study of lichens in the Republic of Moldova and their application in air quality monitoring	Contributii Botanice	44		93-106	
Begu, A.	2013	Biomonitoring of athmosphere air quality	International Journal of Ecosystems and Ecology Science	3	2	247-252	
Beker, C; Sienkiewicz, A	2009	Assessment of the threat to the forest environment in the Zielonka Primeval Forest from air pollution in 1992-2006	SYLWAN	153	7	451-456	
Bell, T; Adams, M	2009	Smoke from Wildfires and Prescribed Burning in Australia: Effects on Human Health and Ecosystems	Wildland Fires and Air Pollution	8		289-316	10.1016/S1474-8177(08)00014-4
Beppu, T.; Matsumura, Y.; Tsuchidate, H.; Oikawa, K.; Yamagishi, Y.; Harada, I.; Kanehara, R.; Ishikawa, Y.; Yasui, Y.; Hayakawa, S.	2010	A step towards feasible phytoremediation	Kagaku to Seibutsu	48	10	724-726	
Bernini, Filippo; Brusa, Guido; Rivellini, Giambattista	2009	Biomonitoring air pollution using lichen biodiversity in a friulian low plain area: Changes on short time scale	Gortania-Atti del Museo Friulano di Storia Naturale Botanica Zoologia	31		15-23	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Bertram, TH; Perring, AE; Wooldridge, PJ; Dibb, J; Avery, MA; Cohen, RC	2013	On the export of reactive nitrogen from Asia: NOx partitioning and effects on ozone	ATMOSPHERIC CHEMISTRY AND PHYSICS	13	9	4617-4630	10.5194/acp-13-4617-2013
Betha, R; Spracklen, DV; Balasubramanian, R	2013	Observations of new aerosol particle formation in a tropical urban atmosphere	ATMOSPHERIC ENVIRONMENT	71		340-351	10.1016/j.atmosenv.2013.01.049
Bezemer, GFG; Bauer, SM; Oberdorster, G; Breysse, PN; Pieters, RHH; Georas, SN; Williams, MA	2011	Activation of Pulmonary Dendritic Cells and Th2-Type Inflammatory Responses on Instillation of Engineered, Environmental Diesel Emission Source or Ambient Air Pollutant Particles in vivo	Journal of Innate Immunity	3	2	150-166	10.1159/000321725
Bignal, KL; Ashmore, MR; Headley, AD	2008	Effects of air pollution from road transport on growth and physiology of six transplanted bryophyte species	ENVIRONMENTAL POLLUTION	156	2	332-340	10.1016/j.envpol.2008.02.011
Bond, TC; Doherty, SJ; Fahey, DW; Forster, PM; Berntsen, T; DeAngelo, BJ; Flanner, MG; Ghan, S; Karcher, B; Koch, D; Kinne, S; Kondo, Y; Quinn, PK; Sarofim, MC; Schultz, MG; Schulz, M; Venkataraman, C; Zhang, H; Zhang, S; Bellouin, N; Guttikunda, SK;	2013	Bounding the role of black carbon in the climate system: A scientific assessment	JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES	118/	11	5380-5552	10.1002/jgrd.50171

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Boquete, MT; Fernandez, JA; Carballeira, A; Aboal, JR	2013	Assessing the tolerance of the terrestrial moss Pseudoscleropodium purum to high levels of atmospheric heavy metals: A reciprocal transplant study	SCIENCE OF THE TOTAL ENVIRONMENT	461		552-559	10.1016/j.scitotenv.2013.05.039
Brasoveanu, V.; Begu, A.	2013	The risk of air pollution by sulphur compounds in forest ecosystems from Republic of Moldova included in the European network of forest monitoring.	Revista Padurilor	128	4/5	59-65	
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Brunialti, G; Frati, L; Incerti, G; Rizzi, G; Vinci, M; Giordani, P	2010	Lichen biomonitoring of air pollution: Issues for applications in complex environments	AIR QUALITY IN THE 21ST CENTURY			211-259	
Carlton, A.G.; Pinder, R.W.; Bhave, P.V.; Pouliot, G.A.	2010	To What Extent Can Biogenic SOA be Controlled?	Environmental Science & Technolocy	44	9	3376-3380	10.1021/es903506b
Carreras, HA; Calderon-Segura, ME; Gomez-Arroyo, S; Murillo-Tovar, MA; Amador-Munoz, O	2013	Composition and mutagenicity of PAHs associated with urban airborne particles in Cordoba, Argentina	Environmental Pollution	17		403-410	10.1016/j.envpol.2013.03.016
Caseiro, A; Oliveira, C	2012	Variations in wood burning organic marker concentrations in the atmospheres of four European cities	JOURNAL OF ENVIRONMENTAL MONITORING	14	8	2261-2269	10.1039/c2em10849f

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Cesar, V.; Stolfa, I.; Maurovic, S.; Paradikovic, N.; Lepedus, H.	2008	Differential appearance of vacuolar polyphenols in black pine (Pinus nigra) needles in response to the lowering of SO2 in the air	Acta Botanica Hungarica	50	3-4	315-323	10.1556/ABot.50.2008.3-4.10
Chan, JKW; Vogel, CF; Baek, J; Kodani, SD; Uppal, RS; Bein, KJ; Anderson, DS; Van Winkle, LS	2013	Combustion derived ultrafine particles induce cytochrome P-450 expression in specific lung compartments in the developing neonatal and adult rat	American Journal Of Physiology - Lung Cellular and Molecular Physiology	304	10	L665-L677	
Chan, JKW; Kodani, SD; Charrier, JG; Morin, D; Edwards, PC; Anderson, DS; Anastasio, C; Van Winkle, LS	2013	Age-Specific Effects on Rat Lung Glutathione and Antioxidant Enzymes after Inhaling Ultrafine Soot	American Journal of Respiratory Cell and Molecular Biology	48	1	114-124	
Chan, JKW; Fanucchi, MV; Anderson, DS; Abid, AD; Wallis, CD; Dickinson, DA; Kumfer, BM; Kennedy, IM; Wexler, AS ; Van Winkle, LS	2011	Susceptibility to Inhaled Flame-Generated Ultrafine Soot in Neonatal and Adult Rat Lungs	Toxicological Sciences	124	2	472-486	10.1093/toxsci/kfr233
Chen Bu-feng; Pan Yong-jun; Xiao Yi-hua; Wu Min; Yang Hong-yu	2012	Characteristics of Environmental Effects in the Landscape Shelter Forest along the Aerodrome Road in Guangzhou	Forest Research	25	3	278-284	
Chen, ZM; Chen, YX; Du, GJ; Wu, XL; Li, F	2010	Effects of 60-day NO2 fumigation on growth, oxidative stress and antioxidative response in Cinnamomum camphora seedlings	JOURNAL OF ZHEJIANG UNIVERSITY-SCIENCE B	11	3	190-199	10.1631/jzus.B0910350

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Cho, SH; Tong, HY; McGee, JK; Baldauf, RW; Krantz, QT; Gilmour, MI	2009	Comparative Toxicity of Size-Fractionated Airborne Particulate Matter Collected at Different Distances from an Urban Highway	ENVIRONMENTAL HEALTH PERSPECTIVES	117	11	1682-1689	10.1289/ehp.0900730
Chung, CY; Chung, PL; Liao, SW	2011	Carbon fixation efficiency of plants influenced by sulfur dioxide	ENVIRONMENTAL MONITORING AND ASSESSMENT	173	1-4	701-707	10.1007/s10661-010-1416-5
Cohn, CA; Lemieux, CL; Long, AS; Kystol, J; Vogel, U; White, PA; Madsen, AM	2011	Physical-Chemical and Microbiological Characterization, and Mutagenic Activity of Airborne PM Sampled in a Biomass-Fueled Electrical Production Facility	Environmental and Molecular Mutagenesis	52	4	319-330	10.1002/em.20628
Coronas, MV; Horn, RC; Ducatti, A; Rocha, JV; Vargas, VMF	2008	Mutagenic activity of airborne particulate matter in a petrochemical industrial area	Mutation Research-Genetic Toxicology and Environmental Mutagenesis	650	2	196-201	10.1016/j.mrgentox.2007.12.002
Courter, LA; Luch, A; Musafia-Jeknic, T; Arlt, VM; Fischer, K; Bildfell, R; Pereira, C; Phillips, DH; Poirier, MC; Baird, WM	2008	The influence of diesel exhaust on polycyclic aromatic hydrocarbon-induced DNA damage, gene expression, and tumor initiation in Sencar mice in vivo	Cancer Letters	265	1	135-147	10.1016/j.canlet.2008.02.017
Cristofolini, F; Giordani, P; Gottardini, E; Modenesi, P	2008	The response of epiphytic lichens to air pollution and subsets of ecological predictors: A case study from the Italian Prealps	ENVIRONMENTAL POLLUTION	151	2	308-317	10.1016/j.envpol.2007.06.040
Cui, J; Wu, B; Halbrook, RS; Zang, SY	2013	Age-dependent accumulation of heavy metals in liver, kidney and lung tissues of homing pigeons in Beijing, China	ECOTOXICOLOGY	22	10	1490-1497	10.1007/s10646-013-1135-0

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Cuinica, LG; Abreu, I; Gomes, CR; da Silva, JCGE	2013	Exposure of Betula pendula Roth pollen to atmospheric pollutants CO, O-3 and SO2	GRANA	52	4	299-304	10.1080/00173134.2013.830145
Czovek, D; Novak, Z; Somlai, C; Asztalos, T; Tiszlavicz, L; Bozoki, Z; Ajtai, T; Utry, N; Filep, A; Bari, F; Petak, F	2012	Respiratory consequences of red sludge dust inhalation in rats	Toxicology Letters	209	2	113-120	10.1016/j.toxlet.2011.12.006
da Costa, TC; de Brito, KCT; Rocha, JAV; Leal, KA; Rodrigues, MLK; Minella, JPG; Matsumoto, ST; Vargas, VMF	2012	Runoff of genotoxic compounds in river basin sediment under the influence of contaminated soils	Ecotoxicology and Environmental Safety	75		63-72	10.1016/j.ecoenv.2011.08.007
de Andrade, SJ; Varella, SD; Pereira, GT; Zocolo, GJ; de Marchi, MRR; Varanda, EA	2011	Mutagenic activity of airborne particulate matter (PM10) in a sugarcane farming area (Araraquara city, southeast Brazil)	Environmental Research	111	4	545-550	10.1016/j.envres.2011.03.004
de Brito, KCT; de Lemos, CT; Rocha, JAV; Mielli, AC; Matzenbacher, C; Vargas, VMF	2013	Comparative genotoxicity of airborne particulate matter (PM2.5) using Salmonella, plants and mammalian cells	Ecotoxicology and Environmental Safety	94	1	14-20	10.1016/j.ecoenv.2013.04.014
de Rainho, CR; Correa, SM; Mazzei, JL; Aiub, CAF; Felzenszwalb, I	2013	Genotoxicity of Polycyclic Aromatic Hydrocarbons and Nitro-Derived in Respirable Airborne Particulate Matter Collected from Urban Areas of Rio de Janeiro (Brazil)	Biomed Research International				

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
De Temmerman, L; Waegeneers, N; Claeys, N; Roekens, E	2009	Comparison of concentrations of mercury in ambient air to its accumulation by leafy vegetables: An important step in terrestrial food chain analysis	ENVIRONMENTAL POLLUTION	157	4	1337-1341	10.1016/j.envpol.2008.11.035
Delfosse, VC; Gioffre, AK; Tasat, DR	2012	Low levels of residual oil fly ash (ROFA) impair innate immune response against environmental mycobacteria infection in vitro	Toxicology In Vitro	26	6	1001-1006	10.1016/j.tiv.2012.04.018
Demers, JD; Blum, JD; Zak, DR	2013	Mercury isotopes in a forested ecosystem: Implications for air-surface exchange dynamics and the global mercury cycle	GLOBAL BIOGEOCHEMICAL CYCLES	27	1	222-238	10.1002/gbc.20021
Demerjian, KL; Schwab, JJ; Roychowdhury, U; Hogrefe, I	2009	Results and Findings from the Joint Enhanced Ozone and PM Precursor - PM2.5 Technology Assessment and Characterization Study in New York (PMTACS-NY)	New York State Energy Research and Development Authority				
Deng, JJ ; Du, K; Wang, K; Yuan, CS; Zhao, JJ	2012	Long-term atmospheric visibility trend in Southeast China, 1973-2010	Atmospheric Environment	59		11-21	
Dong, X.; Li, C.; Li, J.; Wang, J.; Liu, S. & Ye, B.	2010	A novel approach for soil contamination assessment from heavy metal pollution: A linkage between discharge and adsorption	Journal of Hazardous Materials	175		1022-1030	10.1016/j.jhazmat.2009.10.112
Douskova, I; Doucha, J; Livansky, K; Machat, J; Novak, P; Umysova, D; Zachleder, V; Vitova, M	2009	Simultaneous flue gas bioremediation and reduction of microalgal biomass production costs	APPLIED MICROBIOLOGY AND BIOTECHNOLOGY	82	1	179-185	10.1007/s00253-008-1811-9
Driscoll, C.	2013	Ecological Effects of Acidic Deposition	Reference Module in Earth Systems and Environmental Sciences				10.1016/B978-0-12-409548-9.00847-2

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Driscoll, C. T.	2013	Acid and Mercury Deposition Effects on Forest and Freshwater Aquatic Ecosystems	Encyclopedia of Biodiversity (Second Edition), Academic Press				10.1016/B978-0-12-384719-5.00303-8
Dwivedi, AK; Tripathi, BD	2008	Effect of ambient air sulphur dioxide on sulphate accumulation in plants	JOURNAL OF ENVIRONMENTAL BIOLOGY	29	3	377-379	
Electric Power Research Institute		Program on Technology Innovation: Literature Review of Issues Related to the Atmospheric Impacts of Natural Gas Power Plants	Electric Power Research Institute				
Electric Power Research Institute	2007	Mercury in the Environment	Electric Power Research Institute				
Electric Power Research Institute	2013	Measuring Mercury Isotopes in the Atmosphere and Rainfall near a Coal-Fired Power Plant	Electric Power Research Institute				
Ellis, CJ; Coppins, BJ	2010	Integrating multiple landscape-scale drivers in the lichen epiphyte response: climatic setting, pollution regime and woodland spatial-temporal structure	DIVERSITY AND DISTRIBUTIONS	16	1	43-52	10.1111/j.1472-4642.2009.00624.x
Environmental Bioindicators Foundation, Inc. and Pandion Systems, Inc.	2009	Comparison of Reported Effects and Risks to Vertebrate Wildlife from Six Electricity Generation Types in the New York/New England Region	New York State Energy Research and Development Authority				
European Environment Agency	2011	Air quality in Europe	European Environment Agency				10.2800/83213
European Commission, Directorate-General for Research and Innovation		European research on environment and health funded by the Sixth Framework Programme: Snapshots of final results	European Commission, Directorate-General for Research and Innovation				10.2777/19018
Fain, X; Helmig, D; Hueber, J; Obrist, D; Williams, MW	2013	Mercury dynamics in the Rocky Mountain, Colorado, snowpack	BIOGEOSCIENCES	10	6	3793-3807	10.5194/bg-10-3793-2013

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Faloona, Ian	2009	Sulfur processing in the marine atmospheric boundary layer: A review and critical assessment of modeling uncertainties	ATMOSPHERIC ENVIRONMENT	43	18	2841-2854	10.1016/j.atmosenv.2009.02.043
Fantozzi, L; Ferrara, R; Dini, F; Tamburello, L; Pirrone, N; Sprovieri, F	2013	Study on the reduction of atmospheric mercury emissions from mine waste enriched soils through native grass cover in the Mt. Amiata region of Italy	ENVIRONMENTAL RESEARCH	125	SI	69-74	10.1016/j.envres.2013.02.004
Farraj, AK; Hazari, MS; Haykal-Coates, N; Lamb, C; Winsett, DW; Ge, Y; Ledbetter, AD; Carll, AP; Bruno, M; Ghio, A; Costa, DL	2011	ST Depression, Arrhythmia, Vagal Dominance, and Reduced Cardiac Micro-RNA in Particulate-Exposed Rats	American Journal of Respiratory Cell and Molecular Biology	44	2	185-196	10.1165/rcmb.2009-0456OC
Fernandez, J.A.; Ares, A.; Rey-Asensio, A.; Carballeira, A.; Aboal, J.R.	2011	Effect of growth on active biomonitoring with terrestrial mosses	Journal of Atmospheric Chemistry	63	1	1-11	10.1007/s10874-010-9152-3
Fisher, JA; Jacob, DJ; Soerensen, AL; Amos, HM; Steffen, A; Sunderland, EM	2012	Riverine source of Arctic Ocean mercury inferred from atmospheric observations	NATURE GEOSCIENCE	5	7	499-504	10.1038/ngeo1478
Fitt, BDL; Fraaije, BA; Chandramohan, P; Shaw, MW	2011	Impacts of changing air composition on severity of arable crop disease epidemics	PLANT PATHOLOGY	60	1	44-53	10.1111/j.1365-3059.2010.02413.x
Fonken, LK; Xu, X; Weil, ZM; Chen, G; Sun, Q; Rajagopalan, S; Nelson, RJ	2011	Air pollution impairs cognition, provokes depressive-like behaviors and alters hippocampal cytokine expression and morphology	Molecular Psychiatry	16	10	987-995	10.1038/mp.2011.76

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Fritsch-Decker, S; Both, T; Mulhopt, S; Paur, HR; Weiss, C; Diabate, S	2011	Regulation of the arachidonic acid mobilization in macrophages by combustion-derived particles	Particle and Fibre Toxicology	8			10.1186/1743-8977-8-23
Gadsdon, SR; Dagley, JR; Wolseley, PA; Power, SA	2010	Relationships between lichen community composition and concentrations of NO2 and NH3	ENVIRONMENTAL POLLUTION	158	8	2553-2560	10.1016/j.envpol.2010.05.019
Gangwang; Liu, GG; Liu, HJ; Zhang, N; Wang, YL	2012	Photodegradation of salicylic acid in aquatic environment: Effect of different forms of nitrogen	SCIENCE OF THE TOTAL ENVIRONMENT	435		573-577	10.1016/j.scitotenv.2012.05.068
Garcia-Gallardo, MV; Algorta, J; Longo, N; Espinel, S; Aragones, A; Lombardero, M; Bernaola, G; Jauregui, I; Aranzabal, A; Albizu, MV; Gastaminza, G	2013	Evaluation of the Effect of Pollution and Fungal Disease on Pinus radiata Pollen Allergenicity	INTERNATIONAL ARCHIVES OF ALLERGY AND IMMUNOLOGY	160	3	241-250	10.1159/000341368
Gerlofs-Nijland, ME; van Berlo, D; Cassee, FR; Schins, RPF; Wang, K; Campbell, A	2010	Effect of prolonged exposure to diesel engine exhaust on proinflammatory markers in different regions of the rat brain	Particle and Fibre Toxicology	7			10.1186/1743-8977-7-12
Gibson, MD; Heal, MR; Li, ZY; Kuchta, J; King, GH; Hayes, A; Lambert, S	2013	The spatial and seasonal variation of nitrogen dioxide and sulfur dioxide in Cape Breton Highlands National Park, Canada, and the association with lichen abundance	ATMOSPHERIC ENVIRONMENT	64		303-311	10.1016/j.atmosenv.2012.09.068
Giuntoli, J; Boulamanti, AK; Corrado, S; Motegh, M; Agostini, A; Baxter, D	2013	Environmental impacts of future bioenergy pathways: the case of electricity from wheat straw bales and pellets	Global Change Biology Bioenergy	5	5	497-512	10.1111/gcbb.12012

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Gottardini, E; Cristofori, A; Cristofolini, F; Maccherini, S; Ferretti, M	2008	Ambient levels of nitrogen dioxide (NO2) may reduce pollen viability in Austrian pine (Pinus nigra Arnold) trees - Correlative evidence from a field study	SCIENCE OF THE TOTAL ENVIRONMENT	402	2-3	299-305	10.1016/j.scitotenv.2008.04.048
Grayson, JA; St. Louis, VL; Hintelmann, H; Lindberg, SE; Sandilands, KA; Rudd, JW; Kelly, CA; Tate, MT, Krabbenhoft, DP; and Lehnherr, I.	2009	Investigation of Uptake and Retention of Atmospheric Hg(II) by Boreal Forest Plants Using Stable Hg Isotopes	Environmental Science & Technology	43	13	4960–4966	10.1021/es900357s
Grigal, D. F.	2012	Atmospheric nitrogen and inorganic nitrogen flux	Water, Air, and Soil Pollution Journal	223	6	3565-3575	10.1007/s11270-012-1128-2
Guo Er-guo; Wang Cheng; Qie Guang-fa; Cai Yu	2013	Relationships between the factors reflecting ecological health function of urban forests	Shengtaixue Zazhi	32	11	2893-2903	
Gustin, MS; Lindberg, SE; Weisberg, PJ	2008	An update on the natural sources and sinks of atmospheric mercury	APPLIED GEOCHEMISTRY	23	3	482-493	10.1016/j.apgeochem.2007.12.010
Halatek, T ; Stepnik, M; Stetkiewicz, J; Krajnow, A; Kur, B; Szymczak, W; Rydzynski, K; Dybing, E; Cassee, FR	2011	The inflammatory response in lungs of rats exposed on the airborne particles collected during different seasons in four European cities	Journal Of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering	46	13	1469-1481	10.1080/10978526.2011.609064

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Hamer, PD; Shallcross, DE; Yabushita, A; Kawasaki, M	2008	Modelling the impact of possible snowpack emissions of O(P-3) and NO2 on photochemistry in the South Pole boundary layer	ENVIRONMENTAL CHEMISTRY	5	4	268-273	10.1071/EN08022
Hammerschmidt, CR; Fitzgerald, WF	2008	Methylmercury in arctic Alaskan mosquitoes: implications for impact of atmospheric mercury depletion events	ENVIRONMENTAL CHEMISTRY	5	2	127-130	10.1071/EN08003
Hattori, S; Schmidt, JA; Johnson, MS; Danielache, SO; Yamada, A; Ueno, Y; Yoshida, N	2013	SO2 photoexcitation mechanism links mass-independent sulfur isotopic fractionation in cryospheric sulfate to climate impacting volcanism	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA	110	44	17656-17661	10.1073/pnas.1213153110
Hauck, Markus	2009	Global warming and alternative causes of decline in arctic-alpine and boreal-montane lichens in North-Western Central Europe	GLOBAL CHANGE BIOLOGY	15	11	2653-2661	10.1111/j.1365-2486.2009.01968.x
Hauck, Markus	2011	Site factors controlling epiphytic lichen abundance in northern coniferous forests	FLORA	206	2	81-90	10.1016/j.flora.2010.02.001
Hauck, M	2008	Susceptibility to acidic precipitation contributes to the decline of the terricolous lichens Cetraria aculeata and Cetraria islandica in central Europe	ENVIRONMENTAL POLLUTION	152	3	731-735	10.1016/j.envpol.2007.06.046
Hauck, M; Zimmermann, J; Jacob, M; Dulamsuren, C; Bade, C; Ahrends, B; Leuschner, C	2012	Rapid recovery of stem increment in Norway spruce at reduced SO2 levels in the Harz Mountains, Germany	ENVIRONMENTAL POLLUTION	164		132-141	10.1016/j.envpol.2012.01.026

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He Yong; Li Lei; Li JunYi; Li WeiXing; Mu LiQiang	2010	Air purification efficiency of thirty species of landscape trees in northern China	Journal of Northeast Forestry University	38	5	37-39	
He, H; Hembeck, L; Hosley, KM; Canty, TP; Salawitch, RJ; Dickerson, RR	2013	High ozone concentrations on hot days: The role of electric power demand and NOx emissions	Geophysical Research Letters	40	19	5291-5294	10.1002/grl.50967
Heidenfelder, BL; Reif, DM; Harkema, JR; Hubal, EAC; Hudgens, EE; Bramble, LA; Wagner, JG; Morishita, M; Keeler, GJ; Edwards, SW; Gallagher, JE	2009	Comparative Microarray Analysis and Pulmonary Changes in Brown Norway Rats Exposed to Ovalbumin and Concentrated Air Particulates	Toxicological Sciences	108	1	207-221	10.1093/toxsci/kfp005
Heinz, GH; Hoffman, DJ; Klimstra, JD; Stebbins, KR; Kondrad, SL; Erwin, CA	2009	Species Differences in the Sensitivity of Avian Embryos to Methylmercury	ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY	56	1	129-138	10.1007/s00244-008-9160-3
Helmig, D; Seok, B; Williams, MW; Hueber, J; Sanford, R	2009	Fluxes and chemistry of nitrogen oxides in the Niwot Ridge, Colorado, snowpack	BIOGEOCHEMISTRY	95	1	115-130	10.1007/s10533-009-9312-1
Holmes, C. D.; Jacob, D. J.; Corbitt, E. S.; Mao, J.; Yang, X.; Talbot, R.; and Slemr, F.	2010	Global Atmospheric Model for Mercury Including Oxidation by Bromine Atoms	Atmospheric Chemistry and Physics	10		12037-12057	10.5194/acp-10-12037-2010

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Hrdlicka, P; Kula, E	2009	The content of total sulphur and sulphur forms in birch (Betula pendula Roth) leaves in the air-polluted Krusne hory mountains	TREES-STRUCTURE AND FUNCTION	23	3	531-538	10.1007/s00468-008-0299-3
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Jaques, DR; Legge, AH	2012	Ecological Analogues for Biomonitoring Industrial Sulfur Emissions in the Athabasca Oil Sands Region, Alberta, Canada	Developments in Environmental Science	11		219-241	10.1016/B978-0-08-097760-7.00010-X
Jeong, JI; Park, SU	2008	Interaction of gaseous pollutants with aerosols in Asia during March 2002	SCIENCE OF THE TOTAL ENVIRONMENT	392	2-3	262-276	10.1016/j.scitotenv.2007.11.026

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Jochner, S; Hofler, J; Beck, I; Gottlein, A; Ankerst, DP; Traidl-Hoffmann, C; Menzel, A	2013	Nutrient status: a missing factor in phenological and pollen research?	JOURNAL OF EXPERIMENTAL BOTANY	64	7	2081-2092	10.1093/jxb/ert061
Jung, MH; Kim, HR; Park, YJ; Park, DS; Chung, KH; Oh, SM	2012	Genotoxic effects and oxidative stress induced by organic extracts of particulate matter (PM10) collected from a subway tunnel in Seoul, Korea	Mutation Research - Genetic Toxicology and Environmental Mutagenesis	749	1-2	39-47	10.1016/j.mrgentox.2012.08.002
Kaffer, MI; Lemos, AT; Apel, MA; Rocha, JV; Martins, SMD; Vargas, VMF	2012	Use of bioindicators to evaluate air quality and genotoxic compounds in an urban environment in Southern Brazil	ENVIRONMENTAL POLLUTION	163		24-31	10.1016/j.envpol.2011.12.006
Kajino, M; Ueda, H; Nakayama, S	2008	Secondary acidification: Changes in gas-aerosol partitioning of semivolatile nitric acid and enhancement of its deposition due to increased emission and concentration of Sox	JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES	113	D3		10.1029/2007JD008635
Kaldellis, JK; Fragos, P; Kapsali, M	2011	Systematic experimental study of the pollution deposition impact on the energy yield of photovoltaic installations	Renewable Energy	36	10	2717-2724	10.1016/j.renene.2011.03.004
Kamilova, E; Tsarev, B	2008	Mortality of silkworms due to air pollution: environmental indicators induced by ecological stress	ENVIRONMENTAL TOXICOLOGY II; WIT Transactions on Ecology and the Environment	110		241-250	10.2495/ETOX080261
Kapoor, CS; Bamniya, BR; Kapoor, K	2013	Efficient control of air pollution through plants, a cost-effective alternative: studies on Dalbergia sissoo Roxb	ENVIRONMENTAL MONITORING AND ASSESSMENT	185	9	7565-7580	10.1007/s10661-013-3119-1

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Kell, Peter; Fuchs, Renate; Hesse, Juergen; Sarazin, Andreas	2009	Areal expansion of Asplenium adiantum-nigrum L. (Black Spleenwort, Aspleniaceae/Pteridophyta) at the edge of northwestern Germany's low mountain range - caused by climatic change?	Tuexenia		29	199-213	
Khamparia, A.; Chatterjee, S. K.	2013	Assessment of air and soil quality and impact of dust on crops around the cement plants in Chhatisgarh, India.	Journal of Environmental Research and Development	7	4A	1586-1590	
Khan, M. R.	2013	Effect of Sulphur Dioxide Toxicity on Seed Germination of Alstonia scholaris R. Br.	Advances in Plant Sciences	26	1	115-116	
Kimura, KC; Fukumasu, H; Chaible, LM; Lima, CE; Horst, MA; Matsuzaki, P; Sanches, DS; Pires, CG; Silva, TC; Pereira, TC; Mello, ML; Matera, JM; Dias, RA; Monnereau, A; Sasco, AJ; Saldiva, PHN; Dagli, MLZ	2010	Evaluation of DNA damage by the alkaline comet assay of the olfactory and respiratory epithelia of dogs from the city of Sao Paulo, Brazil	EXPERIMENTAL AND TOXICOLOGIC PATHOLOGY	62	3	209-219	10.1016/j.etp.2009.03.008
Kirschbaum, Ulrich; Cezanne, Rainer; Eichler, Marion; Hanewald, Klaus; Windisch, Ute	2012	Long-term monitoring of environmental change in German towns through the use of lichens as biological indicators: comparison between the surveys of 1970, 1980, 1985, 1995, 2005 and 2010 in Wetzlar	Environmental Sciences Europe	24		Article No.: 19	10.1186/2190-4715-24-19

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Kish, L; Hotte, N; Kaplan, GG; Vincent, R; Tso, R; Ganzle, M; Rioux, KP; Thiesen, A; Barkema, HW; Wine, E; Madsen, KL	2013	Environmental Particulate Matter Induces Murine Intestinal Inflammatory Responses and Alters the Gut Microbiome	PLOS ONE	8	4		
Kish, L; Hotte, N; Cheng, E; Rioux, KP; Kaplan, GG; Vincent, R; Storr, M; Madsen, K	2011	Orally Ingested Urban Particulate Matter Induces a PRO-Inflammatory Response and Decreases Microflora Diversity	Gastroenterology	140	5	S46-S47	
Knuckles, TL; Lund, AK; Lucas, SN; Campen, MJ	2008	Diesel exhaust exposure enhances venoconstriction via uncoupling of eNOS	Toxicology and Applied Pharmacology	230	3	346-351	10.1016/j.taap.2008.03.010
Kohler, J; Nittka, J; Aussendorf, M; Peichl, L	2008	Long term observation of pollution effects - 30 years of biomonitoring in Bavaria	GEFAHRSTOFFE REINHALTUNG DER LUFT	68	2	227-234	
Kondo, K; Yamada, K; Nakagawa, A; Takahashi, M; Morikawa, H; Sakamoto, A	2008	Molecular characterization of atmospheric NO(2)-responsive germin-like proteins in azalea leaves	BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS	377	3	857-861	10.1016/j.bbrc.2008.10.060
Konga, DB; Kim, YS; Hong, SC; Roh, YM; Lee, CM; Kim, KY; Lee, SM	2009	Oxidative Stress and Antioxidant Defenses in Asthmatic Murine Model Exposed to Printer Emissions and Environmental Tobacco Smoke	Journal of Environmental Pathology Toxicology and Oncology	28	4	325-340	
Korosi, JB; Ginn, BK; Cumming, BF; Smol, JP	2013	Establishing past environmental conditions and tracking long-term environmental change in the Canadian Maritime provinces using lake sediments	ENVIRONMENTAL REVIEWS	21	1	15-27	10.1139/er-2012-0041

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Kovats, N; Acs, A; Ferincz, A; Kovacs, A; Horvath, E ; Kakasi, B; Jancsek-Turoczi, B ; Gelencser, A	2013	Ecotoxicity and genotoxicity assessment of exhaust particulates from diesel-powered buses	Environmental Monitoring and Assessment	185	10	8707-8713	
Koz, B; Cevik, U; Akbulut, S	2013	Biomonitoring of heavy metals by moss and soil around Afsin-Elbistan coal-fired power plant in the East-Mediterranean region of Turkey	FRESENIUS ENVIRONMENTAL BULLETIN	22	12B	3751-3758	
Kuki, KN; Oliva, MA; Pereira, EG	2008	Iron ore industry emissions as a potential ecological risk factor for tropical coastal vegetation	ENVIRONMENTAL MANAGEMENT	42	1	111-121	10.1007/s00267-008-9093-7
Kulshreshtha, K; Rai, A; Mohanty, CS; Roy, RK; Sharma, SC	2009	Particulate Pollution Mitigating Ability of Some Plant Species	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH	3	1	137-142	
Kumar, S; Katoria, D; Sehgal, D	2013	Environment Impact Assessment of Thermal Power Plant for Sustainable Development	International Journal of Environmental Engineering and Management	4	6	567-527	
Kume, A; Numata, S; Watanabe, K; Honoki, H; Nakajima, H; Ishida, M	2009	Influence of air pollution on the mountain forests along the Tateyama-Kurobe Alpine route	ECOLOGICAL RESEARCH	24	4	821-830	10.1007/s11284-008-0557-2
Kupcinskiene, E; Stikliene, A; Judzentiene, A	2008	The essential oil qualitative and quantitative composition in the needles of Pinus sylvestris L. growing along industrial transects	ENVIRONMENTAL POLLUTION	155	4	481-491	10.1016/j.envpol.2008.02.001
Kylin, H; Bouwman, H; Evans, SW	2011	Evaluating threats to an endangered species by proxy: air pollution as threat to the blue swallow (Hirundo atrocaerulea) in South Africa	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	18	2	282-290	10.1007/s11356-010-0369-0

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Lajtha, K; Jones, J	2013	Trends in cation, nitrogen, sulfate and hydrogen ion concentrations in precipitation in the United States and Europe from 1978 to 2010: a new look at an old problem	BIOGEOCHEMISTRY	116	1-3	303-334	10.1007/s10533-013-9860-2
Larose, C; Dommergue, A; Marusczak, N; Coves, J; Ferrari, CP; Schneider, D	2011	Bioavailable Mercury Cycling in Polar Snowpacks	ENVIRONMENTAL SCIENCE & TECHNOLOGY	45	6	2150-2156	10.1021/es103016x
Laskin, DL; Mainelis, G; Turpin, BJ; Patel, KJ; Sunil,VR	2010	Pulmonary Effects of Inhaled Diesel Exhaust in Young and Old Mice: A Pilot Project	The Health Effects Institute				
Lefevre, S; Jensen, FB; Huong, DTT; Wang, T; Phuong, NT; Bayley, M	2012	Effects of nitrite exposure on functional haemoglobin levels, bimodal respiration, and swimming performance in the facultative air-breathing fish Pangasianodon hypophthalmus	AQUATIC TOXICOLOGY	104	1-2	86-93	10.1016/j.aquatox.2011.03.019
Legge, AH (ed.)	2009	Air Quality and Ecological Impacts: Relating Sources to Effects	Developments in Environmental Science	9			
Li, LH; Yi, HL	2012	Differential expression of Arabidopsis defense-related genes in response to sulfur dioxide	CHEMOSPHERE	87	7	718-724	10.1016/j.chemosphere.2011.12.064
Li, PJ; Wang, X; Allinson, G; Li, XJ; Stagnitti, F; Murray, F; Xiong, XZ	2011	Effects of sulfur dioxide pollution on the translocation and accumulation of heavy metals in soybean grain	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	18	7	1090-1097	10.1007/s11356-011-0454-z
Li, RJ; Meng, ZQ; Xie, JF	2008	Effects of sulfur dioxide on the expressions of EGF, EGFR, and COX-2 in airway of asthmatic rats	ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY	54	4	748-757	10.1007/s00244-007-9054-9
Li, SN; Lu, SW; Pan, QH; Zhang, YP; Chen, B; Yang, XB	2013	Research on the eco-purification function of urban forests in Beijing	JOURNAL OF FOOD AGRICULTURE & ENVIRONMENT	11	2	1247-1254	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Liska, J	2012	Lichen flora of the Czech Republic	PRESLIA	84	3	851-862	
Liu Qi-ming; Qiu Mei-rong; Zhang Jin-li; Huang Ning; Huang Zhi-yong	2009	Bio-indicators for air quality assessment	Shengtaixue Zazhi	28	4	771-775	
Liu, N; Lin, ZF; Guan, LL; Lin, GZ; Peng, CL	2009	Light acclimation and HSO(3) (-) damage on photosynthetic apparatus of three subtropical forest species	ECOTOXICOLOGY	18	7	929-938	10.1007/s10646-009-0356-8
Liu, X.; Duan, L.; Mo, J.; Du, E.; Shen, J.; Lu, X.; Zhang, Y.; Zhou, X.; He, C. & Zhang, F.	2011	Nitrogen deposition and its ecological impact in China: An overview	Environmental Pollution	159	10	2251-2264	10.1016/j.envpol.2010.08.002
Liuzzi, VC; Daresta, BE; de Gennaro, G; De Giorgi, C	2012	Different effects of polycyclic aromatic hydrocarbons in artificial and in environmental mixtures on the free living nematode C. elegans	Journal of Applied Toxicology	32	1	45-50	10.1002/jat.1634
Lodenius, M	2013	Use of plants for biomonitoring of airborne mercury in contaminated areas	ENVIRONMENTAL RESEARCH	125	SI	113-123	10.1016/j.envres.2012.10.014
Luong, Thi-Hoan; Jang, Kyoung-Soo; Choi, Woo-Jung; Lee, Kye-Han	2013	Effects of atmospheric environmental changes on annual ring growth of Cryptomeria japonica in Southern Korea	Journal of Ecology and Environment	36	1-4	31-38	10.5141/ecoenv.2013.004
Madureira, J; Mendes, A; Santos, H; Vilaca, J; Neves, MP; Mayan, O; Teixeira, JP	2012	Evaluation of the Indoor Air Quality in Restaurants Before and After a Smoking Ban in Portugal	Indoor and Built Environment	21	2	323-331	10.1177/1420326X11409459

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Mahne, S; Chuang, GC; Pankey, E; Kiruri, L; Kadowitz, PJ; Dellinger, B; Varner, KJ	2012	Environmentally persistent free radicals decrease cardiac function and increase pulmonary artery pressure	American Journal of Physiology - Heart and Circulatory Physiology	303	9	H1135-H1142	10.1152/ajpheart.00545.2012
Malcolm, EG; Ford, AC; Redding, TA; Richardson, MC; Strain, BM; Tetzner, SW	2009	Experimental investigation of the scavenging of gaseous mercury by sea salt aerosol	JOURNAL OF ATMOSPHERIC CHEMISTRY	63	3	221-234	10.1007/s10874-010-9165-y
Mankovska, Blanka; Oszlanyi, Julius; Goryanova, Zoya I.; Frontasyeva, Marina V.; Kastier, Peter	2012	Regional variation in environmental element concentrations in Slovakia derived from analysis of roe deer teeth (Capreolus capreolus L.)	Ekologia (Bratislava)	31	2	138-149	
Manzo, C; Salvini, R; Guastaldi, E; Nicolardi, V; Protano, G	2013	Reflectance spectral analyses for the assessment of environmental pollution in the geothermal site of Mt. Amiata (Italy)	ATMOSPHERIC ENVIRONMENT	79		650-665	10.1016/j.atmosenv.2013.06.038
Mariano, GL ; Lopes, FJS; Jorge, MPPM; Landulfo, E	2010	Assessment of biomass burnings activity with the synergy of sunphotometric and LIDAR measurements in Sao Paulo, Brazil	Atmospheric Research	98	2-4	486-499	10.1016/j.atmosres.2010.08.025
Massara, AC; Bates, JW; Bell, JNB	2009	Exploring causes of the decline of the lichen Lecanora conizaeoides in Britain: effects of experimental N and S applications	LICHENOLOGIST	41		673-681	10.1017/S0024282909990119
Mast, MA; Ely, D	2013	Effect of power plant emission reductions on a nearby wilderness area: a case study in northwestern Colorado	ENVIRONMENTAL MONITORING AND ASSESSMENT	185	9	7081-7095	10.1007/s10661-013-3086-6

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Matsumoto, G; Nakagawa, NK; Vieira, RD; Mauad, T; da Silva, LFF; de Andre, CDS; Carvalho-Oliveira, R; Saldiva, PHN; Garcia, MLB	2010	The time course of vasoconstriction and endothelin receptor A expression in pulmonary arterioles of mice continuously exposed to ambient urban levels of air pollution	Environmental Research	110	3	237-243	10.1016/j.envres.2010.01.003
Mauderly, JL; Barrett, EG; Gigliotti, AP; McDonald, JD; Reed, MD; Seagrave, J; Mitchell, LA; Seilkop, SK	2011	Health effects of subchronic inhalation exposure to simulated downwind coal combustion emissions	Inhalation Toxicology	23	6	349-362	10.3109/08958378.2011.572932
Mauldin, RL; Berndt, T; Sipila, M; Paasonen, P; Petaja, T; Kim, S; Kurten, T; Stratmann, F; Kerminen, VM; Kulmala, M	2012	A new atmospherically relevant oxidant of sulphur dioxide	NATURE	488	7410	193	10.1038/nature11278
Mayack, DT	2012	Hepatic mercury, cadmium, and lead in mink and otter from New York State: monitoring environmental contamination	ENVIRONMENTAL MONITORING AND ASSESSMENT	184	4	2497-2516	10.1007/s10661-011-2134-3
McClenahen, JR; Hutnik, RJ; Davis, DD	2013	Spatial and Temporal Patterns of Bioindicator Mercury in Pennsylvania Oak Forest	JOURNAL OF ENVIRONMENTAL QUALITY	42	2	305-311	10.2134/jeq2012.0237
McDonald, JD; Doyle-Eisele, M; Kracko, D; Lund, A; Surratt, JD; Hersey, SP; Seinfeld, JH; Rohr, AC; Knipping, EM	2012	Cardiopulmonary response to inhalation of secondary organic aerosol derived from gas-phase oxidation of toluene	Inhalation Toxicology	24	11	689-697	10.3109/08958378.2012.712164

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
McGee, GG; Mitchell, MJ	2010	Assessment of Nitrogen and Acid Deposition Impacts to Terrestrial and Aquatic Ecosystems of the Tug Hill, 2005-2007	New York State Energy Research and Development Authority				
Meyer, C; Gilbert, D; Gaudry, A; Franchi, M; Nguyen-Viet, H; Fabure, J; Bernard, N	2010	Relationship of Atmospheric Pollution Characterized by Gas (NO2) and Particles (PM10) to Microbial Communities Living in Bryophytes at Three Differently Polluted Sites (Rural, Urban, and Industrial)	MICROBIAL ECOLOGY	59	2	324-334	10.1007/s00248-009-9580-2
Michael, S; Montag, M; Dott, W	2013	Pro-inflammatory effects and oxidative stress in lung macrophages and epithelial cells induced by ambient particulate matter	Environmental Pollution	180	SI (Special Issue)	19-29	10.1016/j.envpol.2013.01.026
Migliaccio, CT; Bergauff, MA; Palmer, CP; Jessop, F; Noonan, CW; Ward, TJ	2009	Urinary Levoglucosan as a Biomarker of Wood Smoke Exposure: Observations in a Mouse Model and in Children	ENVIRONMENTAL HEALTH PERSPECTIVES	117	1	74-79	10.1289/ehp.11378
Mishra, UC	2004	Environmental impact of coal industry and thermal power plants in India.	Journal of Environmental Radioactivity	72	1-2	35-40	10.1016/S0265-931X(03)00183-8
Mitchell, R; Maher, BA; Kinnersley, R	2010	Rates of particulate pollution deposition onto leaf surfaces: Temporal and inter-species magnetic analyses	ENVIRONMENTAL POLLUTION	158	5	1472-1478	10.1016/j.envpol.2009.12.029
Mitchell, MJ; Raynal, DJ; Driscoll, CT	2009	Response of Adirondack Ecosystems to Atmospheric Pollutants and Climate Change at the Huntington Forest and Arbutus Watershed: Research Findings and Implications for Public Policy	New York State Energy Research and Development Authority				

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Morgan, WT; Allan, JD; Flynn, M; Darbyshire, E; Hodgson, A; Johnson, T; Haywood, JM; Freitas, S; Longo, K; Artaxo, P; Coe, H	2013	Overview of the South American Biomass Burning Analysis (SAMBBA) Field Experiment	Source: NUCLEATION AND ATMOSPHERIC AEROSOLS; Book Series Title: AIP Conference Proceedings	1527		587-590	10.1063/1.4803339
Munson, R; Harris, R; Summers, K; Chen, L; Roy, SB; Driscoll, CT; Kalicin, M; McLaughlin, E; Lorey, P; Newton, RM; Pufall, A; Yavitt, J; Demers, J; Sutherland, J; Engstrom, DR	2008	Mercury in Adirondack Wetlands, Lakes and Terrestrial Systems (MAWLTS)	New York State Energy Research and Development Authority				
Musah, S; DeJarnett, N; Hoyle, GW	2012	Tumor necrosis factor-alpha mediates interactions between macrophages and epithelial cells underlying proinflammatory gene expression induced by particulate matter	Toxicology	299	2-3	125-132	10.1016/j.tox.2012.05.014
Myking, T; Aarrestad, PA; Derome, J; Bakkestuen, V; Bierke, JW; Gytarsky, M; Isaeva, L; Karaban, R; Korotkov, V; Lindgren, M; Lindroos, AJ; Rosberg, I; Salemaa, M; Tommervik, H; Vassilieva, N	2009	Effects of air pollution from a nickel-copper industrial complex on boreal forest vegetation in the joint Russian-Norwegian-Finnish border area	BOREAL ENVIRONMENT RESEARCH	14	2	279-296	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Nair, U.S.; Wu, Y.; Holmes, C.D.; Ter Schure, A.; Kallos, G.; Walters J.T.	2013	Cloud-resolving simulations of mercury scavenging and deposition in thunderstorms	Atmospheric Chemistry and Physics	13		3575-3611	10.5194/acpd-13-3575-2013
Nasr, M; Malloch, DW; Arp, PA	2012	Quantifying Hg within ectomycorrhizal fruiting bodies, from emergence to senescence	FUNGAL BIOLOGY	116	11	1163-1177	10.1016/j.funbio.2012.09.002
Natali, SM; Sanudo-Wilhelmy, SA; Norby, RJ; Zhang, H; Finzi, AC; Lerdau, MT	2008	Increased mercury in forest soils under elevated carbon dioxide	OECOLOGIA	158	2	343-354	10.1007/s00442-008-1135-6
Nayak, R; Biswal, D; Sett, R	2013	Biochemical changes in some deciduous tree species around Talcher thermal power station, Odisha, India	Source: JOURNAL OF ENVIRONMENTAL BIOLOGY Volume: 34	34	3	521-528	
Nelson, P.	2013	Environmental issues: emissions, pollution control, assessment and management	The Coal Handbook: Towards Cleaner Production	2		21-62	10.1533/9781782421177.1.21
Neuman, JA; Aikin, KC; Atlas, EL; Blake, DR; Holloway, JS; Meinardi, S; Nowak, JB; Parrish, DD; Peischl, J; Perring, AE; Pollack, IB; Roberts, JM; Ryerson, TB; Trainer, M	2012	Ozone and alkyl nitrate formation from the Deepwater Horizon oil spill atmospheric emissions	JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES	117			10.1029/2011JD017150
Neverova, O. A.; Legoshchina, O. M.; Bykov, A. A.	2013	Anatomy of leaves of Betula pendula (Roth.) affected by air emissions in industrial area of Kemerovo city	Middle East Journal of Scientific Research	17	3	354-358	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Nicolardi, V; Cai, G; Parrotta, L; Puglia, M; Bianchi, L; Bini, L; Gaggi, C	2012	The adaptive response of lichens to mercury exposure involves changes in the photosynthetic machinery	ENVIRONMENTAL POLLUTION	160		1-10	10.1016/j.envpol.2011.09.015
Nilin, J; Pestana, JLT; Ferreira, NG; Loureiro, S; Costa-Lotufo, LV; Soares, AMVM	2012	Physiological responses of the European cockle Cerastoderma edule (Bivalvia: Cardidae) as indicators of coastal lagoon pollution	SCIENCE OF THE TOTAL ENVIRONMENT	435		44-52	10.1016/j.scitotenv.2012.06.107
Niu, ZC; Zhang, XS; Wang, S; Ci, ZJ; Kong, XR; Wang, ZW	2013	The linear accumulation of atmospheric mercury by vegetable and grass leaves: Potential biomonitors for atmospheric mercury pollution	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	20	9	6337-6343	10.1007/s11356-013-1691-0
Noyes, PD; McElwee, MK; Miller, HD; Clark, BW; Van Tiem, LA; Walcott, KC; Erwin, KN; Levin, ED	2009	The toxicology of climate change: Environmental contaminants in a warming world	ENVIRONMENT INTERNATIONAL	35	6	971-986	10.1016/j.envint.2009.02.006
Ohmori, K; Sato, Y; Nakajima, D; Kageyama, S; Shiraishi, F; Fujimaki, T; Goto, S	2013	Characteristics of the transformation frequency at the tumor promotion stage of airborne particulate and gaseous matter at ten sites in Japan	Environmental Science - Processes & Impacts	15	5	1031-1040	10.1039/c3em00076a

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Palau, JL; Krupa, SV; Calatayud, V; Sanz, M; Millan, M	2009	Relating Source-Specific Atmospheric Sulfur Dioxide Inputs to Ecological Effects Assessment in a Complex Terrain	AIR QUALITY AND ECOLOGICAL IMPACTS: RELATING SOURCES TO EFFECTS	9		99-120	10.1016/S1474-8177(08)00204-0
Park, EJ; Roh, J; Kim, Y; Park, K; Kim, DS; Yu, SD	2011	PM 2.5 collected in a residential area induced Th1-type inflammatory responses with oxidative stress in mice	Environmental Research	11	3	348-355	10.1016/j.envres.2010.11.001
Pavlik, M; Pavlikova, D; Zemanova, V; Hnilicka, F; Urbanova, V; Szakova, J	2012	Trace elements present in airborne particulate matter-Stressors of plant metabolism	Ecotoxicology and Environmental Safety	79		101-107	10.1016/j.ecoenv.2011.12.009
Pavlova, E.; Pavlov, D.; Doncheva, M.; Malinova, L.; Tsvetkova, E.	2009	Intense beech ecosystem monitiring of Vitinia station	Nauka za Gorata	47	3	25-52	
Perez, CM; Ledbetter, AD; Hazari, MS; Haykal-Coates, N; Carll, AP; Winsett, DW; Costa, DL ; Farraj, AK	2013	Hypoxia Stress Test Reveals Exaggerated Cardiovascular Effects in Hypertensive Rats After Exposure to the Air Pollutant Acrolein	Toxicological Sciences	132	2	467-477	
Petkovsek, SA	2013	Forest biomonitoring of the largest Slovene thermal power plant with respect to reduction of air pollution	ENVIRONMENTAL MONITORING AND ASSESSMENT	185	2	1809-1823	10.1007/s10661-012-2669-y

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Petkovsek, SAS; Batic, F; Lasnik, CR	2008	Norway spruce needles as bioindicator of air pollution in the area of influence of the Sostanj Thermal Power Plant, Slovenia	ENVIRONMENTAL POLLUTION	151	2	287-291	10.1016/j.envpol.2007.06.036
Pham, H; Bonham, AC; Pinkerton, KE; Chen, CY	2009	Central Neuroplasticity and Decreased Heart Rate Variability after Particulate Matter Exposure in Mice	Environmental Health Perspectives	117	9	1448-1453	10.1289/ehp.0900674
Piccotto, M; Bidussi, M; Tretiach, M	2011	Effects of the urban environmental conditions on the chlorophyll a fluorescence emission in transplants of three ecologically distinct lichens	ENVIRONMENTAL AND EXPERIMENTAL BOTANY	73	SI	102-107	10.1016/j.envexpbot.2010.09.010
Piekarska, K	2010	Mutagenicity of Airborne Particulates Assessed by Salmonella Assay and the SOS Chromotest in Wroclaw, Poland	Journal of the Air & Waste Management	60	8	993-1001	10.3155/1047-3289.60.8.993
Pinkerton, KE; Zhou, Y; Zhong, C; Smith, KR; Teague, SV; Kennedy, IM; Ménache MG	2008	Mechanisms of Particulate Matter Toxicity in Neonatal and Young Adult Rat Lungs	The Health Effects Institute				
Pirela, S; Molina, R; Watson, C; Cohen, JM; Bello, D; Demokritou, P; Brain, J	2013	Effects of copy center particles on the lungs: a toxicological characterization using a Balb/c mouse model	Inhalation Toxicology	25	9	498-508	
Pirrone, Nicola, Mason, Robert (Eds.)	2009	Mercury Fate and Transport in the Global Atmosphere					
Pirrone, N; Hedgecock, IM; Cinnirella, S; Sprovieri, F	2010	Overview of major processes and mechanisms affecting the mercury cycle on different spatial and temporal scales	Conference on European Research Course on Atmospheres (ERCA 9) - From the Global Mercury Cycle to the Discoveries of Kuiper Belt Objects	9		3-33	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Pokale, WK	2012	Effects of thermal power plant on envronment	Scientific Reviews & Chemical Communications	2	3	212-215	
Popek, R; Gawronska, H; Wrochna, M; Gawronski, SW; Saebo, A	2013	Particulate matter on foliage of 13 woody species: Deposition on surgaces and phytostabilisation in waxes - A 3-year study	INTERNATIONAL JOURNAL OF PHYTOREMEDIATION	15	3	245-256	10.1080/15226514.2012.694498
Prieto, AM; Santos, AG; Csipak, AR; Caliri, CM; Silva, IC; Arbex, MA; Silva, FS; Marchi, MRR; Cavalheiro, AJ; Silva, DHS; Bolzani, VS; Soares, CP	2012	Chemopreventive activity of compounds extracted from Casearia sylvestris (Salicaceae) Sw against DNA damage induced by particulate matter emitted by sugarcane burning near Araraquara, Brazil	Toxicology and Applied Pharmacology	265	3	368-372	10.1016/j.taap.2012.09.005
Public Service Commission of Wisconsin	2012	Environmental Impacts of Power Plants	Public Service Commission of Wisconsin				
Qin, GH; Wang, JX; Huo, YJ; Yan, HX; Jiang, CC; Zhou, JX; Wang, X; Sang, N	2009	Sulfur dioxide inhalation stimulated mitochondrial biogenesis in rat brains	TOXICOLOGY	300	1-2	67-74	10.1016/j.tox.2012.05.026
Qin, GH; Meng, ZQ	2010	Sulfur Dioxide and Benzo(a)pyrene Modulates CYP1A and Tumor-Related Gene Expression in Rat Liver	ENVIRONMENTAL TOXICOLOGY	25	2	169-179	10.1002/tox.20484
Rainho, CR; Velho, AMA; Correa, SM; Mazzei, JL; Aiub, CAF; Felzenszwalb, I	2013	Prediction of health risk due to polycyclic aromatic hydrocarbons present in urban air in Rio de Janeiro, Brazil	Genetics and Molecular Research	12	3	3992-4002	10.4238/2013.February.28.6
Rekha Nayak; Rupnarayan Sett; Debasis Biswal	2011	Fluctuations in foliar nutrient contents in different tree species induced by thermal power plant emissions in Angul District, Orissa, India. Changes in foliar nutrient content of plants induced by thermal power plant emission	Journal of Tropical Forestry	27	3	1-17	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Rice, K. C. & Herman, J. S.	2012	Acidification of Earth: An assessment across mechanisms and scales	Applied Geochemistry	27	1	1-14	10.1016/j.apgeochem.2011.09.001
Rimmer, CC; Miller, EK; McFarland, KP; Taylor, RJ; Faccio, SD	2010	Mercury bioaccumulation and trophic transfer in the terrestrial food web of a montane forest	ECOTOXICOLOGY	19	4	697-709	10.1007/s10646-009-0443-x
Rinne, KT; Loader, NJ; Switsur, VR; Treydte, KS; Waterhouse, JS	2010	Investigating the influence of sulphur dioxide (SO2) on the stable isotope ratios (delta C-13 and delta O-18) of tree rings	GEOCHIMICA ET COSMOCHIMICA ACTA	74	8	2327-2339	10.1016/j.gca.2010.01.021
Roig, N; Sierra, J; Rovira, J; Schuhmacher, M; Domingo, JL; Nadal, M	2013	In vitro tests to assess toxic effects of airborne PM10 samples. Correlation with metals and chlorinated dioxins and furans	Science of the Total Environment	443		791-797	10.1016/j.scitotenv.2012.11.022
Rolison, JM; Landing, WM; Luke, W; Cohen, M; and Salters, VJM	2013	Isotopic composition of species-specific atmospheric Hg in a coastal environment	Chemical Geology	336		37-49	10.1016/j.chemgeo.2012.10.007
Ross, Z; Kheirbek, I; Clougherty, JE; Ito, K; Matte, T ; Markowitz, S; Eisl, H	2011	Noise, air pollutants and traffic: Continuous measurement and correlation at a high-traffic location in New York City	Environmental Research	111	8	1054-1063	10.1016/j.envres.2011.09.004
Rucandio, MI; Petit-Dominguez, MD; Fidalgo-Hijano, C; Garcia-Gimenez, R	2011	Biomonitoring of chemical elements in an urban environment using arboreal and bush plant species	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	18	1	51-63	10.1007/s11356-010-0350-y
Rydval, M; Wilson, R	2012	The Impact of Industrial SO2 Pollution on North Bohemia Conifers	WATER AIR AND SOIL POLLUTION	223	9	5727-5744	10.1007/s11270-012-1310-6
Sabo, A; Popek, R; Nawrot, B; Hanslin, H M; Gawronska, H; Gawronski, S W	2012	Plant species differences in particulate matter accumulation on leaf surfaces	Science of the total environment	427-428		347-354	10.1016/j.scitotenv.2012.03.084

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Sadeghian, M. M.	2012	Biomonitoring of particulate matter by magnetic properties of Ulmus carpinifolia leaves.	African Journal of Biotechnology	11	73	13827-13830	
Sagnotti, L; Taddeucci, J; Winkler, A; Cavallo, A	2009	Compositional, morphological, and hysteresis characterization of magnetic airborne particulate matter in Rome, Italy	GEOCHEMISTRY GEOPHYSICS GEOSYSTEMS	10			10.1029/2009GC002563
Saha, DC; Padhy, PK	2011	Effects of stone crushing industry on Shorea robusta and Madhuca indica foliage in Lalpahari forest	ATMOSPHERIC POLLUTION RESEARCH	2	4	463-476	10.5094/APR.2011.053
Sander, I; Fleischer, C; Borowitzki, G; Bruning, T; Raulf-Heimsoth, M	2008	Development of a two-site enzyme immunoassay based on monoclonal antibodies to measure airborne exposure to (1 -> 3)-beta-D-glucan	JOURNAL OF IMMUNOLOGICAL METHODS	337	1	55-62	10.1016/j.jim.2008.05.010
Sang, N; Yun, Y; Yao, GY; Li, HY; Guo, L; Li, GK	2011	SO2-Induced Neurotoxicity Is Mediated by Cyclooxygenases-2-Derived Prostaglandin E-2 and its Downstream Signaling Pathway in Rat Hippocampal Neurons	TOXICOLOGICAL SCIENCES	124	4	400-413	10.1093/toxsci/kfr224
Santiago, M; Vivanco, MG; Stein, AF	2012	SO2 effect on secondary organic aerosol from a mixture of anthropogenic VOCs: experimental and modelled results	INTERNATIONAL JOURNAL OF ENVIRONMENT AND POLLUTION	50	SI	224-233	
Sarwar, G; Pinder, RW; Appel, KW ; Mathur, R; Carlton, AG	2009	Examination of the impact of photoexcited NO2 chemistry on regional air quality	ATMOSPHERIC ENVIRONMENT	43	40	6383-6387	10.1016/j.atmosenv.2009.09.012
Schneider, BC; Constant, SL; Patierno, SR; Jurjus, RA; Ceryak, SM	2012	Exposure to particulate hexavalent chromium exacerbates allergic asthma pathology	Toxicology and Applied Pharmacology	25	1	38-44	10.1016/j.taap.2011.12.001

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Semple, S; Garden, C; Coggins, M; Galea, KS; Whelan, P; Cowie, H; Sanchez-Jimenez, A; Thorne, PS; Hurley, JF; Ayres, JG	2012	Contribution of solid fuel, gas combustion, or tobacco smoke to indoor air pollutant concentrations in Irish and Scottish homes	Indoor Air	22	3	212-223	10.1111/j.1600-0668.2011.00755.x
Serbula, SM; Miljkovic, DD; Kovacevic, RM; Ilic, AA		Assessment of airborne heavy metal pollution using plant parts and topsoil	ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY	76		209-214	10.1016/j.ecoenv.2011.10.009
Setala, H; Viippola, V; Rantalainen, AL; Pennanen, A; Yli-Pelkonen, V	2013	Does urban vegetation mitigate air pollution in northern conditions?	ENVIRONMENTAL POLLUTION	183	SI	104-112	10.1016/j.envpol.2012.11.010
Sha, CY; Wang, TH; Lu, JJ	2010	Relative Sensitivity of Wetland Plants to SO2 Pollution	WETLANDS	30	6	1023-1030	10.1007/s13157-010-0095-x
Sharma, A. P.; Tripathi, B. D.	2009	Biochemical responses in tree foliage exposed to coal-fired power plant emission in seasonally dry tropical environment.	Environmental Monitoring and Assessment	158	1/4	197-212	10.1007/s10661-008-0573-2
Silva, LT; Mendes, JFG	2009	Atmospheric emissions of one pulp and paper mill. Contribution to the air quality of Viana do Castelo	8th WSEAS International Conference on System Science and Simulation in Engineering			21-26	
Silva, SF; Meirelles, ST; Moraes, RM	2013	The guava tree as bioindicator during the process of fuel replacement of an oil refinery	ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY	91		39-45	10.1016/j.ecoenv.2013.01.004
Simatonyte, Asta	2010	Possible Changes in the Pace of Scots Pine (Pinus sylvestris L.) Radial Increment in City Forests and Parks	BALTIC FORESTRY	16	1	8-15	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Sims, I; Crane, M; Johnson, I; Credland, P	2009	Biomonitoring the environmental impact of atmospheric emissions from the Avonmouth zinc smelter, United Kingdom	ECOTOXICOLOGY	18	7	961-970	10.1007/s10646-009-0382-6
Singla, V; Pachauri, T; Satsangi, A; Kumari, KM; Lakhani, A	2012	Characterization and Mutagenicity Assessment of PM2.5 and PM10 PAH at Agra, India	Polycyclic Aromatic Compounds	32	2	199-220	10.1080/10406638.2012.657740
Sitkova, Z.; Pavlenda, P.; Pavlendova, H.; Priwitzer, T.; Hlasny, T.	2010	Air pollution load and nutrient status of Norway spruce forest stands in the north-western part of Slovakia	Beskydy	3	1	93-102	
Skeie, R. B.; Fuglestvedt, J.; Berntsen, T.; Lund, M. T.; Myhre, G. & Rypdal, K.	2009	Global temperature change from the transport sectors: Historical development and future scenarios	Atmospheric Environment	43	39	6260-6270	10.1016/j.atmosenv.2009.05.025
Skochilova, E. A.; Zakamskaya, E. S.	2013	The influence of urban environment on chlorophyll content and ascorbic acid in the leaves of Tilia cordata (Tiliaceae)	Rastitel'nye Resursy	49	4	541-547	
Skrbic, B; Milovac, S; Matavulj, M	2012	Multielement profiles of soil, road dust, tree bark and wood-rotten fungi collected at various distances from high-frequency road in urban area	ECOLOGICAL INDICATORS	13	1	168-177	10.1016/j.ecolind.2011.05.023
Slaby, A; Lisowska, M	2012	Epiphytic lichen recolonization in the centre of Cracow (Southern Poland) as a result of air quality improvement	POLISH JOURNAL OF ECOLOGY	60	2	225-240	
Soltuzu, B. D.; Zamfirache, M. M.; Ivanescu, L.; Toma, C.	2012	Foliar response reactions induced by atmospheric pollutants on the Aesculus hippocastanum L. and Tilia tomentosa L. species from Iasi city area	Analele Stiintifice ale Universitatii 'Al I Cuza' din Iasi. (Serie Noua) Sectiunea II a. Biologie Vegetala	58	2	61-71	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Sousa, GD; Zucchi, TD; Zucchi, FD; Miller, RG; Anjos, RMA; Poli, P; Zucchi, TMAD	2009	Aspergillus nidulans as a biological system to detect the genotoxic effects of mercury fumes on eukaryotes	GENETICS AND MOLECULAR RESEARCH	8	2	404-413	
Sovacool, B. K.	2009	Contextualizing avian mortality: A preliminary appraisal of bird and bat fatalities from wind, fossil-fuel, and nuclear electricity	Energy Policy	37	6	2241-2248	10.1016/j.enpol.2009.02.011
Stamenkovic, J; Gustin, MS; Arnone, JA; Johnson, DW; Larsen, JD; Verburg, PSJ	2008	Atmospheric mercury exchange with a tallgrass prairie ecosystem housed in mesocosms	SCIENCE OF THE TOTAL ENVIRONMENT	406	1-2	227-238	10.1016/j.scitotenv.2008.07.047
Stamenkovic, J; Gustin, MS	2009	Nonstomatal versus Stomatal Uptake of Atmospheric Mercury	ENVIRONMENTAL SCIENCE & TECHNOLOGY	43	5	1367-1372	10.1021/es801583a
Stamper, V; Copeland, C; Williams, M; Spencer, T	2012	Poisoning the great lakes: Mercury Emissions from Coal-Fired Power Plants In the Great Lakes Region	Natural Resources Defense Council				
Staszewski, T; Kubiesa, P; Lukasik, W	2012	Response of spruce stands in national parks of southern Poland to air pollution in 1998-2005	EUROPEAN JOURNAL OF FOREST RESEARCH	131	4	1163-1173	10.1007/s10342-011-0587-0
Stavishenko, IV	2010	The State of Forest Xylotrophic Fungal Communities Exposed to Industrial Air Pollutants	RUSSIAN JOURNAL OF ECOLOGY	41	5	445-449	10.1134/S1067413610050140
Stern, GA; Macdonald, RW; Outridge, PM; Wilson, S; Chetelat, J; Cole, A; Hintelmann, H; Loseto, LL; Steffen, A; Wang, FY; Zdanowicz, C	2012	How does climate change influence arctic mercury?	SCIENCE OF THE TOTAL ENVIRONMENT	414		22-42	10.1016/j.scitotenv.2011.10.039

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Stevens, R; Lonsdale, C; Brock, C; Makar, P; Knipping, E; Reed, M; Crawford, J; Holloway, J; Ryerson, T; Huey, LG; Nowak, J; Pierce, J	2013	Aerosol Nucleation in Coal-Fired Power-Plant Plumes	NUCLEATION AND ATMOSPHERIC AEROSOLS	1527		417-420	10.1063/1.4803292
Stravinskiene, V; Bartkevicius, E; Plausinyte, E	2013	Dendrochronological research of Scots pine (Pinus sylvestris L.) radial growth in vicinity of industrial pollution	DENDROCHRONOLOGIA	31	3	179-186	10.1016/j.dendro.2013.04.001
Sunderland, EM; Krabbenhoft, DP; Moreau, JW; Strode, SA; and Landing, WM.	2009	Mercury Sources, Distribution, and Bioavailability in the North Pacific Ocean: Insights from Data and Models	Global Biogeochemical Cycles	23	2		10.1029/2008GB003425
Sutton, MA; Reis, S; Baker, SMH (eds.)	2009	Atmospheric Ammonia:DETECTING EMISSION CHANGES AND ENVIRONMENTAL IMPACTS	UNECE Expert Workshop on Atmospheric Ammonia - Detecting Emission Changes and Environmental Impacts				
Szonyi, M; Sagnotti, L; Hirt, AM	2008	A refined biomonitoring study of airborne particulate matter pollution in Rome, with magnetic measurements on Quercus Ilex tree leaves	GEOPHYSICAL JOURNAL INTERNATIONAL	173	1	127-141	10.1111/j.1365-246X.2008.03715.x
Tabatchnick, MD; Nogaro, G; Hammerschmidt, CR	2012	Potential sources of methylmercury in tree foliage	ENVIRONMENTAL POLLUTION	160		82-87	10.1016/j.envpol.2011.09.013
Taia, W; Basahi, J; Hassan, I	2013	Impact of ambient air on physiology, pollen tube growth, pollen germination and yield in pepper (Capsicum annuum L.)	PAKISTAN JOURNAL OF BOTANY	45	3	921-926	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Takahashi, M; Kohama, S; Shigeto, J; Hase, Y; Tanaka, A; Morikawa, H	2012	Mutants of Ficus pumila produced by ion beam irradiation with an improved ability to uptake and assimilate atmospheric nitrogen dioxide	INTERNATIONAL JOURNAL OF PHYTOREMEDIATION	14	3	275-281	10.1080/15226514.2011.604694
Tanentzap, AJ; Yan, ND; Keller, B; Girard, R; Heneberry, J; Gunn, JM; Hamilton, DP; Taylor, PA	2008	Cooling lakes while the world warms: Effects of forest regrowth and increased dissolved organic matter on the thermal regime of a temperate, urban lake	LIMNOLOGY AND OCEANOGRAPHY	53	1	404-410	10.4319/lo.2008.53.1.0404
Tapanainen, M; Jalava, PI; Maki-Paakkanen, J; Hakulinen, P; Lamberg, H; Ruusunen, J; Tissari, J; Jokiniemi, J; Hirvonen, MR	2012	Efficiency of log wood combustion affects the toxicological and chemical properties of emission particles	Inhalation Toxicology	24	6	343-355	10.3109/08958378.2012.671858
Tazaki, K.; Asada, R.; Watanabe, H.; Shiraki, K.; Iwai, T.; Wakimoto, R.; Songo, M.A.M.; Muhongo, S.M.	2008	Clays and bacteria carry important role to release Hg from small scale Au mine near Lake Victoria, Tanzania	Science Reports of Kanazawa University	52		1-26	
Teranishi, M; Toyooka, T; Ohura, T; Masuda, S; Ibuki, Y	2010	Benzo[a]pyrene exposed to solar-simulated light inhibits apoptosis and augments carcinogenicity	Chemico-Biological Interactions	185	1	4-11	10.1016/j.cbi.2010.02.044
Terhorst, J; Berkman, M	2010	Effect of coal-fired power generation on visibility in a nearby national park	Atmospheric Environment	44	21-22	2524-2531	10.1016/j.atmosenv.2010.04.022
Tesar, V. (et al)	2011	Conversion of a forest affected by air pollution in the Trutnov region	Prestavba lesa zasazeneho imisemi na Trutnovsku				

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Thomas, RB; Spal, SE; Smith, KR; Nippert, JB	2013	Evidence of recovery of Juniperus virginiana trees from sulfur pollution after the Clean Air Act	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA	110	38	15131 9-15324	10.1073/pnas.1308115110
Tiwary, N. P.; Pramod Kumar; Pritam Kumar; Vivekanand Prasad; Deo, D. P.; Om Prakash; Prasad, R. R.	2009	The endocrine kidney of the freshwater air brathing fish, Channa gachua (bloch) in relation to effect of heavy metal pollutants.	Proceedings of the Zoological Society of India	8	1	107-110	
Tiwary, A.; Namdeo, A.; Dore, A. & Bell, M.	2011	Aerosol loading in an urban environment from a biofuel based CHP plant: assessment and mitigation	Procedia Environmental Sciences	4		71-75	10.1016/j.proenv.2011.03.009
Tomashuk, TA; Truong, TM; Mantha, M; McGowin, AE	2012	Atmospheric polycyclic aromatic hydrocarbon profiles and sources in pine needles and particulate matter in Dayton, Ohio, USA	ATMOSPHERIC ENVIRONMENT	51		196-202	10.1016/j.atmosenv.2012.01.028
Traversi, D; Degan, R; De Marco, R; Gilli, G; Pignata, C; Ponzio, M; Rava, M; Sessarego, F; Villani, S; Bono, R	2008	Mutagenic properties of PM2.5 air pollution in the Padana Plain (Italy) before and in the course of XX Winter Olympic Games of "Torino 2006"	ENVIRONMENT INTERNATIONAL	34	7	966-970	10.1016/j.envint.2008.02.007
Traversi, D; Degan, R; De Marco, R; Gilli, G; Pignata, C; Villani, S; Bono, R	2009	Mutagenic properties of PM2.5 urban pollution in the Northern Italy: The nitro-compounds contribution	Environment International	35	6	905-910	10.1016/j.envint.2009.03.010

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Trubina, MR	2009	Species richness and resilience of forest communities: combined effects of short-term disturbance and long-term pollution	PLANT ECOLOGY	201	1	339-350	10.1007/s11258-008-9558-z
U.S. EPA	2009	Integrated Science Assessment for Particulate Matter (Final Report)	United States Environmental Protection Agency				
U.S. EPA	2008	Integrated Science Assessment (ISA) for Oxides of Nitrogen and Sulfur Ecological Criteria (Final Report)	United States Environmental Protection Agency				
Umbuzeiro, G. de A.; Franco, A.; Magalhaes, D.; Castro, F. J. V. de; Kummrow, F.; Rech, C. M.; Carvalho, L. R. F. de; Vasconcellos, P. de C.	2008	A preliminary characterization of the mutagenicity of atmospheric particulate matter collected during sugar cane harvesting using the Salmonella/microsome microsuspension assay.	Environmental and Molecular Mutagenesis	49	4	249-255	
Urosevic, M; Yebra-Rodriguez, A; Sebastian-Pardo, E; Cardell, C	2012	Black soiling of an architectural limestone during two-year term exposure to urban air in the city of Granada (S Spain)	Science of the Total Environment	414		564-575	10.1016/j.scitotenv.2011.11.028
Uslu, I; Gokmese, F	2010	Coal an Impure Fuel Source: Radiation Effects of Coal-fired Power Plants in Turkey	Hacettepe Journal of Bioloby and Chemistry	38	4	259-268	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Vallano, DM; Sparks, JP	2013	Foliar delta N-15 is affected by foliar nitrogen uptake, soil nitrogen, and mycorrhizae along a nitrogen deposition gradient	OECOLOGIA	172	1	47-58	10.1007/s00442-012-2489-3
Van Dam, B; Helmig, D; Burkhart, JF; Obrist, D; Oltmans, SJ	2013	Springtime boundary layer O-3 and GEM depletion at Toolik Lake, Alaska	JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES	118	8	3382-3391	10.1002/jgrd.50213
Vasiliu-Oromulu, L.; Jenser, G.; Barbuceanu, D.	2008	Frankliniella intonsa (Trybom, 1895), a Very Sensitive Bioindicator of Air Pollution	Acta Phytopathologica et Entomologica Hungarica	43	2	405-412	10.1556/APhyt.43.2008.2.25
Veras, MM; Damaceno-Rodrigues, NR; Silva, RMG; Scoriza, JN; Saldiva, PHN; Caldini, EG; Dolhnikoff, M	2009	Chronic exposure to fine particulate matter emitted by traffic affects reproductive and fetal outcomes in mice	Environmental Research	109	5	536-543	10.1016/j.envres.2009.03.006
Veras, MM; Guimaraes-Silva, RM; Caldini, EG; Saldiva, PHN; Dolhnikoff, M; Mayhew, TM	2012	The effects of particulate ambient air pollution on the murine umbilical cord and its vessels: A quantitative morphological and immunohistochemical study	Reproductive Toxicology	34	4	598-606	
Vorobeichik, E. L.; Ermakov, A. I.; Zolotarev, M. P.; Tuneva, T. K.	2012	Changes in diversity of soil macrofauna in industrial pollution gradient	Russian Entomological Journal	21	2	203-218	
Vu, B; Alves, CA; Goncalves, C; Pio, C; Goncalves, F; Pereira, R	2012	Mutagenicity assessment of aerosols in emissions from wood combustion in Portugal	ENVIRONMENTAL POLLUTION	166		172-181	10.1016/j.envpol.2012.03.005

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Waldner, CL	2009	Risk of Abortion and Stillbirth in Cow-Calf Herds Exposed to the Oil and Gas Industry in Western Canada	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	64	SI	29-45	
Waldner, CL	2008	Western Canada Study of Animal Health Effects Associated With Exposure to Emissions From Oil and Natural Gas Field Facilities. Study Design and Data Collection I. Herd Performance Records and Management	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	63	4	167-184	
Waldner, Cheryl L.; Stryhn, Henrik	2008	Risk of Nonpregnancy, Risk of Disposal for Pregnant Cows, and Duration of the Calving Interval in Cow-Calf Herds Exposed to the Oil and Gas Industry in Western Canada	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	63	4	241-261	
Waldner, Cheryl L.	2008	The Association Between Exposure to the Oil and Gas Industry and Beef Calf Mortality in Western Canada	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	63	4	220-240	
Waldner, Cheryl L.	2008	Western Canada Study of Animal Health Effects Associated With Exposure to Emissions From Oil and Natural Gas Field Facilities. Study Design and Data Collection III. Methods of Assessing Animal Exposure to Contaminants From the Oil and Gas Industry	ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH	63	4	201-219	

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Wamelink, G. W. W.; van Adrichem, M. H. C.	2011	End report Ecological Conditions project.	Wageningen University and Research Centre		2195		
Wang, Hua; Lu, Shao-Wei; Li, Shao-Ning; Pan, Qing-Hua; Zhang, Yu-ping	2013	Inhalable particulate matter and fine particulate matter: their basic characteristics, monitoring methods, and forest regulation functions	The journal of applied ecology	24	3	869-877	
Wang, H; Ouyang, ZY; Chen, WP; Wang, XK; Zheng, H; Ren, YF	2011	Water, heat, and airborne pollutants effects on transpiration of urban trees	Environmental Pollution	159	8-9	2127-2137	10.1016/j.envpol.2011.02.031
Wang, PL; Thevenot, P; Saravia, J; Ahlert, T; Cormier, SA	2011	Radical-Containing Particles Activate Dendritic Cells and Enhance Th17 Inflammation in a Mouse Model of Asthma	American Journal of Respiratory Cell and Molecular Biology	45	5	977-983	10.1165/rcmb.2011-00010C
Watras, CJ; Morrison, KA; Rubsam, JL; Rodger, B	2009	Atmospheric mercury cycles in northern Wisconsin	ATMOSPHERIC ENVIRONMENT	43	26	4070-4077	10.1016/j.atmosenv.2009.04.051
Wei, AL; Xin, XJ; Wang, YS; Zhang, C; Cao, DM	2013	Signal regulation involved in sulfur dioxide-induced guard cell apoptosis in Hemerocallis fulva	ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY	98		41-45	10.1016/j.ecoenv.2013.09.029
Westphal, GA; Krahl, J ; Munack, A ; Rosenkranz, N; Schroder, O; Schaak, J; Pabst, C; Bruning, T; Bunger, J	2013	Combustion of Hydrotreated Vegetable Oil and Jatropha Methyl Ester in a Heavy Duty Engine: Emissions and Bacterial Mutagenicity	ENVIRONMENTAL SCIENCE & TECHNOLOGY	47	11	6038-6046	10.1021/es400518d

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
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Wik, A; Dave, G	2009	Occurrence and effects of tire wear particles in the environment - A critical review and an initial risk assessment	Environmental Pollution	157	1	1-11	10.1016/j.envpol.2008.09.028
Wilson, DW; Aung, HH; Lame, MW; Plummer, L; Pinkerton, KE; Ham, W; Kleeman, M; Norris, JW; Tablin, F	2010	Exposure of mice to concentrated ambient particulate matter results in platelet and systemic cytokine activation	INHALATION TOXICOLOGY	22	4	267-276	10.3109/08958370903278069 Published: MAR 2010
Witt, EL; Kolka, RK; Nater, EA; Wickman, TR	2009	Forest Fire Effects on Mercury Deposition in the Boreal Forest	ENVIRONMENTAL SCIENCE & TECHNOLOGY	43	6	1776-1782	10.1021/es802634y
Wittig, Ruediger	2008	Experimental research on recolonisation with Anemone nemorosa of the beech forests of the Ruhr district (Germany) floristically impoverished by air pollution	ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	15	6	492-498	10.1007/s11356-008-0026-z
Wu, SY; Hu, JL; Zhang, Y; Aneja, VP	2008	Modeling atmospheric transport and fate of ammonia in North Carolina - Part II: Effect of ammonia emissions on fine particulate matter formation	ATMOSPHERIC ENVIRONMENT	42	14	3437-3451	10.1016/j.atmosenv.2007.04.022
Wu, YH; Chan, CC; Chew, GL; Shih, PW; Lee, CT; Chao, HJ	2012	Meteorological factors and ambient bacterial levels in a subtropical urban environment	INTERNATIONAL JOURNAL OF BIOMETEOROLOGY	56	6	1001-1009	10.1007/s00484-011-0514-6
Wuytack, T; Wuyts, K; Van Dongen, S; Baeten, L; Kardel, F; Verheyen, K; Samson, R	2011	The effect of air pollution and other environmental stressors on leaf fluctuating asymmetry and specific leaf area of Salix alba L	ENVIRONMENTAL POLLUTION	159	10	2405-2411	10.1016/j.envpol.2011.06.037

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Wuytack, T; AbdElgawad, H; Staelens, J; Asard, H; Boeckx, P; Verheyen, K; Samson, R	2013	The response of the foliar antioxidant system and stable isotopes (delta C-13 and delta N-15) of white willow to low-level air pollution	PLANT PHYSIOLOGY AND BIOCHEMISTRY	67		154-161	10.1016/j.plaphy.2013.03.007
Wuytack, T; Samson, R; Wuyts, K; Adriaenssens, S; Kardel, F; Verheyen, K	2013	Do Leaf Characteristics of White Willow (Salix alba L.), Northern Red Oak (Quercus rubra L.), and Scots Pine (Pinus sylvestris L.) Respond Differently to Ambient Air Pollution and Other Environmental Stressors?	WATER AIR AND SOIL POLLUTION	224	8		10.1007/s11270-013-1635-9
Xie, JF; Li, RJ; Fan, RJ; Meng, ZQ	2009	Effects of sulfur dioxide on expressions of p53, bax and bcl-2 in lungs of asthmatic rats	INHALATION TOXICOLOGY	21	8-11	952-957	10.1080/08958370802629602
Xu Jie; Bai KunDong; Wan XianChong; Cheng GuoHua; Zhang CunYi; Zhang ZhaoXin	2011	Responses of poplar (Populus * euramericana cv. "74/76") SO 2-resistant clone to SO 2 fumigation and the variation in antioxidant systems	Scientia Silvae Sinicae	47	2	66-71	
Xu, Chengxiang; Li, Zizhong; Li, Daohong	2013	Relationships between the diversity of animal communities and the lighting environment and content of heavy metals in soils in Guizhou Zhijin Cave	Shengwu Duoyangxing/Biodiversity Science	21	1	62-70	10.3724/SP.J.1003.2013.09120
Xu, CY; Griffin, KL; Blazier, JC; Craig, EC; Gilbert, DS; Sritrairat, S; Anderson, OR; Castaldi, MJ; Beaumont, L	2009	The growth response of Alternanthera philoxeroides in a simulated post-combustion emission with ultrahigh [CO2] and acidic pollutants	ENVIRONMENTAL POLLUTION	157	7	2118-2125	10.1016/j.envpol.2009.02.013
Yamaguchi, M; Watanabe, M; Tabe, C ; Naba, J; Matsumura, H; Kohno, Y; Izuta, T	2012	Effects of sulfur dioxide on growth and net photosynthesis of six Japanese forest tree species grown under different nitrogen loads	TREES-STRUCTURE AND FUNCTION	26	6	1859-1874	10.1007/s00468-012-0755-y

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Yamagishi, N; Ito, Y; Ramdhan, DH; Yanagiba, Y; Hayashi, Y; Wang, D; Li, CM; Taneda, S; Suzuki, AK; Taya, K; Watanabe, G; Kamijima, M; Nakajima, T	2012	Effect of nanoparticle-rich diesel exhaust on testicular and hippocampus steroidogenesis in male rats	Inhalation Toxicology	24	8	459-467	10.3109/08958378.2012.688225
Yang Dong-yan; Li Xiu-jin; Chen Yuan-yuan; Zou Ben-dong; Lin An-guo	2011	Characteristics of Chemical Compositions of Precipitation in Beijing	Huanjing Kexue	32	7	1867-1873	
Yao Qing; Han SuQin; Cai ZiYing	2013	The pollution characteristics and potential ecological risk of heavy metals in PM 2.5 during heating season in Tianjin.	China Environmental Science	33	9	1596-1600	
Yoshida, T; Yoshioka, Y; Fujimura, M; Yamashita, K; Higashisaka, K; Nakanishi, R; Morishita, Y; Kayamuro, H; Nabeshi, H; Nagano, K; Abe, Y; Kamada, H; Tsunoda, S; Yoshikawa, T; Itoh, N; Tsutsumi, Y	2010	Potential adjuvant effect of intranasal urban aerosols in mice through induction of dendritic cell maturation	Toxicology Letters	199	3	383-388	10.1016/j.toxlet.2010.10.002
Yoshida, S; Takano, H; Nishikawa, M; Miao, H; Ichinose, T	2012	Effects of Fetal Exposure to Urban Particulate Matter on the Immune System of Male Mouse Offspring	Biological and Pharmaceutical Bulletin	35	8	1238-1243	
Yun, Y; Yao, GY; Yue, HF; Guo, L; Qin, GH; Li, GK; Sang, N	2013	SO2 inhalation causes synaptic injury in rat hippocampus via its derivatives in vivo	CHEMOSPHERE	93	10	2426-2432	10.1016/j.chemosphere.2013.08.063

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Zaharia, C	2012	Evaluation of environmental impact produced by different economic activities with the global pollution index	Environmental Science and Pollution Research	19	6	2448-2455	10.1007/s11356-012-0883-3
Zakharov, VP; Makurina, ON; Timchenko, EV; Timchenko, PE; Bratchenko, IA; Kotova, SP	2012	Optical methods for ecological mapping of urban areas	BULLETIN OF THE LEBEDEV PHYSICS INSTITUTE	37	7	222-226	10.3103/S10683356100700067
Zampieri, MCT; Sarkis, JES; Pestana, RCB; Tavares, AR; Melo-de-Pinna, GFA	2013	Characterization of Tibouchina granulosa (Desr.) Cong. (Melastomataceae) as a biomonitor of air pollution and quantification of particulate matter adsorbed by leaves	ECOLOGICAL ENGINEERING	61		316-327	10.1016/j.ecoleng.2013.09.050
Zereini, F; Wiseman, CLS (eds)	2010	Urban Airborne Particulate Matter: Origin, Chemistry, Fate and Health Impacts	Environmental Science and Engineering:Environmental Engineering				
Zhang Jun; Li Suqing; Di Xiaoyan; Wu Dongmei	2012	Effects of Combined Pollution of SO2 and PAHs on Seed Germination and Growth of Wheat Seedlings in Shanxi Industrial and Mining Area	Asian Journal of Ecotoxicology	7	6	646-656	
Zhang, CX; Huang, BC; Piper, JDA; Luo, RS	2008	Biomonitoring of atmospheric particulate matter using magnetic properties of Salix matsudana tree ring cores	SCIENCE OF THE TOTAL ENVIRONMENT	393	1	177-190	10.1016/j.scitotenv.2007.12.032
Zhang, QX; Meng, ZQ	2012	The negative inotropic effects of gaseous sulfur dioxide and its derivatives in the isolated perfused rat heart	ENVIRONMENTAL TOXICOLOGY	27	3	175-184	10.1002/tox.20628
Zhang, Q; Tie, XX; Lin, WL; Cao, JJ; Quan, JN; Ran, L; Xu, WY	2013	Variability of SO2 in an intensive fog in North China Plain: Evidence of high solubility of SO2	PARTICUOLOGY	11	SI	41-47	10.1016/j.partic.2012.09.005

Authors	Year	Title	Publication	Volume	Issue	Pages	DOI
Zhao, Y; Duan, L; Xing, J; Larssen, T; Nielsen, CP; Hao, JM	2009	Soil Acidification in China: Is Controlling SO2 Emissions Enough?	ENVIRONMENTAL SCIENCE & TECHNOLOGY	43	21	8021-8026	10.1021/es901430n
Ziemann, C; Hansen, T; Pohlmann, G; Farrar, D; Pohlenz-Michel, C; Tillmann, T; Mangelsdorf, I	2010	Genotoxicity testing of sulfur dioxide (SO2) in a mouse bone marrow micronucleus test complemented with hematological endpoints	MUTATION RESEARCH-GENETIC TOXICOLOGY AND ENVIRONMENTAL MUTAGENESIS	697	1-2	38-46	10.1016/j.mrgentox.2010.02.002
Zvereva, EL; Roitto, M; Kozlov, MV	2010	Growth and reproduction of vascular plants in polluted environments: a synthesis of existing knowledge	ENVIRONMENTAL REVIEWS	18		355-367	10.1139/A10-017
Zvereva, EL; Toivonen, E; Kozlov, MV	2008	Changes in species richness of vascular plants under the impact of air pollution: a global perspective	GLOBAL ECOLOGY AND BIOGEOGRAPHY	17	3	305-319	10.1111/j.1466-8238.2007.00366.x
Zverev, VE	2009	Mortality and recruitment of mountain birch (Betula pubescens ssp czerepanovii) in the impact zone of a copper-nickel smelter in the period of significant reduction of emissions: The results of 15-year monitoring	RUSSIAN JOURNAL OF ECOLOGY	40	4	254-260	10.1134/S1067413609040055

Number of records: 345

Appendix D – Database

All Records

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Increased mercury in forest soils under elevated carbon dioxide

Publication / Journal

OECOLOGIA

Abstract

Fossil fuel combustion is the primary anthropogenic source of both CO(2) and Hg to the atmosphere. On a global scale, most Hg that enters ecosystems is derived from atmospheric Hg that deposits onto the land surface. Increasing concentrations of atmospheric CO(2) may affect Hg deposition to terrestrial systems and storage in soils through CO(2)-mediated changes in plant and soil properties. We show, using free-air CO(2) enrichment (FACE) experiments, that soil Hg concentrations are almost 30% greater under elevated atmospheric CO(2) in two temperate forests. There were no direct CO(2) effects, however, on litterfall, throughfall or stemflow Hg inputs. Soil Hg was positively correlated with percent soil organic matter (SOM), suggesting that CO(2)-mediated changes in SOM have influenced soil Hg concentrations. Through its impacts on SOM, elevated atmospheric CO(2) may increase the Hg storage capacity of soils and modulate the movement of Hg through the biosphere. Such effects of rising CO(2), ones that transcend the typically studied effects on C and nutrient cycling, are an important next phase for research on global environmental change.

Keywords

Authors

Natali, SM; Sanudo-Wilhelmy, SA; Norby, RJ; Zhang, H; Finzi, AC; Lerdau, MT

Volume	Issue	Pages	Date Published	Times Cited
158	2	343-354	November 2008	6

Digital Object Identifier (DOI)

10.1007/s00442-008-1135-6

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Evaluation of environmental impact produced by different economic activities with the global pollution index

Publication / Journal

Environmental Science and Pollution Research

Abstract

The paper analyses the environment pollution state in different case studies of economic activities (i.e. co-generation electric and thermal power production, iron profile manufacturing, cement processing, waste landfilling, and wood furniture manufacturing), evaluating mainly the environmental cumulative impacts (e.g. cumulative impact against the health of the environment and different life forms). The status of the environment (air, water resources, soil, and noise) is analysed with respect to discharges such as gaseous discharges in the air, final effluents discharged in natural receiving basins or sewerage system, and discharges onto the soil together with the principal pollutants expressed by different environmental indicators corresponding to each specific productive activity. The alternative methodology of global pollution index (I (GP) (*)) for quantification of environmental impacts is applied. Environmental data analysis permits the identification of potential impact, prediction of significant impact, and evaluation of cumulative impact on a commensurate scale by evaluation scores (ESi) for discharge quality, and global effect to the environment pollution state by calculation of the global pollution index (I (GP) (*)). The I (GP) (*) values for each productive unit (i.e. 1.664-2.414) correspond to an 'environment modified by industrial/economic activity within admissible limits, having potential of generating discomfort effects'. The evaluation results are significant in view of future development of each productive unit and sustain the economic production in terms of environment protection with respect to a preventive environment protection scheme and continuous measures of pollution control.

Keywords

Authors

Zaharia, C

Volume	Issue	Pages	Date Published	Times Cited
19	6	2448-2455	July 2012	0

Digital Object Identifier (DOI)

10.1007/s11356-012-0883-3

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☑	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Effect of coal-fired power generation on visibility in a nearby national park

Publication / Journal

Atmospheric Environment

Abstract

The Mohave coal-fired power plant has long been considered a major contributor to visibility impairment in Grand Canyon National Park. The permanent closure of the plant in 2005 provides the opportunity to test this assertion. Although this analysis, based on data from the Interagency Monitoring of Protected Environments (IMPROVE) Aerosol Network, shows that fine sulfate levels in the park dropped following the closure, no statistically significant improvement in visibility resulted. Difference-in-differences estimation was used to control for other influences. This finding has important implications for the methods generally employed to attribute visibility reductions to air pollution sources.

Keywords

Mohave; IMPROVE; Grand Canyon; Visibility; CALPUFF

Authors

Terhorst, J; Berkman, M

Volume	Issue	Pages	Date Published	Times Cited
44	21-22	2524-2531	July 2010	

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2010.04.022

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Coal		

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Contribution of solid fuel, gas combustion, or tobacco smoke to indoor air pollutant concentrations in Irish and Scottish homes

Publication / Journal

Indoor Air

Abstract

There are limited data describing pollutant levels inside homes that burn solid fuel within developed country settings with most studies describing test conditions or the effect of interventions. This study recruited homes in Ireland and Scotland where open combustion processes take place. Open combustion was classified as coal, peat, or wood fuel burning, use of a gas cooker or stove, or where there is at least one resident smoker. Twenty-four-hour data on airborne concentrations of particulate matter <2.5 mu m in size (PM2.5), carbon monoxide (CO), endotoxin in inhalable dust and carbon dioxide (CO2), together with 23 week averaged concentrations of nitrogen dioxide (NO2) were collected in 100 houses during the winter and spring of 2009-2010. The geometric mean of the 24-h time-weighted-average (TWA) PM2.5 concentration was highest in homes with resident smokers (99 mu g/m3 much higher than the WHO 24-h guidance value of 25 mu g/m3). Lower geometric mean 24-h TWA levels were found in homes that burned coal (7 mu g/m3) or wood (6 mu g/m3) and in homes with gas cookers (7 mu g/m3). In peat-burning homes, the average 24-h PM2.5 level recorded was 11 mu g/m3. Airborne endotoxin, CO, CO2, and NO2 concentrations were generally within indoor air quality guidance levels. Practical Implications Little is known about indoor air quality (IAQ) in homes that burn solid or fossil-derived fuels in economically developed countries. Recent legislative changes have moved to improve IAQ at work and in enclosed public places, but there remains a real need to begin the process of quantifying the health burden that arises from indoor air pollution within domestic environments. This study demonstrates that homes in Scotland and Ireland that burn solid fuels or gas for heating and cooking have concentrations of air pollutants generally within guideline levels. Homes where combustion of cigarettes takes place have much poorer air quality.

Keywords

Authors

Semple, S; Garden, C; Coggins, M; Galea, KS; Whelan, P; Cowie, H; Sanchez-Jimenez, A; Thorne, PS; Hurley, JF; Ayres, JG

Volume	Issue	Pages	Date Published	Times Cited
22	3	212-223	June 2012	

Digital Object Identifier (DOI)

10.1111/j.1600-0668.2011.00755.x

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Coal		

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Environmental impacts of future bioenergy pathways: the case of electricity from wheat straw bales and pellets

Publication / Journal

Global Change Biology Bioenergy

Abstract

This study presents the life cycle assessment of electricity generation from straw bales and pellets. Straw is the most abundant biomass residue in Europe and its use for energy purposes is promoted on the premise of high greenhouse gas savings. This assumption has delayed the study of sustainability of straw-fired systems on a broader sense and the literature on the topic is almost absent. This study uses data from specific literature and emissions inventories to model a number of straw pathways. The plant modeled is a medium-scale straw-fired power plant of 50MWth capacity. The results show that electricity from straw-fired power plants can indeed realize high greenhouse gas savings compared both with existing coal plants and with the European electricity mix. The savings are in the range 70-94%. The influence of the geographical origin of straw is analyzed by using datasets for the cultivation of wheat in five different European countries. The highest emissions are recorded for the case of straw from Spain due to the small yields, whereas cultivation processes in United Kingdom and the Netherlands show high environmental impacts due to the high level of fertilization. Other environmental impacts are evaluated, such as acidification potential, eutrophication, particulate matter emissions, and photochemical ozone formation. The bioenergy system scores worse than the current European electricity mix for all the categories. However, it is important to notice that in Spain and United Kingdom the straw system shows lower impacts compared with the local average coal electricity. Finally, the study investigates the break-even' distance at which the higher emissions from the pellets production are paid off by the saved emissions in their transport compared with the bales. The results show that no reasonable break-even distance exists for road transport, whereas advantages for pellets are evident in any configuration for transoceanic transport.

Keywords

Authors

Giuntoli, J; Boulamanti, AK; Corrado, S; Motegh, M; Agostini, A; Baxter, D

Volume	Issue	Pages	Date Published	Times Cited
5	5	497-512	September 2013	0

Digital Object Identifier (DOI)

10.1111/gcbb.12012

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Evaluation of the Indoor Air Quality in Restaurants Before and After a Smoking Ban in Portugal

Publication / Journal

Indoor and Built Environment

Abstract

On 14th August 2007, Portugal instituted a smoking ban in most indoor public places. The goal of this work was to quantify the effects of this ban on indoor air quality (IAQ) in Portuguese restaurants. Ten restaurants were investigated before and after the ban and the following indoor parameters measured: respirable suspended particulate matter (RSP), total volatile organic compounds (TVOC), benzene (C6H6), carbon monoxide (CO), carbon dioxide (CO2), temperature and relative humidity. Results show a statistically significant decrease in RSP and CO concentrations after the ban, as well as for TVOC and benzene concentrations. Additionally, the monitored CO2 concentrations widely exceeded 1800 mg.m(-3) (reference for acceptable ventilation rates), suggesting inefficient ventilation of the indoor spaces. This paper provides the first comparison of IAQ in Portugal before and after the introduction of smoke-free law and these results confirm the positive impact of the law in the indoor air that became smoke-free after the legislation. This information should be provided to decision makers as it has significant health implications. This law thus appear to achieve the aim of protecting people from exposure to unwanted pollutants resulting from poor IAQ.

Keywords

Authors

Madureira, J; Mendes, A; Santos, H; Vilaca, J; Neves, MP; Mayan, O; Teixeira, JP

Volume	Issue	Pages	Date Published	Times Cited
21	2	323-331	April 2012	

Digital Object Identifier (DOI)

10.1177/1420326X11409459

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Study on the reduction of atmospheric mercury emissions from mine waste enriched soils through native grass cover in the Mt. Amiata region of Italy

Publication / Journal

ENVIRONMENTAL RESEARCH

Abstract

Atmospheric mercury emissions from mine-waste enriched soils were measured in order to compare the mercury fluxes of bare soils with those from other soils covered by native grasses. Our research was conducted near Mt. Amiata in central Italy, an area that was one of the largest and most productive mining centers in Europe up into the 1980s. To determine in situ mercury emissions, we used a Plexiglas flux chamber connected to a portable mercury analyzer (Lumex RA-915+). This allowed us to detect, in real time, the mercury vapor in the air, and to correlate this with the meteorological parameters that we examined (solar radiation, soil temperature, and humidity). The highest mercury flux values (8000 ng m(-2) h(-1)) were observed on bare soils during the hours of maximum insulation, while lower values (250 ng m(-2) h(-1)) were observed on soils covered by native grasses. Our results indicate that two main environmental variables affect mercury emission: solar radiation intensity and soil temperature. The presence of native vegetation, which can shield soil surfaces from incident light, reduced mercury emissions, a result that we attribute to a drop in the efficiency of mercury photoreduction processes rather than to decreases in soil temperature. This finding is consistent with decreases in mercury flux values down to 3500 ng m(-2) h(-1), which occurred under cloudy conditions despite high soil temperatures. Moreover, when the soil temperature was 28 degrees C and the vegetation was removed from the experimental site, mercury emissions increased almost four-fold. This increase occurred almost immediately after the grasses were cut, and was approximately eight-fold after 20 h. Thus, this study demonstrates that enhancing wild vegetation cover could be an inexpensive and effective approach in fostering a natural, self-renewing reduction of mercury emissions from mercury-contaminated soils.

Keywords

Authors

Fantozzi, L; Ferrara, R; Dini, F; Tamburello, L; Pirrone, N; Sprovieri, F

Volume	Issue	Pages	Date Published	Times Cited
125	SI	69-74	August 2013	0

Digital Object Identifier (DOI)

10.1016/j.envres.2013.02.004

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☑	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Riverine source of Arctic Ocean mercury inferred from atmospheric observations

Publication / Journal

NATURE GEOSCIENCE

Abstract

Methylmercury is a potent neurotoxin that accumulates in aquatic food webs. Human activities, including industry and mining, have increased inorganic mercury inputs to terrestrial and aquatic ecosystems. Methylation of this mercury generates methylmercury, and is thus a public health concern. Marine methylmercury is a particular concern in the Arctic, where indigenous peoples rely heavily on marine-based diets. In the summer, atmospheric inorganic mercury concentrations peak in the Arctic, whereas they reach a minimum in the northern mid-latitudes. Here, we use a global three-dimensional ocean-atmosphere model to examine the cause of this Arctic summertime maximum. According to our simulations, circumpolar rivers deliver large quantities of mercury to the Arctic Ocean during summer; the subsequent evasion of this riverine mercury to the atmosphere can explain the summertime peak in atmospheric mercury levels. We infer that rivers are the dominant source of mercury to the Arctic Ocean on an annual basis. Our simulations suggest that Arctic Ocean mercury concentrations could be highly sensitive to climate-induced changes in river flow, and to increases in the mobility of mercury in soils, for example as a result of permafrost thaw and forest fires.

Keywords

Authors

Fisher, JA; Jacob, DJ; Soerensen, AL; Amos, HM; Steffen, A; Sunderland, EM

Volume	Issue	Pages	Date Published	Times Cited
5	7	499-504	July 2012	15

Digital Object Identifier (DOI)

10.1038/ngeo1478

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☑	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Secondary acidification: Changes in gas-aerosol partitioning of semivolatile nitric acid and enhancement of its deposition due to increased emission and concentration of Sox

Publication / Journal

JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES

Abstract

Secondary acidification, or the indirect enhancement of semivolatile air pollutant deposition associated with increased SO42- concentrations, is shown to occur in general air pollution using data collected from six stations of the Acid Deposition Monitoring Network in East Asia (EANET) in Japan. This effect was first detected as a result of volcanic SO2 plumes in our previous studies. Results indicate that as SO42- concentration increases, gas-aerosol partitioning of nitric acid shifts to the gas phase, increasing the HNO3 gas concentration. Since the dry and wet deposition rates of HNO3 gas are very high, deposition can be enhanced even when the emission of NOx remains unchanged. In western Japan, the indirect effect for wet deposition is most apparent from spring to autumn, when the Asian continental outflow carries sulfate-rich contaminated air masses. However, it is not pronounced in air masses containing abundant sea-salt particles and related cation components in aerosols. In areas such as forests or farmlands with low surface resistance, dry deposition of nitric acid is more pronounced than wet deposition as the dry deposition velocity of HNO3 gas is high. Increased dry deposition of t-NO3 due to the indirect effect and consequent vegetation damage is thus of considerable concern in such regions. The deposition of other semivolatile components, such as hydrochloric acid and ammonia, can be altered and can also induce secondary acidification.

Keywords

Authors

Kajino, M; Ueda, H; Nakayama, S

Volume: 113

Issue: D3

Pages:

Date Published: February 2008

Times Cited: 5

Digital Object Identifier (DOI)

10.1029/2007JD008635

Media Category: Abiotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Noise, air pollutants and traffic: Continuous measurement and correlation at a high-traffic location in New York City

Publication / Journal

Environmental Research

Abstract

Background: Epidemiological studies have linked both noise and air pollution to common adverse health outcomes such as increased blood pressure and myocardial infarction. In urban settings, noise and air pollution share important sources, notably traffic, and several recent studies have shown spatial correlations between noise and air pollution. The temporal association between these exposures, however, has yet to be thoroughly investigated despite the importance of time series studies in air pollution epidemiology and the potential that correlations between these exposures could at least partly confound statistical associations identified in these studies.
Methods: An aethelometer, for continuous elemental carbon measurement, was co-located with a continuous noise monitor near a major urban highway in New York City for six days in August 2009. Hourly elemental carbon measurements and hourly data on overall noise levels and low, medium and high frequency noise levels were collected. Hourly average concentrations of fine particles and nitrogen oxides, wind speed and direction and car, truck and bus traffic were obtained from nearby regulatory monitors. Overall temporal patterns, as well as day-night and weekday-weekend patterns, were characterized and compared for all variables.
Results: Noise levels were correlated with car, truck, and bus traffic and with air pollutants. We observed strong day-night and weekday-weekend variation in noise and air pollutants and correlations between pollutants varied by noise frequency. Medium and high frequency noise were generally more strongly correlated with traffic and traffic-related pollutants than low frequency noise and the correlation with medium and high frequency noise was generally stronger at night. Correlations with nighttime high frequency noise were particularly high for car traffic (Spearman rho=0.84), nitric oxide (0.73) and nitrogen dioxide (0.83). Wind speed and direction mediated relationships between pollutants and noise.
Conclusions: Noise levels are temporally correlated with traffic and combustion pollutants and correlations are modified by the time of day, noise frequency and wind. Our results underscore the potential importance of assessing temporal variation in co-exposures to noise and air pollution in studies of the health effects of these urban pollutants.

Keywords

Authors

Ross, Z; Kheirbek, I; Clougherty, JE; Ito, K; Matte, T ; Markowitz, S; Eisl, H

Volume	Issue	Pages	Date Published	Times Cited
111	8	1054-1063	November 2011	

Digital Object Identifier (DOI)

10.1016/j.envres.2011.09.004

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☑	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Variability of SO2 in an intensive fog in North China Plain: Evidence of high solubility of SO2

Publication / Journal

PARTICUOLOGY

Abstract

A field experiment was conducted in an intensive fog event between November 5 and November 8, 2009, in a heavily SO2-polluted area in North China Plain (NCP), to measure SO2 and other air pollutants, liquid water content (LWC) of fog droplets, and other basic meteorological parameters. During the fog period, the concentrations of SO2 showed large variability, which was closely related to the LWC in the fog droplets. The averaged concentration of SO2 during non-fog periods was about 25 ppbv, while during the fog period, it rapidly reduced to about 4-7 ppbv. Such large reduction of SO2 suggested that a majority of SO2(about 70%-80%) had reverted from gas to aqueous phase on account of the high solubility of SO2 in water in the fog droplets. However, the calculated gas to aqueous phase conversion was largely underestimated by merely using the Henry's Law constant of SO2, thus suggesting that aqueous reaction of SO2 in fog droplets might play some important role in enhancing the solubility of SO2. To simplify the phenomenon, an "effective solubility coefficient" is proposed in this study. This variability of SO2 measurement during the extensive fog event provides direct evidence of oxidation of SO2 in fog droplets, thus providing important implications for better understanding of the acidity in clouds, precipitation, and fogs in NCP, now a central environmental focus in China due to its rapid economic development. (C) 2012 Chinese Society of Particuology and Institute of Process Engineering, Chinese Academy of Sciences.

Keywords

Authors

Zhang, Q; Tie, XX; Lin, WL; Cao, JJ; Quan, JN; Ran, L; Xu, WY

Volume	Issue	Pages	Date Published	Times Cited
11	SI	41-47	February 2013	0

Digital Object Identifier (DOI)

10.1016/j.partic.2012.09.005

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Forest biomonitoring of the largest Slovene thermal power plant with respect to reduction of air pollution

Publication / Journal

ENVIRONMENTAL MONITORING AND ASSESSMENT

Abstract

The condition of the forest ecosystem in the vicinity of the largest Slovene power plant [the otanj Thermal Power Plant (TPP)] was monitored during the period 1991-2008 by determining the total concentration of sulphur, ascorbic acid and chlorophyll in Norway spruce needles. After 1995, the introduction of cleaning devices at the TPP dramatically reduced the former extremely high SO2 and dust emissions. The most significant findings of this comprehensive, long-duration survey are as follows: (1) the chosen parameters are suitable bioindicators of stress caused by air pollution in Norway spruce needles; they reflect both spatial and temporal variations in air pollution as well as the degree of efficiency of the cleaning devices; (2) observations show that the physiological condition of Norway spruce in northern Slovenia has significantly improved since 1995, when the first desulphurization device at TPP was built, together with a reduction in the area influenced by pollution from TPP; (3) metabolic processes in spruce needles react to air pollution according to the severity of the pollution and the length of exposure; exposure to high SO2 ambient levels and/or spread over a long duration can damage the antioxidant defence mechanisms of spruce trees as well as diminishing the concentration of ascorbic acid; (4) a reduction in the exposure to air pollution improves the vitality of the trees (e.g. higher concentrations of total (a + b) chlorophyll), as well as restoring their defence capabilities as shown by higher concentrations of ascorbic acid; and (5) forest monitoring should be continued and focused on integrating the effects of multiple stressors, which can additionally affect a forest ecosystem.

Keywords

Authors

Petkovsek, SA

Volume: 185

Issue: 2

Pages: 1809-1823

Date Published: February 2013

Times Cited: 0

Digital Object Identifier (DOI)

10.1007/s10661-012-2669-y

Media Category: Abiotic

Generation Type:

CoalType:

BiomassType:

- [ ] Mammals
- [ ] Birds
- [ ] Reptiles
- [ ] Amphibians
- [ ] Aquatic
- [x] Plants
- [ ] Invertebrates
- [ ] Benthic Invertebrates
- [ ] Lichen/Moss
- [ ] Microbes
- [ ] Other Biotic Medium

- [ ] Air
- [ ] Soil
- [ ] Water
- [ ] Sediment
- [ ] Light
- [ ] Noise
- [ ] Temperature
- [ ] Humidity
- [ ] Other Abiotic Medium

- [ ] Nitrogen oxides
- [x] Sulphur dioxide
- [ ] Mercury
- [x] Particulate Matter
- [ ] Inorganic chemical
- [ ] Organic chemical
- [ ] New substance

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Variations in wood burning organic marker concentrations in the atmospheres of four European cities

Publication / Journal

JOURNAL OF ENVIRONMENTAL MONITORING

Abstract

The particulate emissions from biomass burning are a growing concern due to the recent evidence of their ubiquitous and important contribution to the ambient aerosol load. A possible strategy to apportion the biomass burning share of particulate matter is the use of organic molecular tracers. Anhydrosugars (levoglucosan, mannosan and galactosan), together with two organic acids (dehydroabietic and pimaric acids), were previously reported as organic markers for particulate wood burning emissions. These five compounds were studied in four European cities (Helsinki, Copenhagen, Birmingham and Oporto), at both a Roadside and an Urban Background station, during a summer and a winter campaign in the fine (PM2.5) and the coarse (PM10-2.5) size-fractions of the ambient aerosol. Levoglucosan concentrations were highest in the city of Oporto. In winter, levoglucosan was more present in the fine fraction but in summer, concentrations were similar in both size fractions. Levoglucosan concentrations in the fine size fraction were higher in winter, but no seasonal differences were observed for the coarse size fraction. The lack of difference between the Roadside and Urban Background levoglucosan concentrations points towards a regional nature of this type of pollution. Wood burning was estimated to contribute to about 3.1% of the winter PM10 mass in Oporto, and to 3.7% in Copenhagen. Mannosan followed the trends exhibited by levoglucosan. The ratio between the levoglucosan and mannosan concentrations allowed determination of a preference for softwood over hardwood in all four cities. Galactosan, pimaric acid and dehydroabietic acid were found to be minor compounds.

Keywords

Authors

Caseiro, A; Oliveira, C

Volume	Issue	Pages	Date Published	Times Cited
14	8	2261-2269	August 2012	2

Digital Object Identifier (DOI)

10.1039/c2em10849f

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Biomass		

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Cooling lakes while the world warms: Effects of forest regrowth and increased dissolved organic matter on the thermal regime of a temperate, urban lake

Publication / Journal

LIMNOLOGY AND OCEANOGRAPHY

Abstract

Depending on the magnitudes and directions of changes in air temperatures, winds, and underwater light attenuation, lakes may either warm or cool. Here we report a 28-yr decrease in the whole-lake average temperature of Clearwater Lake, Canada, despite regional signatures of climate warming. Using a one-dimensional lake mixing model, we demonstrate that this pattern was attributable to a 35% reduction in surface wind speeds, itself explained by forest regrowth following local SO(2) emission reductions and tree planting, and a 10-fold increase in dissolved organic carbon concentrations causing a substantial increase in vertical light attenuation following deacidification of the lake. Long-term trends in lake temperatures do not necessarily follow those of air temperatures. The Clearwater Lake data demonstrate that any factors that influence local wind speeds and underwater light attenuation should be considered as modifiers of the effects of climate warming on lake thermal regimes.

Keywords

Authors

Tanentzap, AJ; Yan, ND; Keller, B; Girard, R; Heneberry, J; Gunn, JM; Hamilton, DP; Taylor, PA

Volume	Issue	Pages	Date Published	Times Cited
53	1	404-410	January 2008	19

Digital Object Identifier (DOI)

10.4319/lo.2008.53.1.0404

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Soil Acidification in China: Is Controlling SO2 Emissions Enough?

Publication / Journal

ENVIRONMENTAL SCIENCE & TECHNOLOGY

Abstract

Facing challenges of increased energy consumption and related regional air pollution, China has been aggressively implementing flue gas desulfurization (FGD) and phasing out small inefficient units in the power sector in order to achieve the national goal of 10% reduction in sulfur dioxide (SO2) emissions from 2005 to 2010. In this paper, the effect of these measures on soil acidification is explored. An integrated methodology is used, combining emission inventory data, emission forecasts, air quality modeling, and ecological sensitivities indicated by critical load. National emissions of SO2, oxides of nitrogen (NOx), particulate matter (PM), and ammonia (NH3) in 2005 were estimated to be 30.7, 19.6, 31.3, and 16.6 Mt, respectively. Implementation of existing policy will lead to reductions in SO2 and PM emissions, while those of NOx and NH3 Will continue to rise, even under tentatively proposed control measures. In 2005, the critical load for soil acidification caused by sulfur (S) deposition was exceeded in 28% of the country's territory, mainly in eastern and south-central China, The area in exceedance will decrease to 26% and 20% in 2010 and 2020, respectively, given implementation of current plans for emission reductions. However, the exceedance of the critical load for nitrogen (N, combining effects of eutrophication and acidification) will double from 2005 to 2020 due to increased NOx and NH3 emissions. Combining the acidification effects of S and N, the benefits of SO2 reductions during 2005-2010 will almost be negated by increased N emissions. Therefore abatement of N emissions (NOx and NH3) and deposition will be a major challenge to China, requiring policy development and technology investments. To mitigate acidification in the future, China needs a multipollutant control strategy that integrates measures to reduce S, N, and PM.

Keywords

Authors

Zhao, Y; Duan, L; Xing, J; Larssen, T; Nielsen, CP; Hao, JM

Volume	Issue	Pages	Date Published	Times Cited
43	21	8021-8026	November 2009	61

Digital Object Identifier (DOI)

10.1021/es901430n

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Modeling atmospheric transport and fate of ammonia in North Carolina - Part II: Effect of ammonia emissions on fine particulate matter formation

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Accurate estimates of ammonia (NH3) emissions are needed for reliable predictions of fine particulate matter (PM2.5) by air quality models (AQMs), but the current estimates contain large uncertainties in the temporal and spatial distributions of NH3 emissions. In this study, the US EPA Community Multiscale Air Quality (CMAQ) modeling system is applied to study the contributions of the agriculture-livestock NH3 (AL-NH3) emissions to the concentration Of PM2.5 and the uncertainties in the total amount and the temporal variations of NH3 emissions and their impact on the formation Of PM2.5 for August and December 2002.

The sensitivity simulation results show that AL-NH3 emissions contribute significantly to the concentration Of PM2.5, of NH4+, and NO3-; their contributions to the concentrations SO42- are relatively small. The impact of NH3 emissions on PM2.5 formation shows strong spatial and seasonal variations associated with the meteorological conditions and the ambient chemical conditions. Increases in NH3 emissions in August 2002 resulted in > 10% increases in the concentrations of NH4+ and NO3-; reductions in NH3 emissions in December 2002 resulted in > 20% decreases in their concentrations. The large changes in species concentrations occur downwind of the high NH3 emissions where the ambient environment is NH3-poor or neutral. The adjustments in NH3 emissions improve appreciably the model predictions of NH4+ and NO3- both in August and December, but resulted in negligible improvements in PM2.5 in August and a small improvement in December, indicating that other factors (e.g., inaccuracies in meteorological predictions, emissions of other primary species, aerosol treatments) might be responsible for model biases in PM2.5.

Keywords

Authors

Wu, SY; Hu, JL; Zhang, Y; Aneja, VP

Volume	Issue	Pages	Date Published	Times Cited
42	14	3437-3451	April 2008	21

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2007.04.022

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Gas-particle partitioning of atmospheric Hg(II) and its effect on global mercury deposition

Publication / Journal

ATMOSPHERIC CHEMISTRY AND PHYSICS

Abstract

Atmospheric deposition of Hg(II) represents a major input of mercury to surface environments. The phase of Hg(II) (gas or particle) has important implications for deposition. We use long-term observations of reactive gaseous mercury (RGM, the gaseous component of Hg(II)), particle-bound mercury (PBM, the particulate component of Hg(II)), fine particulate matter (PM2.5), and temperature (T) at five sites in North America to derive an empirical gas-particle partitioning relationship log(10)(K-1) = (10 +/- 1)-(2500 +/- 300)/T where K = (PBM/PM2.5)/RGM with PBM and RGM in common mixing ratio units, PM2.5 in mu g m(-3), and T in K. This relationship is within the range of previous work but is based on far more extensive data from multiple sites. We implement this empirical relationship in the GEOS-Chem global 3-D Hg model to partition Hg(II) between the gas and particle phases. The resulting gas-phase fraction of Hg(II) ranges from over 90% in warm air with little aerosol to less than 10% in cold air with high aerosol. Hg deposition to high latitudes increases because of more efficient scavenging of particulate Hg(II) by precipitating snow. Model comparison to Hg observations at the North American surface sites suggests that subsidence from the free troposphere (warm air, low aerosol) is a major factor driving the seasonality of RGM, while elevated PBM is mostly associated with high aerosol loads. Simulation of RGM and PBM at these sites is improved by including fast in-plume reduction of Hg(II) emitted from coal combustion and by assuming that anthropogenic particulate Hg(p) behaves as semivolatile Hg(II) rather than as a refractory particulate component. We improve the simulation of Hg wet deposition fluxes in the US relative to a previous version of GEOS-Chem; this largely reflects independent improvement of the washout algorithm. The observed wintertime minimum in wet deposition fluxes is attributed to inefficient snow scavenging of gas-phase Hg(II).

Keywords

Authors

Amos, HM; Jacob, DJ; Holmes, CD; Fisher, JA; Wang, Q; Yantosca, RM; Corbitt, ES; Galarneau, E; Rutter, AP; Gustin, MS; Steffen, A; Schauer, JJ; Graydon, JA; St Louis, VL; Talbot, RW; Edgerton, ES; Zhang, Y; Sunderland, EM

Volume	Issue	Pages	Date Published	Times Cited
12	1	591-603	2012	36

Digital Object Identifier (DOI)

10.5194/acp-12-591-2012

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Examination of the impact of photoexcited NO2 chemistry on regional air quality

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Impact of the excited nitrogen dioxide (NO2*) chemistry on air quality in the U.S. is examined using the Community Multiscale Air Quality (CMAQ) model for a summer month. Model simulations were conducted with and without the NO2* chemistry. The largest impact of the NO2* chemistry in the eastern U.S. occurred in the northeast and in the western U.S. occurred in Los Angeles. While the single largest daily maximum 8-h ozone (O-3) increased by 9 ppbv in eastern U.S. and 6 ppbv in western U.S., increases on most days were much lower. No appreciable change in model performance statistics for surface-level O-3 predictions relative to measurements is noted between simulations with and without the NO2* chemistry. Based on model calculations using current estimates of tropospheric emission burden, the NO chemistry can increase the monthly mean daytime hydroxyl radicals (OH) and nitrous acid (HONO) by a maximum of 28% and 100 pptv, respectively.

Keywords

Authors

Sarwar, G; Pinder, RW; Appel, KW ; Mathur, R; Carlton, AG

Volume	Issue	Pages	Date Published	Times Cited
43	40	6383-6387	December 2009	9

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2009.09.012

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

A new atmospherically relevant oxidant of sulphur dioxide

Publication / Journal

NATURE

Abstract

Atmospheric oxidation is a key phenomenon that connects atmospheric chemistry with globally challenging environmental issues, such as climate change(1), stratospheric ozone loss(2), acidification of soils and water(3), and health effects of air quality(4). Ozone, the hydroxyl radical and the nitrate radical are generally considered to be the dominant oxidants that initiate the removal of trace gases, including pollutants, from the atmosphere. Here we present atmospheric observations from a boreal forest region in Finland, supported by laboratory experiments and theoretical considerations, that allow us to identify another compound, probably a stabilized Criegee intermediate (a carbonyl oxide with two free-radical sites) or its derivative, which has a significant capacity to oxidize sulphur dioxide and potentially other trace gases. This compound probably enhances the reactivity of the atmosphere, particularly with regard to the production of sulphuric acid, and consequently atmospheric aerosol formation. Our findings suggest that this new atmospherically relevant oxidation route is important relative to oxidation by the hydroxyl radical, at least at moderate concentrations of that radical. We also find that the oxidation chemistry of this compound seems to be tightly linked to the presence of alkenes of biogenic origin.

Keywords

Authors

Mauldin, RL; Berndt, T; Sipila, M; Paasonen, P; Petaja, T; Kim, S; Kurten, T; Stratmann, F; Kerminen, VM; Kulmala, M

Volume	Issue	Pages	Date Published	Times Cited
488	7410	193	August 2012	43

Digital Object Identifier (DOI)

10.1038/nature11278

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☑
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Systematic experimental study of the pollution deposition impact on the energy yield of photovoltaic installations

Publication / Journal

Renewable Energy

Abstract

The current study experimentally investigates the performance of two identical pairs of photovoltaic (PV) panels., the first being clean and the second being artificially polluted with three different, commonly met in urban and other environments, air pollutants (i.e. red soil, limestone and carbonaceous fly-ash particles). The PV-panels under comparison are both operating under the same environmental conditions, being nearby located and adjusted at the same inclination. The effect of pollution deposition on PVs' power output, energy yield and conversion efficiency is examined, considering also various pollutants' mass depositions on the PV-panels' surfaces. According to the results obtained, a considerable reduction of PVs' energy performance is recorded, depending both on particles' composition and origin and on the total mass accumulated on the PV-panels' surfaces. Based on the results, the highest reduction is caused by the deposition of red soil particles, followed by the deposition of limestone and finally by the carbon-based ash.

Keywords

Authors

Kaldellis, JK; Fragos, P; Kapsali, M

Volume	Issue	Pages	Date Published	Times Cited
36	10	2717-2724	October 2011	8

Digital Object Identifier (DOI)

10.1016/j.renene.2011.03.004

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Assessment of biomass burnings activity with the synergy of sunphotometric and LIDAR measurements in Sao Paulo, Brazil

Publication / Journal

Atmospheric Research

Abstract

In the period of July-November of 2007 an aerosol profiling campaign was carried out with a backscattering LIDAR system in Sao Paulo Brazil (23 degrees 33'S 46 degrees 44'W) The goals of this campaign were to perform an aerosol long period observation in the lower atmosphere (up to 10 km) and extract correlations among the microphysical properties obtained from different plataforms as well to pinpoint events where strong indications of biomass burning plumes were present above the planetary boundary layer (PBL) and still impact quality reports emitted by ground stations provided by the local environmental agency In this context the present study alms to Investigate the impact that this type of aerosol has on the environment of Sao Paulo when active fires in South America are observed in close and remote areas Besides the LIDAR system, an AERONET Sunphotometer was used to help in characterizing the aerosol optical properties Ten cases were selected as an identification of biomass burning layer entrance and after they were confirmed by NOAA-12 AVHRR sensor and 5-day Hysplit generated backtrajectones A statistical analysis was carried out for analysis of the extinction-to-backscattering ratio (LIDAR ratio - LR) together with the sunphotometer retrieved Angstrom Exponent (AE) and aerosol optical depth (ADD) data The observed layer sources were potentially from remote regions as the South Amazon basin and the north portion of Argentina and closer parts of Sao Paulo state related to sugar cane harvesting activities The biomass burning plume heights were between 3 and 8 km It has been found that LR AE and AOD values ranged from 44 to 147 sr from 085 to 1 58 and from 014 to 053 respectively In a case study for September 7 2007 an air mass with influence of biomass burning reached the city of Sao Paulo leading to a LR of 59 sr Despite the AOD value of 033 the aerosol size distribution analysis showed a higher amount of fine particulate matter in relation to coarse that is an indicative of transport of material in the free atmosphere The analysis carried out in this study shows that these plumes affect greatly the LR mean values while with low effect on the AOD and AE daily averages

Keywords

Authors

Mariano, GL ; Lopes, FJS; Jorge, MPPM; Landulfo, E

Volume	Issue	Pages	Date Published	Times Cited
98	2-4	486-499	November - Dec	

Digital Object Identifier (DOI)

10.1016/j.atmosres.2010.08.025

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

SO2 effect on secondary organic aerosol from a mixture of anthropogenic VOCs: experimental and modelled results

Publication / Journal

INTERNATIONAL JOURNAL OF ENVIRONMENT AND POLLUTION

Abstract

The effect of SO2 in the photooxidation of a mixture of anthropogenic precursors is studied. Four experiments are carried out in the EUPHORE outdoor chamber, adding different initial SO2 concentrations in each experiment. The experimental secondary organic aerosol (SOA) obtained in the experiments is compared with the aerosol simulated by two air quality models (CMAQ and CHIMERE) under the same initial conditions. A simplified version of the models is designed in order to consider the closed system of the chamber, where only gas phase chemistry and aerosol formation take place. While the experimental results show a clear increase of the aerosol formed in the presence of increasing SO2 concentrations, the models do not consider this enhancement in the simulations. The behaviour of the models points out the need of a way to implement this effect on anthropogenic secondary organic aerosol.

Keywords

Authors

Santiago, M; Vivanco, MG; Stein, AF

Volume	Issue	Pages	Date Published	Times Cited
50	SI	224-233	2012	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Black soiling of an architectural limestone during two-year term exposure to urban air in the city of Granada (S Spain)

Publication / Journal

Science of the Total Environment

Abstract

A two-year term aging test was carried out on a building limestone under different urban conditions in the city of Granada (Southern Spain) to assess its Cultural Heritage sustainability. For this purpose stone tablets were placed vertically at four sites with contrasting local pollution micro-environments and exposure conditions (rain-sheltered and unsheltered). The back (rain-sheltered) and the front (rain-unsheltered) faces of the stone tablets were studied for each site. The soiling process (surface blackening) was monitored through lightness (Delta L*) and chroma changes (Delta C*). Additionally atmospheric particles deposited on the stone surfaces and on PM10 filters during the exposure time were studied through a multianalytical approach including scanning electron microscopy (SEM-EDX), transmission electron microscopy (TEM) and micro-Raman spectroscopy. The identified atmospheric particles (responsible for stone soiling) were mainly soot and soil dust particles; also fly ash and aged salt particles were found. The soiling process was related to surface texture, exposure conditions and proximity to dense traffic streets. On the front faces of all stones, black soiling and surface roughness promoted by differential erosion between micritic and sparitic calcite were noticed. Moreover, it was found that surface roughness enhanced a feedback process that triggers further black soiling. The calculated effective area coverage (EAC) by light absorbing dust ranged from 10.2 to 20.4%, exceeding by far the established value of 2% EAC (limit perceptible to the human eye). Soiling coefficients (SC) were estimated based on square-root and bounded exponential fittings. Estimated black carbon (BC) concentration resulted in relatively similar SC for all studied sites and thus predicts the soiling process better than using particulate matter (PM10) concentration.

Keywords

Authors

Urosevic, M; Yebra-Rodriguez, A; Sebastian-Pardo, E; Cardell, C

Volume	Issue	Pages	Date Published	Times Cited
414		564-575	January 1, 2012	3

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2011.11.028

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Characteristics of Chemical Compositions of Precipitation in Beijing

Publication / Journal

Huanjing Kexue

Abstract

Characteristics of chemical compositions of precipitation in Beijing were analyzed. The average value of pH was 5.19 from 2005 to 2009, showing stable characteristics of acidification with precipitation. The lowest annual average pH was 4.87 in 2008 with the highest acidification frequency of 42% and 23% in Chegongzhuang and Daxing districts respectively. The inorganic ion concentrations declined in 5a, indicating an increasing improvement of air quality in Beijing. The concentrations of NH4+ and NO3- were found to increase and contributed to the high nitrogen amount in precipitation. Different seasons have influence on composition concentrations. Generally speaking, the ion concentrations in winter were higher that that in summer. SO42- was the main factor responsible for the acidification of snow in winter, SO42- and NO3- had similar contributions to the acidification of precipitation in summer. It was also found that the local pollutants of SO2, NOx and NH3 were major contributors to the acidification of precipitation in Beijing area, local geological conditions and long-distance transfers have important effects on the neutralization of the precipitation.

Keywords

Authors

Yang Dong-yan; Li Xiu-jin; Chen Yuan-yuan; Zou Ben-dong; Lin An-guo

Volume	Issue	Pages	Date Published	Times Cited
32	7	1867-1873	July 2011	3

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Interaction of gaseous pollutants with aerosols in Asia during March 2002

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

The Asian Dust Aerosol Model (ADAM) and the aerosol dynamic model with the output of the fifth generation of mesoscale model (MM5) in a grid of 60 x 60 km(2) over the Asian domain have been performed with and without the heterogeneous reaction (gas-aerosol interaction) to estimate the effect of the gas-aerosol interaction on the formation of aerosol for the period of 1-31 March 2002 when a severe Asian dust event has been observed during this period. The simulated gas-phase pollutants concentrations and aerosols are compared with those observed in South Korea and the East Asia Network (EANET). The results indicate that the present modeling system including ADAM, aerosol dynamic model and MM5 model simulates quite well and the gas-phase pollutants concentrations observed in South Korea and the simulated aerosol concentrations with the gas-aerosol interaction yield much better results in concentrations than those without the gas-aerosol interaction. It is found that the favorable regions for the gas-aerosol interaction in Asia are eastern China (high pollutants emissions), Korea, Japan and the East China Sea that are downstream regions of the Asian dust sources and relatively high relative humidity. in these regions the concentrations of SO2 and O-3 decrease whereas the concentrations of sulfate and nitrate increase significantly due to the gas-aerosol interaction. In particular, the increase of sulfate concentration due to the interaction is more than 30% of the corresponding concentration without the gas-aerosol interaction. It is also found that the time-area mean column concentrations of PM10, sulfate, nitrate in the model domain are respectively to be 154.9, 3.2, 3.6 mg m(-2) without the gas-aerosol interaction. However, with the gas-aerosol interaction these values have been increased to 0.6% (155.8 mg m(-2)), 16% (3.7 mg m(-2)), and 14% (4.1 mg m(-2)) of the corresponding concentration without the gas-aerosol interaction. On the other hand, the time-area mean concentration of ammonium is found to decrease about 13% (1.8 mg m(-2) to 1.6 mg m(-2)) due to the gas-aerosol interaction. The result clearly indicates the importance of the gas-aerosol interaction on the tropospheric chemistry during the long-range transport period.

Keywords

Authors

Jeong, JI; Park, SU

Volume	Issue	Pages	Date Published	Times Cited
392	2-3	262-276	March 2008	15

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2007.11.026

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Source Contributions to Visibility Impairment in the Southeastern and Western United States

Publication / Journal

JOURNAL OF THE AIR & WASTE MANAGEMENT ASSOCIATION

Abstract

The 1999 Regional Haze Rule requires states to complete comprehensive technical analyses of air pollutants that impair. visibility and to define long-term strategies to improve visibility in the nation's 156 visibility-protected federal Class I national parks and wilderness areas. Class I areas in the southeastern United States are among the most impacted in the country; fine particle loadings in the western United States are a fraction of those in the East. In the Southeast, (NH(4))(2)SO(4) (ammonium sulfate) predominantly from SO(2) (sulfur dioxide) emissions from electric generating utilities and industrial sources contributes 60-70% of the light extinction on the 20% haziest days; particulate organic matter (POM) predominantly from biogenic emissions and biomass burning is the second largest contributor. In the West, the mix of source contributions is more complex. At Class I areas downwind of major urban areas (e.g., California), ammonium nitrate (NH(4)NO(3)), predominantly because of mobile sources, is the dominant contributor to haze. For many western Class I areas, POM from wildland fires and fine particles from windblown dust, largely uncontrollable sources, are significant contributors to haze. International emissions are an additional uncontrollable and significant contribution to total sulfate (SO(4)) and nitrate (NO(3)) concentrations at the western Class I areas. In the Southeast, SO(2) emissions reductions are projected to result in nearly 1:1 regional SO(4) reductions; oxides of nitrogen (NO(x)) emissions reductions have minimal impact on NO(3) concentrations and haze. In the West, SO(2) emissions reductions result in incremental SO(4) reductions, whereas mobile NO(x) emissions reductions are projected to reduce NO(3) and improve visibility at Class I areas affected by urban areas. Because wildfire, dust, and international emissions have large contributions to the haziest days and are mostly uncontrollable in the West, reductions from anthropogenic sources in the West have less effect in improving visibility compared with the Southeast.

Keywords

Authors

Brewer, P; Moore, T

Volume	Issue	Pages	Date Published	Times Cited
59	9	1070-1081	September 2009	5

Digital Object Identifier (DOI)

10.3155/1047-3289.59.9.1070

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Ozone and alkyl nitrate formation from the Deepwater Horizon oil spill atmospheric emissions

Publication / Journal

JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES

Abstract

Ozone (O-3), alkyl nitrates (RONO2), and other photochemical products were formed in the atmosphere downwind from the Deepwater Horizon (DWH) oil spill by photochemical reactions of evaporating hydrocarbons with NOx (= NO + NO2) emissions from spill response activities. Reactive nitrogen species and volatile organic compounds (VOCs) were measured from an instrumented aircraft during daytime flights in the marine boundary layer downwind from the area of surfacing oil. A unique VOC mixture, where alkanes dominated the hydroxyl radical (OH) loss rate, was emitted into a clean marine environment, enabling a focused examination of O-3 and RONO2 formation processes. In the atmospheric plume from DWH, the OH loss rate, an indicator of potential O-3 formation, was large and dominated by alkanes with between 5 and 10 carbons per molecule (C-5-C-10). Observations showed that NOx was oxidized very rapidly with a 0.8 h lifetime, producing primarily C-6-C-10 RONO2 that accounted for 78% of the reactive nitrogen enhancements in the atmospheric plume 2.5 h downwind from DWH. Both observations and calculations of RONO2 and O-3 production rates show that alkane oxidation dominated O-3 formation chemistry in the plume. Rapid and nearly complete oxidation of NOx to RONO2 effectively terminated O-3 production, with O-3 formation yields of 6.0 +/- 0.5 ppbv O-3 per ppbv of NOx oxidized. VOC mixing ratios were in large excess of NOx, and additional NOx would have formed additional O-3 in this plume. Analysis of measurements of VOCs, O-3, and reactive nitrogen species and calculations of O-3 and RONO2 production rates demonstrate that NOx-VOC chemistry in the DWH plume is explained by known mechanisms.

Keywords

Authors

Neuman, JA; Aikin, KC; Atlas, EL; Blake, DR; Holloway, JS; Meinardi, S; Nowak, JB; Parrish, DD; Peischl, J; Perring, AE; Pollack, IB; Roberts, JM; Ryerson, TB; Trainer, M

Volume	Issue	Pages	Date Published	Times Cited
117			May 2012	2

Digital Object Identifier (DOI)

10.1029/2011JD017150

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

High ozone concentrations on hot days: The role of electric power demand and NOx emissions

Publication / Journal

Geophysical Research Letters

Abstract

High ambient temperatures intensify photochemical production of tropospheric ozone, leading to concerns that global warming may exacerbate smog episodes. This widely observed phenomenon has been termed the climate penalty factor (CPF). A variety of meteorological and photochemical processes have been suggested to explain why surface ozone increases on hot days. Here, we quantify an anthropogenic factor previously overlooked: the rise of ozone precursor emissions on hot summer days due to high electricity demand. Between 1997 and 2011, power plant emissions of NOx in the eastern U.S. increased by 2.5-4.0%/degrees C, raising surface NOx concentrations by 0.10-0.25ppb/degrees C. Given an ozone production efficiency (OPE) of 8mol/mol based on the 2011 NASA DISCOVER-AQ campaign, at least one third of the CPF observed in the eastern U.S. can be attributed to the temperature dependence of NOx emissions. This finding suggests that controlling emissions associated with electricity generation on hot summer days can mitigate the CPF.

Keywords

Authors

He, H; Hembeck, L; Hosley, KM; Canty, TP; Salawitch, RJ; Dickerson, RR

Volume	Issue	Pages	Date Published	Times Cited
40	19	5291-5294	October 2013	0

Digital Object Identifier (DOI)

10.1002/grl.50967

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Photodegradation of salicylic acid in aquatic environment: Effect of different forms of nitrogen

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

Salicylic acid (SA), as an extensively used compound, can be detected in a great variety of environmental water samples. Photodegradation is important in many ways. The present study concerns the environmental behavior of SA under simulated sunlight. A kinetic model was used for SA degradation in water, and the variations of the photodegradation of SA in the presence of different initial concentrations, different oxygen levels, different forms of nitrogen and different pE values in the aquatic environment were determined. Experiments demonstrated that the photodegradation process had pseudo-first-order reaction kinetics. The photodegradation rate decreased with increasing initial concentration and increased with increasing oxygen level. The NO3- and NO2- ions promoted photodegradation of SA, but increases of NH4+ concentration had no effect. The form of nitrogen depends on pE, which therefore has a significant influence on the photodegradation of SA. When the pE value increased gradually, there was a transformation of NH4+ to NO2- and then to NO3-. The photodegradation rate of SA first increased, then decreased and finally increased again. When NO2- and NH4+ coexisted, the photodegradation rate was almost the same as it was in the presence of NO2- alone. When NO2- and NO3- coexisted, the promoting effect on the photodegradation SA was less than the sum of the partial promoting effects. The results indicated that NO2- had an obvious antagonistic action on NO3- when NO3- and NO2- coexisted in the aquatic environment.

Keywords

Authors

Gangwang; Liu, GG; Liu, HJ; Zhang, N; Wang, YL

Volume	Issue	Pages	Date Published	Times Cited
435		573-577	October 2012	0

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2012.05.068

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Sulfur processing in the marine atmospheric boundary layer: A review and critical assessment of modeling uncertainties

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Sulfur is an extremely motile and vital element in the Earth's biogeochemical environment, one whose active redox chemistry maintains small reservoirs in the atmosphere and biosphere yet large fluxes through both. Essential for life, intimately linked to the climate state, and an important component of air quality, sulfur and its transport and processing in the atmosphere have been the subject of active research for several decades. This review article describes the current state of our understanding of the atmospheric sulfur cycle, focusing on the marine atmospheric boundary layer, with the aim of identifying the largest roots of uncertainty that most inhibit accurate simulation of sulfur cycling in the atmosphere. An overview of the emissions by phytoplankton and shipping, dispersion and entrainment in the marine boundary layer, and chemical processing by aerosols, clouds, and dry deposition is presented. Analysis of 20 contemporary modeling studies suggests that the greatest ambiguity in global sulfur cycling derives from (in descending order) wet deposition of aerosol sulfate, dry deposition of sulfur dioxide to the Earth's surface, and the heterogeneous oxidation of SO2 in aerosols and clouds.

Keywords

Authors

Faloona, Ian

Volume	Issue	Pages	Date Published	Times Cited
43	18	2841-2854	June 2009	24

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2009.02.043

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Experimental investigation of the scavenging of gaseous mercury by sea salt aerosol

Publication / Journal

JOURNAL OF ATMOSPHERIC CHEMISTRY

Abstract

Sea salt aerosol may be an important sink for reactive gaseous mercury (RGM) in the marine boundary layer, reducing ambient RGM concentrations and transferring the mercury (Hg) to the oceans and coastal ecosystems. The goal of this study was to determine the affinity of gaseous mercury for sea salt aerosol (SSA) by conducting adsorption experiments with sea salt-coated sampling denuders. In the first set of experiments, ambient outdoor air was passed through denuders coated with either KCl, as in the widely accepted method to sample RGM, or with NaCl, a primary component of sea salt aerosols. On the one sampling day in which RGM was above the MDL, the NaCl coated denuders removed Hg from the ambient air, equivalent to 87% of the RGM in the air (as determined by KCl denuders). For the second set of experiments HgCl2 generated in the laboratory was passed through denuders coated with KCl and either NaCl or sea salt. The NaCl denuders collected an average of 99 +/- 16% of the mercury that the KCl denuders collected. Newly coated sea salt denuders collected 88 +/- 17% of the amount of mercury that the KCl denuders collected, but interestingly the sea salt denuders capacity decreased with repeated use. These experiments demonstrate that HgCl2, a major component of RGM has a strong affinity for NaCl and sea salt and is therefore likely to be scavenged by SSA. This study adds to the growing evidence that RGM is scavenged by sea salt aerosols and therefore more quickly deposited to the ocean and coastal environment.

Keywords

Authors

Malcolm, EG; Ford, AC; Redding, TA; Richardson, MC; Strain, BM; Tetzner, SW

Volume	Issue	Pages	Date Published	Times Cited
63	3	221-234	July 2009	6

Digital Object Identifier (DOI)

10.1007/s10874-010-9165-y

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Springtime boundary layer O-3 and GEM depletion at Toolik Lake, Alaska

Publication / Journal

JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES

Abstract

Atmospheric surface ozone (O-3) was measured at Toolik Lake, Alaska, from September 2010 to August 2011, along with winter and springtime (January-May) measurements of gaseous elemental mercury (GEM). Concurrent episodic springtime depletion of both O-3 and GEM was observed between April and May 2011. To investigate these depletion events, surface O-3 measurements from Toolik Lake were compared with similar measurements from Barrow, the only Alaskan site available to use as an indicator of conditions at the Arctic Ocean coastline. Barrow is located approximately 400 km to the northwest of Toolik Lake. In all cases where O-3 and GEM depletion was observed at Toolik Lake, similar O-3 depletion events (ODEs) were observed at Barrow. Conversely, in over half of the instances where ODEs were observed at Barrow, no such events were recorded at Toolik Lake. The Lagrangian particle dispersion model FLEXPART was utilized to interpret the transport conditions and potential influence of oceanic air masses on depletion events observed at Toolik Lake. These analyses indicate that ODEs observed at Toolik Lake are correlated with depletion events observed at Barrow when the prevailing airflow is from the north and the air mass has spent substantial time over the Arctic Ocean or coast within the previous week. These observations suggest that coastal O-3 and GEM-depleted air masses are likely transported from the Arctic Ocean up to similar to 200 km inland and to at least an altitude of 700 m above sea level. These observations underscore that O-3 and GEM depletion events impact not just the Arctic coastal zone but also extensive inland areas with possible implications for the cycling and bioavailability of mercury (Hg) to inland Arctic ecosystems.

Keywords

Authors

Van Dam, B; Helmig, D; Burkhart, JF; Obrist, D; Oltmans, SJ

Volume	Issue	Pages	Date Published	Times Cited
118	8	3382-3391	April 2013	0

Digital Object Identifier (DOI)

10.1002/jgrd.50213

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☑	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Trends in cation, nitrogen, sulfate and hydrogen ion concentrations in precipitation in the United States and Europe from 1978 to 2010: a new look at an old problem

Publication / Journal

BIOGEOCHEMISTRY

Abstract

Industrial emissions of SO2 and NOx, resulting in the formation and deposition of sulfuric and nitric acids, affect the health of both terrestrial and aquatic ecosystems. Since the mid-late 20th century, legislation to control acid rain precursors in both Europe and the US has led to significant declines in both SO4-S and H+ in precipitation and streams. However, several authors noted that declines in streamwater SO4-S did not result in stoichiometric reductions in stream H+, and suggested that observed reductions in base cation inputs in precipitation could lessen the effect of air pollution control on improving stream pH. We examined long-term precipitation chemistry (1978-2010) from nearly 30 sites in the US and Europe that are variably affected by acid deposition and that have a variety of industrial and land-use histories to (1) quantify trends in SO4-S, H+, NH4-N, Ca, and NO3-N, (2) assess stoichiometry between H+ and SO4-S before and after 1990, and (3) examine regional synchrony of trends. We expected that although the overall efforts of developed countries to reduce air pollution and acid rain by the mid-late 20th century would tend to synchronize precipitation chemistry among regions, geographically varied patterns of fossil fuel use and pollution control measures would produce important asynchronies among European countries and the United States. We also expected that control of particulate versus gaseous emission, along with trends in NH3 emissions, would be the two most significant factors affecting the stoichiometry between SO4-S and H+. Relationships among H+, SO4-S, NH4-N, and cations differed markedly between the US and Europe. Controlling for SO4-S levels, H+ in precipitation was significantly lower in Europe than in the US, because (1) alkaline dust loading from the Sahara/Sahel was greater in Europe than the US, and (2) emission of NH3, which neutralizes acidity upon conversion to NH4 (+), is generally significantly higher in Europe than in the US. Trends in SO4-S and H+ in precipitation were close to stoichometric in the US throughout the period of record, but not in Europe, especially eastern Europe. Ca in precipitation declined significantly before, but not after 1990 in most of the US, but Ca declined in eastern Europe even after 1990. SO4-S in precipitation was only weakly related to fossil fuel consumption. The stoichiometry of SO4-S and H+ may be explained in part by emission controls, which varied over time and among regions. Control of particulate emissions reduces alkaline particles that neutralize acid precursors as well as S-containing particulates, reducing SO4-S and Ca more steeply than H+, consistent with trends in the northeastern US and Europe before 1990. In contrast, control of gaseous SO2 emissions results in a stoichiometric relationship between SO4-S and H+, consistent with trends in the US and many western European countries, especially after 1991. However, in many European countries, declining NH3 emissions contributed to the lack of stoichiometry between SO4-S and H+.Recent reductions in NOx emissions have also contributed to declines in H+ in precipitation.
Future changes in precipitation acidity are likely to depend on multiple factors including trends in NOx and NH3 emission controls, naturally occurring dust, and fossil fuel use, with significant implications for the health of both terrestrial and aquatic ecosystems.

Keywords

Authors

Lajtha, K; Jones, J

Volume: 116

Issue: 1-3

Pages: 303-334

Date Published: December 2013

Times Cited: 0

Digital Object Identifier (DOI)

10.1007/s10533-013-9860-2

Media Category: Abiotic

Generation Type

CoalType

BiomassType

Mammals ☐ Air ☐ Nitrogen oxides ☑

Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

On the export of reactive nitrogen from Asia: NOx partitioning and effects on ozone

Publication / Journal

ATMOSPHERIC CHEMISTRY AND PHYSICS

Abstract

The partitioning of reactive nitrogen (NOy) was measured over the remote North Pacific during spring 2006. Aircraft observations of NO, NO2, total peroxy nitrates (Sigma PNs), total alkyl and multi-functional nitrates (Sigma ANs) and nitric acid (HNO3), made between 25 degrees and 55 degrees N, confirm a controlling role for peroxyacyl nitrates in NOx production in aged Asian outflow. Sigma PNs account for more than 60% of NOy above 5 km, while thermal dissociation limits their contribution to less than 10% in the lower troposphere. Using simultaneous observations of NOx, Sigma PNs, Sigma ANs, HNO3 and average wind speed, we calculate the flux of reactive nitrogen through the meridional plane of 150 degrees W (between 20 degrees and 55 degrees N) to be 0.007 +/- 0.002 Tg N day(-1), which provides an upper limit of 23 +/- 6.5% on the transport efficiency of NOy from East Asia. Observations of NOx, and HOx are used to constrain a 0-D photochemical box model for the calculation of net photochemical ozone production or tendency (Delta O-3) as a function of aircraft altitude and NOx concentrations. The model analysis indicates that the photochemical environment of the lower troposphere (altitude < 6km) over the north Pacific is one of net O-3 destruction, with an experimentally determined crossover point between net O-3 destruction and net O-3 production of 60 pptv NOx. Qualitative indicators of integrated net O-3 production derived from simultaneous measurements of O-3 and light alkanes (Parrish et al., 1992), also indicate that the north Pacific is, on average, a region of net O-3 destruction.

Keywords

Authors

Bertram, TH; Perring, AE; Wooldridge, PJ; Dibb, J; Avery, MA; Cohen, RC

Volume	Issue	Pages	Date Published	Times Cited
13	9	4617-4630	2013	0

Digital Object Identifier (DOI)

10.5194/acp-13-4617-2013

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Atmospheric mercury cycles in northern Wisconsin

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Total gaseous mercury (TGM) in the lower atmosphere of northern Wisconsin exhibits strong annual and diurnal cycles similar to those previously reported for other rural monitoring sites across mid-latitude North America. Annually, TGM was highest in late winter and then gradually declined until late summer. During 2002-04, the average TGM concentration was 1.4 +/- 0.2 (SD) ng m(-3), and the amplitude of the annual cycle was 0.4 ng m(-3) (similar to 30% of the long-term mean). The diurnal cycle was characterized by increasing TGM concentrations during the morning followed by decreases during the afternoon and night. The diurnal amplitude was variable but it was largest in spring and summer, when daily TGM oscillations of 20-40% were not uncommon. Notably, we also observed a diurnal cycle for TGM indoors in a room ventilated through an open window. Even though TGM concentrations were an order of magnitude higher indoors, (presumably due to historical practices within the building: e.g. latex paint, fluorescent lamps, thermometers), the diurnal cycle was remarkably similar to that observed outdoors. The indoor cycle was not directly attributable to human activity, the metabolic activity of vegetation or diurnal atmospheric dynamics; but it was related to changes in temperature and oxidants in outdoor air that infiltrated the room. Although there was an obvious difference in the proximal source of indoor and outdoor TGM, similarities in behavior suggest that common TGM cycles may be driven largely by adsorption/desorption reactions involving solid surfaces, such as leaves, snow, dust and walls. Such behavior would imply a short residence time for Hg in the lower atmosphere and intense recycling consistent with the "ping-pong ball" or "multi-hop" conceptual models proposed by others.

Keywords

Authors

Watras, CJ; Morrison, KA; Rubsam, JL; Rodger, B

Volume: 43

Issue: 26

Pages: 4070-4077

Date Published: August 2009

Times Cited: 6

Digital Object Identifier (DOI): 10.1016/j.atmosenv.2009.04.051

Media Category: Abiotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Modelling the impact of possible snowpack emissions of O(P-3) and NO2 on photochemistry in the South Pole boundary layer

Publication / Journal

ENVIRONMENTAL CHEMISTRY

Abstract

O(P-3) emissions due to photolysis of nitrate were recently identified from ice surfaces doped with nitric acid. O(P-3) atoms react directly with molecular oxygen to yield ozone. Therefore, these results may have direct bearing on photochemical activity monitored at the South Pole, a site already noted for elevated summertime surface ozone concentrations. NO2 is also produced via the photolysis of nitrate and the firn air contains elevated levels of NO2, which will lead to direct emission of NO2. A photochemical box model was used to probe what effect O(P-3) and NO2 emissions have on ozone concentrations within the South Pole boundary layer. The results suggest that these emissions could account for a portion of the observed ozone production at the South Pole and may explain the observed upward fluxes of ozone identified there.

Keywords

Authors

Hamer, PD; Shallcross, DE; Yabushita, A; Kawasaki, M

Volume	Issue	Pages	Date Published	Times Cited
5	4	268-273	2008	1

Digital Object Identifier (DOI)

10.1071/EN08022

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Fluxes and chemistry of nitrogen oxides in the Niwot Ridge, Colorado, snowpack

Publication / Journal

BIOGEOCHEMISTRY

Abstract

The effect of snow cover on surface-atmosphere exchanges of nitrogen oxides (nitrogen oxide (NO) + nitrogen dioxide (NO(2)); note, here 'NO(2)' is used as surrogate for a series of oxidized nitrogen gases that were detected by the used monitor in this analysis mode) was investigated at the high elevation, subalpine (3,340 m asl) Soddie site, at Niwot Ridge, Colorado. Vertical (NO + NO(2)) concentration gradient measurements in interstitial air in the deep (up to similar to 2.5 m) snowpack were conducted with an automated sampling and analysis system that allowed for continuous observations throughout the snow-covered season. These measurements revealed sustained, highly elevated (NO + NO(2)) mixing ratios inside the snow. Nitrogen oxide concentrations were highest at the bottom of the snowpack, reaching levels of up to 15 ppbv during mid-winter. Decreasing mixing ratios with increasing distance from the soil-snow interface were indicative of an upwards flux of NO from the soil through the snowpack, and out of the snow into the atmosphere, and imply that biogeochemical processes in the subnival soil are the predominant NO source. Nitrogen dioxide reached maximum levels of similar to 3 ppbv in the upper layers of the snowpack, i.e., similar to 20-40 cm below the surface. This behavior suggests that a significant fraction of NO is converted to NO(2) during its diffusive transport through the snowpack. Ozone showed the opposite behavior, with rapidly declining levels below the snow surface. The mirroring of vertical profiles of ozone and the NO(2)/(NO + NO(2)) ratio suggest that titration of ozone by NO in the snowpack contributes to the ozone reaction in the snow and to the ozone surface deposition flux. However, this surface efflux of (NO + NO(2)) can only account for a minor fraction of ozone deposition flux over snow that has been reported at other mid-latitude sites. Neither (NO + NO(2)) nor ozone levels in the interstitial air showed a clear dependence on incident solar irradiance, much in contrast to observations in polar snow. Comparisons with findings from polar snow studies reveal a much different (NO + NO(2)) and ozone snow chemistry in this alpine environment. Snowpack concentration gradients and diffusion theory were applied to estimate an average, wintertime (NO + NO(2)) flux of 0.005-0.008 nmol m(-2) s(-1), which is of similar magnitude as reported (NO + NO(2)) fluxes from polar snow. While fluxes are similar, there is strong evidence that processes controlling (NO + NO(2)) fluxes in these environments are very different, as subnivial soil at Niwot Ridge appears to be the main source of the (NO + NO(2)) efflux, whereas in polar snow (NO + NO(2)) has been found to be primarily produced from photochemical de-nitrification of snow nitrate.

Keywords

Authors

Helmig, D; Seok, B; Williams, MW; Hueber, J; Sanford, R

Volume	Issue	Pages	Date Published	Times Cited
95	1	115-130	August 2009	14

Digital Object Identifier (DOI)

10.1007/s10533-009-9312-1

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐

Benthic Invertebrates	☐	Humidity	☐
Lichen/Moss	☐	Other Abiotic Medium	☑
Microbes	☐		
Other Biotic Medium	☐		

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

A novel approach for soil contamination assessment from heavy metal pollution: A linkage between discharge and adsorption

Publication / Journal

Journal of Hazardous Materials

Abstract

Soil protection from heavy metal contamination requires scientific assessment on the linkage between site-specific pollutant discharge and environmental effects. However, this kind of linkage is usually disregarded due to the lack of assessment tools in environmental policies, e.g., some developed coastal cities in China have forced their highly polluting industries out to less developed interior areas without consideration of the impacts from pollution transfer. This paper developed a soil adsorption fraction (SAF) model to characterize the emissions-to-adsorption relationship between heavy metal emission and the adsorption by soil. Case studies were carried out for two adjacent southern cities in China, i.e., Guangzhou and Shaoguan. The results indicated that the average SAF of cadmium was 5.38 × 10−3 for Shaoguan and 1.28 × 10−3 for Guangzhou, i.e., cadmium released from Shaoguan threatened the soil environment 4.2 times of that from Guangzhou. Further analysis showed the polluting pathway and abundance of water resources were the main influencing factors on SAF. Soil contamination will be exaggerated by relocating heavy metal polluting industries from coastal areas to interior areas. The results should be useful to prompt site-specific policies on heavy metal pollution control.

Keywords

Heavy metal; Soil adsorption fraction; Soil pollution; Intake fraction

Authors

Dong, X.; Li, C.; Li, J.; Wang, J.; Liu, S. & Ye, B.

Volume	Issue	Pages	Date Published	Times Cited
175		1022-1030	2010	

Digital Object Identifier (DOI)

10.1016/j.jhazmat.2009.10.112

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: A

Title

Effect of power plant emission reductions on a nearby wilderness area: a case study in northwestern Colorado

Publication / Journal

ENVIRONMENTAL MONITORING AND ASSESSMENT

Abstract

This study evaluates the effect of emission reductions at two coal-fired power plants in northwestern Colorado on a nearby wilderness area. Control equipment was installed at both plants during 1999-2004 to reduce SO2 and NOx emissions. One challenge was separating the effects of local from regional emissions, which also declined during the study period. The long-term datasets examined confirm that emission reductions had a beneficial effect on air and water quality in the wilderness. Despite a 75 % reduction in SO2 emissions, sulfate aerosols measured in the wilderness decreased by only 20 %. Because the site is relatively close to the power plants (< 75 km), the slow rate of conversion of SO2 to sulfate, particularly under conditions of low relative humidity, might account for this less than one-to-one response. On the clearest days, emissions controls appeared to improve visibility by about 1 deciview, which is a small but perceptible improvement. On the haziest days, however, there was little improvement perhaps reflecting the dominance of regional haze and other components of visibility degradation particularly organic carbon and dust. Sulfate and acidity in atmospheric deposition decreased by 50 % near the southern end of the wilderness of which 60 % was attributed to power plant controls and the remainder to reductions in regional sources. Lake water sulfate responded rapidly to trends in deposition declining at 28 lakes monitored in and near the wilderness. Although no change in the acid-base status was observed, few of the lakes appear to be at risk from chronic or episodic acidification.

Keywords

Authors

Mast, MA; Ely, D

Volume: 185

Issue: 9

Pages: 7081-7095

Date Published: September 2013

Times Cited: 0

Digital Object Identifier (DOI)

10.1007/s10661-013-3086-6

Media Category: Abiotic

Generation Type: Coal

CoalType:

BiomassType:

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Long-term atmospheric visibility trend in Southeast China, 1973-2010

Publication / Journal

Atmospheric Environment

Abstract

Particulate matter (PM) pollution in Southeast China has been worsening because of the rapid industrial development and urbanization, which have significant negative effects on atmospheric visibility. Characterization of the trend in atmospheric visibility is important for evaluating the impact of PM pollution on the impairment of visual air quality in urban and rural areas. Long-term trend in atmospheric visibility in Southeast China was analyzed for the period of 1973-2010 based on the meteorological data from the National Climatic Data Center (NCDC) database using four statistical methods: annual mean visibility, percentages of "very good" visibility and "bad" visibility, ridit analysis, and cumulative percentiles. The relationship of atmospheric extinction with Air Pollution Index (API) was studied. In addition, the effects of recent environment policies on visibility were studied. The results showed that the visibility had decreased in 94% stations of this region and prefecture stations had the highest decreasing trend of -3.1 km/decade during the entire period. The average visibility of all the 17 stations (i.e., region-average) declined at a rate of -2.0 km/decade, with a 38-year average of 18.1 km. Decrease in the percentage of "very good" visibility and increase in the percentage of "bad" visibility existed in 14 and 16 stations, respectively. Region-average percentage of "bad" visibility was in the range of 2.2-21.5%, with an increasing rate of 5.0% per decade, and that of "very good" visibility was 24.4-71.8%, with a decreasing rate of -10.7% per decade. During the entire period, county and prefecture stations had similar changing patterns and trends in visibility, while town stations had the least worsening trends. Region-average visibility was better before 1988 while worse after 1993 when comparing to the entire period, with the transition period of 1988-1993. The worst 20%, 50% and best 20% of region-average visibility declined at a rate of -1.6, -2.0 and -2.4 km/decade, with the average of 13.1,17.8 and 23.0 km, respectively. During 2000-2010, the daily dry extinction coefficients were positively correlated with API with linear R-2 values of 0.42 and 0.43 for Xiamen and Shantou, respectively, suggesting that the air pollution could be responsible for the visibility impairment in Southeast China. Analysis on the effects of recent policies suggested that visibility change was significantly positively correlated with environment treatment variables including Removed Industrial SO2 (RISO2), Total Investment in Environmental Pollution Control (TIEPC), Area of Green Space (AGS) and Removed Industrial Dust (RID), but significantly negatively correlated with Emission of Industrial Dust (EID). Time-lag effect on the contribution of TIEPC to visibility was found. It is suggested that continuous and effective pollution control strategy, particularly increasing investment in environment control and pollutant emission reduction, is needed to counteract the degradation of atmospheric visibility in Southeast China.

Keywords

Authors

Deng, JJ ; Du, K; Wang, K; Yuan, CS; Zhao, JJ

Volume	Issue	Pages	Date Published	Times Cited
59		11-21	November 2012	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐

Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Observations of new aerosol particle formation in a tropical urban atmosphere

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Particle number concentrations (PNC) and particle size distributions (PSD) in the size range of 5.6-560 nm were measured in Singapore during South West (SW) and North East (NE) monsoon periods. The field study was conducted from 27 July 2008 to 15 August 2008 and from 21 January 2009 to 22 February 2009. A distinct peak of PNC in the afternoon was observed in addition to morning and evening rush hour peaks during the SW monsoon period. Concurrent measurements of PSD, SO2, Black Carbon (BC) and proxy H2SO4 concentrations revealed that the afternoon peaks observed during the SW monsoon period were likely due to new particle formation. These nucleation events were frequently observed during the SW monsoon period, but were rarely seen during the NE monsoon period. The effect of meteorological parameters viz. Temperature (T), Relative Humidity (RH), Incoming Solar radiation (SR) on the rate and intensity of nucleation was examined. Strong nucleation events were observed in the presence of high H2SO4 concentrations at high T, high SR, and low RH. The newly formed particles did not show any signs of growth during the nucleation events. New particle formation (NPF) events appear to be mainly induced by SO2 emissions from the local point sources (e.g. petroleum refineries), so when winds blew from that direction nucleation events were prominent. Local bush fires were observed during the course of air sampling due to a prolonged dry spell in the months of January and February 2009. During the occurrence of the local smoke haze induced by bush fires, nucleation events were suppressed.

Keywords

Authors

Betha, R; Spracklen, DV; Balasubramanian, R

Volume	Issue	Pages	Date Published	Times Cited
71		340-351	June 2013	0

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2013.01.049

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mercury Sources, Distribution, and Bioavailability in the North Pacific Ocean: Insights from Data and Models

Publication / Journal

Global Biogeochemical Cycles

Abstract

The research attempts to tie together mercury soundings in the North Pacific, mercury (Hg) levels in upper trophic level fish, and ocean circulation as a transport mechanism between hemispheres. Fish captured in the North Pacific make up a majority of the U.S. fish in commerce, so represent a large component of U.S. Hg exposure. Limited sounding data on Pacific mono- and dimethylmercury are presented, and used in combination with regional results from global Hg deposition modeling to develop patterns of Hg into and across the North Pacific. The study finds that concentrations of total-Hg from the most recent cruises have increased with respect to those of earlier cruises. These data compared well to global model results. Methylated Hg (methHg) is about 30% of total-Hg in subsurface waters along eastern Pacific north-south cruise transects, although lower levels are found in deeper waters away from net primary productivity zones. A significant relationship between methHg and organic carbon supports the importance of particulate organic carbon in the transport and removal of methHg in the Pacific. The assumption is that increasing Hg in the western Pacific due to deposition from increasing Asian source emissions, plus upper-ocean methylation in place, will then be transported eastward by the North Pacific Gyre

Keywords

methylmercury;organic carbon;atmospheric deposition

Authors

Sunderland, EM; Krabbenhoft, DP; Moreau, JW; Strode, SA; and Landing, WM.

Volume	Issue	Pages	Date Published	Times Cited
23	2		2009	

Digital Object Identifier (DOI)

10.1029/2008GB003425

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Technical analysis of coal utilization and environmental pollution

Publication / Journal

International Journal of Innovation and Applied Studies

Abstract

Coal is known as black gold, the food of industry. It has been used as one of the main energies for human being since the 18th century. Although its important place has been taken by petroleum nowadays, due to the daily drying up of petroleum for quite a period of time in the future, the large quantity of coal reserves and with the rapid development of science and technology, especially maturity and wide use of integrated coal gasification technology, coal will become one of the energies that cannot be replaced in human life and production. Coal increased fastest for five successive years. Coal consumption increased by 4.5% in the world which is higher than the average level 3.2% of last ten years. However, the use of coal has brought up serious ecological environment problems. In the 20th century, serious air environmental pollution events, such as acid rain, damage to ozonosphere, global warming, photochemical smog and urban coal smog, are all related to coal burning. The principal source of main pollutants in air, for example, SO 2, NO x, CO, fume dust, particles, organic pollutants and heavy metals, are caused by coal burning. These pollutants have caused irreversible damage to human health and ecological environment. Finally this paper describes coal consumption and environmental problems due to coal utilization.

Keywords

Authors

Jamil, I.; Jamil, R.; Ghaffar, A.; Li Ming; Zhao JinQuan; Rizwan Jamil

Volume	Issue	Pages	Date Published	Times Cited
4	3	568-581	2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Coal		

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Acidification of Earth: An assessment across mechanisms and scales

Publication / Journal

Applied Geochemistry

Abstract

In this review article, anthropogenic activities that cause acidification of Earth's air, waters, and soils are examined. Although there are many mechanisms of acidification, the focus is on the major ones, including emissions from combustion of fossil fuels and smelting of ores, mining of coal and metal ores, and application of nitrogen fertilizer to soils, by elucidating the underlying biogeochemical reactions as well as assessing the magnitude of the effects. These widespread activities have resulted in (1) increased CO2 concentration in the atmosphere that acidifies the oceans; (2) acidic atmospheric deposition that acidifies soils and bodies of freshwater; (3) acid mine drainage that acidifies bodies of freshwater and groundwaters; and (4) nitrification that acidifies soils. Although natural geochemical reactions of mineral weathering and ion exchange work to buffer acidification, the slow reaction rates or the limited abundance of reactant phases are overwhelmed by the onslaught of anthropogenic acid loading. Relatively recent modifications of resource extraction and usage in some regions of the world have begun to ameliorate local acidification, but expanding use of resources in other regions is causing environmental acidification in previously unnoticed places. World maps of coal consumption, Cu mining and smelting, and N fertilizer application are presented to demonstrate the complex spatial heterogeneity of resource consumption as well as the overlap in acidifying potential derived from distinctly different phenomena. Projected population increase by country over the next four decades indicates areas with the highest potential for acidification, so enabling anticipation and planning to offset or mitigate the deleterious environmental effects associated with these global shifts in the consumption of energy, mineral, and food resources.

Keywords

Authors

Rice, K. C. & Herman, J. S.

Volume	Issue	Pages	Date Published	Times Cited
27	1	1-14	2012	

Digital Object Identifier (DOI)

10.1016/j.apgeochem.2011.09.001

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Atmospheric nitrogen and inorganic nitrogen flux

Publication / Journal

Water, Air, and Soil Pollution Journal

Abstract

This paper examines the critical issue of the contribution of atmospheric deposition of nitrogen to acidification of aquatic systems. Flux of dissolved inorganic N from terrestrial ecosystems (DINout–primarily NO3-), resulting from atmospheric deposition (DINin–NO3- and NH4+) is considered to be an important contributor to aquatic acidification. It is generally believed that atmospheric deposition of DIN in excess of a threshold of approximately 10 kg ha-1yr-1 leads to significant flux that can lead to acidification. The issue of N leaching from terrestrial to aquatic systems (leading to acidification) has regulatory importance, as it plays a critical role in future possible secondary NOx and SOx standards being considered by EPA. The objective of this study was to test the hypothesis of the presence of a threshold of increased leaching of DIN beyond about 10 kg ha-1 yr-1 DINin.

An examination of large and diverse data from published literature, personal communication, and web sites provided no evidence of a 10 kg ha-1yr-1 threshold of DINin leading to significant flux of DINout. The DIN flux is highly variable both in space and time; the spatial uncertainty as measured by the pooled coefficient of variation (CV) was about 0.95, and the temporal (inter-year) uncertainty was about 0.75. The relationship between atmospheric deposition of DIN and annual flux was found to be near-linear within the range of current deposition for U.S. sites (≤ 8 kg ha-1 yr-1 wet deposition). If wet and dry deposition are considered approximately equal, over 85% of total DIN deposition is retained in the terrestrial systems. Although input-output data have high uncertainty, the 85% retention of atmospheric DIN by terrestrial watersheds casts doubt on its importance as a contributor to aquatic acidification.

Keywords

Nitrogen saturation
Aquatic acidification
Nitrogen retention
Nitrogen saturation; Aquatic acidification; Nitrogen retention; DIN variation

Authors

Grigal, D. F.

Volume	Issue	Pages	Date Published	Times Cited
223	6	3565-3575	July 2012	

Digital Object Identifier (DOI)

10.1007/s11270-012-1128-2

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Global Atmospheric Model for Mercury Including Oxidation by Bromine Atoms

Publication / Journal

Atmospheric Chemistry and Physics

Abstract

A limitation of current atmospheric mercury fate and transport computer models is the uncertainty in the atmospheric chemistry of mercury. Such models assume that hydrogen oxide (OH) and ozone (O3) are the main oxidants converting gaseous elemental mercury (GEM, Hg0) to gaseous oxidized mercury (GOM, Hg2+) and thus drive mercury deposition. However, recent research questions the overall importance of these reactions, as atomic bromine (Br) is considered a viable alternative for oxidation of Hg0. EPRI funded a global 3-D simulation with Harvard's GEOS-Chem global chemical transport model to evaluate whether a model with Br as the Hg0 oxidant is consistent with atmospheric observations. Results are compared to the original model with OH and O3 as the oxidants.

It was found that, in-line with current measurements, using Br as the Hg0 oxidant instead of OH and O3 mainly lowered Hg0 concentrations in the southern hemisphere, increased mercury deposition to the Southern Ocean, and resulted in an atmospheric lifetime of mercury more consistent with available observations. In light of current doubts that OH and O3 effectively oxidize Hg0 under atmospheric conditions on a global scale, it was concluded that instead Br is the major global oxidant of atmospheric Hg0.

Keywords

Authors

Holmes, C. D.; Jacob, D. J.; Corbitt, E. S.; Mao, J.; Yang, X.; Talbot, R.; and Slemr, F.

Volume	Issue	Pages	Date Published	Times Cited
10		12037-12057	2010	

Digital Object Identifier (DOI)

10.5194/acp-10-12037-2010

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Global temperature change from the transport sectors: Historical development and future scenarios

Publication / Journal

Atmospheric Environment

Abstract

Transport affects climate directly and indirectly through mechanisms that operate on very different timescales and cause both warming and cooling. We calculate contributions to the historical development in global mean temperature for the main transport sectors (road transport, aviation, shipping and rail) based on estimates of historical emissions and by applying knowledge about the various forcing mechanisms from detailed studies. We also calculate the development in future global mean temperature for four transport scenarios consistent with the IPCC SRES scenarios, one mitigation scenario and one sensitivity test scenario. There are large differences between the transport sectors in terms of sign and magnitude of temperature effects and with respect to the contributions from the long- and short-lived components. Since pre-industrial times, we calculate that transport in total has contributed 9% of total net man-made warming in the year 2000. The dominating contributor to warming is CO2, followed by tropospheric O3. By sector, road transport is the largest contributor; 11% of the warming in 2000 is due to this sector. Likewise, aviation has contributed 4% and rail ~1%. Shipping, on the other hand, has caused a net cooling up to year 2000, with a contribution of −7%, due to the effects of SO2 and Nox emissions. The total net contribution from the transport sectors to total man-made warming is ~15% in 2050, and reaches 20% in 2100 in the A1 and B1 scenarios. For all scenarios and throughout the century, road transport is the dominating contributor to warming. Due to the anticipated reduction in sulphur content of fuels, the net effect of shipping changes from cooling to warming by the end of the century. Significant uncertainties are related to the estimates of historical and future net warming mainly due to cirrus, contrails and aerosol effects, as well as uncertainty in climate sensitivity.

Keywords

Transport sectors; Radiative forcing; Temperature; Historical emissions; Scenarios

Authors

Skeie, R. B.; Fuglestvedt, J.; Berntsen, T.; Lund, M. T.; Myhre, G. & Rypdal, K.

Volume	Issue	Pages	Date Published	Times Cited
43	39	6260-6270	2009	

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2009.05.025

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Aerosol loading in an urban environment from a biofuel based CHP plant: assessment and mitigation

Publication / Journal

Procedia Environmental Sciences

Abstract

This study presents outcomes from a preliminary dispersion modeling exercise for the extent of aerosol loading owing to enhanced biomass combustion in the future energy mix. Secondary aerosol generation potential from photochemical interactions between the precursor emissions from a typical biomass based combined heat and power (CHP) plant and the associated local emissions from harvest and transportation of the biofuels has been estimated for a peri-urban site in the UK. The study provides results for two options – one, direct firing of the energy crop (miscanthus) i.e. base case; two, biomass gasification prior to combustion i.e. mitigation. We demonstrate that on considering the main life cycle stages of biofuel use i.e. harvest, transportation and combustion, the overall effect of the mitigation option is trivial. This is primarily due to increased emissions from harvest and transportation stages while meeting additional biomass feedstock demands incurred in achieving identical energy output as the base case.

Keywords

biofuel; miscanthus; secondary aerosols; photochemical; CHP; decentralised generation

Authors

Tiwary, A.; Namdeo, A.; Dore, A. & Bell, M.

Volume	Issue	Pages	Date Published	Times Cited
4		71-75	2011	

Digital Object Identifier (DOI)

10.1016/j.proenv.2011.03.009

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Biomass		

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☑
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Cloud-resolving simulations of mercury scavenging and deposition in thunderstorms

Publication / Journal

Atmospheric Chemistry and Physics

Abstract

This study examines dynamical and microphysical features of convective clouds that affect mercury (Hg) wet scavenging and concentrations in rainfall. Using idealized numerical model simulations in the Regional Atmospheric Modeling System (RAMS), we diagnose vertical transport and scavenging of soluble Hg species in thunderstorms under typical environmental conditions found in the Northeast and Southeast United States (US). Three important environmental characteristics that impact thunderstorm morphology were studied: convective available potential energy (CAPE), vertical shear (0–6 km) of horizontal wind (SHEAR) and precipitable water (PW).

We find that in a strong convective storm in the Southeast US that about 40% of mercury in the boundary layer (0–2 km) can be scavenged and deposited to the surface. Removal efficiencies are 35% or less in the free troposphere and decline with altitude. Nevertheless, if we assume that soluble Hg species are initially uniformly mixed vertically, then about 60% deposited mercury deposited by the thunderstorm originates in the free troposphere.

For a given CAPE, storm morphology and Hg deposition respond to SHEAR and PW. Experiments show that the response of mercury concentration in rainfall to SHEAR depends on the amount of PW. For low PW, increasing SHEAR decreases mercury concentrations in high-rain amounts (>13 mm). However, at higher PW values, increasing SHEAR decreases mercury concentrations for all rainfall amounts. These experiments suggest that variations in environmental characteristics relevant to thunderstorm formation and evolution can also contribute to geographical difference in wet deposition of mercury.

An ensemble of thunderstorm simulations was also conducted for different combinations of CAPE, SHEAR and PW values derived from radiosonde observations at five sites in the Northeast United States (US) and at three sites in the Southeast US. Using identical initial concentrations of gaseous oxidized mercury (GOM) and particle-bound mercury (HgP), from the GEOS-Chem model, the simulations predict higher mercury concentrations in rainfall from thunderstorms forming in the environmental conditions over the Southeast US compared to the Northeast US.

Mercury concentrations in rainfall are also simulated for a typical stratiform rain event and found to be less than in thunderstorms forming in environments typical of the Southeast US. The stratiform cloud scavenges mercury from the lower ~4 km of the atmosphere, while thunderstorms scavenge up to ~10 km.

Keywords

Authors

Nair, U.S.; Wu, Y.; Holmes, C.D.; Ter Schure, A.; Kallos, G.; Walters J.T.

Volume	Issue	Pages	Date Published	Times Cited
13		3575-3611	2013	

Digital Object Identifier (DOI)

10.5194/acpd-13-3575-2013

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐

Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mercury dynamics in the Rocky Mountain, Colorado, snowpack

Publication / Journal

BIOGEOSCIENCES

Abstract

Gaseous elemental mercury (GEM) was monitored at the Niwot Ridge (NWT) Long-Term Ecological Research (LTER) site (Colorado, USA, 40 degrees N) from interstitial air extracted from the snowpack at depths ranging from the snow surface to 10 cm above the soil. A highly dynamic cycling of mercury (Hg) in this mid-latitude snowpack was observed. Patterns were driven by both GEM production in surface snow and GEM destruction in the deeper snowpack layers. Thorough mixing and vertical transport processes were observed through the snowpack. GEM was photochemically produced near the snow-air interface throughout the entire winter, leading to enhanced GEM levels in interstitial air of surface snow of up to 8 ng m(-3). During low-wind periods, GEM in surface snow layers remained significantly above ambient air levels at night as well, which may indicate a potential weak GEM production overnight. Analyses of vertical GEM gradients in the snowpack show that surface GEM enhancements efficiently propagated down the snowpack, with a temporal lag in peak GEM levels observed with increasing depth. Downward diffusion was responsible for much of these patterns, although vertical advection also contributed to vertical redistribution. Destruction of GEM in the lower snowpack layers was attributed to dark oxidation of GEM. Analysis of vertical GEM/CO2 flux ratios indicated that this GEM destruction occurred in the snow and not in the underlying soil. The strong, diurnal patterns of photochemical GEM production at the surface ultimately lead to re-emission losses of deposited Hg back to the atmosphere. The NWT data show that highest GEM surface production and re-emissions occur shortly after fresh snowfall, which possibly resupplies photoreducible Hg to the snowpack, and that photochemical GEM reduction is not radiation-limited as it is strong even on cloudy days.

Keywords

Authors

Fain, X; Helmig, D; Hueber, J; Obrist, D; Williams, MW

Volume	Issue	Pages	Date Published	Times Cited
10	6	3793-3807	2013	0

Digital Object Identifier (DOI)

10.5194/bg-10-3793-2013

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Bounding the role of black carbon in the climate system: A scientific assessment

Publication / Journal

JOURNAL OF GEOPHYSICAL RESEARCH-ATMOSPHERES

Abstract

Black carbon aerosol plays a unique and important role in Earth's climate system. Black carbon is a type of carbonaceous material with a unique combination of physical properties. This assessment provides an evaluation of black-carbon climate forcing that is comprehensive in its inclusion of all known and relevant processes and that is quantitative in providing best estimates and uncertainties of the main forcing terms: direct solar absorption; influence on liquid, mixed phase, and ice clouds; and deposition on snow and ice. These effects are calculated with climate models, but when possible, they are evaluated with both microphysical measurements and field observations. Predominant sources are combustion related, namely, fossil fuels for transportation, solid fuels for industrial and residential uses, and open burning of biomass. Total global emissions of black carbon using bottom-up inventory methods are 7500 Gg yr(-1) in the year 2000 with an uncertainty range of 2000 to 29000. However, global atmospheric absorption attributable to black carbon is too low in many models and should be increased by a factor of almost 3. After this scaling, the best estimate for the industrial-era (1750 to 2005) direct radiative forcing of atmospheric black carbon is +0.71 W m(-2) with 90% uncertainty bounds of (+0.08, +1.27) W m(-2). Total direct forcing by all black carbon sources, without subtracting the preindustrial background, is estimated as +0.88 (+0.17, +1.48) W m(-2). Direct radiative forcing alone does not capture important rapid adjustment mechanisms. A framework is described and used for quantifying climate forcings, including rapid adjustments. The best estimate of industrial-era climate forcing of black carbon through all forcing mechanisms, including clouds and cryosphere forcing, is +1.1 W m(-2) with 90% uncertainty bounds of +0.17 to +2.1 W m(-2). Thus, there is a very high probability that black carbon emissions, independent of co-emitted species, have a positive forcing and warm the climate. We estimate that black carbon, with a total climate forcing of +1.1 W m(-2), is the second most important human emission in terms of its climate forcing in the present-day atmosphere; only carbon dioxide is estimated to have a greater forcing. Sources that emit black carbon also emit other short-lived species that may either cool or warm climate. Climate forcings from co-emitted species are estimated and used in the framework described herein. When the principal effects of short-lived co-emissions, including cooling agents such as sulfur dioxide, are included in net forcing, energy-related sources (fossil fuel and biofuel) have an industrial-era climate forcing of +0.22 (-0.50 to +1.08) W m(-2) during the first year after emission. For a few of these sources, such as diesel engines and possibly residential biofuels, warming is strong enough that eliminating all short-lived emissions from these sources would reduce net climate forcing (i.e., produce cooling). When open burning emissions, which emit high levels of organic matter, are included in the total, the best estimate of net industrial-era climate forcing by all short-lived species from black-carbon-rich sources becomes slightly negative (-0.06 W m(-2) with 90% uncertainty bounds of -1.45 to +1.29 W m(-2)).
The uncertainties in net climate forcing from black-carbon-rich sources are substantial, largely due to lack of knowledge about cloud interactions with both black carbon and co-emitted organic carbon. In prioritizing potential black-carbon mitigation actions, non-science factors, such as technical feasibility, costs, policy design, and implementation feasibility play important roles. The major sources of black carbon are presently in different stages with regard to the feasibility for near-term mitigation. This assessment, by evaluating the large number and complexity of the associated physical and radiative processes in black-carbon climate forcing, sets a baseline from which to improve future climate forcing estimates

Keywords

Authors

Bond, TC; Doherty, SJ; Fahey, DW; Forster, PM; Berntsen, T; DeAngelo, BJ; Flanner, MG; Ghan, S; Karcher, B; Koch, D; Kinne, S; Kondo, Y; Quinn, PK; Sarofim, MC; Schultz, MG; Schulz, M; Venkataraman, C; Zhang, H; Zhang, S; Bellouin, N; Guttikunda, SK;

Volume	Issue	Pages	Date Published	Times Cited
118/	11	5380-5552	June 2013	81

Digital Object Identifier (DOI)

10.1002/jgrd.50171

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Isotopic composition of species-specific atmospheric Hg in a coastal environment

Publication / Journal

Chemical Geology

Abstract

The isotopic composition of species-specific atmospheric mercury (Hg0, HgII, and HgP) was investigated in the coastal environment of the Gulf of Mexico. This study reports the first attempt to measure the isotopic compositions of Hg0, HgII, and HgP collected concurrently in a coastal marine environment. Mass Dependent Fractionation (MDF; δ) of Hg0 (δ202Hg) was observed, suggesting that the evasion flux of Hg from surface water contributes significantly to atmospheric Hg0 along the northern coast of the Gulf of Mexico. Alternatively, the low Hg0 δ202Hg values and negative Mass Independent Fraction (MIF; Δ), with an average Δ199Hg of -0.25‰ ± 0.09‰, could reflect fractionation induced by atmospheric processes, such as oxidation and/or deposition, during long range transport. Although a variety of U.S. coal deposits display similar MIF (Δ199Hg between -0.30‰ to +0.10‰), the burning of coal and control technologies can change these values. Diurnal variation observed in HgII (g) and Hg(p) concentrations suggests that the primary source of HgII (g) and Hg(p) at Grand Bay, Gulf Coast, is the photochemical oxidation of Hg0(g). Positive mass-independent fractionation in Hg(p) suggests that significant in-aerosol photochemical reduction of HgII takes place.

Keywords

Mercury; Isotope fractionation; MIF; In-aerosol photoreduction; Isotope tracing; Grand Bay

Authors

Rolison, JM; Landing, WM; Luke, W; Cohen, M; and Salters, VJM

Volume	Issue	Pages	Date Published	Times Cited
336		37-49	January 2013	

Digital Object Identifier (DOI)

10.1016/j.chemgeo.2012.10.007

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title: Contributions to the study of lichens in the Republic of Moldova and their application in air quality monitoring

Publication / Journal: Contributii Botanice

Abstract: Currently, the lichen flora of the Republic of Moldova comprises c. 200 species and varieties, of which 22 species are reported nationally for the first time and 40 species are recommended as reliable indicators. The paper presents a Lichens Toxi-tolerance Scale (LTS) towards SO2 concentration in the air. An air quality assessment scale with 6 gradations (further referred to as AQAS) is proposed, taking into account the specific diversity, abundance and indicator species toxi-tolerance. The proposed scale has been applied to 62 forest ecosystems. The paper also presents a comparative analysis of the application of AQAS towards EMEP data for the Republic of Moldova.

Keywords:

Authors: Begu, A.

Volume	Issue	Pages	Date Published	Times Cited
44		93-106	2009	0

Digital Object Identifier (DOI):

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mortality and recruitment of mountain birch (Betula pubescens ssp czerepanovii) in the impact zone of a copper-nickel smelter in the period of significant reduction of emissions: The results of 15-year monitoring

Publication / Journal

RUSSIAN JOURNAL OF ECOLOGY

Abstract

Long-term monitoring of mountain birch populations (1992-2006) was performed in 14 test plots located at distances of 1 to 63 km from the copper-nickel smelter in Monchegorsk (Murmansk oblast) and differing in the degree of disturbance. In the period from 1999 to 2006, atmospheric emissions of sulfur dioxide and heavy metals amounted to only one-third of those between 1992 and 1998, but birch mortality in heavily polluted areas (with nickel concentrations in leaves exceeding 160 mg/kg) remained at the same level, being absent (as previously) in less polluted areas. Throughout the observation period, birch recruitment was observed only in areas where nickel concentrations in the leaves were below 160 mg/kg; i.e., this concentration proved to be the threshold with respect to both mortality and recruitment of mountain birch. The course of demographic processes in its populations has remained unchanged after the reduction of emissions, confirming the hypothesis of the "inertial" effect of industrial emissions on ecosystems. In some areas of industrial barrens, mountain birch may perish completely within the next decade.

Keywords

Authors

Zverev, VE

Volume	Issue	Pages	Date Published	Times Cited
40	4	254-260	July 2009	5

Digital Object Identifier (DOI)

10.1134/S1067413609040055

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Species Differences in the Sensitivity of Avian Embryos to Methylmercury

Publication / Journal

ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY

Abstract

We injected doses of methylmercury into the air cells of eggs of 26 species of birds and examined the dose-response curves of embryo survival. For 23 species we had adequate data to calculate the median lethal concentration (LC50). Based on the dose-response curves and LC(50)s, we ranked species according to their sensitivity to injected methylmercury. Although the previously published embryotoxic threshold of mercury in game farm mallards (Anas platyrhynchos) has been used as a default value to protect wild species of birds, we found that, relative to other species, mallard embryos are not very sensitive to injected methylmercury; their LC50 was 1.79 mu g/g mercury on a wet-weight basis. Other species we categorized as also exhibiting relatively low sensitivity to injected methylmercury (their LC(50)s were 1 mu g/g mercury or higher) were the hooded merganser (Lophodytes cucullatus), lesser scaup (Aythya affinis), Canada goose (Branta canadensis), double-crested cormorant (Phalacrocorax auritus), and laughing gull (Larus atricilla). Species we categorized as having medium sensitivity (their LC(50)s were greater than 0.25 mu g/g mercury but less than 1 mu g/g mercury) were the clapper rail (Rallus longirostris), sandhill crane (Grus canadensis), ring-necked pheasant (Phasianus colchicus), chicken (Gallus gallus), common grackle (Quiscalus quiscula), tree swallow (Tachycineta bicolor), herring gull (Larus argentatus), common tern (Sterna hirundo), royal tern (Sterna maxima), Caspian tern (Sterna caspia), great egret (Ardea alba), brown pelican (Pelecanus occidentalis), and anhinga (Anhinga anhinga). Species we categorized as exhibiting high sensitivity (their LC(50)s were less than 0.25 mu g/g mercury) were the American kestrel (Falco sparverius), osprey (Pandion haliaetus), white ibis (Eudocimus albus), snowy egret (Egretta thula), and tri-colored heron (Egretta tricolor). For mallards, chickens, and ring-necked pheasants (all species for which we could compare the toxicity of our injected methylmercury with that of published reports where methylmercury was fed to breeding adults and was deposited into the egg by the mother), we found the injected mercury to be more toxic than the same amount of mercury deposited naturally by the mother. The rank order of sensitivity of these same three species to methylmercury was, however, the same whether the methylmercury was injected or maternally deposited in the egg (i.e., the ring-necked pheasant was more sensitive than the chicken, which was more sensitive than the mallard). It is important to note that the dose-response curves and LC(50)s derived from our egg injections are useful for ranking the sensitivities of various species but are not identical to the LC(50)s that would be observed if the mother bird had put the same concentrations of mercury into her eggs; the LC(50)s of maternally deposited methylmercury would be higher.

Keywords

Authors

Heinz, GH; Hoffman, DJ; Klimstra, JD; Stebbins, KR; Kondrad, SL; Erwin, CA

Volume	Issue	Pages	Date Published	Times Cited
56	1	129-138	January 2009	75

Digital Object Identifier (DOI)

10.1007/s00244-008-9160-3

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☑	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐

Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Urinary Levoglucosan as a Biomarker of Wood Smoke Exposure: Observations in a Mouse Model and in Children

Publication / Journal

ENVIRONMENTAL HEALTH PERSPECTIVES

Abstract

BACKGROUND: Biomass smoke is an important source of particulate matter (PM), and much remains to be discovered with respect to the human health effects associated with this specific PM source. Exposure to biomass smoke can occur in one of two main categories: short-term exposures consist of periodic, seasonal exposures typified by communities near forest fires or intentional agricultural burning, and long-term exposures are chronic and typified by the use of biomass materials for cooking or heating. Levoglucosan (LG), a sugar anhydride released by combustion of cellulose-containing materials, is an attractive candidate as a biomarker of wood smoke exposure.
OBJECTIVES: In the present study, Balb/c mice and children were assessed for LG in urine to determine its feasibility as a biomarker.
METHODS: We performed urinary detection of LG by gas chromatography/mass spectrometry after intranasal instillations of LG or concentrated PM (mice) or biomass exposure (mice or humans).
RESULTS: After instillation, we recovered most of the LG within the first 4 hr. Experiments using glucose instillation proved the specificity of our system, and instillation of concentrated PM from wood smoke, ambient air, and diesel exhaust supported a connection between wood smoke and LG. In addition, LG was detected in the urine of mice exposed to wood smoke. Finally, a pilot human study proved our ability to detect LG in urine of children.
CONCLUSIONS: These results demonstrate that LG in the lungs is detectable in the urine of both mice and humans and that it is a good candidate as a biomarker of exposure to biomass smoke.

Keywords

Authors

Migliaccio, CT; Bergauff, MA; Palmer, CP; Jessop, F; Noonan, CW; Ward, TJ

Volume	Issue	Pages	Date Published	Times Cited
117	1	74-79	January 2009	14

Digital Object Identifier (DOI)

10.1289/ehp.11378

Media Category	Generation Type	CoalType	BiomassType
Biotic	Biomass		

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Relating Source-Specific Atmospheric Sulfur Dioxide Inputs to Ecological Effects Assessment in a Complex Terrain

Publication / Journal

AIR QUALITY AND ECOLOGICAL IMPACTS: RELATING SOURCES TO EFFECTS

Abstract

The Andorra Power Plant (APP) at Teruel, Aragon, Spain (40 degrees 54' 0 '' N, 1 degrees 8' 0 '' W, 605 m ASL), with a stack height of 343 m has three units, each with a 350 MW power-generating capacity. It uses 12,000-15,000 tons of low-grade lignite daily, with high sulfur content (5-6% and estimated sulfur dioxide (SO2) emissions of 11.2 g/m(3) - S). A SO2 control (scrubber) system was installed in 1999. In an effort to understand the ecological impacts of APP SO2 emissions, the path of plume transport through a highly complex terrain of mountains and valleys was documented, separately during 1995-1999 and 1999-2003, using a mobile unit equipped with a Correlation Spectrometer (COSPEC, for the SO2 levels in the plume aloft) and a rapid response pulse fluorescence detector (for the simultaneous measurements of SO2 concentrations at ground level). In 2003, 13 ecological monitoring plots consisting of Austrian pine (Pinus nigra) were established for long-term effects studies. These plots were located within the most frequent direction of plume transport. To separate the contributions of the atmosphere from those of the soil to P. nigra foliar concentrations of total S and other elements, an Elemental Enrichment Analysis (EEA) method was used. Based on the least amount of variance between several elemental concentrations in P. nigra needles and the corresponding soils in the plots, aluminum was chosen as the normalization element for computing elemental enrichment factors. Those results identifying sites with various levels of impacts were in close agreement with the results of measured plume transport and deposition in the complex terrain, before and after the installation of the SO2 control system. Consequently, additional studies are underway to determine the long-term impacts of SO2 exposure on growth and productivity of P. nigra.

Keywords

Authors

Palau, JL; Krupa, SV; Calatayud, V; Sanz, M; Millan, M

Volume	Issue	Pages	Date Published	Times Cited
9		99-120	2009	0

Digital Object Identifier (DOI)

10.1016/S1474-8177(08)00204-0

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Associations Between Immune Function in Yearling Beef Cattle and Airborne Polycyclic Aromatic Hydrocarbons and PM1.0 Near Oil and Natural Gas Field Facilities

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

Researchers determined the potential associations between exposure to airborne tine particulate matter (ie, particulate matter that is < 1 mu m in diameter, or PM1.0) and polycyclic aromatic hydrocarbons (PAHs) and immune system function in beef cattle by using blood samples collected from yearling cattle in 22 herds in the spring of 2002. The herds were located at variable distances from industry field facilities in the major oil- and gas-producing areas of western Canada. The researchers evaluated immune system competence by measuring populations of B-lymphocytes and T-lymphocyte subtypes (CD4, CD8, gamma delta, and WC1) in peripheral circulation (n = 469), and systemic antibody production in response to vaccine administration (n = 446). They used particulate air monitors to estimate the exposure of the cattle to airborne contaminants by determining mean monthly concentrations of PM1.0 and 24 different PAHs from January to June. The mean concentration of PAHs measured in the ambient air of herds monitored in this study was low, with naphthalene being present in the highest concentration (geometric mean = 5.6 ng/m(3); geometric standard deviation = 38), followed by 1-methylnaphthalene (geometric mean = 2.2 ng/m(3); geometric standard deviation = 12). The geometric mean monthly exposure to PM1.0 was 7.1 mu g/m(3) (geometric standard deviation = 1.5) for the same period. The researchers detected no significant plausible associations between exposure to any measured airborne contaminants and immune system function.

Keywords

Authors

Bechtel, DG; Waldner, CL; Wickstrom, M

Volume: 64

Issue: SI

Pages: 47-58

Date Published: 2009

Times Cited: 3

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Simultaneous flue gas bioremediation and reduction of microalgal biomass production costs

Publication / Journal

APPLIED MICROBIOLOGY AND BIOTECHNOLOGY

Abstract

A flue gas originating from a municipal waste incinerator was used as a source of CO(2) for the cultivation of the microalga Chlorella vulgaris, in order to decrease the biomass production costs and to bioremediate CO(2) simultaneously. The utilization of the flue gas containing 10-13% (v/v) CO(2) and 8-10% (v/v) O(2) for the photobioreactor agitation and CO(2) supply was proven to be convenient. The growth rate of algal cultures on the flue gas was even higher when compared with the control culture supplied by a mixture of pure CO(2) and air (11% (v/v) CO(2)). Correspondingly, the CO(2) fixation rate was also higher when using the flue gas (4.4 g CO(2) l(-1) 24 h(-1)) than using the control gas (3.0 g CO(2) l(-1) 24 h(-1)). The toxicological analysis of the biomass produced using untreated flue gas showed only a slight excess of mercury while all the other compounds (other heavy metals, polycyclic aromatic hydrocarbons, polychlorinated dibenzodioxins and dibenzofurans, and polychlorinated biphenyls) were below the limits required by the European Union foodstuff legislation. Fortunately, extending the flue gas treatment prior to the cultivation unit by a simple granulated activated carbon column led to an efficient absorption of gaseous mercury and to the algal biomass composition compliant with all the foodstuff legislation requirements.

Keywords

Authors

Douskova, I; Doucha, J; Livansky, K; Machat, J; Novak, P; Umysova, D; Zachleder, V; Vitova, M

Volume	Issue	Pages	Date Published	Times Cited
82	1	179-185	February 2009	43

Digital Object Identifier (DOI)

10.1007/s00253-008-1811-9

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Species richness and resilience of forest communities: combined effects of short-term disturbance and long-term pollution

Publication / Journal

PLANT ECOLOGY

Abstract

Recovery of the species richness of plant communities after experimental disturbances of various severities were studied in spruce forests polluted by atmospheric entry of SO(2) and heavy metals from a copper smelter. In the three toxic load zones (impact, buffer, and background), 60 experimental "pit-and-mound" complexes (sized 1 m x 2 m, 20 complexes in each zone) were created. Colonization of disturbed areas by vascular plants was observed during a 6-year period after the disturbance. The results showed that the recovery processes were affected by disturbance severity and that the recovery differed significantly among the communities. In all of the zones, species richness increased rapidly after mild disturbance. In degraded communities, levelling of differences in the rate of colonization after mild and severe disturbances was observed. The highest colonization rate was found in the communities of background zone, while the lowest was found in the heavily degraded communities of impact zone. The disturbances significantly increased the species diversity of communities in all zones and caused a certain reversion of degraded communities to previous stage of anthropogenic succession. Mild disturbance promoted the greatest increase in the diversity indices. The study results indicate that recovery rate of species richness of plant communities is determined by the duration of negative effect of disturbances. Recovery also depends significantly on the magnitude and endurance of positive effect of disturbances. The studied communities differed significantly in these parameters. The study results also suggest that short-term disturbances can significantly modify the process of transformation of plant communities by atmospheric pollution. On the other hand, long-term pollution can considerably modify the response of forest communities to disturbances. The results also conclude that the resilience of communities does not exclusively depend on their species richness.

Keywords

Authors

Trubina, MR

Volume	Issue	Pages	Date Published	Times Cited
201	1	339-350	March 2009	8

Digital Object Identifier (DOI)

10.1007/s11258-008-9558-z

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Stable isotope food-web analysis and mercury biomagnification in polar bears (Ursus maritimus)

Publication / Journal

POLAR RESEARCH

Abstract

Mercury (Hg) biomagnification occurs in many ecosystems, resulting in a greater potential for toxicological effects in higher-level trophic feeders. However, Hg transport pathways through different food-web channels are not well known, particularly in high-latitude systems affected by the atmospheric Hg deposition associated with snow and ice. Here, we report on stable carbon and nitrogen isotope ratios, and Hg concentrations, determined for 26, late 19th and early 20th century, polar bear (Ursus maritimus) hair specimens, collected from catalogued museum collections. These data elucidate relationships between the high-latitude marine food-web structure and Hg concentrations in polar bears. The carbon isotope compositions of polar bear hairs suggest that polar bears derive nutrition from coupled food-web channels, based in pelagic and sympagic primary producers, whereas the nitrogen isotope compositions indicate that polar bears occupy > fourth-level trophic positions. Our results show a positive correlation between polar bear hair Hg concentrations and delta 15N. Interpretation of the stable isotope data in combination with Hg concentrations tentatively suggests that polar bears participating in predominantly pelagic food webs exhibit higher mercury concentrations than polar bears participating in predominantly sympagic food webs.

Keywords

Authors

Horton, TW; Blum, JD; Xie, ZQ; Hren, M; Chamberlain, CP

Volume	Issue	Pages	Date Published	Times Cited
28	3	443-454	December 2009	10

Digital Object Identifier (DOI)

10.1111/j.1751-8369.2009.00114.x

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Forest Fire Effects on Mercury Deposition in the Boreal Forest

Publication / Journal

ENVIRONMENTAL SCIENCE & TECHNOLOGY

Abstract

Particulate Hg (pHg) is a component of smoke from biomass burning and has the potential for local redeposition. Throughfall (precipitation collected beneath a conifer or deciduous canopy) and open precipitation samples were collected pre- and postfire in 2005 and 2006 using passive precipitation collectors across the Superior National Forest, located in northern Minnesota, USA. Samples were collected approximately every two weeks and analyzed for total Hg (THg) and methyl Hg (MeHg). THg concentrations increased significantly postfire in conifer throughfall (>4x increase), open precipitation (2.5x), and when all canopy types were considered (2.9x). MeHg concentrations also increased after fire regardless of the cover type (conifer throughfall: 10x increase; open precipitation: 3.5x increase; deciduous throughfall: 1.7x increase; all canopy types analyzed together: 8x increase). Total Hg deposition increased significantly under conifer cover (3.8x). Methyl Hg deposition increased significantly after fire when all canopy types were analyzed together (4.6x) and in conifer throughfall (5.9x). Canopy type influenced the magnitude of postfire THg and MeHg increase and the duration of elevated MeHg levels. Particulate Hg present in forest fire smoke represents a short-term source of increased Hg in the atmosphere that is available for local redeposition during and following fire.

Keywords

Authors

Witt, EL; Kolka, RK; Nater, EA; Wickman, TR

Volume	Issue	Pages	Date Published	Times Cited
43	6	1776-1782	March 2009	13

Digital Object Identifier (DOI)

10.1021/es802634y

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Influence of air pollution on the mountain forests along the Tateyama-Kurobe Alpine route

Publication / Journal

ECOLOGICAL RESEARCH

Abstract

The effects of air pollution on the growth of mountain trees were investigated at Buna-daira (1,180 m a.s.l.), about half the way up Mt. Tateyama, located in Japan. Every year, about 1 million tourists are transported by highland buses through the Tateyama-Kurobe Alpine route. Since the route opened in 1971, some tree species along the road have declined and have been blighted, suggesting that bus exhaust was the cause. However, the level of regional and long-range transboundary air pollution has also increased significantly over the last few decades. The atmospheric NO(2) concentration at the roadside in the forest was highly correlated with the traffic density of buses and penetration of the exhaust into the forest was detected. However, the maximum average NO(2) concentration was lower than 3.5 ppbv during the peak traffic period in the year. At Buna-daira, the total stem cross-sectional area at breast height (BA) of the forest was nearly unchanged from 1999 to 2006, but the BA of Fagus crenata decreased 10% and that of Cryptomeria japonica increased 6%. Neither tree growth nor tree death was significantly correlated with distance from the road. The cause of the decline of F. crenata could not be attributed to the effects of road, i.e., air pollution emitted from the buses or edge effects of the road. This area was more affected by regional, long-range transport of air pollution (O(3), SO(2), etc.). The average atmospheric O(3) concentration in autumn was higher than 40 ppbv and the recent increase in the O(3) concentration may be an important factor of F. crenata decline through the changes in the interspecific relationships between F. crenata and C. japonica, O(3) sensitive and tolerant species, respectively.

Keywords

Authors

Kume, A; Numata, S; Watanabe, K; Honoki, H; Nakajima, H; Ishida, M

Volume	Issue	Pages	Date Published	Times Cited
24	4	821-830	July 2009	14

Digital Object Identifier (DOI)

10.1007/s11284-008-0557-2

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Compositional, morphological, and hysteresis characterization of magnetic airborne particulate matter in Rome, Italy

Publication / Journal

GEOCHEMISTRY GEOPHYSICS GEOSYSTEMS

Abstract

The magnetic properties of tree leaves may be used to delineate the abundance and dispersal of anthropogenic airborne particulate matter (PM) in urban environments. In the city of Rome, Italy, circulating vehicles are the main source of magnetic PM, already characterized as prevalently low-coercivity, magnetite-like particles. To further constrain the nature and origin of such magnetic particles, we carried out coupled field emission scanning electron microscopy and a variety of rock magnetic analyses on PM specimens from Quercus ilex leaves and from potential PM sources in circulating motor vehicles in Rome. Fe-rich particles are mostly 0.1-5 mm in size, with irregular shapes and moss-like surface. Particles from disk brakes and diesel and gasoline exhaust pipes show distinct compositional and magnetic hysteresis signatures, suggesting that the magnetic PM collected on tree leaves consists of a mixture of particle populations deriving mostly from the abrasion of disk brakes and, to a lesser extent, from fuel combustion residuals emitted by diesel and gasoline exhausts. The contribution of fine superparamagnetic particles to the overall magnetic assemblage has been evaluated with specific rock magnetic analyses. The combined magnetic and microtextural-compositional analyses provide an effective and original tool to characterize urban PM air pollution.

Keywords

Authors

Sagnotti, L; Taddeucci, J; Winkler, A; Cavallo, A

Volume	Issue	Pages	Date Published	Times Cited
10			August 2009	18

Digital Object Identifier (DOI)

10.1029/2009GC002563

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Light acclimation and HSO(3) (-) damage on photosynthetic apparatus of three subtropical forest species

Publication / Journal

ECOTOXICOLOGY

Abstract

The effects of long-term (33 months) sun/shade acclimation and short-term (within 10 h) HSO(3) (-) treatment on leaf photosynthetic apparatus were investigated in three subtropical forest plants, Pinus massoniana, Schima superba, and Acmena acuminatissima. After 33 months' growth in two light environments (100 and 12% sunlight), rapid light curves (RLC), chlorophyll fluorescence imaging and chloroplast ultrastructures of three tested species were changed to different degrees. When leaf sections were immersed in 50 mM NaHSO(3) for 10 h, all the RLCs were lowered; chlorophyll fluorescence imaging was inclined to present warmer colors and imaging areas were decreased. However, changes in chloroplast ultrastructures differed from three species. Our results showed that the photosynthetic apparatus of a dominant species, A. acuminatissima, in the late succession stage of a subtropical forest in South China, was less sensitive to NaHSO(3) under both growing light intensities. Conversely, the chloroplasts of P. massoniana, the pioneer heliophyte species, were most susceptible to NaHSO(3). It is deduced that, SO(2) pollution may become as a factor to accelerate the succession of subtropical forest.

Keywords

Authors

Liu, N; Lin, ZF; Guan, LL; Lin, GZ; Peng, CL

Volume	Issue	Pages	Date Published	Times Cited
18	7	929-938	October 2009	6

Digital Object Identifier (DOI)

10.1007/s10646-009-0356-8

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Associations Between In Utero Exposure to Airborne Emissions From Oil and Gas Production and Processing Facilities and Immune System Outcomes in Neonatal Beef Calves

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

To determine if oil- and gas-facility emissions prospectively measured as airborne sulfur dioxide and volatile organic compounds (VOCs) were associated with immunomodulation in neonatal beef calves, veterinarians collected samples from 325 calves from 60 western Canadian herds in the spring of 2002. Researchers assessed immune system effects by enumerating B-lymphocytes and specific T-lymphocyte subtypes (CD4, CD8, gamma delta, and WC1) in peripheral circulation using flow cytometry. They estimated in utero exposure for each calf from the earliest possible breeding date of the dam to the calving date, using air-quality data from passive monitors installed in pastures and wintering areas. Numbers of circulating CD4 and CD8 T-lymphocytes were 42% and 43% lower, respectively, in calves exposed to the highest quartile (>= 0.378 mu g/m(3)) of VOCs measured as airborne concentrations of benzene compared with calves exposed to concentrations in the lowest quartile (< 0.276 mu g/m(3)). Similarly, the number of CD4 T-lymphocytes was 40% lower in calves exposed to VOCs measured as concentrations of toluene in the highest quartile (>= 0.713 mu g/m(3)), compared with calves exposed to concentrations in the lowest quartile (< 0.348 mu g/m(3)). There was no statistically significant association between in utero exposure and numbers of B-lymphocytes and gamma delta and WC1 T-lymphocyte subtypes in calf blood samples.

Keywords

Authors

Bechtel, DG; Waldner, CL; Wickstrom, M

Volume: 64

Issue: 1

Pages: 59-71

Date Published: 2009

Times Cited: 2

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Particulate Pollution Mitigating Ability of Some Plant Species

Publication / Journal

INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH

Abstract

Foliar surface of plants is continuously exposed to the surrounding atmosphere and is, therefore, the main receptor of particulate pollutants. This physical trait can be used to determine the level of particulate pollution in the surroundings, as well as the ability of individual plant species to intercept and mitigate particulate pollutants. In the present study, leaf cuticle characters of four common roadside plant species, namely Bougainvillea 'Mahara', Terminalia arjuna (Roxb.) Wt. and Arn, Cassia fistula Linn, and Polyalthia longifolia Thw. were studied from sites with heavy particulate pollutants in the atmosphere and compared with those of control/non polluted environs to evaluate their respective pollution mitigating ability. The particles deposited on the leaf surface were 2.5 to 10.0 mu m in size and the dust load was recorded in the trend of T arjuna (2.31 mg/cm(2)) > C. fistula (1.47 mg/cm(2)) > B. 'Mahara'(1.33 mg/cm(2)) and P. longifolia (0.97 mg/cm(2)). The increase in the size and frequency of epidermal cells and stomata were observed. Cuticle rupture was a major injury symptom, that was observed in T arjuna, C fistula and P. longifolia while no cuticular damage was not observed in B. 'Mahara'. On the basis of these observations it can be concluded that B. 'Mahara' is a dust mitigator and it adsorbs and / or absorbs the pollutants from the environment in which it grows.

Keywords

Authors

Kulshreshtha, K; Rai, A; Mohanty, CS; Roy, RK; Sharma, SC

Volume	Issue	Pages	Date Published	Times Cited
3	1	137-142	2009	4

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Associations Between Immune Function in Yearling Beef Cattle and Airborne Emissions of Sulfur Dioxide, Hydrogen Sulfide, and VOCs From Oil and Natura Gas Facilities

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

Researchers assessed the associations between airborne emissions from oil and gas field facilities and the structure and function of the immune system of yearling beef cattle in 27 herds during spring 2002. They evaluated the immune systems of these animals by enumerating B lymphocytes and T-lymphocyte subtypes (CD4, CD8, gamma delta, and WC1) in peripheral circulation and by measuring systemic antibody production in response to vaccination. Researchers prospectively measured exposure to sulfur dioxide, hydrogen sulfide, and volatile organic compounds (VOCs) by using air-quality data from passive monitors installed in pastures and wintering areas. They estimated the mean exposure of each animal over the 6-month period before the start of sample collection. The researchers used mixed models, which adjusted for clustering by herd and accounted for known risk factors, to examine potential associations between exposure to airborne sulfur dioxide. VOCs (measured as concentrations of benzene and toluene) and hydrogen sulfide, as well as proximity to emission sources (well-site density), and the immune system outcomes. Increasing exposure to VOCs measured as toluene was associated with significant CD4 T lymphocytopenia. The number of CD4 T lymphocytes was 30% lower in cattle exposed to VOCs measured as toluene in the highest quartile (> 0.823 mu g/m(3)) than in cattle exposed in the lowest quartile (< 0.406 mu g/m(3)).

Keywords

Authors

Bechtel, DG; Waldner, CL; Wickstrom, M

Volume: 64

Issue: SI

Pages: 73-86

Date Published: 2009

Times Cited: 3

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Nonstomatal versus Stomatal Uptake of Atmospheric Mercury

Publication / Journal

ENVIRONMENTAL SCIENCE & TECHNOLOGY

Abstract

Atmospheric constituents may be deposited to and incorporated into plant leaves, with gases entering via stomata, and gas and particles being sorbed at the surface and in some cases traversing the cuticle, possibly reaching the epidermis. Plants are known to be a sink for atmospheric mercury (Hg), and the current paradigm is that uptake of gaseous elemental Hg occurs by way of the stomata. Four plant species, Rudbeckia hirta, Sorghastrum nutans, Andropogon gerardii, and Populus tremuloides, were exposed to air from different sources and with different Hg and CO(2) concentrations in light and dark within a gas exchange chamber at similar to 25% relative humidity. Data showed that Hg concentration and air source had a significant effect ($p < 0.001$) on leaf-atmosphere Hg flux, with more deposition to the leaf occurring in elevated-Hg air, and in scrubbed air compared to ambient air. Deposition also occurred during dark and elevated CO(2) exposures, when stomatal conductance was reduced. These observations and the fact that limited or no Hg emission occurred after deposition of atmospheric Hg suggests that the nonstomatal pathway may be an important route of foliar accumulation of atmospheric Hg.

Keywords

Authors

Stamenkovic, J; Gustin, MS

Volume	Issue	Pages	Date Published	Times Cited
43	5	1367-1372	March 2009	38

Digital Object Identifier (DOI)

10.1021/es801583a

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Differential appearance of vacuolar polyphenols in black pine (Pinus nigra) needles in response to the lowering of SO2 in the air

Publication / Journal

Acta Botanica Hungarica

Abstract

The changes of vacuolar polyphenols appearance in the mesophyll cells of Black pine needles during the second year of their development and the connection of these changes with distance from the pollution source were studied as needle S-content started to decrease two years after the SO, concentration in the air approached the level that Could be considered as low near the Plomin thermal power plant. Investigation plot was arranged in zones: I - less than 10 kin, 11 - 10 to 20 km, III - 20 to 30 km around the power plant. Seven forms of vacuolar polyphenols were detected: two forms of granules - fine and larger ones, globules, thin and thick ribbons, ribbons occupying the whole cell and homogeneous mass. In the zone I the dominating were ribbon like polyphenols. The most abundant polyphenols in the zone 11 was the globular type while in the zone III besides large and fine granules thin ribbons were, also, well abundant. According to the linkage clustering zones I and 11 are more similar to each other than zone 111, based on the abundance of different polyphenols types. At this point the hypothesis that vacuolar polyphenols could be considered as some kind of "memory" molecules in the environmental monitoring of the SO2 effects on plants can be made.

Keywords

Authors

Cesar, V.; Stolfa, I.; Maurovic, S.; Paradikovic, N.; Lepedus, H.

Volume	Issue	Pages	Date Published	Times Cited
50	3-4	315-323	September 2008	0

Digital Object Identifier (DOI)

10.1556/ABot.50.2008.3-4.10

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Assessment of air and soil quality and impact of dust on crops around the cement plants in Chhatisgarh, India.

Publication / Journal

Journal of Environmental Research and Development

Abstract

Cement kilns operating in the Chhattisgarh are known to be a prime cause of air pollution. There are more than 12 industries in Chhattisgarh which deteriorate the air quality and degrading health of vegetation and human being living in the vicinity of the factories. Present study indicates that the concentration of particulate matters in the air was higher than the limits; provided by Central Pollution Control Board(CPCB),i.e. in spring of season 0-100 g/m 3 for respirable Suspended Particulate Matter (RSRM), 0-200 g/m 3 for Suspended Particulate Matter (SPM), 0-80 g/m 3 for SO 2 and NO 2 for good air quality. In the ambient air of factory the RSPM was 132.3253 g/m 3, SPM was 282.3263 g/m 3, Sulphur dioxide SO 2 was 25.865 g/m 3, nitrogen dioxide NO 2 was 44.165 g/m 3 in winter (October to December) and in the months from June to September RSPM was 104.442 g/m 3, SPM was 201.418g/m 3, SO 2 was 17.856 g/m 3, NO 2 was 33.1 g/m 3. There was apparent seasonal variability of particulate matter concentration but was not significant. Other environmental impact of cement industry was on reduction of soil fertility, availability of nutrients and yield of crops.

Keywords

Authors

Khamparia, A.; Chatterjee, S. K.

Volume	Issue	Pages	Date Published	Times Cited
7	4A	1586-1590	2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Molecular characterization of atmospheric NO(2)-responsive germin-like proteins in azalea leaves

Publication / Journal

BIOCHEMICAL AND BIOPHYSICAL RESEARCH COMMUNICATIONS

Abstract

Atmospheric nitrogen dioxide (NO(2)) is ail environmental oxidant that is removed through direct uptake by foliage, but plant responses to this highly reactive gas are nor well understood at the molecular level. From NO(2)-exposed leaves of a woody azalea (Rhododendron mucronatum), we cloned two cDNAs (RmGLP1 and RmGLP2) for germin-like proteins (GLPs), a group of ubiquitous plant proteins that have been implicated in various plant physiological and developmental processes. Quantitative analysis of mRNA expression, together with immunoblotting data, showed that foliar exposure to NO(2) caused a robust induction of these GLP-encoding genes. When produced in tobacco cell Culture, recombinant RmGLP2 was secreted into the apoplast, where it exhibited Superoxide dismutase activity. RmGLP1 and RmGLP2 represent the first examples of plant genes that are responsive to airborne NO(2). These enzymes might have a potential role in extracellular defense mechanisms through attenuation of interactions between reactive nitrogen and oxygen species.

Keywords

Authors

Kondo, K; Yamada, K; Nakagawa, A; Takahashi, M; Morikawa, H; Sakamoto, A

Volume	Issue	Pages	Date Published	Times Cited
377	3	857-861	December 2008	7

Digital Object Identifier (DOI)

10.1016/j.bbrc.2008.10.060

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Contextualizing avian mortality: A preliminary appraisal of bird and bat fatalities from wind, fossil-fuel, and nuclear electricity

Publication / Journal

Energy Policy

Abstract

This article explores the threats that wind farms pose to birds and bats before briefly surveying the recent literature on avian mortality and summarizing some of the problems with it. Based on operating performance in the United States and Europe, this study offers an approximate calculation for the number of birds killed per kWh generated for wind electricity, fossil-fuel, and nuclear power systems. The study estimates that wind farms and nuclear power stations are responsible each for between 0.3 and 0.4 fatalities per gigawatt-hour (GWh) of electricity while fossil-fueled power stations are responsible for about 5.2 fatalities per GWh. While this paper should be respected as a preliminary assessment, the estimate means that wind farms killed approximately seven thousand birds in the United States in 2006 but nuclear plants killed about 327,000 and fossil-fueled power plants 14.5 million. The paper concludes that further study is needed, but also that fossil-fueled power stations appear to pose a much greater threat to avian wildlife than wind and nuclear power technologies.

Keywords

Avian mortality; Wind energy; Birds and bats

Authors

Sovacool, B. K.

Volume	Issue	Pages	Date Published	Times Cited
37	6	2241-2248	2009	

Digital Object Identifier (DOI)

10.1016/j.enpol.2009.02.011

Media Category	Generation Type	CoalType	BiomassType
Biotic	Coal		

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☑	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Nitrogen deposition and its ecological impact in China: An overview

Publication / Journal

Environmental Pollution

Abstract

Nitrogen (N) deposition is an important component in the global N cycle that has induced large impacts on the health and services of terrestrial and aquatic ecosystems worldwide. Anthropogenic reactive N (Nr) emissions to the atmosphere have increased dramatically in China due to rapid agricultural, industrial and urban development. Therefore increasing N deposition in China and its ecological impacts are of great concern since the 1980s. This paper synthesizes the data from various published papers to assess the status of the anthropogenic Nr emissions and N deposition as well as their impacts on different ecosystems, including empirical critical loads for different ecosystems. Research challenges and policy implications on atmospheric N pollution and deposition are also discussed. China urgently needs to establish national networks for N deposition monitoring and cross-site N addition experiments in grasslands, forests and aquatic ecosystems. Critical loads and modeling tools will be further used in Nr regulation.

Keywords

Atmospheric pollution; N emission and deposition; Critical loads; Ecological impact

Authors

Liu, X.; Duan, L.; Mo, J.; Du, E.; Shen, J.; Lu, X.; Zhang, Y.; Zhou, X.; He, C. & Zhang, F.

Volume: 159

Issue: 10

Pages: 2251-2264

Date Published: 2011

Times Cited:

Digital Object Identifier (DOI)

10.1016/j.envpol.2010.08.002

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Biomonitoring of atmospheric particulate matter using magnetic properties of Salix matsudana tree ring cores

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

Magnetic properties of atmospheric particulate matter collected by both natural and artificial dust receptors are increasingly being used as proxy parameters for environmental analyses. This study reports the first investigation of the relationship between smelting factory activity and the impact on the environment as recorded by the magnetic signature in Salix matsudana tree rings. Magnetic techniques including low-temperature experiments, successive acquisition of isothermal remanent magnetisation (IRM), hysteresis loops and measurements of saturated IRM (SIRM) indicated that magnetic particles were omnipresent in tree bark and trunk wood, and that these particles were predominantly magnetite with multidomain properties. The magnetic properties of tree trunk and branch cores sampled from different directions and heights implied that the acquisition of magnetic particles by a tree depends on both orientation and height. The differences of SIRM values of tree ring cores indicated that pollution source-facing tree trunk wood contained significantly more magnetic particles than other faces. The results indicated that magnetic particles are most likely to be intercepted and collected by tree bark and then enter into tree xylem tissues during the growing season to become finally enclosed into the tree ring by lignification. There was a significant correlation between time-dependent SIRM values of tree ring cores and the annual iron production of the smelting factory. From the dependence of magnetic properties with sampling direction and height, it is argued that magnetic particles in the xylem cannot move between tree rings. Accordingly, the SIRM of tree ring cores from the source-facing side can contribute to historic studies of atmospheric particulate matter produced by heavy metal smelting activities.

Keywords

Authors

Zhang, CX; Huang, BC; Piper, JDA; Luo, RS

Volume	Issue	Pages	Date Published	Times Cited
393	1	177-190	April 2008	19

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2007.12.032

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Effect of ambient air sulphur dioxide on sulphate accumulation in plants

Publication / Journal

JOURNAL OF ENVIRONMENTAL BIOLOGY

Abstract

Present study deals with the relationship between ambient air sulphur dioxide and sulphate content in leaf of selected tropical plant species, Ficus religiosa. The study reveals a positive correlation between ambient air sulphur dioxide and sulphate in the leaves. Two way ANOVA finds the obtained values to be highly significant ($p<0.001$). Amount of sulphate in leaves shows positive correlation with sulphur dioxide in air ($p<0.001$) during most pad of the study. A marked reduction of sulphate content in leaf was found during October when reduction in ambient air sulphur dioxide was recorded.

Keywords

Authors

Dwivedi, AK; Tripathi, BD

Volume: 29

Issue: 3

Pages: 377-379

Date Published: May 2008

Times Cited: 7

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Ambient levels of nitrogen dioxide (NO2) may reduce pollen viability in Austrian pine (Pinus nigra Arnold) trees - Correlative evidence from a field study

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

A fully randomized sampling design was adopted to test whether pollen viability of Austrian pine (Pinus nigra Arnold) was impacted by NO2 pollution. Spatial strata (500 (.) 500 m each) with high (41.9-44.6 mu g m(-3)) and low (15.4-21.0 mu g m(-3)) NO2 were selected from a defined population in a small area (236.5 km(2), < 200 m range in elevation) in Northern Italy. Pollen viability was measured by means of the Tetrazolium (TTC) test. Analysis of variance by means of a generalised linear model showed that NO2 was a significant factor (P = 0.0425) affecting pollen viability. within the treatment, no significant differences were detected among replicates. Within each replicate, sampling unit data were significantly different (P = 0.000) and this suggested some improvement in the applied sampling design was needed. Pollen viability was significantly related to pollen germination (P < 0.01) and tube length (P < 0.01). This suggested a possible impact of NO2 on the regeneration of Austrian pine in polluted environments.

Keywords

Authors

Gottardini, E; Cristofori, A; Cristofolini, F; Maccherini, S; Ferretti, M

Volume: 402

Issue: 2-3

Pages: 299-305

Date Published: September 2008

Times Cited: 1

Digital Object Identifier (DOI): 10.1016/j.scitotenv.2008.04.048

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

The response of epiphytic lichens to air pollution and subsets of ecological predictors: A case study from the Italian Prealps

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

We investigated the response of epiphytic lichens to air pollution, against the background of other ecological predictors in a prealpine heterogeneous area, using Non-Parametric Multiplicative Regression (NPMR). The best NPMR model for total lichen diversity according to N environmental predictors at tree level has a cross R(2) = 0.709. It includes 10 variables, belonging to three different subsets of factors: two pollution-related factors (distance in meters from the road and from the cement factory); four stand-related (habitat, heat index, LAI and elevation) and four substrate-related factors (inclination, circumference and texture and tree species). Considering separately the effects of each subset on lichen diversity, substrate- and stand-related factors produce good models with similar cross R(2) (0.490 and 0.500, respectively), whereas pollution-related factors produce a model with a lower cross R(2) (0.340). Hence, we provide information to investigate the applicability of lichen biomonitoring to complex heterogeneous areas where standardized protocols are not reliable.

Keywords

Authors

Cristofolini, F; Giordani, P; Gottardini, E; Modenesi, P

Volume: 151

Issue: 2

Pages: 308-317

Date Published: January 2008

Times Cited: 11

Digital Object Identifier (DOI)

10.1016/j.envpol.2007.06.040

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

- [ ] Mammals
- [ ] Birds
- [ ] Reptiles
- [ ] Amphibians
- [ ] Aquatic
- [ ] Plants
- [ ] Invertebrates
- [ ] Benthic Invertebrates
- [x] Lichen/Moss
- [ ] Microbes
- [ ] Other Biotic Medium

- [ ] Air
- [ ] Soil
- [ ] Water
- [ ] Sediment
- [ ] Light
- [ ] Noise
- [ ] Temperature
- [ ] Humidity
- [ ] Other Abiotic Medium

- [ ] Nitrogen oxides
- [ ] Sulphur dioxide
- [ ] Mercury
- [ ] Particulate Matter
- [ ] Inorganic chemical
- [ ] Organic chemical
- [ ] New substance

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Norway spruce needles as bioindicator of air pollution in the area of influence of the Sostanj Thermal Power Plant, Slovenia

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

This paper reports the results of total sulphur content, photosynthetic pigments, ascorbic acid (vitamin Q and a-tocopherol (vitamin E) analysed in current-year needles of Norway spruce (Picea abies (L.) Karst.) in the area influenced by sulphur emissions from the Sostanj Thermal Power Plant (STPP), Slovenia, in the period 1991-2004. Ten differently polluted sampling sites in the emission area of STPP were selected. After desulphurization of emission gases from STPP total sulphur content in needles decreased and vitality parameters of needles increased. Moreover, a strong correlation between the average annual emissions Of SO2 from STPP and average annual sulphur content (increase) or average annual chlorophyll content (decrease) in current-year needles was found. The results showed that spruce needles may be an useful bioindicator for detecting changes in the emission rates Of SO2.

Keywords

Authors

Petkovsek, SAS; Batic, F; Lasnik, CR

Volume	Issue	Pages	Date Published	Times Cited
151	2	287-291	January 2008	10

Digital Object Identifier (DOI)

10.1016/j.envpol.2007.06.036

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effect of changes in immission characteristics on the amount of epicuticular waxes in spruce (Picea abies/L./Karst.) growing in montane regions

Publication / Journal

Beskydy

Abstract

A long-term study on the condition of Norway spruce (Picea abies) assimilation apparatus was performed on the base of monitoring the changes in epicuticular waxes in forest stands situated in the highest parts of the Beskydy and Krusne Hory Mountains, Czech Republic. The effect of changes, which took place in the immission spectrum within the last decade, on the amount of epicuticular waxes, was also covered. A significant decrease in atmospheric concentrations of sulfur oxides and no overlimit (i.e. above 20 g/m 3) occurrences were recorded since 1997 in montane regions. A damaged assimilation apparatus was the main cause of withering of Norway spruce stands. Within the period of 1997-2000, there was a significant decrease in the immission (i.e. SO 2) load of trees in all localities. The high concentrations of ground-level ozone were not influence only by the altitude alone but also by air temperature and radiation. Epicuticular waxes can be used as a natural bioindicator of the immission load in those regions where the evaluated forest stands are situated.

Keywords

Authors

Bednarova, E.

Volume	Issue	Pages	Date Published	Times Cited
1		19-22	2008	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Changes in species richness of vascular plants under the impact of air pollution: a global perspective

Publication / Journal

GLOBAL ECOLOGY AND BIOGEOGRAPHY

Abstract

Aim To investigate the general pattern of changes in species richness and diversity of vascular plants due to environmental contamination and associated habitat changes imposed by point polluters, and identify the sources of variation in the response of plant communities to industrial pollution.
Location Global.
Methods We collected species richness and diversity data from 86 studies that were conducted around 60 atmospheric point polluters worldwide and reported in 95 papers (published in 1953-2007). We used meta-analysis to search for a general effect and to compare between polluter types and plant groups, and linear regression to describe the latitudinal gradient and to quantify relationships between pollution and effect size.
Results Although the species richness of vascular plants generally decreased with pollution, the effects were not uniform across the studies. Polluters that cause soil acidification imposed a stronger detrimental effect on plant diversity than industries whose emissions increased soil pH. An overall adverse effect was primarily due to the contribution of non-ferrous smelters and aluminium plants; the effects of other SO2-emitting industries were less detrimental, albeit negative, and the effects of chemical plants, fertilizer factories and cement industries did not differ from zero. Longevity of the pollution impact only made a slight contribution to the detected variation, while adverse effects increased with increase in pollution load.
Main conclusions This study is the first demonstration of geographical variation in the responses of plant communities to aerial emissions: adverse effects increased from high to low latitudes, and this pattern was explained primarily by increases in both the diversity of original (undisturbed) communities and mean summer temperatures. The latter result suggests that under a future warmer climate the existing pollution loads may become more harmful. Model calculations indicate that a detectable depauperation of plant communities is unlikely if the polluter emits < 1500 t of SO2 annually.

Keywords

Authors

Zvereva, EL; Toivonen, E; Kozlov, MV

Volume	Issue	Pages	Date Published	Times Cited
17	3	305-319	May 2008	18

Digital Object Identifier (DOI)

10.1111/j.1466-8238.2007.00366.x

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Iron ore industry emissions as a potential ecological risk factor for tropical coastal vegetation

Publication / Journal

ENVIRONMENTAL MANAGEMENT

Abstract

In the coastal zone of the Espirito Santo state, Brazil, fragments of restinga, which form a natural ecosystem, share their space with an increasing number of iron ore industries. The iron ore dust and SO(2) originating from the industry processing activities can interfere with the vegetation of the adjacent ecosystems at various levels. This study was undertaken in order to evaluate the effects of industry emissions on representative members of the restinga flora, by measuring physiological and phenological parameters. Foliar samples of Ipomoea pes caprae, Canavalia rosea, Sophora tomentosa, and Schinus terebinthifolius were collected at three increasing distances from an ore industry (1.0, 5.0, and 15.0 km), and were assessed for their dust deposition, chlorophyll, and Fe content. Phenological monitoring was focused on the formation of shoots, flowers, and fruits and was also performed throughout the course of a year. The results showed that the edaphic characteristics and the mineral constitutions of the plants were affected by industry emissions. In addition, the chlorophyll content of the four species increased with proximity to the industry. Phenological data revealed that the reproductive effort, as measured by fruit production, was affected by emissions and S. tomentosa was the most affected species. The use of an integrative approach that combines biochemical and ecological data indicates that the restinga flora is under stress due to industry emissions, which on a long-term basis may put the ecosystem at risk.

Keywords

Authors

Kuki, KN; Oliva, MA; Pereira, EG

Volume	Issue	Pages	Date Published	Times Cited
42	1	111-121	July 2008	6

Digital Object Identifier (DOI)

10.1007/s00267-008-9093-7

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Experimental research on recolonisation with Anemone nemorosa of the beech forests of the Ruhr district (Germany) floristically impoverished by air pollution

Publication / Journal

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract

High SO(2) concentrations as have been observed over decades in the Ruhr district lead to a remarkable reduction of leaf area in the majority of the characteristic broad-leafed herbs of the Central European beech forests even after only a few months of experimental fumigation. Thus, it is no wonder in the time of high SO(2) pollution, e.g., in the town of Herne (centre of the Ruhr district), that there was not a single beech forest hosting, for instance, Viola reichenbachiana or Anemone nemorosa. As air quality has improved very much over some decades in the Ruhr district, one can expect a recolonisation of the beech forests by the species of former time characteristic for the herb layer. However, one has to consider that only the air pollution was reduced, while soil acidification and contamination with heavy metals and PAH are, on the short run, irreversible. That is why experiments were carried out, considering the question as to whether recolonisation of the forests of the Ruhr district by the aforementioned species is possible and why such a recolonisation up to now has not occurred.

Keywords

Authors

Wittig, Ruediger

Volume: 15

Issue: 6

Pages: 492-498

Date Published: September 2008

Times Cited: 2

Digital Object Identifier (DOI)

10.1007/s11356-008-0026-z

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Biomonitoring air pollution using lichen biodiversity in a friulian low plain area: Changes on short time scale

Publication / Journal

Gortania-Atti del Museo Friulano di Storia Naturale Botanica Zoologia

Abstract

The study reports the results of two biomonitoring surveys on air pollution using lichens as bioindicators in the Friulian Low Plain. Three years after the first survey and after an industrial plant had started, compositional differences in lichen communities between the two surveys were not generally recognized. However an increase in Lichen Biodiversity was evident in Poplar sites but not in those with Oaks and Lindens. The epiphytic communities on Poplar usually revealed a pioneer character and a higher degree of Graphidion species; in addition, Lichen Biodiversity values were positively correlated to tree diameter. The results seem to indicate that the changes were related to the natural evolution of lichen communities on Poplar rather than to variations in the levels of sulphur dioxide and nitrogen oxides, both of which were slightly decreasing.

Keywords

Authors

Bernini, Filippo; Brusa, Guido; Rivellini, Giambattista

Volume	Issue	Pages	Date Published	Times Cited
31		15-23	2009	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Effects of air pollution from road transport on growth and physiology of six transplanted bryophyte species

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Motor vehicles emit a cocktail of pollutants; however, little is known about the effects of these pollutants on bryophytes located in roadside habitats. Six bryophyte species were transplanted to either a woodland or a moorland site adjacent to a motorway, and were monitored over seven months, from autumn through to spring. All species showed all increase in one or more of the following near the motorway; growth, membrane leakage, chlorophyll concentration, and nitrogen concentration. The strongest effects were observed in the first 50-100 m from the motorway: this was consistent with the nitrogen dioxide pollution profile, which decreased to background levels at a distance of 100-125 m. It is hypothesised that motor vehicle pollution was responsible for the effects observed, and that nitrogen oxides had a key influence. The observed effects may lead to changes in vegetation composition with significant implications for nature conservation and management of roadside sites.

Keywords

Authors

Bignal, KL; Ashmore, MR; Headley, AD

Volume	Issue	Pages	Date Published	Times Cited
156	2	332-340	November 2008	11

Digital Object Identifier (DOI)

10.1016/j.envpol.2008.02.011

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Risk of Nonpregnancy, Risk of Disposal for Pregnant Cows, and Duration of the Calving Interval in Cow-Calf Herds Exposed to the Oil and Gas Industry in Western Canada

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

To determine potential associations between emissions from oil and gas field facilities and the reproductive success of cow-calf herds in Western Canada, researchers followed approximately 33,000 beef cows from the beginning of the breeding season in 2001 through pregnancy testing in 2002. They prospectively measured exposure to sulfur dioxide, hydrogen sulfide, and volatile organic compounds (VOCs) by using data from passive air monitors installed in pastures and linked to the locations of individual animals. They used the density of oil and gas well sites surrounding each pasture as an additional measure of exposure. The researchers Measured the risk of nonpregnancy in cattle in 205 herds in fall 2001 and 200 herds in fill 2002, and they determined the interval between the dates of calving in 2001 and 2002 for all cows calving in both years from 202 herds. The risk of disposal in pregnant cows was measured as the risk of removal from inventory for any reason other than nonpregnancy between pregnancy testing in 2001 and calving in 2002. There was no evidence that exposure to sulfur dioxide or VOCs measured as benzene and toluene increased the odds of nonpregnancy or disposal for pregnant cows. Density of oil and gas well sites was not related to the odds of nonpregnancy in either 2001 or 2002 or the odds of disposal for pregnant cows. During the first month after bull contact, exposures to increasing concentrations of sulfur dioxide, VOCs measured as toluene, and the density of oil and gas well sites were also not associated with an increase in the 2001-2002 breeding-to-calving interval. However, there was an estimated 3.0-day increase in the breeding-to-calving interval for mature cows exposed to benzene concentrations in the highest quartile of exposure (> 0.236 mu g/m(3)) compared with those cows exposed to benzene concentrations in the lowest quartile of exposure (< 0.082 mu g/m(3)).

Keywords

Authors

Waldner, Cheryl L.; Stryhn, Henrik

Volume	Issue	Pages	Date Published	Times Cited
63	4	241-261	2008	4

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The Association Between Exposure to the Oil and Gas Industry and Beef Calf Mortality in Western Canada

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

Researchers assessed the association between exposure to emissions from oil and gas field facilities and newborn Calf Survival and health status by determining the risks of calf mortality and treatment reported for 27,511 beef calves born to cows in 203 herds. which were followed from the beginning of the 2001 breeding season through the 2002 calving season. They prospectively measured exposures to sulfur dioxide, hydrogen sulfide, and volatile organic compounds (VOCs) by using data from passive air monitors. They also used the density of oil and gas well sites surrounding each pasture as all additional measure of exposure. The researchers found that well-site density as well as exposures to hydrogen sulfide and VOCs measured as benzene or toluene were not associated with the odds of calf mortality in the first 3 months of life. After adjusting for cow-and herd-level risk factors. they found that exposure to sulfur dioxide near the time of calving was associated with in increased risk of calf mortality during this period. Exposure to Sulfur dioxide in the 3-month period before calving was Most suggestive of a causal exposure-response relationship (the odds ratio for every 1 ppb increase in sulfur dioxide = 1.32; 95% confidence interval = 1.13-1.54; p = .0004). Exposure to sulfur dioxide, hydrogen sulfide, and VOCs measured as benzene or toluene during gestation was not associated with the odds of calf treatment in the first 3 months of life. However, exposure to sulfur dioxide, hydrogen sulfide, and VOCs measured as benzene or toluene, and sulfur dioxide in the first month after calving, was associated with a small increase in the odds of calf treatment after the first month of life when risk was compared across quartiles for exposure: only the association between hydrogen sulfide exposure and the odds of treatment was consistent with a causal exposure.

Keywords

Authors

Waldner, Cheryl L.

Volume	Issue	Pages	Date Published	Times Cited
63	4	220-240	2008	6

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Western Canada Study of Animal Health Effects Associated With Exposure to Emissions From Oil and Natural Gas Field Facilities. Study Design and Data Collection III. Methods of Assessing Animal Exposure to Contaminants From the Oil and Gas Industry

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

Researchers measured exposure to oil and gas industry emissions in 205 cow-calf herds located in Western Canada. They measured airborne concentrations of sulfur dioxide, hydrogen sulfide, and volatile organic compounds with passive monitors placed in each pasture, wintering, or calving area that contained study animals from the start of the breeding season in the spring of 2001 until June 30, 2002. Researchers continued air monitoring in a subset of herds to the end of the study in fall 2002. Each sampling device was exposed for 1 month and then shipped to the laboratory for analysis. New samplers were installed and the shelters relocated, as necessary, to follow the movements of herd-management groups between pastures. Researchers linked the results of the air-monitoring analysis to individual animals for the relevant month. For the 205 herds examined at pregnancy testing in 2001, monthly mean exposures on the basis of all available data were as follows: sulfur dioxide, geometric mean (GM) 0.5 ppb, geometric standard deviation (GSD) = 2.2; hydrogen sulfide, GM = 0.14 ppb, GSD 2.3; benzene, GM = 0.247 mu g/m(3), GSD = 2.5; and toluene, GM = 0.236 mu g/m(3), GSD = 2.7. Benzene and toluene were surrogates for volatile organic compound exposure. In addition to passive measurements of air quality, researchers obtained data from provincial regulatory agencies on the density of oil and gas field facilities and on flaring and venting from the surrounding facilities. They developed the data into additional measures of exposure that were linked to each animal at each location for each month of the study.

Keywords

Authors

Waldner, Cheryl L.

Volume	Issue	Pages	Date Published	Times Cited
63	4	201-219	2008	3

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Frankliniella intonsa (Trybom, 1895), a Very Sensitive Bioindicator of Air Pollution

Publication / Journal

Acta Phytopathologica et Entomologica Hungarica

Abstract

The LIFE 02ENV/RO/000461 AIR-AWARE project is partly dedicated to research on the flora and invertebrate fauna of downtown Bucharest (Romania). In this area, products of local industrial pollution, heavy metals, SO2 and powders in suspension exceed standard levels. The pilot zone is represented by two public parks in downtown Bucharest. Thysanopterological samples were collected from the herbaceous layer, on both weeds and ornamentals, following a transect approach. The preliminary results revealed a biodiversity that decreased from the park centres, which suffered the least air pollution, towards the edges of the parks, which were the most polluted. The dominant species was Frankliniella intonsa, which had high values for structural and functional indices, as well as morphological changes in body size, colour and antennae, all due to the air pollution. F. intonsa could be considered to be a very sensitive bioindicator of environmental pollution. Future analysis, however, may reveal whether Bagnalliella yuccae, F. intonsa or Haplothrips niger are more sensitive bioindicators for air pollution.

Keywords

Authors

Vasiliu-Oromulu, L.; Jenser, G.; Barbuceanu, D.

Volume	Issue	Pages	Date Published	Times Cited
43	2	405-412	December 2008	0

Digital Object Identifier (DOI)

10.1556/APhyt.43.2008.2.25

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The endocrine kidney of the freshwater air brathing fish, Channa gachua (bloch) in relation to effect of heavy metal pollutants.

Publication / Journal

Proceedings of the Zoological Society of India

Abstract

Channa gachua was exposed to sublethal concentrations of HgCl 2 (0.4 ppm), CdCl 2 (1.5 ppm) and CuCl 2 (1.0 ppm) for 30 days. Head kidney showed increased number of inter-renal cells upto 10 days of exposure, but later on the number appeared to be slightly decreased. In CdCl 2 treated fish hyderplasia was observed in the inter-renal and chromaffin cells. However, in HgCl 2 and CuCl 2 treated fish the inter-renal cells exhibited shrinkage. Chromaffin cells lost their identity due to their destruction after 30 days of exposure in both HgCl 2 and CuCl 2, however their number was found to be increased. The hyperplasia observed in all the test fish, indicating more release of cortisol and catecholamines during the heavy metal stress to cope up with the toxic environment. Secondary physiological responses on the metabolic alterations were also observed.

Keywords

Authors

Tiwary, N. P.; Pramod Kumar; Pritam Kumar; Vivekanand Prasad; Deo, D. P.; Om Prakash; Prasad, R. R.

Volume	Issue	Pages	Date Published	Times Cited
8	1	107-110	2009	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Intense beech ecosystem monitiring of Vitinia station

Publication / Journal

Nauka za Gorata

Abstract

The international co-operative programme on intense monitoring of forest ecosystems has been adopted and applied for Bulgaria. Observations, analyses, assessments and prognoses for some changes in the tree growth have been made according to the ecological condition assessed on the basis of meteorological parameters, pollution, depositions and soil properties. The parameters used for observation of the tree response are: floristic composition and phytocenotic structure of shrub-grass synusiae, leaf analysis, crown assessments and tree growth. Destabilizing factors for the stand are the high concentration of O 3, SO 2, and NOx in the air, high level of acid deposition, lower buffer capacity of soil and quantity of nutrients. An attempt for risk assessment of the pollution effects on some ecosystem components has been made.

Keywords

Authors

Pavlova, E.; Pavlov, D.; Doncheva, M.; Malinova, L.; Tsvetkova, E.

Volume	Issue	Pages	Date Published	Times Cited
47	3	25-52	2009	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Biochemical responses in tree foliage exposed to coal-fired power plant emission in seasonally dry tropical environment.

Publication / Journal

Environmental Monitoring and Assessment

Abstract

A biomonitoring study was conducted to investigate the responses of plants exposed to power plant emission in a dry tropical environment. For this purpose, five sampling sites were selected in the prevailing wind direction (NE) at different distance to thermal power plant (TPP) within 8.0 km range and a reference site was selected in eastern direction at a distance of 22.0 km. The two most common tree species, Ficus benghalensis L. (Evergreen tree) and Dalbergia sisso Roxb. (deciduous tree) were selected as test plants. Ambient sulphur dioxide (SO 2), nitrogen dioxide (NO 2), suspended particulate matter (SPM), respirable suspended particulate matter (RSPM), dust-fall rate (DFR) and plant responses such as leaf pigments (chlorophyll a, chlorophyll b and carotenoids), ascorbic acid, sugar and sulphate-sulphur (SO 42--S) contents were measured. Ambient SO 2, NO 2, SPM, RSPM and DFR showed significant spatial and temporal variation at different sites. Considerable reduction in pigment (chlorophyll a, chlorophyll b and carotenoids) and sugar contents were observed at sites receiving higher pollution load. Ascorbic acid exhibited significant positive correlation with pollution load. Accumulation of SO 42--S in leaf tissue showed significant positive correlation with ambient SO 2 concentration at all the sites. At the same time, SO 42--S showed significant negative correlation with pigment and sugar content. D. sisso Roxb. tree was found to be more sensitive as compared to F. benghalensis L. tree.

Keywords

Authors

Sharma, A. P.; Tripathi, B. D.

Volume	Issue	Pages	Date Published	Times Cited
158	1/4	197-212	2009	0

Digital Object Identifier (DOI)

10.1007/s10661-008-0573-2

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Areal expansion of Asplenium adiantum-nigrum L. (Black Spleenwort, Aspleniaceae/Pteridophyta) at the edge of northwestern Germany's low mountain range - caused by climatic change?

Publication / Journal

Tuexenia

Abstract

For approximately the last 20 years, Asplenium adiantum-nigrum (Aspleniaceae, Pteridophyta) has been spreading from the edge of its native range, the Rheinisch-Westfalische Mittelgebirge (Rheinisch-Westfalische low mountain range), into adjacent lower regions ("Niederrrheinisches Tiefland" and the "Westfalische Bucht"). Until the end of the 1980's this fern taxon was only found in collin-montane areas of North Rhine-Westphalia, with a stable range margin and occurrences in rocky locations of the Ruhr valley (southern Ruhr area). Propagation history, population development, plant communities, as well as the new occurrences of the species are presented in this paper. More than 560 plants have been observed since 1990 In 25 new locations, 16 of which are located in the flat area of the "Niederrheinisches Tiefland" and the "Westfalische Bucht". The alleged causes of the observed range expansion are discussed in the context of 4 hypotheses and are compared with results from western and northwestern Europe. At present the spreading of species is generally explained by climatic change, which call be described in the investigation area by milder winters and damper summers and by a change of humidity. However, in the case of Asplenium adiantum-nigrum, climatic change cannot be regarded as the only reason. These climatic changes occur simultaneously with air-quality changes, e. g. lower amount of SO2 and higher amount of nitrogen immissions, which cause changes in site conditions at possible growing places and, therefore, positively affect the growth conditions of the fern taxon. Climatic change as the single reason for the spreading of Asplenium adiantum-nigrum cannot be verified.

Keywords

Authors

Kell, Peter; Fuchs, Renate; Hesse, Juergen; Sarazin, Andreas

Volume	Issue	Pages	Date Published	Times Cited
	29	199-213	2009	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

The content of total sulphur and sulphur forms in birch (Betula pendula Roth) leaves in the air-polluted Krusne hory mountains

Publication / Journal

TREES-STRUCTURE AND FUNCTION

Abstract

In leaves of birch (Betula pendula Roth), changes in the content of total sulphur and its inorganic and organic forms were determined in relation to the decreasing air-pollution load (SO(2)) in the air-polluted Krusne hory mountains and the Decin sandstone highlands in 1995, 1998, 2001 and 2004. Results have shown that birch is able to use considerable amounts of sulphur taken through leaves from air-pollution load. Birch responds fast to changes in air-pollution load by fall in the content of total and inorganic forms of sulphur in leaves.

Keywords

Authors

Hrdlicka, P; Kula, E

Volume: 23

Issue: 3

Pages: 531-538

Date Published: June 2009

Times Cited: 2

Digital Object Identifier (DOI): 10.1007/s00468-008-0299-3

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Assessment of the threat to the forest environment in the Zielonka Primeval Forest from air pollution in 1992-2006

Publication / Journal

SYLWAN

Abstract

Since 1992, the Forest Management Department in cooperation with the Forestry Natural Foundation Department of the University of Life Sciences in Poznan have been regularly monitoring the levels of sulphur compound and dust emissions in the Ziclonka Primeval Forest at observation points distributed on 14 permanent study sites located in pine stands in age classes II-V This paper presents an assessment of the threat posed to the forest environment on the basis of changes in the industrial emission level over the past fifteen years in this area of special value for nature. In 1993, the area was included in the "Puszcza Zielonka" Landscape Park.

Keywords

Authors

Beker, C; Sienkiewicz, A

Volume	Issue	Pages	Date Published	Times Cited
153	7	451-456	July 2009	1

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Bio-indicators for air quality assessment

Publication / Journal

Shengtaixue Zazhi

Abstract

The sensitivity of plant to SO2 is a complicated and comprehensive character formed by the interactions of many factors, and often used to qualitatively describe air environmental quality. In this paper, the leaf appearance symptoms of plants exposed to different concentration SO2 were observed. The results showed that different plants had different sensitivity to SO2. The symptoms of plants exposed to low SO2 concentration for a long time were similar with those exposed to high SO2 concentration for a short time. The cell membrane permeability (electrical conductivity) of plants could directly reflect the damaged degree of plants. Based on the integrated data of plant appearance symptoms and physiological/blochemical indicators, a quantitative bio-evaluation model of air quality was established, which provided a basis for monitoring and evaluating atmospheric environment by plants.

Keywords

Authors

Liu Qi-ming; Qiu Mei-rong; Zhang Jin-li; Huang Ning; Huang Zhi-yong

Volume	Issue	Pages	Date Published	Times Cited
28	4	771-775	April 2009	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

The Impact of Industrial SO2 Pollution on North Bohemia Conifers

Publication / Journal

WATER AIR AND SOIL POLLUTION

Abstract

Conifer forests in the Jizerske Mountains, Czech Republic have experienced widespread and long-lasting effects related to industrial SO2 pollution. To explore the spatial and temporal impact of this phenomenon on Norway spruce stands, a transect of sites was sampled to the southeast of the Polish coal-fired power station Turow. Tree growth at all sites displayed a significant reduction around 1980, which could not be explained by climate alone. However, by incorporating both climate and SO2 variables in multiple regression models, the chronology trends could be explained well. The lowest growth rates were found to coincide with the period of greatest atmospheric SO2 concentrations and the degree of suppression decreased with increasing distance from the power station. The period of growth suppression in a Silver fir site appeared to be more severe and longer in duration than for the spruce, although differing site conditions prevented a direct comparison. Fir trees also appeared to be affected by SO2 pollution earlier in the twentieth century compared to spruce. Growth of both species, however, did not return to predicted levels following the reduction of pollution levels in the 1990s. A comparison with spruce and fir data from the Bavarian Forest, a region also affected by pollution in the past, revealed a temporal difference in growth suppression, likely related to different timings and loadings of SO2 emissions between both regions. This study highlights pollution as another potential causal factor for the 'divergence problem' and dendroclimatic reconstructions in polluted regions should be developed with caution.

Keywords

Authors

Rydval, M; Wilson, R

Volume	Issue	Pages	Date Published	Times Cited
223	9	5727-5744	November 2012	2

Digital Object Identifier (DOI)

10.1007/s11270-012-1310-6

Media Category	Generation Type	CoalType	BiomassType
Biotic	Coal		

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The spatial and seasonal variation of nitrogen dioxide and sulfur dioxide in Cape Breton Highlands National Park, Canada, and the association with lichen abundance

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Over 200,000 tourists per year visit Cape Breton Highlands National Park, Nova Scotia, Canada. The forests within the park are home to many rare epiphytic lichens, the species diversity of which has declined in some areas. The primary motivation for this study was to gain insight into the concentrations and potential local and long-range sources of air pollution, but its association with lichen species diversity was also examined. Ogawa passive diffusion samplers were used to measure nitrogen dioxide (NO2) and sulfur dioxide (SO2) in the park at 19 sites in the winter and 20 sites in the summer of 2011. An improvement in the sensitivity of the sampler analytical protocol was developed. The mean concentrations in the park of winter and summer NO2 (0.81 and 0.16 ppb) and SO2 (0.24 and 0.21 ppb) are not at levels known to be phytotoxic to lichen. The NO2 concentrations in winter were significantly ($p = 0.001$) higher than those in summer whilst the SO2 concentrations did not differ significantly between winter and sunnmer ($p = 0.429$). Highest NO2 concentrations in both seasons were observed in the Grand Anse Valley, presumably due to the steep road, emissions from the Pleasant Bay community at the foot of the valley and the enclosed topography of this area reducing dispersion of primary emissions. The SO2 concentrations in the park tended to be greater at elevated sites than valley sites, consistent with dispersion from long-range, rather than local, sources for this pollutant. Significant predictors in a multilinear regression for an index of air purity (lichen based measure of air quality) were lichen species number ($p = 0.009$), forest old growth index ($p = 0.001$) and distance from roads ($p < 0.001$) (model R-2 = 0.8, model $p = 0.004$). The study suggests that local sources of pollution (roads emissions) are adversely associated with lichen species diversity in this National Park, compared with long-range transport, and that monitoring programs such as a lichen-based 'index of air purity' can reveal locations where ambient air pollution, although low, is nevertheless at a level that may cause ecological detriment. The implications from this work could be applicable to national parks elsewhere.

Keywords

Authors

Gibson, MD; Heal, MR; Li, ZY; Kuchta, J; King, GH; Hayes, A; Lambert, S

Volume	Issue	Pages	Date Published	Times Cited
64		303-311	January 2013	2

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2012.09.068

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Particulate matter on foliage of 13 woody species: Deposition on surgaces and phytostabilisation in waxes - A 3-year study

Publication / Journal

INTERNATIONAL JOURNAL OF PHYTOREMEDIATION

Abstract

Particulate matter (PM) as an air pollutant can be harmful for human health through allergic, mutagenic and carcinogenic effects. Although the main focus is on decreasing air pollution, after PM has been emitted to the atmosphere, one of the realistic options to decrease it's concentrations in urbanized area will be phytoremediation. This study compared the capacity to capture PM from air of seven tree species commonly cultivated in Poland (Catalpa bignonioides Walter, Corylus colurna L., Fraxinus pennsylvanica Marsh., Ginkgo biloba L., Platanus x hispanica Mill. ex Muenchh., Quercus rubra L., Tilia tomentosa Moench 'Brabant') and six shrub species (Acer tataricum subsp. ginnala (Maxim.) Wesm., Sambucus nigra L., Sorbaria sorbifolia (L.) A. Br., Spiraea japonica L.f., Syringa meyeri C. K. Schneid. 'Palibin', Viburnum lantana L.). Significant differences were found between species in mass of total PM accumulation for two PM categories and three size fractions determined and in amount of waxes. A positive correlation was found between in-wax PM of diameter 2.5-10 mu m and amount of waxes, but not between amount of waxes and amount of total PM or of any size fraction.

Keywords

Authors

Popek, R; Gawronska, H; Wrochna, M; Gawronski, SW; Saebo, A

Volume	Issue	Pages	Date Published	Times Cited
15	3	245-256	2013	4

Digital Object Identifier (DOI)

10.1080/15226514.2012.694498

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Meteorological factors and ambient bacterial levels in a subtropical urban environment

Publication / Journal

INTERNATIONAL JOURNAL OF BIOMETEOROLOGY

Abstract

We conducted a study to investigate the characteristics and determinants of ambient bacteria in Taipei, Taiwan from August 2004 to March 2005. We monitored ambient culturable bacteria in Shin-Jhuang City, an urban area in the Taipei metropolitan areas, using duplicate Burkard Portable Air Samplers with R2A agar. The average concentration of total bacteria was 1,986 colony-forming units per cubic meter of air (CFU/m(3)) (median = 780 CFU/m(3)) over the study period, with the highest level in autumn. Most bacterial taxa had similar seasonal variation, with higher concentrations in autumn and winter. During the study period, Gram negative rods and cocci were predominant. Multivariate analyses indicated that wind speed and wind direction significantly influenced ambient bacterial distribution. Temperature and relative humidity were also important environmental factors positively associated with ambient bacterial concentrations. We observed statistically significant relationships between ambient bacteria and air pollutants, including sulfur dioxide (SO2), ozone, particulate matter (aerodynamic diameter a parts per thousand currency sign10 mu m (PM10)), methane and total hydrocarbons. The concentrations of methane and total hydrocarbons during the previous day were positively associated with total bacteria and Gram negative rods, respectively. Ozone level on the previous day had a negative relationship with Gram negative cocci. SO2 level with a 3-day lag was positively correlated with concentrations of both total bacteria and Gram negative cocci. In the future, more longitudinal studies are needed to confirm the relationships and possible mechanisms between ambient bacteria and meteorological factors, as well as to evaluate the ecological and health impacts of ambient bacteria.

Keywords

Authors

Wu, YH; Chan, CC; Chew, GL; Shih, PW; Lee, CT; Chao, HJ

Volume	Issue	Pages	Date Published	Times Cited
56	6	1001-1009	November 2012	0

Digital Object Identifier (DOI)

10.1007/s00484-011-0514-6

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Physiological responses of the European cockle Cerastoderma edule (Bivalvia: Cardidae) as indicators of coastal lagoon pollution

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

Physiological responses can be used as effective parameters to identify environmentally stressful conditions. In this study, physiology changes such as oxygen consumption, clearance rate, survival in air, condition index and energy reserves were measured on natural populations of cockles collected from different sites at Ria de Aveiro, Portugal. At those sites, sediment samples were collected for Hg concentration analysis. Cockles were used for the evaluation of both the Hg concentration and physiological response. Mercury was detected in the cockle tissue and in the sediment collected from the sampling points both nearby and distant from the main mercury contamination source. The energy content was negatively correlated with both Hg concentration in cockle tissues and survival in air. Nonetheless, the energy content was positively correlated with the condition index, and there was a positive correlation between the survival in air test and the tissue mercury concentration. A PCA-factor analysis explained 86.8% of the total variance. The principal factor (62.7%) consisted of the air survival, the Hg in soft tissues (positive) and the condition index (negative). The second factor (24.1%) consisted of a negative correlation between the oxygen consumption and the clearance rate. Due to their sensitivity to environmental conditions, the physiological responses of cockles can be used to assess the ecological status of aquatic environments. More effort should be invested in investigating the effects of environmental perturbations on cockle health once they are a good reporter organism.

Keywords

Authors

Nilin, J; Pestana, JLT; Ferreira, NG; Loureiro, S; Costa-Lotufo, LV; Soares, AMVM

Volume: 435

Issue:

Pages: 44-52

Date Published: October 2012

Times Cited: 0

Digital Object Identifier (DOI): 10.1016/j.scitotenv.2012.06.107

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Lichen flora of the Czech Republic

Publication / Journal

PRESLIA

Abstract

This review of the lichen flora of the Czech Republic deals with the history of the research and highlights the most important summarizing publications. The diversity of the lichen flora is discussed and compared with that recorded in neighbouring countries. The main phytogeographic elements are outlined and illustrated with representative examples. The threat to the lichen flora in the Czech Republic is discussed in terms of the recently published Red List (version 1.1) and several endangered ecological groups of lichens with examples of the most threatened and extinct species are identified. Changes in the lichen flora along with the main causal factors are discussed. Air pollution, in particular sulphur dioxide was the most serious damaging factor in the 20th century. However, there has been a change in the trend in air pollution over the last two decades, with a decrease in sulphur and increase in nitrogen emissions, which has resulted in recolonization by formerly vanishing species of nitrophytic lichens (e.g. Xanthoria park's inn) and decrease in the abundance of the toxitolerant acidophytic species Lecanora conizaeoides. Ongoing present changes are very dynamic and not yet fully recognized. Therefore, field surveys are very important and will result in the recording of further species new to the Czech lichen flora

Keywords

Authors

Liska, J

Volume	Issue	Pages	Date Published	Times Cited
84	3	851-862	September 2012	3

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Mutagenicity assessment of aerosols in emissions from wood combustion in Portugal

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Polycyclic aromatic hydrocarbon (PAH) extracts of fine particles (PM2.5) collected from combustion of seven wood species and briquettes were tested for mutagenic activities using Ames test with Salmonella typhimurium TA98 and TA100. The woods were Pinus pinaster (maritime pine), Eucalyptus globulus (eucalypt), Quercus suber (cork oak), Acacia longifolia (golden wattle), Quercus faginea (Portuguese oak), Olea europea (olive), and Quercus ilex rotundifolia (Holm oak). Burning experiments were done using woodstove and fireplace, hot start and cold start conditions. A mutagenic response was recorded for all species except golden wattle, maritime pine, and briquettes. The mutagenic extracts were not correlated with high emission factors of carcinogenic PAHs. These extracts were obtained both from two burning appliances and start-up conditions. However, fireplace seemed to favour the occurrence of mutagenic emissions. The negative result recorded for golden wattle was interesting, in an ecological point of view, since after confirmation, this invasive species, can be recommended for domestic use

Keywords

Authors

Vu, B; Alves, CA; Goncalves, C; Pio, C; Goncalves, F; Pereira, R

Volume	Issue	Pages	Date Published	Times Cited
166		172-181	July 2012	2

Digital Object Identifier (DOI)

10.1016/j.envpol.2012.03.005

Media Category	Generation Type	CoalType	BiomassType
Biotic	Biomass		

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Plant species differences in particulate matter accumulation on leaf surfaces

Publication / Journal

Science of the total environment

Abstract

Particulate matter (PM) accumulation on leaves of 22 trees and 25 shrubs was examined in test fields in Norway and Poland. Leaf PM in different particle size fractions (PM(10), PM(2.5), PM(0.2)) differed among the species, by 10- to 15-folds at both test sites. Pinus mugo and Pinus sylvestris, Taxus media and Taxus baccata, Stephanandra incisa and Betula pendula were efficient species in capturing PM. Less efficient species were Acer platanoides, Prunus avium and Tilia cordata. Differences among species within the same genus were also observed. Important traits for PM accumulation were leaf properties such as hair and wax cover. The ranking presented in terms of capturing PM can be used to select species for air pollution removal in urban areas. Efficient plant species and planting designs that can shield vulnerable areas in urban settings from polluting traffic etc. can be used to decrease human exposure to anthropogenic pollutants.

Keywords

Authors

Sabo, A; Popek, R; Nawrot, B; Hanslin, H M; Gawronska, H; Gawronski, S W

Volume: 427-428

Issue:

Pages: 347-354

Date Published: June 2012

Times Cited: 0

Digital Object Identifier (DOI): 10.1016/j.scitotenv.2012.03.084

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

- [ ] Mammals
- [ ] Birds
- [ ] Reptiles
- [ ] Amphibians
- [ ] Aquatic
- [x] Plants
- [ ] Invertebrates
- [ ] Benthic Invertebrates
- [ ] Lichen/Moss
- [ ] Microbes
- [ ] Other Biotic Medium

- [ ] Air
- [ ] Soil
- [ ] Water
- [ ] Sediment
- [ ] Light
- [ ] Noise
- [ ] Temperature
- [ ] Humidity
- [ ] Other Abiotic Medium

- [ ] Nitrogen oxides
- [ ] Sulphur dioxide
- [ ] Mercury
- [x] Particulate Matter
- [ ] Inorganic chemical
- [ ] Organic chemical
- [ ] New substance

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Quantifying Hg within ectomycorrhizal fruiting bodies, from emergence to senescence

Publication / Journal

FUNGAL BIOLOGY

Abstract

Ectomycorrhizal fruiting bodies (basidiomata) collected from forested areas in southwestern New Brunswick were analyzed for total mercury, sulphur, nitrogen, and carbon concentrations (THg, TS, TN, and TC, respectively). This analysis was done for caps and stalks and by development stage (emergent, mature, senescent) across 27 species associated with five classes, eight families, and 13 genera. Across the species, THg correlated positively with TN and TS, thereby implying N as well as S mitigated transfer of Hg from the mycelia into the basidiomata, with THg ranging from 3 to 10457 ppb. TS, TN, and TC varied from 0.07 to 1, 1 to 11, and 43 to 53 %, respectively. Cap and stalk THg, TS, TN, and TC were also correlated to one another, with mean stalk/cap ratios of 0.59, 0.76, 0.71, and 0.98, respectively. Soil availability indexed by THg, TS, TN, and TC within the forest floor contributed to basidiomatal THg as well. THg, THg/TS, and THg/N varied strongly by species. These variations involved: (i) no growth dilution and no volatilization (Group I), (ii) growth dilution only (Group II), (iii) growth dilution followed by loss during senescence (Group III), and (iv) growth dilution combined with loss from emergence onward (Group IV). Depending on species, TN and IS remained the same or declined from 100% at emergence to about 80 and 70% at senescence. Lack of THg decline for the Group I species would be due to HgS encapsulation. Reanalyzing the freeze-dried samples revealed that THg continued to drop during the first year of air-dry storage for the Group II, II, and IV species, but TS, TN, and TC remained stable. The results were quantified by way of best-fitted regression models.

Keywords

Authors

Nasr, M; Malloch, DW; Arp, PA

Volume	Issue	Pages	Date Published	Times Cited
116	11	1163-1177	November 2012	1

Digital Object Identifier (DOI)

10.1016/j.funbio.2012.09.002

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The guava tree as bioindicator during the process of fuel replacement of an oil refinery

Publication / Journal

ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY

Abstract

This study was performed to verify whether the exchange of the fuel used in the boilers of a crude oil refinery located in Cubatao (SE Brazil) would result in alterations on gas exchange, growth and leaf injuries in saplings of Psidium guajava 'Paluma'. The purpose of the refinery was to reduce the SO2 emission, but using natural gas as fuel could increase the concentrations of O-3 precursors in the atmosphere. Thus a biomonitoring was performed with a native species sensitive to O-3. The plants were exposed in five areas (CM1, CM5, CEPEMA, Centro, and RP) at different distances to the refinery, both before and after the fuel exchange. We performed six exposures under environmental conditions, with length of ca. 90 days each. With the utilization of natural gas, the saplings presented reductions in carbon assimilation rate under saturating light conditions (Asat, mu mol CO2 m(-2) s(-1)) and the stomatal conductance (gs, mol H2O m(-2) s(-1)), and increase in height, number of leaves, and dry mass of leaves and shoots. There were also reductions in root dry mass and in the root/shoot ratio. The saplings also presented O-3-induced leaf injuries. The responses of P. guajava 'Paluma' were altered after the fuel exchange as a result of a new combination of pollutants in the atmosphere. The fuel exchange has not resulted in environmental benefit to the surrounding forest; it has only altered the contamination profile of the region.

Keywords

Authors

Silva, SF; Meirelles, ST; Moraes, RM

Volume	Issue	Pages	Date Published	Times Cited
91		39-45	May 2013	0

Digital Object Identifier (DOI)

10.1016/j.ecoenv.2013.01.004

Media Category	Generation Type	CoalType	BiomassType
Biotic	Natural Gas		

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Sulphur dioxide fumigation effects on stomatal density and index of non-resistant plants: Implications for the stomatal palaeo-[CO2] proxy method

Publication / Journal

REVIEW OF PALAEOBOTANY AND PALYNOLOGY

Abstract

The inverse relationship between the number of stomata on the surface of a leaf and the atmospheric concentration of carbon dioxide ([CO2]) in which it developed permits the use of fossil plants as indicators of palaeo-atmospheric [CO2] level (palaeo-[CO2]). This "stomatal method" to reconstruct palaeo-[CO2] is dependant upon stomatal initiation being determined by [CO2]. However, global perturbations to the carbon cycle and climate system throughout earth history are not only characterised by fluctuations in the level of atmospheric [CO2], but also by the release of large volumes of toxic gases such as sulphur dioxide (SO2) into the atmosphere. Recent studies have raised uncertainties into the efficacy of stomatal palaeo-[CO2] proxies during episodes of SO2 fumigation. This study aims to assess the effect of exposure to 0.2 ppm SO2 on the stomatal frequencies of plant species with no evolutionarily acquired resistance to toxic gases in comparison to individuals grown under control conditions and atmospheres of elevated [CO2]. Fumigation with SO2 resulted in a general pattern of increased stomatal density (SD) values, but induced variability in the stomatal index (SI) responses of the plant species studied. Ginkgo biloba exhibited an increase in SI, whereas the araucariacean conifers Agathis australis and Araucaria bidwillii displayed reductions in SI that were indistinguishable from values observed under [CO2] enrichment. These results suggest that the presence of atmospheric SO2 may reduce the effectiveness of stomatal reconstructions of palaeo-[CO2] during intervals characterised by the release of large volumes of toxic gases into the atmosphere. However, exposure to SO2 induced significant increases in the SD/SI ratios of six of the seven species studied. Calculation of the SD/SI ratios of fossil plants may identify any stratigraphic horizons where the stomatal initiation responses of the fossil flora were affected by sudden fumigation with toxic gases, and thus influence palaeo-[CO2] estimates. Therefore the SD/SI ratios of fossil plants may serve as indicators of the effectiveness of stomatal reconstructions of palaeo-[CO2].

Keywords

Authors

Haworth, M; Elliott-Kingston, C; Gallagher, A; Fitzgerald, A; McElwain, JC

Volume	Issue	Pages	Date Published	Times Cited
182		44-54	August 2012	4

Digital Object Identifier (DOI)

10.1016/j.revpalbo.2012.06.006

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Foliar response reactions induced by atmospheric pollutants on the Aesculus hippocastanum L. and Tilia tomentosa L. species from Iasi city area

Publication / Journal

Analele Stiintifice ale Universitatii 'Al I Cuza' din Iasi. (Serie Noua) Sectiunea II a. Biologie Vegetala

Abstract

In this paper we present the foliar response reaction induced by atmospheric pollutants on the Aesculus hippocastanum L. and Tilia tomentosa L. species situated around Iasi city's air quality monitoring stations. Pollutants monitored by the five stations are represented by gaseous (sulfur dioxide, carbon dioxide, nitrogen dioxide, ozone) and solid pollutants (dust prone to sedimentation). Our investigations focused on morphological observations and tracked the dynamic of physiological and biochemical changes induced on leaves as compared with the unpolluted ones. We emphasized that the large amount of dry leaves is not always related to necrotic leaf surface. It was found that the amount of chlorophyll a and b and the intensity of photosynthesis aren't always correlated, as already known from literature.

Keywords

Authors

Soltuzu, B. D.; Zamfirache, M. M.; Ivanescu, L.; Toma, C.

Volume: 58

Issue: 2

Pages: 61-71

Date Published: 2012

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Ecological Analogues for Biomonitoring Industrial Sulfur Emissions in the Athabasca Oil Sands Region, Alberta, Canada

Publication / Journal

Developments in Environmental Science

Abstract

An ecological analogue system for biomonitoring the chronic and long-term effects of anthropogenic atmospheric emissions in the Alberta Oil Sands Region (AOSR) is described. This system has shown to be an efficient adjunct to ambient air quality measurements and has been previously applied successfully in western Canada. The essence of an ecological analogue system is the classification and identification of plant associations that are most sensitive to the atmospheric emissions of concern. An ecosystem classification and ordination was applied to sites of the most sensitive plant associations to identify detailed ecological analogue types (EATs). The EATs were then selected for use in locating field sites for the WBEA Forest Health Monitoring Program.
Twenty-one major plant associations were identified within the AOSR with jack pine (Pinus banksiana)/bearberry (Arctostaphylos sp.)/green reindeer lichen (Cladina mitis) communities considered most sensitive. Among those, nine EATs most sensitive to atmospheric emissions were identified by classification and ordination techniques. These EATs possessed 10 specific ecological parameters necessary for field identification and mapping. Field sites were located near major AOSR emission sources, radiating outwards from similar to 18 to 130 km. A significant and high, nonlinear negative correlation (r = -0.98) was determined between the foliar inorganic/organic sulfur ratios in first year jack pine needles and the distance from the SO2 sources. This foliar sulfur ratio metric coupled with other growth parameters provided a robust measure for deploying the ecological analogue system to monitor for the biological effects from the atmospheric chemical species of concern.

Keywords

Authors

Jaques, DR; Legge, AH

Volume	Issue	Pages	Date Published	Times Cited
11		219-241	2012	0

Digital Object Identifier (DOI)

10.1016/B978-0-08-097760-7.00010-

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Biomonitoring of particulate matter by magnetic properties of Ulmus carpinifolia leaves.

Publication / Journal

African Journal of Biotechnology

Abstract

Biomonitoring of the particulate matter (PM) helps us to find out quantity and quality of vegetation in different parts of the city and create sustainable urban landscape. This study explains the results of an air pollution biomonitoring in Isfahan (Iran) with regards to the magnetic properties of tree leaves of Elm (Ulmus carpinifolia). Isothermal remanent magnetization (IRM 300 mT) of U. carpinifolia leaves was determined. Data collection apparatus was a magnetometer. Four stations in different areas of green space, including, one park, one square, one street and one control station were determined and the tree leaves of U. carpinifolia from two meter height were collected. Ten leaves from each tree were separated and ten repetitions were achieved for each station. Leaves were placed in a special box to measure magnetic field with magnetometer. Comparison of magnetic properties of Elm tree leaves before and after washing was done. Magnetic properties showed that high concentrations were seen in trees found in squares and streets. Also, rainfall and washing decreased the magnetic properties of the leaves.

Keywords

Authors

Sadeghian, M. M.

Volume	Issue	Pages	Date Published	Times Cited
11	73	13827-13830	2012	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Epiphytic lichen recolonization in the centre of Cracow (Southern Poland) as a result of air quality improvement

Publication / Journal

POLISH JOURNAL OF ECOLOGY

Abstract

Epiphytic lichen distribution and diversity were investigated in seven localities in the centre of Cracow (South Poland). Field studies were carried out in the years 2007-2009. A total of 39 species were recorded at 434 sites; 6 species are new to Cracow. Compared to previous surveys, the overall situation has generally improved, with higher lichen species richness and cover rate. The area of former 'lichen desert' in the city centre has disappeared and it has been colonized by SO2 sensitive macrolichen species. Dominance of nitrogen- and dust-tolerant species has been observed. The health of lichen thalli has improved and many young specimens were recorded in the study area. These changes follow air quality improvement, mainly the SO2 decline, during the last twenty years. Transport-related NOx and dust have become the main pollutants in the centre of Cracow. The recolonization process seems to be not completed yet and further improvement in lichen distribution and diversity is expected. Thus long-term biomonitoring is required.

Keywords

Authors

Slaby, A; Lisowska, M

Volume	Issue	Pages	Date Published	Times Cited
60	2	225-240	2012	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Regional variation in environmental element concentrations in Slovakia derived from analysis of roe deer teeth (Capreolus capreolus L.)

Publication / Journal

Ekologia (Bratislava)

Abstract

Values emanating from element analysis in roe deer teeth from 3 polluted sites and the control locality in the Nizke Tatry National Park ("Low Tatra Mountains Nat. Pk." - NAPANT) are discussed herein. We found the following highest concentrations in the roe deer teeth: As, Ba, Br, Cl and Na in Ziar nad Hronom; Cd, Cu, Hg and Zn in Spis and Al, Ca, Co, Fe, Mg, Mn, Pb, Rb, Sb and Sr in Orava. Statistically significant difference was established between the concentration of of As, Cd, Co, Cu, Hg, Na, Pb, Rb, Sr and Zn in roe deer teeth from Ziar, Spis and Orava sites and the control locality of NAPANT. This obtained data is a useful reference point for comparison with future measurements of air pollution in the examined area, whenever hazards due to heavy metal accumulation in the food chain are assessed.

Keywords

Authors

Mankovska, Blanka; Oszlanyi, Julius; Goryanova, Zoya I.; Frontasyeva, Marina V.; Kastier, Peter

Volume: 31

Issue: 2

Pages: 138-149

Date Published: 2012

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Plant biomass, productivity and characterization of species diversity under the effect of gaseous emission

Publication / Journal

Plant Archives

Abstract

In developing country the cities are being industrialized and increasing in size, diversity and population. The increase in emissious of primary pollutant in industrial area may have severe consequence on plant growth and metabolism. The present study the experimental evidence of sensitivity of some deciduous plant to ambient air pollution from the crowdy city of Allahabad. The response of plants under the influence of gaseous emission may be considered and the determination of biomass, productivity and yield of three plant species, viz. Aegle marmelos, Emblica officinalis and Albizia lebbeck in Allahabad city. The biomass, productivity and yield of plant species than the polluted one. Plant species exposed to SO 2 (0.07 ppm to 0.14 ppm) showed greater variation in relative growth of root (-4.8 to 17.80%) and shoot (-19.16 to 48.50%). Maximum relative growth reduction occurs in Emblica officinalis and minimum in Albizia lebbeck. Maximum productivity and fruit yield found in Aegle marmelos and minimum productivity in Emblica officinalis and minimum fruit yield Albizia lebbeck. after 60 days exposure of 0.07 and 0.14 ppm of SO 2 at different age of plant species (210, 225, 240, 255 day ages).

Keywords

Authors

Arvind Mishra; Siddiqui, K. A.; Shukla, C. P.

Volume	Issue	Pages	Date Published	Times Cited
10	2	741-744	2010	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Effects of sulfur dioxide on growth and net photosynthesis of six Japanese forest tree species grown under different nitrogen loads

Publication / Journal

TREES-STRUCTURE AND FUNCTION

Abstract

We examined the growth and photosynthetic responses of Japanese forest tree species to sulfur dioxide (SO2) under different nitrogen (N) loads to soil. We grew Quercus serrata, Fagus crenata, Castanopsis sieboldii, Larix kaempferi, Pinus densiflora, and Cryptomeria japonica seedlings in Andisol supplemented with N as NH4NO3 solution at 0, 20, and 50 kg ha(-1) year(-1). Seedlings were exposed daily to charcoal-filtered air or SO2 at 10, 20, and 40 nl l(-1) for two growing seasons. Except for C. japonica seedlings, exposure to SO2 at a relatively low concentration stimulated whole-plant growth, especially under a relatively high N load. The effects of N load on the negative impact of SO2 on whole-plant growth were synergistic in Q. serrata, F. crenata, C. sieboldii, and P. densiflora, counteractive in L. kaempferi, and additive in C. japonica. In Q. serrata, F. crenata, C. sieboldii, and P. densiflora seedlings, the different responses of whole-plant growth to SO2 among the N treatments were because of the effect of N load on the response of the net photosynthetic rate to SO2. L. kaempferi seedlings showed N load-induced tolerance of whole-plant growth to SO2. This was explained by the effect of N load on the responses of photosynthesis and development of assimilative organs to SO2. The different growth responses to SO2 among the N treatments were explained by the effects of N load on the SO2 uptake rate (evaluated by stomatal diffusive conductance) or the accumulated SO2 uptake (evaluated by foliar S concentration).

Keywords

Authors

Yamaguchi, M; Watanabe, M; Tabe, C ; Naba, J; Matsumura, H; Kohno, Y; Izuta, T

Volume: 26

Issue: 6

Pages: 1859-1874

Date Published: December 2012

Times Cited: 0

Digital Object Identifier (DOI): 10.1007/s00468-012-0755-y

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

The risk of air pollution by sulphur compounds in forest ecosystems from Republic of Moldova included in the European network of forest monitoring.

Publication / Journal

Revista Padurilor

Abstract

This paper presents an assessment of air quality using the lichenoindication method and an estimation of the throughfall deposition of S-SO 42-, according to the methodology recommended by the ICP Forest Program. Air pollution with SO 2 was determined according to GECA, using the metod proposed by Begu (2009), for the territory of Republic of Moldova. A comparison of the results obtained in 2012 using the European scale for the estimation of the intensity of pollution, emphasised that in Republic of Moldova the deposition of S-SO 42- was high (5,7-8 kg/ha year) and very high (8-32 kg/ha year). These results indicate that the oak species will be the most affected due to their uduced tolerance to sulphur. The studied lichen species belong to the second (II) and (HI) degrees of toxitoleration, fact which indicates, according to abundance, a low and moderate air pollution by SO 2. Based on lichenoindication we can say that most of the studied forest ecosystems have not the structural stability and sustainable functionality.

Keywords

Authors

Brasoveanu, V.; Begu, A.

Volume: 128

Issue: 4/5

Pages: 59-65

Date Published: 2013

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Genetic signatures of natural selection in response to air pollution in red spruce (Picea rubens, Pinaceae)

Publication / Journal

MOLECULAR ECOLOGY

Abstract

One of the most important drivers of local adaptation for forest trees is climate. Coupled to these patterns, however, are human-induced disturbances through habitat modification and pollution. The confounded effects of climate and disturbance have rarely been investigated with regard to selective pressure on forest trees. Here, we have developed and used a population genetic approach to search for signals of selection within a set of 36 candidate genes chosen for their putative effects on adaptation to climate and human-induced air pollution within five populations of red spruce (Picea rubens Sarg.), distributed across its natural range and air pollution gradient in eastern North America. Specifically, we used F-ST outlier and environmental correlation analyses to highlight a set of seven single nucleotide polymorphisms (SNPs) that were overly correlated with climate and levels of sulphate pollution after correcting for the confounding effects of population history. Use of three age cohorts within each population allowed the effects of climate and pollution to be separated temporally, as climate-related SNPs (n=7) showed the strongest signals in the oldest cohort, while pollution-related SNPs (n=3) showed the strongest signals in the youngest cohorts. These results highlight the usefulness of population genetic scans for the identification of putatively nonneutral evolution within genomes of nonmodel forest tree species, but also highlight the need for the development and application of robust methodologies to deal with the inherent multivariate nature of the genetic and ecological data used in these types of analyses.

Keywords

Authors

Bashalkhanov, S; Eckert, AJ; Rajora, OP

Volume	Issue	Pages	Date Published	Times Cited
22	23	5877-5889	December 2013	0

Digital Object Identifier (DOI)

10.1111/mec.12546

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Age-dependent accumulation of heavy metals in liver, kidney and lung tissues of homing pigeons in Beijing, China

Publication / Journal

ECOTOXICOLOGY

Abstract

Biomonitoring provides direct evidence of the bioavailability and accumulation of toxic elements in the environment. In the current study, 1-2, 5-6, and 9-10+ year old homing pigeons collected from the Haidian District of Beijing during 2011 were necropsied and concentrations of cadmium, lead, and mercury were measured in liver, lung, and kidney tissue. At necropsy, gray/black discoloration of the margins of the lungs was observed in 98 % of the pigeons. There were no significant differences in metal concentrations as a function of gender. Cadmium concentrations in all tissues and Pb concentrations in the lung tissues were significantly greater in 9-10+ year old pigeons compared to other age groups indicating that Cd and Pb were bioavailable. Mercury concentrations were not significantly different among age groups. Cadmium concentrations in kidney and lung tissues of 9-10+ year old pigeons were similar to or exceeded concentrations of Cd reported in pigeons from another high traffic urban area and most wild avian species from Korea suggesting that Cd in this region of Beijing may be of concern. Homing pigeons provide valuable exposure and bioaccumulation data not readily available from air monitoring alone, thus providing information regarding potential health effects in wildlife and humans in urban areas. As environmental quality standards are implemented in China, homing pigeons will serve as a valuable bio-monitor of the efficacy of these actions.

Keywords

Authors

Cui, J; Wu, B; Halbrook, RS; Zang, SY

Volume	Issue	Pages	Date Published	Times Cited
22	10	1490-1497	December 2013	0

Digital Object Identifier (DOI)

10.1007/s10646-013-1135-0

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☑	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Reflectance spectral analyses for the assessment of environmental pollution in the geothermal site of Mt. Amiata (Italy)

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

We studied the environmental impact of geothermal activities in the Mt. Amiata area, using on-site spectral analyses of various ecological components. Analytical techniques were based on the study of the "red-edge", which represents the spectral feature of the reflectance spectra defined between red and infrared wavelengths (A) within the range 670-780 nm. Since in the study area the geothermal exploitation causes the drifting of contaminants such as Hg, Sb, S, B, As and H2S (hydrogen sulfide) from power plants, the spectral response of vegetation and lichens depends on their distance from the power stations, and also on the exposed surface, material type and other physical parameters. In the present research, the spectral radiance of targets was measured in the field using an Analytical Spectral Device (ASD) Field-SpecTmFR portable radiometer. Spectral measurements were made on vegetation and lichen samples located near to and far from geothermal areas and potential pollution sources (e.g., power plants), with the aim of spatially defining their environmental impact. Observations for vegetation and lichens showed correlation with laboratory chemical analyses when these organisms were under stress conditions. The evaluation of relationships was carried out using several statistical approaches, which allowed to identify methods for identifying contamination indicators for plants and lichens in polluted areas. Results show that the adopted spectral indices are sensitive to environmental pollution and their responses spatialstatically correlated to chemical and ecophysiological analyses within a notable distance.

Keywords

Authors

Manzo, C; Salvini, R; Guastaldi, E; Nicolardi, V; Protano, G

Volume	Issue	Pages	Date Published	Times Cited
79		650-665	November 2013	

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2013.06.038

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Combustion of Hydrotreated Vegetable Oil and Jatropha Methyl Ester in a Heavy Duty Engine: Emissions and Bacterial Mutagenicity

Publication / Journal

ENVIRONMENTAL SCIENCE & TECHNOLOGY

Abstract

Research on renewable fuels has to assess possible adverse health and ecological risks as well as conflicts with global food supply. This investigation compares the two newly developed biogenic diesel fuels hydrotreated vegetable oil (HVO) and jatropha methyl ester (JME) with fossil diesel fuel (DF) and rapeseed methyl ester (RME) for their emissions and bacterial mutagenic effects. Samples of exhaust constituents were compared after combustion in a Euro III heavy duty diesel engine. Regulated emissions were analyzed as well as particle size and number distributions, carbonyls, polycyclic aromatic hydrocarbons (PAHs), and bacterial mutagenicity of the exhausts. Combustion of RME and JME resulted in lower particulate matter (PM) compared to DF and HVO. Particle numbers were about 1 order of magnitude lower for RME and JME. However, nitrogen oxides (NOx) of RME and JME exceeded the Euro III limit value of 5.0 g/kWh, while HVO combustion produced the smallest amount of NOx. RME produced the lowest emissions of hydrocarbons (HC) and carbon monoxide (CO) followed by JME. Formaldehyde, acetaldehyde, acrolein, and several other carbonyls were found in the emissions of all investigated fuels. PAH emissions and mutagenicity of the exhausts were generally low, with HVO revealing the smallest number of mutations and lowest PAH emissions. Each fuel showed certain advantages or disadvantages. As proven before, both biodiesel fuels produced increased NOx emissions compared to DF. HVO showed significant toxicological advantages over all other fuels. Since jatropha oil is nonedible and grows in arid regions, JME may help to avoid conflicts with the food supply worldwide. Hydrogenated jatropha oil should now be investigated if it combines the benefits of both new fuels.

Keywords

Authors

Westphal, GA; Krahl, J ; Munack, A ; Rosenkranz, N; Schroder, O; Schaak, J; Pabst, C; Bruning, T; Bunger, J

Volume	Issue	Pages	Date Published	Times Cited
47	11	6038-6046	June 2013	0

Digital Object Identifier (DOI)

10.1021/es400518d

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Characterization of Tibouchina granulosa (Desr.) Cong. (Melastomataceae) as a biomonitor of air pollution and quantification of particulate matter adsorbed by leaves

Publication / Journal

ECOLOGICAL ENGINEERING

Abstract

The main anatomical features of Tibouchina granulosa (Desr.) Cong. (Melastomataceae) have been investigated in order to assess the potential of the species as a possible biomonitor of air pollution in the state of Sao Paulo, Brazil. Various types of trichomes located on the adaxial and abaxial surfaces of the leaves of this ornamental tree were able to adsorb particulate matter (PM) within the size range 2.5-100 mu m. Following dry or wet deposition, the particles remained adsorbed to the leaves and did not return to the environment under normal weather conditions. The numbers of particles adsorbed per unit area of leaf differed significantly depending on the location at which the samples were collected. Leaves from a relatively unpolluted site located in a remnant of the Atlantic Forest within the city of Sao Paulo showed the lowest particle density, while samples collected in the city centers of Sao Paulo and Cubatao presented the highest numbers of particles with aerodynamic sizes <2.5 and 2.5-10 mu m. It is concluded that T. granulosa may be employed as a passive biomonitor, thereby offering a valuable alternative for monitoring air pollution and spatial-temporal evaluation of PM composition. Additionally, landscape cultivation of T. granulosa in inner-city areas may help to improve the quality of air by reducing the concentration of harmful PM2.5 and PM10. (C) 2013 Elsevier B.V. All rights reserved.

Keywords

Authors

Zampieri, MCT; Sarkis, JES; Pestana, RCB; Tavares, AR; Melo-de-Pinna, GFA

Volume: 61

Issue:

Pages: 316-327

Date Published: December 2013

Times Cited: 0

Digital Object Identifier (DOI): 10.1016/j.ecoleng.2013.09.050

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Exposure of Betula pendula Roth pollen to atmospheric pollutants CO, O-3 and SO2

Publication / Journal

GRANA

Abstract

Betula pendula pollen, under laboratory conditions, was exposed to three atmospheric pollutants: carbon monoxide (CO), ozone (O-3) and sulphur dioxide (SO2). Two levels of each pollutant were used; the first level corresponds to a concentration on the atmospheric hour-limit value acceptable for human health protection in Europe, the second level to a higher, at least more than double of the first, concentration level. Experiments were done under artificial solar light with controlled temperature and relative humidity. Our results indicate that, in urban areas, concentrations of CO, O-3 and SO2 on the limits established for human protection, can affect pollen fertility. We verified a decrease in the viability and germination of the pollen, indicating damage to the pollen membrane system. Also, a general decreasing trend in the total protein content of the exposed samples when compared with the control samples was observed, which suggests alterations in the antigenic characteristics of pollen.

Keywords

Authors

Cuinica, LG; Abreu, I; Gomes, CR; da Silva, JCGE

Volume	Issue	Pages	Date Published	Times Cited
52	4	299-304	December 2013	0

Digital Object Identifier (DOI)

10.1080/00173134.2013.830145

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Efficient control of air pollution through plants, a cost-effective alternative: studies on Dalbergia sissoo Roxb

Publication / Journal

ENVIRONMENTAL MONITORING AND ASSESSMENT

Abstract

Plants can be used as both passive biomonitors and biomitigators in urban and industrial environments to indicate the environmental quality and to ameliorate pollution level in a locality. Many studies reveal that plants are negatively affected by the ambient levels of air pollutants. The present study was conducted to evaluate the impact of air pollution on comparative basis with reference to changes in photosynthetic pigments, plant height, leaves, as well as, biochemical parameters of plants of different sites around Udaipur city receiving varying levels of pollution load. The investigated tree species Dalbergia sissoo Roxb. (Family: Fabaceae) exhibited a reduction in various physiological and biochemical growth parameters that correspond with air pollution levels at different sites. The tree species growing in polluted and control areas were compared with respect to foliar dust load, leaf area, and chlorophyll and total carbohydrate and total protein concentration in the leaves. Our studies suggest that D. sissoo Roxb. can successfully be grown in an area for monitoring air pollution, where it is mild and droughts are common. It will prove as an ideal tree species to control pollution effectively beside acting as a shade tree and being a source of food for birds and animals. By plantation of D. sissoo Roxb., mitigative measure at the polluted sites to control generation of particulate matter and the air quality required can be ensured. Our results also confirm that industrial and vehicular air pollution level in Udaipur city is shifting beyond limits.

Keywords

Authors

Kapoor, CS; Bamniya, BR; Kapoor, K

Volume	Issue	Pages	Date Published	Times Cited
185	9	7565-7580	September 2013	0

Digital Object Identifier (DOI)

10.1007/s10661-013-3119-1

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Relationships between the diversity of animal communities and the lighting environment and content of heavy metals in soils in Guizhou Zhijin Cave

Publication / Journal

Shengwu Duoyangxing/Biodiversity Science

Abstract

We investigated the community diversity of cave animals in different light zones of the Guizhou Zhijin Cave in August, 2011. We used principal components analysis (PCA) to examine the relationships between animal community diversity and environment factors. We assessed the potential ecological risk degree of heavy metals in the cave based on the Hakanson potential ecological risk index. We identified 1,080 specimens, which belong to three phyla, five classes, 26 families and 41 species or groups of species, which could be divided into five communities. The highest community diversity, richness index, evenness index, and dominance index were light zone of exit (2.7996), light zone of entrance (4.5399), light zone of exit (0.9196) and weak-light zone of exit (0.1868), respectively. Index of similarity between light zone of entrance and light zone of exit (0.6248) was highest. The richness and dominance indices of the communities were low, but community diversity and richness tended to decrease based on the order of the light intensity (i.e., light zone>weak-light zone>dark zone). Dominant species included Hemiphaedusa pluviatilis and H. moellendorffiana. Organic matter of soil, content of CO2 in the air, cave humidity, cave temperature, and heavy metal contamination of soil were the dominant factors to affect animal community diversity in the cave. Although Cu, Zn, Ni, Cr, As in soils were at ecologically low levels, Hg pollution was relatively high in the whole cave and at especially severe level of ecological risk (E-r(i)=256.000) in the light zone of cave entrance. As far as the average potential ecological risk level (RI=192.714) of six heavy metals were concerned, the cave was contaminated at a certain degree with heavy metals.

Keywords

Authors

Xu, Chengxiang; Li, Zizhong; Li, Daohong

Volume: 21

Issue: 1

Pages: 62-70

Date Published: January 2013

Times Cited: 0

Digital Object Identifier (DOI): 10.3724/SP.J.1003.2013.09120

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☑				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Biomonitoring of heavy metals by moss and soil around Afsin-Elbistan coal-fired power plant in the East-Mediterranean region of Turkey

Publication / Journal

FRESENIUS ENVIRONMENTAL BULLETIN

Abstract

This research investigated heavy metal pollution around the Afsin-Elbistan coal-fired power plant, one of the most important energy power plants in Turkey, by means of analyzing moss and soil samples collected in the neighborhood of the plant at different distances. The presented study also examines the relation of the obtained heavy metal concentrations with the dominant wind directions in the region. The heavy metal analysis is realized on 16 soil and 10 moss samples obtained from the studied area. A state of the art energy dispersive X-ray fluorescence (EDXRF) spectrometry (Epsilon 5, PANalytical, Almelo, The Netherlands) was utilized in the experiments. The results (mg/kg between minimum and maximum values) indicated that the soil samples contained of Al (349-902), V (4.9-36.3), Cr (8.31-24.83), Mn (51.9-465.9), Fe (366-1049), Ni (4.01-17.75), Cu (3.8-24.8), Zn (10.8-384.6), Hg (3-8), and Pb (2-75.1) whereas moss samples contained Al (342-657), V (7.9-18.9), Cr (7.26-18.36), Mn (132.8-420.3), Fe (631-906), Ni (4.58-12.05), Cu (1.33-25.49), Zn (53.4-394.3), Hg (5-9), and Pb (11-83.1). The research has verified the increasing amount of heavy metal concentrations at closer distances to the plant and the high correlation of these concentrations with the dominant wind directions. The comparison of the obtained heavy metal concentrations with the measurements in Europe and Israel, and with the limit values for the human health, has revealed crucial pollution levels in the region. The possible consequences of these results are briefly discussed from the point of potential hazards to ecology and human health.

Keywords

Authors

Koz, B; Cevik, U; Akbulut, S

Volume: 22

Issue: 12B

Pages: 3751-3758

Date Published: 2013

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Nutrient status: a missing factor in phenological and pollen research?

Publication / Journal

JOURNAL OF EXPERIMENTAL BOTANY

Abstract

Phenology ranks among the best ecosystem processes for fingerprinting climate change since temperature explains a high percentage of the interannual or spatial variation in phenological onset dates. However, roles of other environmental variables, such as foliar nutrient concentrations, are far from adequately understood. This observational study examined the effects of air temperature and 11 nutrients on spring phenology of Betula pendula Roth (birch) along an urbanrural gradient in Munich, Germany, during the years 2010/2011. Moreover, the influence of temperature, nutrients, and air pollutants (NO2 and O-3) on the amounts of pollen and catkin biomass in 2010 was evaluated. In addition to the influence of higher temperatures advancing phenological onset dates, higher foliar concentrations of potassium, boron, zinc, and calcium were statistically significantly linked to earlier onset dates. Since flushing of leaves is a turgor-driven process and all the influential nutrients are involved in cell extension, membrane function, and stability, there might be a reasonable physiological interpretation of the observed association. The amounts of pollen were negatively correlated with temperature, atmospheric NO2, and foliar iron concentration, suggesting that these variables restrict pollen production. The results of this study suggested an influence of nutritional status on both phenology and pollen production. The interaction of urbanization and climate change should be considered in the assessment of the impact of global warming on ecosystems and human health.

Keywords

Authors

Jochner, S; Hofler, J; Beck, I; Gottlein, A; Ankerst, DP; Traidl-Hoffmann, C; Menzel, A

Volume: 64

Issue: 7

Pages: 2081-2092

Date Published: April 2013

Times Cited: 1

Digital Object Identifier (DOI)

10.1093/jxb/ert061

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

The influence of urban environment on chlorophyll content and ascorbic acid in the leaves of Tilia cordata (Tiliaceae)

Publication / Journal

Rastitel'nye Resursy

Abstract

Here results of pollutant study in the air of Yoshkar-Ola city (Man El Republic) are adduced, the excess of SO2 and dust was revealed. As the concentration of SO2 in the atmosphere raised the amount of sulfur and ascorbic acid in the leaves increased, chlorophyll content decreased in specimens of Tilia cordata Mill. The sulfur content in the soil in the areas of research was within normal limits.

Keywords

Authors

Skochilova, E. A.; Zakamskaya, E. S.

Volume	Issue	Pages	Date Published	Times Cited
49	4	541-547	2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Dendrochronological research of Scots pine (Pinus sylvestris L.) radial growth in vicinity of industrial pollution

Publication / Journal

DENDROCHRONOLOGIA

Abstract

The aim of this research is to investigate changes in the annual radial increment of Scots pine (Pinus sylvestris L) in the vicinity of intensive (3-10 km) and moderate (11-20 km) industrial pollution during different growth periods (growth promotion, inhibition, and recovery). Low level of emission was beneficial for tree growth during the growth promotion period, and the annual radial increment in the zones of intensive and moderate pollution increased by approximately 15-25% and 10%, respectively. Severe loss was reported to forests during the growth inhibition period when nitrogen and sulphur dioxide emissions were 37-40 thousand (thou.) tons per year. About 40-45% tree radial increment loss was observed in the stands closest to the pollution source, and 15-20% loss was observed for the most distant stands. The stabilization of radial growth decrease and the beginning of recovery of damaged stands began in 1988-1992, when the annual amount of industrial emissions and environmental pollution were considerably reduced. The stabilization of radial growth and the initiation of recovery after pollution reduction were high for the most damaged stands. Their radial increment was stable and close to that of the control stands in 2000-2011. Stands with less damage growing further from the pollution source were recovered earlier, and their radial increment stabilized near the control increment in 1995-1999. The results of linear regression analysis demonstrated that the impact of pollution is different for stands growing at different distances from the plant, and the impact decreases with distance (R-2=0.78 and R-2=0.75, respectively; p <0.05).

Keywords

Authors

Stravinskiene, V; Bartkevicius, E; Plausinyte, E

Volume: 31

Issue: 3

Pages: 179-186

Date Published: 2013

Times Cited: 0

Digital Object Identifier (DOI)

10.1016/j.dendro.2013.04.001

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Biomonitoring of athmosphere air quality

Publication / Journal

International Journal of Ecosystems and Ecology Science

Abstract

The foundation of the sustainable ecological balance in the functioning of forest ecosystems serve Critical Loads established by the Geneva Convention (1979) for SO 2, NO x and NH 3. Through critical loads concerning the harmfulness of sulphur and nitrogen on ecosystems are understood the acidification deposition concentration levels, which cause no long-term adverse effects on the structure and functionality of ecosystems. Within our research, the air quality of 62 forest ecosystems from Republic of Moldova was assessed, taking into consideration the lichens indicator species specific diversity, abundance and toxitolerance. It was established that the Moldavian forest ecosystems do not contain reserves concerning critical loads for SO 2 pollution, the annual average for the vegetation season for dendrological species being 0,02 mg/m 3 air, and for communities of lichens and cyanobacteria, organisms sensitive to pollution, represented only 0,01 mg/m 3. Lichen indication demonstrated that the current level of pollution is between 0,05 and 0,5 mg/m 3 SO 2 air, thus long-term harmful effects are manifested in all 62 studied forest ecosystems.

Keywords

Authors

Begu, A.

Volume: 3

Issue: 2

Pages: 247-252

Date Published: 2013

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The response of the foliar antioxidant system and stable isotopes (delta C-13 and delta N-15) of white willow to low-level air pollution

Publication / Journal

PLANT PHYSIOLOGY AND BIOCHEMISTRY

Abstract

In this study we aimed to determine and elucidate the effect of ambient air pollution on the foliar antioxidant system and stable carbon and nitrogen isotopes of white willow (Salix alba L.). We grew white willow in uniform potting soil in the near vicinity of sixteen air quality monitoring stations in Belgium where nitrogen dioxide (NO2), ozone, sulfur dioxide and particulate matter concentrations were continuously measured. The trees were exposed to ambient air during six months (April-September 2011), and, thereafter, the degree of lipid peroxidation and foliar content of antioxidant molecules (ascorbate, glutathione, polyphenols, flavonoids), antioxidant enzymes (superoxide dismutase, ascorbate peroxidase, peroxidase) and foliar stable carbon (delta C-13) and nitrogen (delta N-15) isotopes were measured. We found that lipid peroxidation was caused by air pollution stress, arising from high ambient NO2 concentrations, as shown by an increased amount of malondialdehyde. The antioxidant system was activated by increasing the amount of polyphenols at monitoring stations with a high atmospheric NO2 and low O-3 concentration, while no increase of key enzymes (e.g., ascorbate, glutathione) was observed. The delta C-13 also decreased with increasing NO2 concentrations and decreasing O-3 concentrations, probably reflecting a decreased net photosynthesis and/or a concomitant decrease of (CO2)-C-13 in the atmosphere. Shade also influenced foliar delta C-13 and the content of leaf ascorbate and glutathione

Keywords

Authors

Wuytack, T; AbdElgawad, H; Staelens, J; Asard, H; Boeckx, P; Verheyen, K; Samson, R

Volume	Issue	Pages	Date Published	Times Cited
67		154-161	June 2013	0

Digital Object Identifier (DOI)

10.1016/j.plaphy.2013.03.007

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Biochemical changes in some deciduous tree species around Talcher thermal power station, Odisha, India

Publication / Journal

Source: JOURNAL OF ENVIRONMENTAL BIOLOGY
Volume: 34

Abstract

The present study was conducted to evaluate biochemical traits in leaves to assess the air pollution impact on plants caused by thermal power plant emissions. Ten species of deciduous trees were selected from study sites in different seasons. pH, chlorophyll, phenols, total soluble sugar content and proline content in fresh leaf was analyzed. The leaf wash pH content reveals moderately acidic (4.5-5.0) to highly acidic (3.5-4.5) range. Significant differences ($p<0.01$) were observed in chlorophyll content according to the seasons and sites. Maximum reduction in chlorophyll was noticed at 2.5 km and 5.0 km west from the power plant. Greater reduction in chloropOhyll 'b' than chlorophyll 'a' was noticed. An increase in total soluble sugars and phenols was observed at sites closer to thermal power plant in comparison to control. Highest concentration of total phenols was found in summer season in Dalbergia sissoo (1.52 %), Butea monosperma (1.12 %), Mangifera indica (1.2 %), Tectona grandis (1.26%) and Acacia leucophloea (1.16 %) at 2.5 km north from the source. Highest concentration of soluble sugar was found in Dalbergia sissoo (7.75 %) during winter season. There was about 10-20 fold increase in proline content of leaves in comparison to the control.

Keywords

Authors

Nayak, R; Biswal, D; Sett, R

Volume: 34

Issue: 3

Pages: 521-528

Date Published: May 2013

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

- [ ] Mammals
- [ ] Birds
- [ ] Reptiles
- [ ] Amphibians
- [ ] Aquatic
- [x] Plants
- [ ] Invertebrates
- [ ] Benthic Invertebrates
- [ ] Lichen/Moss
- [ ] Microbes
- [ ] Other Biotic Medium

- [ ] Air
- [ ] Soil
- [ ] Water
- [ ] Sediment
- [ ] Light
- [ ] Noise
- [ ] Temperature
- [ ] Humidity
- [ ] Other Abiotic Medium

- [ ] Nitrogen oxides
- [ ] Sulphur dioxide
- [ ] Mercury
- [ ] Particulate Matter
- [ ] Inorganic chemical
- [ ] Organic chemical
- [ ] New substance

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Foliar delta N-15 is affected by foliar nitrogen uptake, soil nitrogen, and mycorrhizae along a nitrogen deposition gradient

Publication / Journal

OECOLOGIA

Abstract

Foliar nitrogen isotope (delta N-15) composition patterns have been linked to soil N, mycorrhizal fractionation, and within-plant fractionations. However, few studies have examined the potential importance of the direct foliar uptake of gaseous reactive N on foliar delta N-15. Using an experimental set-up in which the rate of mycorrhizal infection was reduced using a fungicide, we examined the influence of mycorrhizae on foliar delta N-15 in potted red maple (Acer rubrum) seedlings along a regional N deposition gradient in New York State. Mycorrhizal associations altered foliar delta N-15 values in red maple seedlings from 0.06 to 0.74 aEuro degrees across sites. At the same sites, we explored the predictive roles of direct foliar N uptake, soil delta N-15, and mycorrhizae on foliar delta N-15 in adult stands of A. rubrum, American beech (Fagus grandifolia), black birch (Betula lenta), and red oak (Quercus rubra). Multiple regression analysis indicated that ambient atmospheric nitrogen dioxide (NO2) concentration explained 0, 69, 23, and 45 % of the variation in foliar delta N-15 in American beech, red maple, red oak, and black birch, respectively, after accounting for the influence of soil delta N-15. There was no correlation between foliar delta C-13 and foliar %N with increasing atmospheric NO2 concentration in most species. Our findings suggest that total canopy uptake, and likely direct foliar N uptake, of pollution-derived atmospheric N deposition may significantly impact foliar delta N-15 in several dominant species occurring in temperate forest ecosystems.

Keywords

Authors

Vallano, DM; Sparks, JP

Volume	Issue	Pages	Date Published	Times Cited
172	1	47-58	May 2013	0

Digital Object Identifier (DOI)

10.1007/s00442-012-2489-3

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Rapid recovery of stem increment in Norway spruce at reduced SO2 levels in the Harz Mountains, Germany

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Tree-ring width of Picea abies was studied along an altitudinal gradient in the Harz Mountains, Germany, in an area heavily affected by SO2-related forest decline in the second half of the 20th century. Spruce trees of exposed high-elevation forests had earlier been shown to have reduced radial growth at high atmospheric SO2 levels. After the recent reduction of the SO2 load due to clean air acts, we tested the hypothesis that stem growth recovered rapidly from the SO2 impact. Our results from two formerly damaged high-elevation spruce stands support this hypothesis suggesting that the former SO2-related spruce decline was primarily due to foliar damage and not to soil acidification, as the deacidification of the (still acidic) soil would cause a slow growth response. Increasing temperatures and deposited N accumulated in the topsoil are likely additional growth-promoting factors of spruce at high elevations after the shortfall of SO2 pollution.

Keywords

Authors

Hauck, M; Zimmermann, J; Jacob, M; Dulamsuren, C; Bade, C; Ahrends, B; Leuschner, C

Volume: 164

Issue:

Pages: 132-141

Date Published: May 2012

Times Cited: 6

Digital Object Identifier (DOI): 10.1016/j.envpol.2012.01.026

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Do Leaf Characteristics of White Willow (Salix alba L.), Northern Red Oak (Quercus rubra L.), and Scots Pine (Pinus sylvestris L.) Respond Differently to Ambient Air Pollution and Other Environmental Stressors?

Publication / Journal

WATER AIR AND SOIL POLLUTION

Abstract

This study assessed the effect of ambient air pollution on leaf characteristics of white willow, northern red oak, and Scots pine. Willow, oak, and pine saplings were planted at sixteen locations in Belgium, where nitrogen dioxide (NO2), ozone (O-3), sulfur dioxide (SO2), and particulate matter (PM10) concentrations were continuously measured. The trees were exposed to ambient air during 6 months (April-September 2010), and, thereafter, specific leaf area (SLA), stomatal resistance (R-s), leaf fluctuating asymmetry (FA), drop contact angle (CA), relative chlorophyll content, and chlorophyll fluorescence (F-v/F-m) were measured. Leaf characteristics of willow, oak, and pine were differently related to the ambient air pollution, indicating a species-dependent response. Willow and pine had a higher SLA at measuring stations with higher NO2 and lower O-3 concentrations. Willow had a higher Rs and pine had a higher F-v/F-m at measuring stations with a higher NO2 and lower O-3 concentrations, while oak had a higher F-v/F-m and a lower FA at measuring stations with a higher NO2 and lower O-3 concentrations. FA and R-s of willow, oak, and pine, SLA of oak, and CA of willow were rather an indicator for local adaptation to the micro-environment than an indicator for the ambient air pollution.

Keywords

Authors

Wuytack, T; Samson, R; Wuyts, K; Adriaenssens, S; Kardel, F; Verheyen, K

Volume	Issue	Pages	Date Published	Times Cited
224	8		August 2013	0

Digital Object Identifier (DOI)

10.1007/s11270-013-1635-9

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Air purification efficiency of thirty species of landscape trees in northern China

Publication / Journal

Journal of Northeast Forestry University

Abstract

A study was conducted to determine the capabilities of dust detaining, sterilization, and SO 2 absorption of 30 species of superior landscape trees, including 10 domestically introduced species and 20 native tree species. Result shows that, in all the species studied, Potentilla fruticosa, Caragana rosea, Potentilla davurica, Rosa multiflora var. cornea and Caragana ussuriensis have the best effect on dust detaining, which can be applied as the afforestation plants in the seriously dust polluted area. Spiraea fritschiana, Caragana ussuriensis, Lonicera praeflorens, Rosa rugosa, and Maackia amurensis exhibit stronger sterilizing capacity, which can be planted in the areas where bacteria pollution is high, such as hospital and city streets. C. rosea, Acanthopanax sessiliflorus, P. davurica, Lonicera tatarinowii and R. rugosa, having strong sulfur dioxide absorption performances, are suitable to be planted in factories, power stations and so on.

Keywords

Authors

He Yong; Li Lei; Li JunYi; Li WeiXing; Mu LiQiang

Volume: 38

Issue: 5

Pages: 37-39

Date Published: 2010

Times Cited: 7

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

- [ ] Mammals
- [ ] Birds
- [ ] Reptiles
- [ ] Amphibians
- [ ] Aquatic
- [x] Plants
- [ ] Invertebrates
- [ ] Benthic Invertebrates
- [ ] Lichen/Moss
- [ ] Microbes
- [ ] Other Biotic Medium

- [ ] Air
- [ ] Soil
- [ ] Water
- [ ] Sediment
- [ ] Light
- [ ] Noise
- [ ] Temperature
- [ ] Humidity
- [ ] Other Abiotic Medium

- [ ] Nitrogen oxides
- [x] Sulphur dioxide
- [ ] Mercury
- [x] Particulate Matter
- [ ] Inorganic chemical
- [ ] Organic chemical
- [ ] New substance

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Relationships between lichen community composition and concentrations of NO2 and NH3

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

The relationship between different features of lichen communities in Quercus robur canopies and environmental variables, including concentrations of NO2 and NH3 was investigated. NO2 concentration was the most significant variable, it was positively correlated with the proportion of lichen cover comprising nitrophytes and negatively correlated with total lichen cover. None of the lichen community features were correlated with NH3 concentrations, which were relatively low across the site. Since nitrophytes and nitrophobes are likely to react in opposite directions to nitrogenous compounds, total lichen cover is not a suitable indicator for these pollutants. It is, therefore, suggested that the proportion of lichen cover comprising nitrophytes may be a suitable simple indicator of air quality, particularly in locations where the pollution climate is dominated by oxides of nitrogen

Keywords

Authors

Gadsdon, SR; Dagley, JR; Wolseley, PA; Power, SA

Volume	Issue	Pages	Date Published	Times Cited
158	8	2553-2560	August 2010	8

Digital Object Identifier (DOI)

10.1016/j.envpol.2010.05.019

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Rates of particulate pollution deposition onto leaf surfaces: Temporal and inter-species magnetic analyses

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Evaluation of health impacts arising from inhalation of pollutant particles <10 mu m (PM(10)) is an active research area. However, lack of exposure data at high spatial resolution impedes identification of causal associations between exposure and illness. Biomagnetic monitoring of PM(10) deposited on tree leaves may provide a means of obtaining exposure data at high spatial resolution. To calculate ambient PM(10) concentrations from leaf magnetic values, the relationship between the magnetic signal and total PM(10) mass must be quantified, and the exposure time (via magnetic deposition velocity (MV(d)) calculations) known. Birches display higher MV(d) (similar to 5 cm(-1)) than lime trees (similar to 2 cm(-1)). Leaf saturation remanence values reached 'equilibrium' with ambient PM(10) concentrations after similar to 6 'dry' days (<3 mm/day rainfall). Other co-located species displayed within-species consistency in MV(d); robust inter-calibration can thus be achieved, enabling magnetic PM(10) biomonitoring at unprecedented spatial resolution.

Keywords

Authors

Mitchell, R; Maher, BA; Kinnersley, R

Volume	Issue	Pages	Date Published	Times Cited
158	5	1472-1478	May 2010	28

Digital Object Identifier (DOI)

10.1016/j.envpol.2009.12.029

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Investigating the influence of sulphur dioxide (SO2) on the stable isotope ratios (delta C-13 and delta O-18) of tree rings

Publication / Journal

GEOCHIMICA ET COSMOCHIMICA ACTA

Abstract

This study reports the influence of a 20th century pollution signal recorded in the delta C-13 and delta O-18 of absolutely dated tree rings from Quercus robur and Pinus sylvestris from southern England. We identify a correspondence between the inter-relationship and climate sensitivity of stable isotope series that appears to be linked to recent trends in local SO2 emissions. This effect is most clearly exhibited in the broadleaved trees studied but is also observed in the delta C-13 values of the (less polluted) pine site at Windsor. The SO2 induced stomatal closure leads to a maximum increase of 2.5 parts per thousand in the isotope values (delta C-13). The combined physiological response to high pollution levels is less in delta O-18 than delta C-13. The SO2 signal also seems to be present as a period of reduced growth in the two ring-width chronologies. Direct, quantitative correction for the SO2 effect represents a significant challenge owing to the nature of the records and likely local plant response to environmental pollution. Whilst it appears that this signal is both limited to the late industrial period and demonstrates a recovery in line with improvements in air quality, the role of atmospheric pollution during the calibration period should not be underestimated and adequate consideration needs to be taken when calibrating biological environmental proxies in order to avoid development of biased reconstructions.

Keywords

Authors

Rinne, KT; Loader, NJ; Switsur, VR; Treydte, KS; Waterhouse, JS

Volume	Issue	Pages	Date Published	Times Cited
74	8	2327-2339	April 2010	12

Digital Object Identifier (DOI)

10.1016/j.gca.2010.01.021

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mercury bioaccumulation and trophic transfer in the terrestrial food web of a montane forest

Publication / Journal

ECOTOXICOLOGY

Abstract

We investigated mercury (Hg) concentrations in a terrestrial food web in high elevation forests in Vermont. Hg concentrations increased from autotrophic organisms to herbivores < detritivores < omnivores < carnivores. Within the carnivores studied, raptors had higher blood Hg concentrations than their songbird prey. The Hg concentration in the blood of the focal study species, Bicknell's thrush (Catharus bicknelli), varied over the course of the summer in response to a diet shift related to changing availability of arthropod prey. The Bicknell's thrush food web is more detrital-based (with higher Hg concentrations) in early summer and more foliage-based (with lower Hg concentrations) during late summer. There were significant year effects in different ecosystem compartments indicating a possible connection between atmospheric Hg deposition, detrital-layer Hg concentrations, arthropod Hg concentrations, and passerine blood Hg concentrations.

Keywords

Authors

Rimmer, CC; Miller, EK; McFarland, KP; Taylor, RJ; Faccio, SD

Volume	Issue	Pages	Date Published	Times Cited
19	4	697-709	April 2010	15

Digital Object Identifier (DOI)

10.1007/s10646-009-0443-x

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☑	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☑	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Effects of 60-day NO2 fumigation on growth, oxidative stress and antioxidative response in Cinnamomum camphora seedlings

Publication / Journal

JOURNAL OF ZHEJIANG UNIVERSITY-SCIENCE B

Abstract

To study the oxidative stress and antioxidative response of Cinnamomum camphora seedlings exposed to nitrogen dioxide (NO2) fumigation.
Measurements were made up of the growth, chlorophyll content, chlorophyll fluorescence, antioxidant system and lipid peroxidation of one-year-old C. camphora seedlings exposed to NO2 (0.1, 0.5, and 4 mu l/L) fumigation in open top chambers over a period of 60 d.
After the first 30 d, 0.5 and 4.0 mu l/L NO2 showed insignificant effects on the growth of C. camphora seedlings. However, exposure to 0.5 and 4.0 mu l/L NO2 for 15 d significantly reduced their chlorophyll content ($P < 0.05$), enhanced their malondialdehyde (MDA) content and superoxide dismutase (SOD) activity ($P < 0.05$), and also significantly reduced the maximal quantum yield of PSII in the dark [the ratio of variable fluorescence to maximal fluorescence (F (v)/F (m))] ($P < 0.05$). In the latter 30 d, 0.5 mu l/L NO2 showed a positive effect on the vitality of the seedlings, which was reflected by a recovery in the ratio of F (v)/F (m) and chlorophyll content, and obviously enhanced growth, SOD activity, ascorbate (AsA) content and glutathione reductase (GR) activity ($P < 0.05$); 4.0 mu l/L NO2 then showed a negative effect, indicated by significant reductions in chlorophyll content and the ratio of F (v)/F (m), and inhibited growth ($P < 0.05$). Conclusion: The results suggest adaptation of C. camphora seedlings to 60-d exposure to 0.1 and 0.5 mu l/L NO2, but not to 60-d exposure to 4.0 mu l/L NO2. C. camphora seedlings may protect themselves from injury by strengthening their antioxidant system in response to NO2-induced oxidative stress.

Keywords

Authors

Chen, ZM; Chen, YX; Du, GJ; Wu, XL; Li, F

Volume: 11

Issue: 3

Pages: 190-199

Date Published: March 2010

Times Cited: 5

Digital Object Identifier (DOI)

10.1631/jzus.B0910350

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Relationship of Atmospheric Pollution Characterized by Gas (NO2) and Particles (PM10) to Microbial Communities Living in Bryophytes at Three Differently Polluted Sites (Rural, Urban, and Industrial)

Publication / Journal

MICROBIAL ECOLOGY

Abstract

Atmospheric pollution has become a major problem for modern societies owing to its fatal effects on both human health and ecosystems. We studied the relationships of nitrogen dioxide atmospheric pollution and metal trace elements contained in atmospheric particles which were accumulated in bryophytes to microbial communities of bryophytes at three differently polluted sites in France (rural, urban, and industrial) over an 8-month period. The analysis of bryophytes showed an accumulation of Cr and Fe at the rural site; Cr, Fe, Zn, Cu, Al, and Pb at the urban site; and Fe, Cr, Pb, Al, Sr, Cu, and Zn at the industrial site. During this study, the structure of the microbial communities which is characterized by biomasses of microbial groups evolved differently according to the site. Microalgae, bacteria, rotifers, and testate amoebae biomasses were significantly higher in the rural site. Cyanobacteria biomass was significantly higher at the industrial site. Fungal and ciliate biomasses were significantly higher at the urban and industrial sites for the winter period and higher at the rural site for the spring period. The redundancy analysis showed that the physico-chemical variables ([NO2], relative humidity, temperature, and site) and the trace elements which were accumulated in bryophytes ([Cu], [Sr], [Pb]) explained 69.3% of the variance in the microbial community data. Moreover, our results suggest that microbial communities are potential biomonitors of atmospheric pollution. Further research is needed to understand the causal relationship underlined by the observed patterns.

Keywords

Authors

Meyer, C; Gilbert, D; Gaudry, A; Franchi, M; Nguyen-Viet, H; Fabure, J; Bernard, N

Volume: 59

Issue: 2

Pages: 324-334

Date Published: February 2010

Times Cited: 7

Digital Object Identifier (DOI): 10.1007/s00248-009-9580-2

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Response of spruce stands in national parks of southern Poland to air pollution in 1998-2005

Publication / Journal

EUROPEAN JOURNAL OF FOREST RESEARCH

Abstract

The purpose of this study was to describe changes in the deposition of air pollutants and the response of spruce trees in the period of 1998-2005. The investigation was carried out in twelve sites, mainly national parks. Air pollution level, that is, SO2, NO2, and O-3 concentrations in the air, as well as throughfall and soil solution chemical composition was analysed. The reaction of trees was described based on a stand health parameter, that is, defoliation. A decrease in the concentration of SO2 and NO2 in the investigated period was observed. In most of the analysed sites, ozone concentrations in the growing season exceeded the level regarded as harmful to plants. Annual loads of nitrogen and sulphur reaching the forest soil exceeded 10 kg/ha. The data collected for the analysed period confirmed that the health status of forests at the investigated sites did not show a general tendency towards improvement. Also, no dependency between the air pollution level and defoliation rate was found.

Keywords

Authors

Staszewski, T; Kubiesa, P; Lukasik, W

Volume	Issue	Pages	Date Published	Times Cited
131	4	1163-1173	July 2012	1

Digital Object Identifier (DOI)

10.1007/s10342-011-0587-0

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Air pollution load and nutrient status of Norway spruce forest stands in the north-western part of Slovakia

Publication / Journal

Beskydy

Abstract

The article summarizes the results of research of air pollution load, site conditions, and nutrition of spruce stands in the Kysuce and Orava regions (Beskydy Mts.). The region was intensively exposed to air pollution from emission sources in neighbouring countries mainly in the 1970s and 1980s. At present, this region is affected by a vast decline of spruce stands, which is thought, at least partly, to be related to air pollution. Long-term research during the last decade indicated: i/ decrease in SO 2 and NO x concentrations, ii/ although the trend of sulphate concentration in precipitation is decreasing, the deposition of sulphur and especially nitrogen remain relatively high, iii/ in general, there is no evidence of continued forest soil acidification, and the share of the area with an exceedance of critical load of total acidity is decreasing, iv/ the nutrition status of spruce is relatively good, v/ ground-level ozone exceeds the concentration that could damage the trees.

Keywords

Authors

Sitkova, Z.; Pavlenda, P.; Pavlendova, H.; Priwitzer, T.; Hlasny, T.

Volume: 3

Issue: 1

Pages: 93-102

Date Published: 2010

Times Cited: 1

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Optical methods for ecological mapping of urban areas

Publication / Journal

BULLETIN OF THE LEBEDEV PHYSICS INSTITUTE

Abstract

The results of the study of spectral characteristics of tree crops of Samara city as a method for measuring air pollutant concentrations. Even-age plantings of European white birch at ten points of Samara near main motorways were chosen as objects of study. It was shown that the ratio K of the light backscattering intensities at wavelengths of 750 and 550 nm is sensitive to pollutants and insensitive to measurement conditions. The relation between the coefficient K and the leaf chlorophyll concentration and their dependence on the total concentration of anthropogenic substances characteristic of internal-combustion engine exhausts (CO, NO(2), SO(2)) were experimentally determined. The carbon oxide concentration has the strongest effect on the coefficient K. This makes it possible to apply the described method tested by the example of Samara city to ecological mapping of city territories.

Keywords

Authors

Zakharov, VP; Makurina, ON; Timchenko, EV; Timchenko, PE; Bratchenko, IA; Kotova, SP

Volume	Issue	Pages	Date Published	Times Cited
37	7	222-226	July 2012	0

Digital Object Identifier (DOI)

10.3103/S1068335610070067

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Behavioral responses of leaves and vascular cambium of Prosopis cineraria (L.) Druce to different regimes of coal-smoke pollution

Publication / Journal

JOURNAL OF PLANT INTERACTIONS

Abstract

The foliar and cambial responses of Prosopis cineraria to five different coal-smoke regimes in Delhi, India, were studied using the monthly collections of leaves and cambial blocks as well as the data on SO(2), NO(2) and particulate concentrations from each of the five study sites. Coal-smoke inhibited pigment concentration, NR activity and sugar content and promoted stomatal index and the nitrate and sulfur contents. Stomatal conductance was low, leading to a drop in the net photosynthetic rate. Cambial activity started quite late and the annual increment of wood was reduced despite a prolonged active phase, possibly due to a distinctly retarded rate of cambial cell division. Vessel proportion in the wood increased but the size of vessel elements and fibers decreased. Such studies may help in identifying trees suitable for cultivation in the pollution-affected areas.

Keywords

Authors

Iqbal, M; Mahmooduzzafar; Aref, IM; Khan, PR

Volume	Issue	Pages	Date Published	Times Cited
5	2	117-133	2010	2

Digital Object Identifier (DOI)

10.1080/17429140903438084

Media Category: Biotic

Generation Type: Coal

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Cytotoxic, phytotoxic, and mutagenic appraisal to ascertain toxicological potential of particulate matter emitted from automobiles

Publication / Journal

Environmental Science and Pollution Research

Abstract

Vehicular air pollution is a mounting health issue of the modern age, particularly in urban populations of the developing nations. Auto-rickshaws are not considered eco-friendly as to their inefficient engines producing large amount of particulate matter (PM), thus posing significant environmental threat. The present study was conducted to ascertain the cytotoxic, phytotoxic, and mutagenic potential of PM from gasoline-powered two-stroke auto-rickshaws (TSA) and compressed natural gas-powered four-stroke auto-rickshaws (FSA). Based on the increased amount of aluminum quantified during proton-induced X-ray emission analysis of PM from TSA and FSA, different concentrations of aluminum sulfate were also tested to determine its eco-toxicological potential. The MTT assay demonstrated significant ($p < 0.001$) dose-dependent cytotoxic effects of different concentrations of TSA, FSA, and aluminum sulfate on BHK-21 cell line. LC50 of TSA, FSA, and aluminum sulfate was quantified at 16, 11, and 23.8 mu g/ml, respectively, establishing PM from FSA, a highly cytotoxic material. In case of phytotoxicity screening using Zea mays, the results demonstrated that all three tested materials were equally phytotoxic at higher concentrations producing significant reduction ($p < 0.001$) in seed germination. Aluminum sulfate proved to be a highly phytotoxic agent even at its lowest concentration. Mutagenicity was assessed by fluctuation Salmonella reverse mutation assay adopting TA100 and TA98 mutant strains with (+S9) and without (-S9) metabolic activation. Despite the fact that different concentrations of PM from both sources, i.e., TSA and FSA were highly mutagenic ($p < 0.001$) even at lower concentrations, the mutagenic index was higher in TSA. Data advocate that all tested materials are equally ecotoxic, and if the existing trend of atmospheric pollution by auto-rickshaws is continued, airborne heavy metals will seriously affect the normal growth of local inhabitants and increased contamination of agricultural products, which will amplify the dietary intake of the toxic elements and could result in genetic mutation or long-term health implications.

Keywords

Authors

Anwar, K; Ejaz, S; Ashraf, M; Altaf, I; Anjum, AA

Volume	Issue	Pages	Date Published	Times Cited
20	7	4817-4830	July 2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

A step towards feasible phytoremediation

Publication / Journal

Kagaku to Seibutsu

Abstract

An innovative study is presented, to utilize plants which obtain strong resilience to air pollution and can intake nitrogen dioxide as nitrogen resource for the purpose of phytoremediation. In a test of the effects of emission gas on plants, when emission gas is introduced into the soil through a pipe, various positive effects are observed; the nitrogen concentration of a salvia, a lily of valley and a Ohphiopogon japonicas increases, and a strawberry obtains fruits earlier and more than the control, an azalea and a Japanese stone oak have much darker green colour of leaves to perform photosynthesis more.

Keywords

Authors

Beppu, T.; Matsumura, Y.; Tsuchidate, H.; Oikawa, K.; Yamagishi, Y.; Harada, I.; Kanehara, R.; Ishikawa, Y.; Yasui, Y.; Hayakawa, S.

Volume	Issue	Pages	Date Published	Times Cited
48	10	724-726	2010	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of copy center particles on the lungs: a toxicological characterization using a Balb/c mouse model

Publication / Journal

Inhalation Toxicology

Abstract

Context: Printers and photocopiers release respirable particles into the air. Engineered nanomaterials (ENMs) have been recently incorporated into toner formulations but their potential toxicological effects have not been well studied.
Objective: To evaluate the biological responses to copier-emitted particles in the lungs using a mouse model.
Methods: Particulate matter (PM) from a university copy center was sampled and fractionated into three distinct sizes, two of which (PM0.1 and PM0.1-2.5) were evaluated in this study. The particles were extracted and dispersed in deionized water and RPMI/10% FBS. Hydrodynamic diameter and zeta potential were evaluated by dynamic light scattering. The toxicological potential of these particles was studied using 8-week-old male Balb/c mice. Mice were intratracheally instilled with 0.2, 0.6, 2.0 mg/kg bw of either the PM0.1 and PM0.1-2.5 size fractions. Fe2O3 and welding fumes were used as comparative materials, while RPMI/10% FBS was used as the vehicle control. Bronchoalveolar lavage (BAL) was performed 24 hours post-instillation. The BAL fluid was analyzed for total and differential cell counts, and biochemical markers of injury and inflammation.
Results: Particle size- and dose-dependent pulmonary effects were found. Specifically, mice instilled with PM0.1 (2.0 mg/kg bw) had significant increases in neutrophil number, lactate dehydrogenase and albumin compared to vehicle control. Likewise, pro-inflammatory cytokines were elevated in mice exposed to PM0.1 (2.0 mg/kg bw) compared to other groups.
Conclusion: Our results indicate that exposure to copier-emitted nanoparticles may induce lung injury and inflammation. Further exposure assessment and toxicological investigations are necessary to address this emerging environmental health pollutant.

Keywords

Authors

Pirela, S; Molina, R; Watson, C; Cohen, JM; Bello, D; Demokritou, P; Brain, J

Volume	Issue	Pages	Date Published	Times Cited
25	9	498-508	August 2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Global warming and alternative causes of decline in arctic-alpine and boreal-montane lichens in North-Western Central Europe

Publication / Journal

GLOBAL CHANGE BIOLOGY

Abstract

Lichens are thought to be sensitive indicators of global warming, as the spread of several thermophilous epiphytes in north-western Central Europe has been attributed to late 20th century warming. In the present paper, the potential contribution of late 20th century warming to the decline of arctic-alpine and boreal-montane lichen species is analyzed. Relevant ecological groups of lichens include terricolous heathland species, saxicolous species of exposed rock outcrops and boulder fields as well as epiphytes of mountain forests. These three groups of lichens experienced significant declines before the onset of late 20th century warming in the 1970s. These declines can be attributed to the abandonment of traditional land use systems in the case of the heathland lichens, increased recreational use of the exposed summits usually inhabited by cold-tolerant saxicolous lichens, and to high atmospheric SO(2) levels in the mid-20th century, but are probably not directly connected to global warming.

Keywords

Authors

Hauck, Markus

Volume: 15

Issue: 11

Pages: 2653-2661

Date Published: November 2009

Times Cited: 9

Digital Object Identifier (DOI): 10.1111/j.1365-2486.2009.01968.x

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Measuring Uncertainty in Lichen Biomonitoring of Atmospheric Pollution: The Case of SO2

Publication / Journal

IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT

Abstract

Large-scale biomonitoring surveys on atmospheric air pollution face the following challenges: 1) how to select which biomonitor and how this organism reflects the atmospheric pollutant of interest and 2) what methods to use for interpreting the vast data that will be gathered. This paper addresses these issues through an integrative fuzzy knowledge-based system for environmental biomonitoring applications with lichens. The system gathers and combines geographical, ecological, and physicochemical data of lichen responses to pollution within a computer program that 1) recognizes groups of indigenous species suitable for long-term pollution monitoring and 2) estimates pollution levels from species distribution data. Thereby, the proposed scheme provides a means to convert species field data to measurements under conditions of uncertainty. The proposed biosurveillance program has been successfully tested at a small scale, proving its functionality even under conditions of increased uncertainty. Within a suitable management framework, it could further be utilized in environmental impact studies and risk assessment (positive or analytic approach), short-term decision making (normative or tactical approach), and long-term policy making (normative or strategic approach).

Keywords

Authors

Batzias, FA; Siontorou, CG

Volume	Issue	Pages	Date Published	Times Cited
58	9	3207-3220	September 2009	2

Digital Object Identifier (DOI)

10.1109/TIM.2009.2017162

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The growth response of Alternanthera philoxeroides in a simulated post-combustion emission with ultrahigh [CO2] and acidic pollutants

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Although post-combustion emissions from power plants are a major source of air pollution, they contain excess CO2 that could be used to fertilize commercial greenhouses and stimulate plant growth. We addressed the combined effects of ultrahigh [CO2] and acidic pollutants in flue gas on the growth of Alternanthera philoxeroides. When acidic pollutants were excluded, the biomass yield of A. philoxeroides saturated near 2000 mu mol mol(-1) [CO2] with doubled biomass accumulation relative to the ambient control. The growth enhancement was maintained at 5000 mu mol mol(-1) [CO2], but declined when [CO2] rose above 1%, in association with a strong photosynthetic inhibition. Although acidic components (SO2 and NO2) significantly offset the CO2 enhancement, the aboveground yield increased considerably when the concentration of pollutants was moderate (200 times dilution). Our results indicate that using excess CO2 from the power plant emissions to optimize growth in commercial green house could be viable.

Keywords

Authors

Xu, CY; Griffin, KL; Blazier, JC; Craig, EC; Gilbert, DS; Sritrairat, S; Anderson, OR; Castaldi, MJ; Beaumont, L

Volume	Issue	Pages	Date Published	Times Cited
157	7	2118-2125	July 2009	1

Digital Object Identifier (DOI)

10.1016/j.envpol.2009.02.013

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Possible Changes in the Pace of Scots Pine (Pinus sylvestris L.) Radial Increment in City Forests and Parks

Publication / Journal

BALTIC FORESTRY

Abstract

Air pollution determined threats for trees growing in cities will change due to warming climate and increasing air pollution after the end of Ignalina nuclear power plant exploitation. The aim of this research was to evaluate the pace of radial increment possible changes of Scots pine (Pinus sylvestris L.) in future scenarios of warming climate and increasing SO(2) and NO(2) concentration in city atmosphere. Wood samples were collected from 80-90 year old sample pines, growing in parks and forest parks in Vilnius and Kaunas cities, for the analysis of annual radial increment reaction to environmental changes. Multiple regression models (describing 53-66 % of variability of actual dendroscales with probability of 95 %) for predicting pine radial increment were created. If recent cautious climate warming prognosis will be true, the pace of pine radial increment possible changes in cities will be rather slow in the coming 30 years: from +0.001 to +0.004 mm per year. The pace of pine radial increment possible changes in future scenario of increasing SO(2) and NO(2) concentration in city atmosphere will be slow: from -0.002 till -0.006 mm per year and pine radial increment in 2020 will decrease (by 0.03-0.05 mm) in major part of sample plots despite the positive impact of warming climate.

Keywords

Authors

Simatonyte, Asta

Volume	Issue	Pages	Date Published	Times Cited
16	1	8-15	2010	3

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of stone crushing industry on Shorea robusta and Madhuca indica foliage in Lalpahari forest

Publication / Journal

ATMOSPHERIC POLLUTION RESEARCH

Abstract

One of the various causes of forest decline is certainly the industrial expansion and the resultant air pollution of anthropogenic origin. Gradual and extensive encroachment of the forest area by the quarrying (mining) and crushing activities of the naturally occurring stones since early 1960s is found in the district of Birbhum, West Bengal, India. The aim of this study was to evaluate the effect of stone crushing industry on different foliar parameters of Shorea robusta and Madhuca indica which are two dominant broad-leaved tree species of the forest concerned. Measurement of suspended particulate matter (SPM), dustfall and gaseous pollutants in ambient air were done. Heavy deposition of dust particles on leaf surfaces was noted. Various types of foliar anomalies, both microscopic and macroscopic, were detected externally. Decrease in amount of chlorophyll and total carbohydrate in foliar tissues indicated reduction of photosynthesis. Reduction of protein content in foliar tissues was also noted. Site-wise and season-wise variations of almost all data were found to be statistically significant. Comparison of air pollution status and foliar biochemical parameters with those recorded in a control forest was done along with study of spatial significance between polluted sites at Lalpahari with increasing distance from the source of pollution. A significant correlation was established in many cases between foliar parameters and air pollutants present in ambient air in the highly polluted site of the forest close to the source of pollution.

Keywords

Authors

Saha, DC; Padhy, PK

Volume	Issue	Pages	Date Published	Times Cited
2	4	463-476	October 2011	1

Digital Object Identifier (DOI)

10.5094/APR.2011.053

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Atmospheric polycyclic aromatic hydrocarbon profiles and sources in pine needles and particulate matter in Dayton, Ohio, USA

Publication / Journal

ATMOSPHERIC ENVIRONMENT

Abstract

Polycyclic aromatic hydrocarbons (PAHs) were measured in pine needles (passive sampling) and on high-volume particulate matter (PM) filters (active sampling) over a period of eight to ten months at two separate sites in the Dayton, Ohio, USA metropolitan area: Moraine and Yellow Springs. Total PAH concentrations for PM ranged from 77.4 mu g g(-1) to 837 mu g g(-1) (dry wt.) at both sites with high molecular weight PAHs being the predominant form that tended to be higher in concentration during the colder months. Total PAH concentrations for pine needles varied by tree species and location. With an average concentration of 4187 ng g(-1), Austrian pine (Pinus nigra) needles in Moraine ranged from 2543 ng g(-1) to 6111 ng g(-1) (dry wt.) with the lowest and highest concentrations occurring in October and August, respectively. The amount of phenanthrene was extremely high for August, 4200 +/- 112, which could have resulted from the close proximity of the tree to the parking lot at a firehouse. White pine (Pinus strobus) needles in Yellow Springs had an average concentration of 384 ng g(-1) and ranged from 127 ng g(-1) to 589 ng g(-1) (dry wt.) with September and November, respectively, having the lowest and highest PAH concentrations. The 2- and 3-ring PAHs were the predominant form in P. nigra, while the 4-ring PAHs predominated in P. strobus. Total PAH concentrations in P. nigra were an order of magnitude greater than for P. strobus. A bivariate plot of BaA/(BaA + Chry) versus Flt(Flt + Pyr) allowed the PM and pine needle data to be included in the same source analysis and indicated sources of PM at both sites were biomass and/or coal combustion. This plot also suggested PAHs in Yellow Springs P. strobus originated from petroleum combustion sources, whereas PAHs in Moraine P. nigra originated from petroleum combustion with some sources more aged or remote.

Keywords

Authors

Tomashuk, TA; Truong, TM; Mantha, M; McGowin, AE

Volume	Issue	Pages	Date Published	Times Cited
51		196-202	May 2012	3

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2012.01.028

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Hepatic mercury, cadmium, and lead in mink and otter from New York State: monitoring environmental contamination

Publication / Journal

ENVIRONMENTAL MONITORING AND ASSESSMENT

Abstract

Many non-linear processes link atmospheric emissions to the bioavailability of metals; consequently, the monitoring of metals in ecosystem components is required to model their ecodynamics. American mink (Neovison vison) and river otter (Lontra canadensis) have the potential to serve as an upper-level-consumer component in monitoring metals bioavailability. However, the relationship of bioaccumulated metals to various environmental factors has not been explored nor have the effects of demographic factors been resolved. To address these limitations, mink and otter, collected throughout New York State during 1998-2002, were analyzed for hepatic concentrations of total mercury (Hg), cadmium (Cd), and lead (Pb). Relationships were investigated between metals concentrations and landscape-level factors (physiographic zone, hydrologic unit, and elevation) and demographic factors (gender and age). Considerable variation in Hg and Cd concentrations was observed relative to both physiographic zone and hydrologic unit for both species. In contrast with Hg, Cd concentration increased predictably with increasing elevation. Mercury concentrations were greater, but for Cd less, in otter than mink. Lead concentrations showed little landscape heterogeneity and were independent of elevation. Age-related bioaccumulation was evident for Hg and Cd, but not for Pb, in both species. Mercury and Cd concentrations were greater in female than male mink; however, Pb concentrations were greater in males than females. Inverse relationships of relative growth (weight/length) to metals concentrations explained gender differences in Hg and Cd in mink. For otter, no gender-related differences in metals concentrations were apparent. The suitability of mink and otter for monitoring programs is discussed.

Keywords

Authors

Mayack, DT

Volume	Issue	Pages	Date Published	Times Cited
184	4	2497-2516	April 2012	0

Digital Object Identifier (DOI)

10.1007/s10661-011-2134-3

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Assessment of airborne heavy metal pollution using plant parts and topsoil

Publication / Journal

ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY

Abstract

Robinia pseudoacacia L (Fabaceae) was evaluated as a possible bioindicator of airborne heavy metal pollution, which originates from mining and pyrometallurgical copper production in Bor (Eastern Serbia). Concentrations of Cu, Zn, Pb, Cd, As and Hg were determined in different plant organs (washed/unwashed leaves, branches, roots) and topsoil of R. pseudoacacia by ICP-AES and by AAS. Sampling was carried out during 2008 at ten selected sites distributed in five zones with different levels of pollution. Concentrations of Pb, Cd and Hg did not exceeded the maximum allowed concentration (MAC) in soils at any of the sampling sites. Cu and As were present only at two sites within the MAC, whereas Zn exceeded the MAC at two sampling sites. Although present in the soil, As. Cd and Hg were below limit of detection in all parts of R. pseudoacacia. The rest of the studied elements, collected at the sites closest to the copper smelter or in the directions of the prevailing winds, were found to be at high levels. The higest Cu and Zn concentrations were detected in branches of R. pseudoacacia at the site Krivelj in the rural zone (6418.2 +/- 355.4 mg kg(-1) and 4699.8 +/- 320.8 mg kg(-1), respectively). Pb was present in similar amounts in all parts of R. pseudoacacia in the concentration ranging from 4.9 +/- 0.3 mg kg(-1) (in washed leaves, at tourist zone) to 66.9 +/- 5.3 mg kg(-1) (in roots, at urban-industrial zone). According to the mobility ratio, leaves and branches of R. pseudoacacia acted as excluders of Cu, Zn and Pb, except for the branches which acted as indicators of Zn. Although As is present in high concentrations in the air and topsoil of the examined area, results show that R. pseudoacacia is not a suitable indicator of environmental pollution with As.

Keywords

Authors

Serbula, SM; Miljkovic, DD; Kovacevic, RM; Ilic, AA

Volume	Issue	Pages	Date Published	Times Cited
76		209-214		14

Digital Object Identifier (DOI)

10.1016/j.ecoenv.2011.10.009

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Multielement profiles of soil, road dust, tree bark and wood-rotten fungi collected at various distances from high-frequency road in urban area

Publication / Journal

ECOLOGICAL INDICATORS

Abstract

Multielemental profiles of soil, dust, linden tree bark (Tilia sp.) and wood-rotting fungi (Schizophyllum commune) collected in central public park of Banja Luka, Bosnia and Herzegovina, at two distances from the nearby high-frequency road, were assessed as potential air pollution indicators. The samples were microwave digested and 10 elements were measured by graphite furnace (Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn) and cold vapor (Hg) atomic absorption spectrometry. This is the first report on the heavy element contents in the selected type of samples collected in the Banja Luka City and also in Bosnia and Herzegovina. The obtained results showed significant decrease of element contents, particularly of Pb, Ni, Cu, Cr, Fe, Hg, Zn and Co, in the samples with increasing distance from the road edge. According to the Dutch soil quality standard, the Cd, Co, and Hg concentrations of the examined soils were higher than the target values for unpolluted soil, but they were not above the intervention values for which a serious case of soil contamination exists. Compared to the roadside soil, roadside dust had significantly higher contents of Co, Cr, Cu, Pb, Zn and Hg, but majority of them were in the range of concentrations previously reported in literature. The exceptions were Co and Hg, being up to 2 times higher than the maximum of the previously reported levels, which might be considered as peculiarity for the Banja Luka dust samples. Dust significantly contributed to the elemental profile of tree bark. The Hg concentration in the roadside tree bark sample was far above the phytotoxic limit, and the problem of "dying trees" in the Banja Luka park previously related to the presence of white-rot fungi could be attributed to the excessive contents of this biotoxic element. Principal component analysis (PCA) and analysis of enrichment factors (EFs) provided a framework for differentiation of dominant sources of elements in the analyzed samples.

Keywords

Authors

Skrbic, B; Milovac, S; Matavulj, M

Volume: 13

Issue: 1

Pages: 168-177

Date Published: February 2012

Times Cited: 3

Digital Object Identifier (DOI): 10.1016/j.ecolind.2011.05.023

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mutants of Ficus pumila produced by ion beam irradiation with an improved ability to uptake and assimilate atmospheric nitrogen dioxide

Publication / Journal

INTERNATIONAL JOURNAL OF PHYTOREMEDIATION

Abstract

Production of novel mutants with a high ability to mitigate pollutants is important for phytoremediation. We investigated the use of ion beam irradiation to produce mutants of Ficus pumila L. with an improved ability to mitigate atmospheric nitrogen dioxide (NO2). More than 25,000 shoot explants were irradiated with an ion beam (C-12(5+), C-12(6+), or He-4(2+)), from which 263 independent plant lines were obtained. The plants were analyzed for NO2 uptake by fumigation with 1 ppm N-15-labeled NO2 for 8 h in light, followed by mass spectrometric analysis. The mean NO2 uptake values of each of the 263 lines differed over a 110-fold range. Propagation was attempted using cuttings from 44 lines showing the greatest NO2 uptake; in total, 15 lines were propagated. Two of the 15 lines showed a mean NO2 uptake 1.7- to 1.8-fold greater than that of the wild-type. This increase in NO2 uptake was heritable in both lines; their progenies showed a significantly greater ability to take up and assimilate NO2 than did the wild-type. RAPD analysis demonstrated DNA variation between the progeny plants and the wild type, suggesting that the progeny were true mutants. These mutants of F. pumila may prove useful in mitigating atmospheric NO2.

Keywords

Authors

Takahashi, M; Kohama, S; Shigeto, J; Hase, Y; Tanaka, A; Morikawa, H

Volume	Issue	Pages	Date Published	Times Cited
14	3	275-281	2012	0

Digital Object Identifier (DOI)

10.1080/15226514.2011.604694

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The adaptive response of lichens to mercury exposure involves changes in the photosynthetic machinery

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Lichens are an excellent model to study the bioaccumulation of heavy metals but limited information is available on the molecular mechanisms occurring during bioaccumulation. We investigated the changes of the lichen proteome during exposure to constant concentrations of mercury. We found that most of changes involves proteins of the photosynthetic pathway, such as the chloroplastic photosystem I reaction center subunit II, the oxygen-evolving protein and the chloroplastic ATP synthase beta-subunit. This suggests that photosynthesis is a target of the toxic effects of mercury. These findings are also supported by changes in the content of photosynthetic pigments (chlorophyll a and b, and beta-carotene). Alterations to the photosynthetic machinery also reflect on the structure of thylakoid membranes of algal cells. Response of lichens to mercury also involves stress-related proteins (such as Hsp70) but not cytoskeletal proteins. Results suggest that lichens adapt to mercury exposure by changing the metabolic production of energy.

Keywords

Authors

Nicolardi, V; Cai, G; Parrotta, L; Puglia, M; Bianchi, L; Bini, L; Gaggi, C

Volume	Issue	Pages	Date Published	Times Cited
160		1-10	January 2012	6

Digital Object Identifier (DOI)

10.1016/j.envpol.2011.09.015

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Potential sources of methylmercury in tree foliage

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Litterfall is a major source of mercury (Hg) and toxic methylmercury (MeHg) to forest soils and influences exposures of wildlife in terrestrial and aquatic ecosystems. However, the origin of MeHg associated with tree foliage is largely unknown. We tested the hypothesis that leaf MeHg is influenced by root uptake and thereby related to MeHg levels in soils. Concentrations of MeHg and total Hg in deciduous and coniferous foliage were unrelated to those in soil at 30 urban and rural forested locations in southwest Ohio. In contrast, tree genera and trunk diameter were significant variables influencing Hg in leaves. The fraction of total Hg as MeHg averaged 0.4% and did not differ among tree genera. Given that uptake of atmospheric Hg(0) appears to be the dominant source of total Hg in foliage, we infer that MeHg is formed by in vivo transformation of Hg in proportion to the amount accumulated.

Keywords

Authors

Tabatchnick, MD; Nogaro, G; Hammerschmidt, CR

Volume	Issue	Pages	Date Published	Times Cited
160		82-87	January 2012	3

Digital Object Identifier (DOI)

10.1016/j.envpol.2011.09.013

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	

Title

The State of Forest Xylotrophic Fungal Communities Exposed to Industrial Air Pollutants

Publication / Journal

RUSSIAN JOURNAL OF ECOLOGY

Abstract

N/A

Keywords

air pollutants; sulfur dioxide; polymetallic dust; acid gases; fluorine compounds; aerotechnogenic pollution; xylotrophic fungi; mycocoplexes; mycobiota transformation; bioindication

Authors

Stavishenko, IV

Volume	Issue	Pages	Date Published	Times Cited
41	5	445-449	September 2010	2

Digital Object Identifier (DOI)

10.1134/S1067413610050140

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of nitrite exposure on functional haemoglobin levels, bimodal respiration, and swimming performance in the facultative air-breathing fish Pangasianodon hypophthalmus

Publication / Journal

AQUATIC TOXICOLOGY

Abstract

In this study we investigated nitrite (NO(2)(-)) effects in striped catfish, a facultative air-breather. Fish were exposed to 0, 0.4, and 0.9 mM nitrite for 0, 1, 2, 4, and 7 days, and levels of functional haemoglobin, methaemoglobin (metHb) and nitrosyl haemoglobin (HbNO) were assessed using spectral deconvolution. Plasma concentrations of nitrite, nitrate, chloride, potassium, and sodium were also measured. Partitioning of oxygen consumption was determined to reveal whether elevated metHb (causing functional hypoxia) induced air-breathing. The effects of nitrite on maximum oxygen uptake (MO(2max)) and critical swimming speed (U(crit)) were also assessed. Striped catfish was highly tolerant to nitrite exposure, as reflected by a 96h LC(50) of 1.65 mM and a moderate nitrite uptake into the blood. Plasma levels of nitrite reached a maximum after 1 day of exposure, and then decreased, never exceeding ambient levels. MetHb, HbNO and nitrate (a nitrite detoxification product) also peaked after 1 day and then decreased. Only high levels of nitrite and metHb caused reductions in MO(2max) and U(crit). The response of striped catfish contrasts with that seen in most other fish species and discloses efficient mechanisms of combating nitrite threats. Furthermore, even though striped catfish is an efficient air-breather, this species has the ability to sustain aerobic scope and swimming performance without air-breathing, even when faced with nitrite-induced reductions in blood oxygen carrying capacity. Our study is the first to confirm that high levels of nitrite and metHb reduce MO(2max) and thereby aerobic scope, while more moderate elevations fail to do so. Further studies are needed to elucidate the mechanisms underlying the low nitrite accumulation in striped catfish.

Keywords

Authors

Lefevre, S; Jensen, FB; Huong, DTT; Wang, T; Phuong, NT; Bayley, M

Volume	Issue	Pages	Date Published	Times Cited
104	1-2	86-93	July 2012	4

Digital Object Identifier (DOI)

10.1016/j.aquatox.2011.03.019

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Relative Sensitivity of Wetland Plants to SO2 Pollution

Publication / Journal

WETLANDS

Abstract

Sulfur dioxide (SO2) is a major air pollutant and its concentration is increasing in many metropolitan and industrial areas. Identification of SO2 tolerant species that can be used in wetland plantings in those areas is needed. We compared SO2 toxicity and tolerance in 16 wetland herbaceous plants by examining SO2 effects on their photosynthetic apparatus. After leaf sections had been immersed in 0, 10, 20, 30, 40, 50, and 100 mmol/L NaHSO3 for 20 h, the maximum quantum yield and maximum electron transport rate of all 16 herbaceous plants decreased at different rates with increasing SO2 concentrations, suggesting that photosystem reaction centers were damaged due to SO2 stress, electron transport was inhibited, and photosynthetic efficiency decreased. Species were assigned to two groups, relatively resistant and sensitive, with dendrograms. The relatively resistant species were Typha angustifolia, Arundo donax, Echinochloa crusgalli var. mitis, Acorus gramineus, Phragmites australis, Zizania caduciflora, Carex scabrifolia, and Polygonum lapathifolium var. salicifolium. Sensitive species were Cayratia japonica, Eclipta prostrata, Solidago canadensis, Phacelurus latifolius, Scirpus triqueter, Inula linariaefolia, Kalimeris indica, and Alternanthera philoxeroides. Determining sensitivity of different wetland herbaceous plants to SO2 provides basic information for screening suitable species for wetland creation and restoration in urban areas.

Keywords

Authors

Sha, CY; Wang, TH; Lu, JJ

Volume	Issue	Pages	Date Published	Times Cited
30	6	1023-1030	December 2010	4

Digital Object Identifier (DOI)

10.1007/s13157-010-0095-x

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Carbon fixation efficiency of plants influenced by sulfur dioxide

Publication / Journal

ENVIRONMENTAL MONITORING AND ASSESSMENT

Abstract

In the land ecosystem, the forest can absorb the carbon dioxide (CO2) in the atmosphere and turn the CO2 into organic carbon to store it in the plant body. About 2 x 10(11) tons of CO2 changes through photosynthesis into organic matter by plant annually. In this research, ten kinds of woody plants were selected for assessing the carbon fixation ability influenced by sulfur dioxide (SO2). The tested trees were put into a fumigation chamber for 210 days in a 40-ppb SO2 environment. The results of this study showed that there was no clear symptom of tested trees under a 40-ppb SO2 environment. The tested trees could tolerate this polluted environment, but it will impact their CO2 absorption ability. The carbon fixation ability will reduce as the polluted period lengthens. The carbon fixation potential of tested trees ranged from 2.1 to 15.5 g.CO2/m(2).d with an average of 7.7 g.CO2/m(2).d. The changes in CO2 absorption volume for Messerschmidia argentea were more stable during the fumigation period with a variation of 102%. Among the tested trees, Diospyros morrisiana had the best carbon fixation potential of 9.19 g.CO2/m(2).d and M. argentea had the least with 2.54 g.CO2/m(2).d.

Keywords

Authors

Chung, CY; Chung, PL; Liao, SW

Volume	Issue	Pages	Date Published	Times Cited
173	1-4	701-707	February 2011	1

Digital Object Identifier (DOI)

10.1007/s10661-010-1416-5

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Impacts of changing air composition on severity of arable crop disease epidemics

Publication / Journal

PLANT PATHOLOGY

Abstract

This review assesses the impacts, both direct and indirect, of man-made changes to the composition of the air over a 200 year period on the severity of arable crop disease epidemics. The review focuses on two well-studied UK arable crops, wheat and oilseed rape, relating these examples to worldwide food security. In wheat, impacts of changes in concentrations of SO(2) in air on two septoria diseases are discussed using data obtained from historical crop samples and unpublished experimental work. Changes in SO(2) seem to alter septoria disease spectra both through direct effects on infection processes and through indirect effects on soil S status. Work on the oilseed rape diseases phoma stem canker and light leaf spot illustrates indirect impacts of increasing concentrations of greenhouse gases, mediated through climate change. It is projected that, by the 2050s, if diseases are not controlled, climate change will increase yields in Scotland but halve yields in southern England. These projections are discussed in relation to strategies for adaptation to environmental change. Since many strategies take 10-15 years to implement, it is important to take appropriate decisions soon. Furthermore, it is essential to make appropriate investment in collation of long-term data, modelling and experimental work to guide such decision-making by industry and government, as a contribution to worldwide food security.

Keywords

Authors

Fitt, BDL; Fraaije, BA; Chandramohan, P; Shaw, MW

Volume	Issue	Pages	Date Published	Times Cited
60	1	44-53	February 2011	19

Digital Object Identifier (DOI)

10.1111/j.1365-3059.2010.02413.x

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Responses of poplar (Populus * euramericana cv. "74/76") SO 2-resistant clone to SO 2 fumigation and the variation in antioxidant systems

Publication / Journal

Scientia Silvae Sinicae

Abstract

This paper systematically compared variations in antioxidant systems and physiological responses to SO 2 fumigation between a SO 2-resistant clone of poplar (Populus * euramericana cv. "74/76") and its ordinary clone. The resistant clone expressed significantly stronger resistance to SO 2 than the ordinary clone. Under SO 2 fumigation, the resistant clone maintained relative higher net assimilation rate and had higher survival rate in comparison with the ordinary clone. Under 12 mg . m -3 SO 2 concentration fumigation, the resistant clone reduced by 13% while the ordinary clone reduced by 56%. The resistant clone had (P<0.01) 16% higher superoxide dismutase (SOD) activity and 24% higher reduced glutathione (GSH) content than the ordinary clone. Moreover, the size of stomata of the resistant clone was larger, with a lower density in comparison with the ordinary clone. The resistant clone had thicker cuticle than the ordinary clone. The results suggested that higher SOD activity and GSH content in the resistant clone played an important role in resisting atmospheric SO 2 pollution.

Keywords

Authors

Xu Jie; Bai KunDong; Wan XianChong; Cheng GuoHua; Zhang CunYi; Zhang ZhaoXin

Volume	Issue	Pages	Date Published	Times Cited
47	2	66-71	2011	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Ecology of the terrestrial and freshwater tardigrades (Tardigrada): autecological aspect

Publication / Journal

Zoologiya Bespozvonochnykh

Abstract

This review generalizes the autecological data on terrestrial and freshwater tardigrades for the 100 past years, systematizing the research results showing the influence of the various environmental factors on tardigrades and adaptations of these amazing animals. Autecological researches help to understand the distribution of tardigrades in recent conditions, and also show the potential of these animals. The extraordinary tardigrade tolerance to ionizing radiation, high pressure and low temperatures in the anhydrobiosis gives the key to solve the problem of organism survival in extraterrestrial environments. In spite of the high tolerance to the significant anthropogenic exposure, such as influence of transport emissions, industrial pollution, cuttings, fires, etc., many among them change the quantitative and qualitative composition of tardigradofauna. Therefore Tardigrada can be used as biological indicators of air pollution, particularly by the sulfur dioxide and the heavy metals.

Keywords

Authors

Avdonina, A.M.

Volume	Issue	Pages	Date Published	Times Cited
8	1	11-22	2011	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Site factors controlling epiphytic lichen abundance in northern coniferous forests

Publication / Journal

FLORA

Abstract

Epiphytic lichens are an important part of the vegetation of northern coniferous forests of Eurasia and North America. Much progress has been made during recent decades at disentangling relevant site factors, which control the diversity and distribution of epiphytic lichens in boreal and oroboreal forests. The present paper aims at summarizing the present state of knowledge. Relevant site factors include the microclimate, nutrient supply, structural diversity and, if applicable, air pollution. The continuity of site conditions decides over the presence of species with dispersal limitations. The effects of fire on epiphytic lichens are largely unstudied, although fire is an important ecological factor in boreal forests.

Keywords

Authors

Hauck, Markus

Volume: 206

Issue: 2

Pages: 81-90

Date Published: 2011

Times Cited: 12

Digital Object Identifier (DOI)

10.1016/j.flora.2010.02.001

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Pinus halepensis Mill. as environmental pollution indicator in an urban industrial zone

Publication / Journal

Ciencia Forestal en Mexico

Abstract

Particulate matter (TSP) is one of the main pollutants in the air; its monitoring can be carried out by using mechanical equipment or living organisms (biomonitoring). The monitoring of TSP with high volume samplers (HV) is very precise but very expensive. A more economic alternative is the use of foliage as a biomonitor in the estimation of TSP concentrations. The objective of this research was to study the relationship between TSP concentrations and the particulate material retained (PMR) in Aleppo pine needles, with the aim of using this pine species as a passive biomonitor for air quality. The study was conducted on an industrial zone (Nombre de Dios) in Chihuahua, Mexico, from November 2007 till May 2008. TSP concentrations were determined according to EPA method I0-2.1. The monitoring was carried out for 24-hr in 6 days cycles. The PMR was determined by sampling and washing pine's needles once per month. The results showed a strong correlation (0,901) between the concentration of TSP and PMR. The regression model gave an R 2 of 0,812, so we can ascertain that PMR can be considered as an acceptable predictor for measuring TSP. In conclusion the use of Aleppo pine leaves as a passive biomonitor of TSP is a viable alternative compared to active sampling using HV equipment, especially in medium and long term studies monitoring air quality. This methodology is practical and can be applied in small towns and remote sites whithout electricity supply.

Keywords

Authors

Astorga Bustillos, F. R.; Sosa Cerecedo, M.; Herrera Peraza, E. F.; Moreno Lopez, M. V.; Tena Vega, M.; Campos Trujillo, A.

Volume	Issue	Pages	Date Published	Times Cited
2	7	79-86	2011	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Study of lead phytoavailability for atmospheric industrial micronic and sub-micronic particles in relation with lead speciation

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Particles from channelled emissions of a battery recycling facility were size-segregated and investigated to correlate their speciation and morphology with their transfer towards lettuce. Microculture experiments carried out with various calcareous soils spiked with micronic and sub-micronic particles (1650 +/- 20 mg Ph kg(-1)) highlighted a greater transfer in soils mixed with the finest particles. According to XRD and Raman spectroscopy results. the two fractions presented differences in the amount of minor lead compounds like carbonates, but their speciation was quite similar, in decreasing order of abundance: PbS, PbSO4, PbSO4 center dot PbO, alpha-PbO and Pb-0. Morphology investigations revealed that PM2.5 (i.e. Particulate Matter 2.5 composed of particles suspended in air with aerodynamic diameters of 2.5 gm or less) contained many Pb nanoballs and nanocrystals which could influence lead availability. The soil-plant transfer of lead was mainly influenced by size and was very well estimated by 0.01 M CaCl2 extraction.

Keywords

Authors

Uzu, G; Sobanska, S; Aliouane, Y; Pradere, P; Dumat, C

Volume	Issue	Pages	Date Published	Times Cited
157	4	1178-1185	April 2009	26

Digital Object Identifier (DOI)

10.1016/j.envpol.2008.09.053

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of the urban environmental conditions on the chlorophyll a fluorescence emission in transplants of three ecologically distinct lichens

Publication / Journal

ENVIRONMENTAL AND EXPERIMENTAL BOTANY

Abstract

The sensitivity of three foliose lichen species to urban environments with different air pollution loads and climatic conditions was tested using chlorophyll a fluorescence (Chl(a)F) PAM measurements. Transplants of Xanthoria parietina (L.) Th. Fr., Flavoparmelia caperata (L.) Hale and Parmotrema perlatum (Huds.) M. Choisy collected in a pristine site of the Classic Karst (Trieste, NE Italy) were exposed for 12 weeks (August-December 2008) at that site (control, A), and in two urban sites with heavy traffic in Trieste (B) and Udine (C). Concentrations of the main gaseous pollutants were monitored by passive samplers in A (NO(2), O(3)). and by pollution monitoring stations in B and C (NO(x), NO(2), SO(2), O(3)). In the laboratory, Kautsky curves were induced under standardized conditions at species-specific PPFD values before exposure, after 6 weeks and at the end of the exposure. Significant decrease in F(v)/F(m) was only observed in P. perlatum transplants exposed in B. possibly as a consequence of the dry conditions of that site. Non-photochemical quenching (NPQ) was negatively affected in all three species, although with different intensity, in both urban sites, but more intensively in C than in B. Chl(a)F data shows clearly that (i) the decrease of NPQ was modulated by time exposure to NO(x) as well as by NO(x) concentration, and (ii) the species response to pollutants was related to species ecology: X. parietina, which is more nitro- and xerophytic than the other two species, tolerated better the transplant environmental conditions, confirming recent floristic observations carried out in several urban areas of Central Europe.

Keywords

Authors

Piccotto, M; Bidussi, M; Tretiach, M

Volume	Issue	Pages	Date Published	Times Cited
73	SI	102-107	November 2011	4

Digital Object Identifier (DOI)

10.1016/j.envexpbot.2010.09.010

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mutagenic activity of airborne particulate matter in a petrochemical industrial area

Publication / Journal

Mutation Research-Genetic Toxicology and Environmental Mutagenesis

Abstract

Exposure to airborne particulate matter has adverse effects on human health and ecosystem. Mutagenic activity of airborne particulate organic matter extracts in three time periods from total suspended particles (TSP) and particles less than 10 mu m (PM 10) was evaluated in an area under the influence of a petrochemical industry located in the town of Triunfo, Brazil. The extracts were investigated using the Salmonellal microsome assay, with the microsuspension method. The extracts were obtained by sonication extracted using dichloromethane (DCM) solvent. The fractions were tested for mutagenicity with the Salmonella typhimurium strains TA98 (with and without metabolic activation), TA98NR and TA98/1,8DNP(6); or YG1021 and YG1024. A positive frameshift mutagenic response was observed for the environmental samples during the different periods. The responses according to percentage of extractable organic matter (EOM%), EOM/m(3), revertants/mu g (rev/mu g) and revertants/m(3) (rev/m(3)) were lower for TSP than for PM10 extracts. The highest rev/m(3) values were observed in PM[10 extract samples collected in winter, July 2005, in the presence (13.79 rev/m(3)) or absence (6.87 rev/m(3)) of S9 fraction. Similarly in the first (1995) or second period (2000) the highest values for TSP were observed in winter, but with lower activity (3.00 and 0.89 reV/m(3) respectively). The responses observed for the nitrosensitive strains suggest the contribution of nitro, amino and/or hydroxylamino derivatives of PAHs to the total mutagenicity of matter extracted from airborne particles. The Salmonella/microsome assay was a sensitive method to define areas contaminated by genotoxic compounds, even in samples with TSP or PM 10 values that are acceptable according to legal environmental quality standards, favoring environmental control measures with an effective response seen in the population's improved quality of life.

Keywords

Authors

Coronas, MV; Horn, RC; Ducatti, A; Rocha, JV; Vargas, VMF

Volume	Issue	Pages	Date Published	Times Cited
650	2	196-201	February 29, 200	

Digital Object Identifier (DOI)

10.1016/j.mrgentox.2007.12.002

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Characteristics of the transformation frequency at the tumor promotion stage of airborne particulate and gaseous matter at ten sites in Japan

Publication / Journal

Environmental Science - Processes & Impacts

Abstract

We used a high-volume air sampler in the summer of 2007 and the winter of 2008 at ten Japanese sites (Sapporo, Sendai, Maebashi, Tsukuba, Shinjuku, Sagamihara, Shizuoka, Touhaku, Kitakyushu, and Kagoshima) to collect total suspended particulate (TSP) and gaseous matter for evaluation. We evaluated the transformation frequency at the tumor promotion stage of these samples in a cell transformation assay using Bhas 42 cells, which were established from BALB/c 3T3 cells transfected with the v-Ha-ras oncogene. All samples collected from the gaseous matter were negative for transformed foci. There were several patterns of transformation frequency at the tumor promotion stage by area for the TSP samples. At Sapporo, the transformation frequency at the tumor promotion stage was remarkably higher in winter than in summer as well as in winter at the other sites. At six urban cities from Sendai to Shizuoka, the levels of transformed frequencies per mu g of suspended particulates in winter were almost the same, and were higher than those of the remaining three sites. At three sites, Touhaku, Kitakyushu and Kagoshima, the transformation results in winter were judged as negative. The characteristics of the transformed frequencies of the compounds adsorbed on particulate matter at the sampling sites were significant in winter. We also studied the correlation between the transformation frequency at the tumor promotion stage of the TSP samples and the results of quantitative analysis of 16 polyaromatic hydrocarbons (PAHs) at the ten sites. We found that the transformation frequency at the tumor promotion stage of airborne samples could not be predicted based on the quantitative results of the PAHs in those samples. These data suggest that direct risk assessment of air samples with a bioassay is more valuable than quantitative analysis of compounds such as PAHs for predicting carcinogenicity.

Keywords

Authors

Ohmori, K; Sato, Y; Nakajima, D; Kageyama, S; Shiraishi, F; Fujimaki, T; Goto, S

Volume	Issue	Pages	Date Published	Times Cited
15	5	1031-1040	2013	0

Digital Object Identifier (DOI)

10.1039/c3em00076a

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Susceptibility to acidic precipitation contributes to the decline of the terricolous lichens Cetraria aculeata and Cetraria islandica in central Europe

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

The effective quantum yield of photochemical energy conversion in photosystem II (Phi(2)) was shown to be reduced in the terricolous lichens Cetraria aculeata and Cetraria islandica by short-term exposure to aqueous SO2 at pH values occurring in the precipitation of areas with high SO2 pollution. Significant reduction of Phi(2) was found at pH <= 3.3. At pH 2.8, Phi(2) was close to zero and did not recover within 24 h. This suggests that sensitivity to SO2 (primarily associated with epiphytic lichens in the past) has contributed to the decline of both species in central Europe. In C. islandica, but not in C. aculeata, thalli with the natural content of lichen substances were more tolerant to SO2 than thalli where the extracellular lichen substances were extracted before the experiment. This supports published results that the depsidone fumarprotocetraric acid, a major lichen substance of C. islandica, increases the pollution tolerance in lichens.

Keywords

Authors

Hauck, M

Volume	Issue	Pages	Date Published	Times Cited
152	3	731-735	April 2008	5

Digital Object Identifier (DOI)

10.1016/j.envpol.2007.06.046

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Prediction of health risk due to polycyclic aromatic hydrocarbons present in urban air in Rio de Janeiro, Brazil

Publication / Journal

Genetics and Molecular Research

Abstract

Risk assessment can provide a comprehensive estimate of potential effects of contaminants under specific, well-defined, and well-described circumstances, providing quantitative relationships between exposure and effects to identify and to define areas of concern. We investigated the mutagenic activity of particulate matter in air samples collected from three sites in Rio de Janeiro city. Samples were collected using a high-volume sampler at Avenida Brasil, at Campus of Universidade do Estado do Rio de Janeiro, and at Reboucas Tunnel. Six polycyclic aromatic hydrocarbons were quantified by gas chromatography/mass spectrometry. Salmonella typhimurium TA98 and the derivative strains TA98/1.8-DNP6, YG1021, and YG1024, commonly used in mutagenicity assays, were treated (10-50 mu g/plate), with and without exogenous metabolization. The highest values for the polycyclic aromatic hydrocarbons were detected at Reboucas Tunnel. For chrysene, as an example, the concentration was nearly 200 times higher than that established by the US Environmental Protection Agency. Frequent traffic jams can place bus drivers who go through the Reboucas Tunnel at risk of exposure to up to 0.69 ng/m(3) benzo(a) pyrene. Independent of exogenous metabolization, mutagenicity was detected in strains YG1021 and YG1024 at all the sites, suggesting nitro and amino derivatives of polycyclic aromatic hydrocarbons. Reboucas Tunnel air samples gave the highest values for rev/mu g and rev/m(3). This could be due to the fact that the long, enclosed passageway through a mountain restricts ventilation. The cancer risk estimate in this study was 10(-3) for the benzo(a) pyrene, at the two sites, indicating a high risk.

Keywords

Authors

Rainho, CR; Velho, AMA; Correa, SM; Mazzei, JL; Aiub, CAF; Felzenszwalb, I

Volume	Issue	Pages	Date Published	Times Cited
12	3	3992-4002	2013	1

Digital Object Identifier (DOI)

10.4238/2013.February.28.6

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Air pollution impact assessment on agroecosystem and human health characterisation in the area surrounding the industrial settlement of Milazzo (Italy): a multidisciplinary approach

Publication / Journal

ENVIRONMENTAL MONITORING AND ASSESSMENT

Abstract

In order to evaluate the impact of atmospheric pollutants emitted by the industrial settlement of Milazzo (Italy) on agriculture, sulphur dioxide and ozone levels in air were monitored and the data were used to estimate yield losses of the most widespread cultures. Trace element concentrations in crops and soils were also detected and metabolic profiles of soil microbial communities were considered. Vibrio fischeri test was used to appraise airborne pollutant ecotoxicity and epidemiological studies on causes of death distribution were carried out to characterize health state of people living in the area. All the sampling points were selected in farms on the basis of a theoretical meteo-diffusive model of industrial air pollutants. Experimental SO2 and O-3 values mainly exceeded the threshold established by Italian and EU regulations to protect vegetation and they correspond to estimated significant crop losses. Conversely toxic element residues in soils and in agroalimentary products were generally lower than the fixed values. SO2 and O-3 concentrations, toxic element contents and ecotoxicity levels of airborne pollutants were not related only to industrial site emissions, while the fluctuations on metabolic profiles of soil microbial communities seem to agree with the predicted deposition of xenobiotic compounds from the industrial plants. The epidemiological study evidenced a better health state of populations living in the investigated area than in the Messina province and the Sicily region but, inside the area, males living in the municipalities closest to the industrial settlement exhibited a worst health state than those in the very far ones.

Keywords

Authors

Triolo, L; Binazzi, A; Cagnetti, P; Carconi, P; Correnti, A; De Luca, E; Di Bonito, R; Grandoni, G; Mastrantonio, M; Rosa, S; Schimberni, M; Uccelli, R; Zappa, G

Volume: 140

Issue: 1-3

Pages: 191-209

Date Published: May 2008

Times Cited: 8

Digital Object Identifier (DOI): 10.1007/s10661-007-9859-z

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

In vitro tests to assess toxic effects of airborne PM10 samples. Correlation with metals and chlorinated dioxins and furans

Publication / Journal

Science of the Total Environment

Abstract

Inhalation is an important exposure pathway to airborne pollutants such as heavy metals, polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) and particulate matter. Chronic exposure to those chemicals, which form part of complex environmental mixtures, may mean important human health risks. In the present study, the suitability of different in vitro tests to evaluate the toxic effects of air PM10 pollutants is investigated. In addition, it is also assessed how to distinguish the contribution of chemical pollutants to toxicity. Sixty-three air samples were collected in various areas of Catalonia (Spain), and the levels of ecotoxicity, cytotoxicity and genotoxicity were evaluated. Aqueous acidic extractions of quartz fiber filters, where PM10 had been retained, were performed. The photo-luminescent bacteria Vibrio fischeri (Microtox (R)) bioassay was performed to assess ecotoxicity. Moreover, MTT and Comet Assays, both using human lung epithelial cells A549 as target cells, were applied to assess the cytotoxicity and genotoxicity of air samples, respectively. The results show that Microtox (R) is an excellent screening test to perform a first evaluation of air quality, as it presented a significant correlation with chemical contaminants, contrasting with MTT Assay. Although none of the samples exhibited genotoxicity, a high correlation was found between this in vitro test and carcinogenic agents. Urban samples from traffic-impacted areas would be significantly more toxic. Finally, environmental temperature was identified as a key parameter, as higher values of ecotoxicity were found in winter.

Keywords

Authors

Roig, N; Sierra, J; Rovira, J; Schuhmacher, M; Domingo, JL; Nadal, M

Volume	Issue	Pages	Date Published	Times Cited
443		791-797	January 15, 2013	2

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2012.11.022

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of sulfur dioxide on the expressions of EGF, EGFR, and COX-2 in airway of asthmatic rats

Publication / Journal

ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY

Abstract

The pathogenesis of asthma involves a combination of genetic and environmental factors. The epidemiology studies have shown that SO2 might play an important role in the initiation or exacerbation of the asthma disease. To investigate the asthmatic molecular mechanisms exposed to SO2, male Wistar rats were divided randomly into four equal groups of six animals each: (1) SO2 group, (2) ovalbumin (OVA) group (asthma group), (3) SO2 plus OVA group, and (4) control group. The rats were challenged by ovalbumin (OVA) or SO2 (5.6 mg/m(3)) inhalation alone or together. The mRNA and protein levels of asthma-related genes (EGF, EGFR, and COX-2) were analyzed in lungs and tracheas using real-time reverse transcription-polymerase chain reaction assay, radioimmunoassay method, and Western blot analysis, respectively. The results showed that inhaled SO2 alone increased the mRNA and protein expressions of three tested genes in lung and trachea tissues, but only the mRNA levels of EGFR and COX-2 in tracheas were significantly increased compared with the control. However, OVA exposure significantly induced the mRNA and protein expressions of EGF, EGFR, and COX-2 compared with the control. Meanwhile, OVA plus SO2 inhalation enhanced the mRNA and protein levels of these genes in rat airways, versus exposure to OVA alone. These results suggested that SO2 could increase the expressions of EGF, EGFR, and COX-2 on the transcription and translation levels in the lungs and tracheas from asthmatic rats, which might be one of the possible mechanisms by which SO2 pollution aggravates asthma disease.

Keywords

Authors

Li, RJ; Meng, ZQ; Xie, JF

Volume	Issue	Pages	Date Published	Times Cited
54	4	748-757	May 2008	3

Digital Object Identifier (DOI)

10.1007/s00244-007-9054-9

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Pro-inflammatory effects and oxidative stress in lung macrophages and epithelial cells induced by ambient particulate matter

Publication / Journal

Environmental Pollution

Abstract

The objective of this study was to compare the toxicological effects of different source-related ambient PM10 samples in regard to their chemical composition. In this context we investigated airborne PM from different sites in Aachen, Germany. For the toxicological investigation human alveolar epithelial cells (A549) and murine macrophages (RAW264.7) were exposed from 0 to 96 h to increasing PM concentrations (0-100 mu g/ml) followed by analyses of cell viability, pro-inflammatory and oxidative stress responses. The chemical analysis of these particles indicated the presence of 21 elements, water-soluble ions and PAHs. The toxicological investigations of the PM10 samples demonstrated a concentration- and time-dependent decrease in cell viability and an increase in pro-inflammatory and oxidative stress markers.

Keywords

Authors

Michael, S; Montag, M; Dott, W

Volume	Issue	Pages	Date Published	Times Cited
180	SI (Special Issue)	19-29	December 2013	1

Digital Object Identifier (DOI)

10.1016/j.envpol.2013.01.026

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Long term observation of pollution effects - 30 years of biomonitoring in Bavaria

Publication / Journal

GEFAHRSTOFFE REINHALTUNG DER LUFT

Abstract

In the field of environmental protection the 1970ies were characterized by the symptoms of the "Waldsterben" (forest decline). Therefore, in Bavaria the newly founded Landesamt for Umweltschutz (Environmental Protection Agency) has to deal with the effects of air pollution on ecosystems and plants. We started with two bioindicator networks spread over the whole area of Bavaria. They detect regional differences and temporal development of pollution effects. Spruce needles are tested for sulphur to study the effects Of SO2 pollution, epiphytic mosses are analysed for heavy metals to determine the influence of other anthropogenic activities. For the assessment of background pollution of special areas examinations were expanded by the active bioindicators 'standardised grass culture', 'curly kale' and tobacco plants.

Keywords

Authors

Kohler, J; Nittka, J; Aussendorf, M; Peichl, L

Volume	Issue	Pages	Date Published	Times Cited
68	2	227-234	June 2008	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking:

Title

Ecotoxicity and genotoxicity assessment of exhaust particulates from diesel-powered buses

Publication / Journal

Environmental Monitoring and Assessment

Abstract

Diesel exhaust is one of the major sources of fine and ultra-fine particulate matter in urban air. Toxicity of diesel-powered engine emissions has been quite widely assessed; however, much less information is available on their ecotoxicity. In our study, the kinetic version of the Vibrio fischeri bioluminescence inhibition bioassay based on the ISO 21338:2010 standard was used to characterise the ecotoxicity of diesel-powered buses. It is a direct contact test in which solid samples are tested in suspension and test organisms are in direct contact with toxic particles. The age of the selected buses fell into a wide range; the oldest one was produced in 1987. Diesel engines of different emission standards (Euro0-Euro4) were included. Measured EC50 values of Euro0-Euro1 engine emissions fell into the same range, 1.24-0.96 mu g ml(-1), respectively. On the contrary, emission of Euro4 vehicle proved to be non-toxic. Genotoxic potential of the samples was also estimated, using the colorimetric SOS-chromotest (TM). Genotoxicity was detected also for Euro0 and Euro1 buses, showing correlation with the ecotoxic potential. The fact that the particulates from Euro4 vehicles did not show ecotoxic/genotoxic effect implies that replacing old Euro1 and Euro2 buses can be a highly effective solution for reducing environmental hazard of automotive emissions. The whole-aerosol testing method is a cheap alternative that can be used in engine developments and emission control.

Keywords

Authors

Kovats, N; Acs, A; Ferincz, A; Kovacs, A; Horvath, E ; Kakasi, B; Jancsek-Turoczi, B ; Gelencser, A

Volume: 185

Issue: 10

Pages: 8707-8713

Date Published: October 2013

Times Cited:

Digital Object Identifier (DOI):

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The essential oil qualitative and quantitative composition in the needles of Pinus sylvestris L. growing along industrial transects

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

The aim of this study was to evaluate composition of the essential oils in the needles of Pinus sylvestris growing in the areas affected by a cement factory (CF), and an oil refinery (OR). Volatile components of the needles were analyzed by GC and GC/MS. The most heavily polluted CF stand had significantly higher concentration of gamma-Terpinene, Caryophyllene oxide in the current-year needles, while higher concentration of delta-3-Carene, alpha-Terpinene, gamma-Terpinene and Terpinolene was documented for 1-year-old needles. The most heavily polluted OR stand had a significantly higher concentration of Sabinene + beta-Pinene, 1-epi-Cubenol in the current-year needles and a significantly higher concentration of Camphene, Sabinene + beta-Pinene, Myrcene, alpha-Cadinene, 1-epi-Cubenol in the 1-year-old needles than the least polluted site. Along transects an increase in the amount of some diterpenes and a decrease in the components of the shorter chain essential oils was observed. These effects Could be at least partially attributed to SO(2).

Keywords

Authors

Kupcinskiene, E; Stikliene, A; Judzentiene, A

Volume	Issue	Pages	Date Published	Times Cited
155	4	481-491	October 2008	12

Digital Object Identifier (DOI)

10.1016/j.envpol.2008.02.001

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Combustion derived ultrafine particles induce cytochrome P-450 expression in specific lung compartments in the developing neonatal and adult rat

Publication / Journal

American Journal Of Physiology - Lung Cellular and Molecular Physiology

Abstract

Vehicle exhaust is rich in polycyclic aromatic hydrocarbons (PAH) and can be a dominant contributor to ultrafine urban particulate matter (PM). Exposure to ultrafine PM is correlated with respiratory infections and asthmatic symptoms in young children. The lung undergoes substantial growth, alveolarization, and cellular maturation within the first years of life, which may be impacted by environmental pollutants such as PM. PAHs in PM can serve as ligands for the aryl hydrocarbon receptor (AhR) that induces expression of certain isozymes in the cytochrome P-450 superfamily, such as CYP1A1 and CYP1B1, localized in specific lung cell types. Although AhR activation and induction has been widely studied, its context within PM exposure and impact on the developing lung is poorly understood. In response, we have developed a replicable ultrafine premixed flame particle (PFP) generating system and used in vitro and in vivo models to define PM effects on AhR activation in the developing lung. We exposed 7-day neonatal and adult rats to a single 6-h PFP exposure and determined that PFPs cause significant parenchymal toxicity in neonates. PFPs contain weak AhR agonists that upregulate AhR-xenobiotic response element activity and expression and are capable inducers of CYP1A1 and CYP1B1 expression in both ages with different spatial and temporal patterns. Neonatal CYP1A1 expression was muted and delayed compared with adults, possibly because of differences in the enzyme maturation. We conclude that the inability of neonates to sufficiently adapt in response to PFP exposure may, in part, explain their susceptibility to PFP and urban ultrafine PM.

Keywords

Authors

Chan, JKW; Vogel, CF; Baek, J; Kodani, SD; Uppal, RS; Bein, KJ; Anderson, DS; Van Winkle, LS

Volume: 304

Issue: 10

Pages: L665-L677

Date Published: May 2013

Times Cited:

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Western Canada Study of Animal Health Effects Associated With Exposure to Emissions From Oil and Natural Gas Field Facilities. Study Design and Data Collection I. Herd Performance Records and Management

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

Beef cow-calf herds are the most common livestock operation in Western Canada. Beef cows also have the greatest opportunity for direct contact with their environment through continuous sampling of the air, water, vegetation, and soil. These factors combine to make cow-calf herds a potentially useful sentinel of environmental change. Researchers individually tracked more than 33,000 cows in 205 beef cow-calf herds from spring 2001 to the end of the calving season in 2002 to examine the potential effects of emissions from the oil and gas industry on productivity. This article describes the study design and methodology of the Western Canada Study, with emphasis on herd-selection criteria and Study implementation, the collection of herd-production data, and the challenges of tracking individual animals in a large prospective observational study-as the Western Canada Study is the largest on-farm study of its kind in North American cow-calf herds to date. ne primary objective of this project was to examine the potential association between reproductive success and cumulative chronic exposure to sulfur dioxide, hydrogen sulfide, and volatile organic compounds in beef herds. Herd-selection criteria included potential exposure to oil and gas facilities, herd size, quality of available records, an established relationship with a local veterinary clinic, and participant interest. With the cooperation of local herd owners and veterinarians, on-farm collection of detailed individual animal data was successful in this group of cow-calf operations. Of the 212 herds initially selected to participate, complete calving season data for 2002 were available for 203 herds (96%). Individual animal records were available for more than 98% of eligible cows for each measurement period throughout the Study. Herd-production records were rated as satisfactory or better in 94% of the herds. These process outcomes confirm the practicality of using cow-calf herds as sentinel populations for environmental exposures and support the validity of subsequent research on these animal populations.

Keywords

Authors

Waldner, CL

Volume	Issue	Pages	Date Published	Times Cited
63	4	167-184	2008	12

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Comparative genotoxicity of airborne particulate matter (PM2.5) using Salmonella, plants and mammalian cells

Publication / Journal

Ecotoxicology and Environmental Safety

Abstract

This study compared genotoxicity in bacteria, plants and cell cultures in areas at risk of exposure to airborne pollution. Genotoxicity of moderately polar organic extracts of PM2.5 from areas with urban airborne pollution (Site 1) and urban-industrial pollution (Site 2) was evaluated using microsuspension assays in Salmonella/microsome, micronucleus test with Tradescantia pallida (Trad-MN) with acute exposure, and in V79 (V79-MN) cells, Comet assay in V79 and human lymphocyte, besides Trad-MN in situ at Site 1. In the Salmonella/microsome assay all samples presented frameshift mutagenic activity (-/+S9), most intense at Site 2 (rev/m(3)). The presence of nitro-PAHs and hydroxylamines in PM2.5 was shown by positive mutagenic responses with YG1021 and YG1024. In tests with Trad-MN, no significant genotoxic responses were found (MN %). In V79-MN a genotoxic response was not found. The Cornet assay damages were found in the DNA at Site 1 in both cell systems. Non-detection of genotoxicity with Trad-MN at sites or in environmental samples from polluted areas detected using other biomarkers suggests the need for careful evaluation when biomonitoring genotoxic compounds using plants. The microsuspension assay in Salmonella/microsome was sensitive to detect and identify different classes of airborne mutagenic compounds present in fine particulate matter in Porto Alegre city, showing that monitoring air quality with PM2.5 using this methodology is relevant.

Keywords

Authors

de Brito, KCT; de Lemos, CT; Rocha, JAV; Mielli, AC; Matzenbacher, C; Vargas, VMF

Volume	Issue	Pages	Date Published	Times Cited
94	1	14-20	August 2013	

Digital Object Identifier (DOI)

10.1016/j.ecoenv.2013.04.014

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effect of Sulfur Dioxide on Expression of Proto-oncogenes and Tumor Suppressor Genes from Rats

Publication / Journal

ENVIRONMENTAL TOXICOLOGY

Abstract

Sulfur dioxide (SO2) is a ubiquitous air pollutant that is present in low concentrations in the urban air, and in higher concentrations in the working environment. In the present study, male Wistar rats were housed in exposure chambers and treated with 14.00 +/- 1.01, 28.00 +/- 1.77 and 56.00 +/- 3.44 mg m(-3) SO2 for 6 h/day for 7 days, while control group was exposed to filtered air in the same condition. The mRNA and protein levels of proto-oncogenes (c-fos, c-jun, c-myc, and Ki-ras) and tumor suppressor genes (p53, Rb, and p16) were analyzed in lungs using a real-time reverse transcription-polymerase chain reaction (real-time RT-PCR) assay and Western blot analysis. The results showed that mRNA and protein levels of c-fos, c-jun, c-myc, Ki-ras, and p53 in lungs were increased in a dose-dependent manner, while mRNA and protein levels of Rb and p16 were decreased in lungs of rats after SO2 inhalation. These results lead to a conclusion that SO2 exposure could activate expressions of proto-oncogenes and suppress expressions of tumor suppressor genes, which might relate to the molecular mechanism of cocarcinogenic properties and potential carcinogenic effects of SO2. According to previous studies, the results also indicated that promoter genes of apoptosis and tumor suppressor genes could produce apoptotic signals to antagonize the growth signals that arise from oncogenes. Understanding its molecular controls will benefit development of treatments for many diseases.

Keywords

Authors

Bai, JL; Meng, ZQ

Volume	Issue	Pages	Date Published	Times Cited
25	3	272-283	June 2010	3

Digital Object Identifier (DOI)

10.1002/tox.20495

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of air pollution from a nickel-copper industrial complex on boreal forest vegetation in the joint Russian-Norwegian-Finnish border area

Publication / Journal

BOREAL ENVIRONMENT RESEARCH

Abstract

The effect of air pollution from the Petchenganickel industrial complex, northwestern part of the Kola Peninsula, on forest vegetation was studied by combining three dormant monitoring networks in Finland, Russia and Norway, comprising a total of 21 plots that were revisited in 2004. Chemical composition of precipitation was monitored during 20042005, and indicated continuing high deposition of heavy metals and SO(2) in the border area. The cover of epiphytic lichens on the trunks of downy birch (Betula pubescens) and Scots pine (Pinus sylvestris) was severely affected by pollution, and there was also a consistent negative effect on the abundance and richness of lichens and bryophytes on the forest floor in a more limited area. The effects of pollution on crown condition and stand growth were weak or absent. This study is an important reference for evaluating the effects of the planned renovation of the smelter in Nikel.

Keywords

Authors

Myking, T; Aarrestad, PA; Derome, J; Bakkestuen, V; Bierke, JW; Gytarsky, M; Isaeva, L; Karaban, R; Korotkov, V; Lindgren, M; Lindroos, AJ; Rosberg, I; Salemaa, M; Tommervik, H; Vassilieva, N

Volume	Issue	Pages	Date Published	Times Cited
14	2	279-296	April 2009	6

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Sulfur Dioxide and Benzo(a)pyrene Modulates CYP1A and Tumor-Related Gene Expression in Rat Liver

Publication / Journal

ENVIRONMENTAL TOXICOLOGY

Abstract

Sulfur dioxide (SO(2)) and benzo(a)pyrene (B(a)P) are common industrial and environmental contaminants. However, few data are available on the effects of SO(2) on photo-oncogenes and tumor suppressor genes, as well as the interactions between SO(2) and other xenobiotics regulating photo-oncogenes or tumor suppressor genes expression. To investigate the interactions between SO(2) and B(a)P, male Wistar rats were exposed to intratracheally instilled with B(a)P or SO(2) inhalation alone or together. We detected mRNA expression of CYP1A1 and 1A2, 7-ethoxyresorufin O-deethylase (EROD), and methoxyresorufin O-demethylase (MROD) activities in livers. The mRNA and protein levels of several cancer-related genes were analyzed in livers by real-time RT-PCR and Western blot, respectively. The EROD/MROD activities and CYP1A1/2 expression were down-regulated by SO(2) but up-regulated by B(a)P alone. Exposure of SO(2) alone induced c-fos, c-jun, c-myc, H-ras, and p53 expression, and depressed p16 and Rb expression in livers. The effects of B(a)P on the above gene were similar to SO(2) except c-fos expression. Furthermore, SO(2) + B(a)P exposure increased the expression of c-fos, c-jun, c-myc, and p53, and decreased p16 and Rb expression in livers compared with exposed to SO(2) or B(a)P alone. However, no synergistic effects were observed on H-ras and CYP1A1/2 after SO(2) + B(a)P exposure. Our findings indicate that multiple cell cycle regulatory proteins play key roles in the toxicity of SO(2) and B(a)P in livers. It might involve the activation of c-fos, c-jun, c-myc, and p53. And p16-Rb pathway might also participate in the progress. Although the gene products we studied are classed as oncogenes and tumor suppressor genes, their functions actually relate to more general processes of control of cell proliferation, survival, and/or apoptosis.

Keywords

Authors

Qin, GH; Meng, ZQ

Volume	Issue	Pages	Date Published	Times Cited
25	2	169-179	April 2010	2

Digital Object Identifier (DOI)

10.1002/tox.20484

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Genotoxicity testing of sulfur dioxide (SO2) in a mouse bone marrow micronucleus test complemented with hematological endpoints

Publication / Journal

MUTATION RESEARCH-GENETIC TOXICOLOGY AND ENVIRONMENTAL MUTAGENESIS

Abstract

Sulfur dioxide (SO2) is a non-flammable, non-explosive, colorless gas. It is a ubiquitous environmental pollutant and an important chemical intermediate in several industrial processes. The toxicological properties of SO2, including its genotoxic potential, have been studied extensively. The majority of the available in vitro data indicate a lack of genotoxicity of SO2, while for sulfite salts some positive results have been reported. However, recent in vivo studies, using Kunming albino mice, have pointed to in vivo clastogenicity of SO2. To re-evaluate these positive findings, a bone-marrow micronucleus test according to OECD Guideline No. 474 was performed. NMRI mice (m/f) were exposed by inhalation via whole-body exposure to 0 (clean air), 2.7, 8, 27, or 80 mg/m(3) (0, 1, 3, 10, or 30 ppm) SO2 for 4 h/day on 7 consecutive days. Animals were sacrificed 24 h after start of the last exposure, and blood samples (for complementing hematology) and bone marrow smears (for analysis of micronuclei) were prepared. Under the conditions used, exposure to SO2 caused no acute toxicity, mortality, or reduction in body weight. Compared with the clean-air controls, hematological parameters such as hematocrit, hemoglobin, erythrocyte/platelet/total leukocyte counts, differential white blood cell counts, and indicators of blood formation (reticulocyte counts, ratio of polychromatic to normochromatic erythrocytes in the bone marrow) remained unchanged by SO2 treatment. Unlike the previously reported studies on micronucleus formation, SO2 did not induce micronuclei in polychromatic erythrocytes of the bone marrow, whereas the positive control cyclophosphamide (60 mg/kg body weight) was quite effective in this respect. Interestingly, SO2 treatment significantly enhanced malondialdehyde levels in erythrocyte lysates (TBARS method), indicating SO2-mediated oxidative stress, but also demonstrating systemic availability of the inhaled SO2. In conclusion, the present study could not reproduce the genotoxicity findings of the previously reported studies. SO2 is thus considered non-genotoxic in polychromatic erythrocytes in the bone marrow of NMRI mice under the conditions and in the concentrations used.

Keywords

Authors

Ziemann, C; Hansen, T; Pohlmann, G; Farrar, D; Pohlenz-Michel, C; Tillmann, T; Mangelsdorf, I

Volume	Issue	Pages	Date Published	Times Cited
697	1-2	38-46	March 2010	0

Digital Object Identifier (DOI)

10.1016/j.mrgentox.2010.02.002

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Integrating multiple landscape-scale drivers in the lichen epiphyte response: climatic setting, pollution regime and woodland spatial-temporal structure

Publication / Journal

DIVERSITY AND DISTRIBUTIONS

Abstract

Aim To quantify the role of multiple biodiversity drivers - pollution, woodland structure and climate - controlling lichen epiphyte composition and diversity.
Location Scotland, north-west Europe.
Methods Four compatible datasets were assembled: site-scale species distribution data (response) and base-line modelled data on climate, pollution loads and extent of old-growth woodland (explanatory variables). First, partial-canonical correspondence analysis was used: (1) to compare the importance of environmental variables to pure spatial effects and (2) to partition the importance of environmental variables in explaining species composition. Secondly, patterns of species richness were investigated using multiple least-squares regression.
Results Old-growth woodland was the most important control of species richness. Pollution was the most important explanatory variable for species composition. The impact of pollution on composition (and to a lesser extent on richness) is explained: (1) By recovery of lichens with declining SO(2) pollution, although with epiphyte composition shifted by the recent effects of N-pollution and (2) By the limited spatial extent of severe pollution, and generally low-to-moderate pollution loads across our study area, combined with the positive effect of old-growth woodland extent in controlling species richness. The effect of climate and old-growth woodland on species composition covaried, supporting an interaction between habitat quality and climatic setting, which may be important in understanding the epiphyte response to climate change.
Conclusions Advances in conservation planning will likely require an integrated approach to understanding simultaneous effects of multiple drivers, providing opportunities for integrated management strategies. Our study provides a preliminary example of this approach by combining three key biodiversity drivers into a single framework for lichen epiphytes. Thus, reducing pollution loads may make old-growth woodland that currently exists in a polluted landscape available for colonization, thereby extending the available habitat for epiphytes, and facilitating an effective species response to climate change.

Keywords

Authors

Ellis, CJ; Coppins, BJ

Volume: 16

Issue: 1

Pages: 43-52

Date Published: January 2010

Times Cited: 19

Digital Object Identifier (DOI)

10.1111/j.1472-4642.2009.00624.x

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		

Microbes ☐
Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Growth and reproduction of vascular plants in polluted environments: a synthesis of existing knowledge

Publication / Journal

ENVIRONMENTAL REVIEWS

Abstract

Identification of factors explaining diversity in plant responses to industrial pollution is crucial for predicting fates of polluted ecosystems. Meta-analysis based on 203 publications demonstrated that plants growing near point polluters showed similar decreases in characters reflecting growth (-13.1%) and reproduction processes (-8.5%). In herbaceous plants, root growth was reduced, while aboveground biomass did not change, because the decrease in leaf size was compensated by an increase in leaf number. In contrast, woody plants demonstrated no changes in allometry and their growth was reduced to a greater extent than growth of herbaceous plants. Raunkiaer's classification of life forms appeared the best predictor of species' responses to pollution. Within woody plants, trees and shrubs, but not dwarf shrubs, showed strong decreases in growth and reproduction. Within herbaceous plants, significant growth reduction was observed only in annuals. Longevity of foliage or plant phylogeny did not explain variation in species' responses. Adverse effects of pollution were stronger in regions with higher temperature and precipitation, hinting that existing pollution loads may become more harmful for plants as climate changes. Relatively minor explanatory value of the characteristics of individual polluters removes one of the principal obstacles to accounting for the effects of pollution in vegetation models and allows extrapolation of the effects observed near point polluters to both regional and global scales. We conclude that losses in productivity of plant communities due to aerial pollution can be approximately estimated on the basis of the life form spectra and climate.

Keywords

Authors

Zvereva, EL; Roitto, M; Kozlov, MV

Volume	Issue	Pages	Date Published	Times Cited
18		355-367	2010	6

Digital Object Identifier (DOI)

10.1139/A10-017

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Exploring causes of the decline of the lichen Lecanora conizaeoides in Britain: effects of experimental N and S applications

Publication / Journal

LICHENOLOGIST

Abstract

The crustose lichen Lecanora conizaeoides has declined markedly around London with progressively diminishing sulphur dioxide pollution of the air since the 1960s. To identify the immediate causes of its decline, we applied S in the form of bisulphite (0.2 & 2 mM) and sulphate (2 mM), and N as nitrate (2 mM) to relict colonies of the lichen on beech trunks in a plantation in Windsor Forest. Growth of the lichen was monitored by estimating changes in percentage cover. By the end of a 25-month period of two-weekly treatments, all the chemical treatments had resulted in significant decreases in cover of L. conizaeoides compared to distilled water controls, with the 2 mM bisulphite causing the greatest loss. Bark surface pH was also lowered by the chemical treatments, but most by the 2 mM bisulphite applications. Similar results were obtained in two laboratory experiments where the nutrient applications were repeated under a controlled environment and thallus area monitored photographically. No evidence was obtained to support the hypothesis that growth of L. conizaeoides is stimulated by an elevated sulphur supply. We conclude that the disappearance of the lichen is linked to gradual increase in bark pH caused by the combined effects of a marked reduction in SO(2) emissions and rising emissions of NH(3).

Keywords

Authors

Massara, AC; Bates, JW; Bell, JNB

Volume	Issue	Pages	Date Published	Times Cited
41		673-681	November 2009	2

Digital Object Identifier (DOI)

10.1017/S0024282909990119

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

In vivo examination of the genotoxicity of the urban air and surface soil pollutant, 3,6-dinitrobenzo[e]pyrene, with intraperitoneal and intratracheal administration

Publication / Journal

Environmental Toxicology

Abstract

3,6-Dinitrobenzo[e]pyrene (3,6-DNBeP) was identified as a new potent mutagen toward Salmonella strains in surface soil and airborne particles. Because data of in vivo examination of the genotoxicity of 3,6-DNBeP are limited, micronucleus test was performed in peripheral blood and bone marrow, and comet assay in the lungs of mice treated with 3,6-DNBeP. In male ICR mice intraperitoneally (i.p.) injected with 3,6-DNBeP, the frequency of micronuclated polychromatic erythrocytes (MNPCEs) was increased in the peripheral blood and bone marrow after 24 h in a dose-dependent manner. Compared to controls, the highest dose of 3,6-DNBeP (40 mg/kg B.W.) induced 7.3- and 8.7-fold increases of MNPCE frequency in the peripheral blood and bone marrow, respectively. Furthermore, when 3,6-DNBeP was intratracheally (i.t.) instilled to male ICR mice, 3,6-DNBeP at the highest dose of 0.1 mg/kg body exhibited 3.1-fold increase of DNA tail moment in the lungs at 3 h after the instillation compared to controls. The values of DNA tail moment at 9 and 24 h after the instillation were increased up to 3.5 and 4.2-fold, respectively. These data indicate that 3,6-DNBeP is genotoxic to mammalians in in vivo and suggest that 3,6-DNBeP may be a carcinogenic compound present in the human environment.

Keywords

Authors

Kato, T; Totsuka, Y; Hasei, T; Watanabe, T; Wakabayashi, K; Kinae, N; Masuda, S

Volume	Issue	Pages	Date Published	Times Cited
28	10	588-594	October 2013	

Digital Object Identifier (DOI)

10.1002/tox.20754

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Oxidative Stress and Antioxidant Defenses in Asthmatic Murine Model Exposed to Printer Emissions and Environmental Tobacco Smoke

Publication / Journal

Journal of Environmental Pathology Toxicology and Oncology

Abstract

Exposure to particulate emissions from printer and cigarette smoke affects the structure and function of mitochondria, which may account for the pathogenesis of respiratory diseases. The addition of charge for the pollutant aerosols may increase the toxicity by their deposition in the lower respiratory tract. The mitochondrial damage in the lung of asthmatic mice was assessed by examining the levels of reactive oxygen species (ROS), lipid peroxides, reduced glutathione, and the activities of isocitrate dehydrogenase, (x-ketoglutarate dehydrogenase, succinate dehydrogenase, malate dehydrogenase, complexes I to IV, and cytochrome c. The oxidative phosphorylation levels of adenosine triphosphatase) was evaluated for the assessment of mitochondrial functional capacity. We found highly significant elevated levels of ROS, lipid peroxides, and decreased levels of mitochondrial enzymes in the mice exposed to environmental tobacco smoke and printer emissions + environmental tobacco smoke (ETS). However, mice exposed to printer emissions alone exhibited slight significant variations in the parameters studied. From the results, we conclude that printer emissions exert a synergistic effect in the presence of ETS and induce intense damage to the lung mitochondria by disrupting the structural and functional integrity of the mitochondrial membrane.

Keywords

Authors

Konga, DB; Kim, YS; Hong, SC; Roh, YM; Lee, CM; Kim, KY; Lee, SM

Volume: 28

Issue: 4

Pages: 325-340

Date Published: 2009

Times Cited:

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Relationships between the factors reflecting ecological health function of urban forests

Publication / Journal

Shengtaixue Zazhi

Abstract

A 24-hour seasonal observation was conducted on the 4 factors reflecting urban forest ecological heath function (decreasing atmospheric particulate matters (PMs), declining airborne microbes, increasing aero-anions, and increasing biogenic volatile organic compounds (BVOCs)) in three typical urban forests in West Mountain of Beijing, and an analysis was made on the interrelationships between these factors, aimed to understand the ecological health function of urban forest. There existed close relationships between these four factors. The four sizes of atmospheric PMs had significant positive relationships each other, among which, PM2.5 and PM1.0 had the highest correlation, followed by total suspended particulate (TSP) and PM10. The larger the difference in particulate size, the weaker the correlation was. The airborne bacteria were significantly positively correlated with the PMs, especially with the TSP. The aero-anions had a negative relationship with the PMs, and this relationship became stronger when the particulate size increased. The aero-anions had inhibitory effect on the airborne microbes, and this effect was more obvious on bacteria than on fungi. In Platycladus orientalis and Cotinus coggygria forests, BVOCs played definite roles in inhibiting airborne microbes and increasing aero-anions, and also, had definite association with PMs, but these effects varied with the components of BVOCs.

Keywords

Authors

Guo Er-guo; Wang Cheng; Qie Guang-fa; Cai Yu

Volume	Issue	Pages	Date Published	Times Cited
32	11	2893-2903	November 2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Smoke from Wildfires and Prescribed Burning in Australia: Effects on Human Health and Ecosystems

Publication / Journal

Wildland Fires and Air Pollution

Abstract

Much of Australia is seasonally hot and dry, and fuel beds can become very flammable. Biomass burning ranges from annual savanna fires in the north to sporadic but extensive forest fires in the south. In addition, prescribed burning (the controlled application of fire) is being used more frequently as a means of reducing fuel loads, for maintenance of plant and animal biodiversity and in forestry practices. Despite this and in comparison to the Northern Hemisphere, there are few Australian studies of the production or composition of smoke from biomass burning. There is also relatively minimal Australian literature detailing the effect of wildfire smoke on human health and flora and fauna. Most of the literature dealing with smoke and human health issues in Australia outline epidemiological studies that document the incidence of hospital visits and admissions during wildfire events. The causal link between smoke and respiratory illness is yet to be established. The bulk of the publications dealing with ecological effects of smoke are concerned with germination of seed, with little information available on the direct effects of components of smoke on the physiology and biochemistry of plants, animals, invertebrates, or microorganisms. We will outline the knowledge of emissions and effects of smoke from prescribed and wildland fire in Australia on human health and the environment and will indicate potential areas for future research. In addition, a large proportion of the vegetation of Australia is composed of forests dominated by native species of Eucalyptus and Acacia, while large expanses of plantations are dominated by single species of Eucalyptus, and the production of volatile organic compounds (VOCs) by such vegetation is substantial. Thus, we will also outline an emerging research area in which the links among the production of VOCs by native Australian species, environmental conditions, and VOCs found in smoke produced from burning native vegetation are explored.

Keywords

Authors

Bell, T; Adams, M

Volume	Issue	Pages	Date Published	Times Cited
8		289-316	2009	

Digital Object Identifier (DOI)

10.1016/S1474-8177(08)00014-4

Media Category	Generation Type	CoalType	BiomassType
Biotic	Biomass		

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Association Between Exposure to Emissions From the Oil and Gas Industry and Pathology of the Immune, Nervous, and Respiratory Systems, and Skeletal and Cardiac Muscle in Beef Calves

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

To determine potential associations between emissions from oil and gas field facilities and the risk of lesions in the immune, nervous, and respiratory systems of beef calves, researchers examined tissue samples collected from 1.531 cases with exposure data, which included aborted fetuses, stillbirths, and calf mortalities from 203 cow-calf herds, by means of histopathology. The researchers prospectively measured exposure to sulfur dioxide, hydrogen sulfide, and volatile organic compounds by using air-monitoring data from passive monitors. They used the density of facilities surrounding each pasture as a second measure of exposure. Each tissue was classified by the presence or absence of a series of specified lesions, including those associated with degeneration, necrosis, infection. inflammation, anomaly, lympholysis (for lymphoid tissue), and proliferation (for the respiratory system). Exposure was not associated with the risk of lesions to tissues of either the immune or nervous system in calves that were aborted or died in spring 2002. Exposures to sulfur dioxide and hydrogen sulfide were not significantly associated with the risk of lesions to respiratory tissues in calves that were born alive in spring 2002. Increasing postnatal exposures to volatile organic compounds measured as benzene and toluene were associated with increased odds of respiratory lesions. The association between volatile organic compounds measured as benzene and respiratory lesions was significant for calves older than 3 weeks. During gestation, increasing exposure to sulfur dioxide was associated with increased odds of lesions in either the skeletal muscle or myocardium.

Keywords

Authors

Waldner, CL; Clark, EG

Volume	Issue	Pages	Date Published	Times Cited
64	SI	6-27	2009	1

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Diesel exhaust exposure enhances venoconstriction via uncoupling of eNOS

Publication / Journal

Toxicology and Applied Pharmacology

Abstract

Environmental air pollution is associated with adverse cardiovascular events, including increased hospital admissions due to heart failure and myocardial infarction. The exact mechanism(s) by which air pollution affects the heart and vasculature is currently unknown. Recent studies have found that exposure to air pollution enhances arterial vasoconstriction in humans and animal models. Work in our laboratory has shown that diesel emissions (DE) enhance vasoconstriction of mouse coronary arteries. Thus, we hypothesized that DE could enhance vasoconstriction in arteries and veins through uncoupling of endothelial nitric oxide synthase (eNOS). To test this hypothesis, we first bubbled DE through a physiological saline solution and exposed isolated mesenteric veins. Second, we exposed animals, whole body, to DE at 350 mu g/m(3) for 4 h, after which mesenteric arteries and veins were isolated. Results from these experiments show that saline bubbled with DE as well as inhaled DE enhances vasoconstriction in veins but not arteries. Exposure to several representative volatile organic compounds found in the DE-exposed saline did not enhance arterial constriction. L-nitro-arginine-methyl-ester (L-NAME), an eNOS inhibitor, normalized the control vessels to the DE-exposed vessels implicating an uncoupling of eNOS as a mechanism for enhanced vasoconstriction. The principal conclusions of this research are 1) veins exhibit endothelial dysfunction following in vivo and ex vivo exposures to DE, 2) veins appear to be more sensitive to DE effects than arteries, and 3) DE components most likely induce endothelial dysfunction through the uncoupling of eNOS.

Keywords

Authors

Knuckles, TL; Lund, AK; Lucas, SN; Campen, MJ

Volume	Issue	Pages	Date Published	Times Cited
230	3	346-351	August 1, 2008	

Digital Object Identifier (DOI)

10.1016/j.taap.2008.03.010

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Risk of Abortion and Stillbirth in Cow-Calf Herds Exposed to the Oil and Gas Industry in Western Canada

Publication / Journal

ARCHIVES OF ENVIRONMENTAL & OCCUPATIONAL HEALTH

Abstract

To investigate the associations between emissions from oil and gas field facilities and fetal survival, researchers followed more than 28,000 beef cows from the beginning of the breeding season through calving. They prospectively measured exposure to sulfur dioxide, hydrogen Sulfide, and volatile organic compounds and linked them to the location of individual cattle; they used the density of oil and gas well sites surrounding each pasture as an alternate measure of exposure. The researchers measured the risks of abortion and stillbirth in 203 cow-calf herds for the 2002 calving season, as well as animal and herd-management factors known or suspected to affect these parameters. Using mixed models to adjust for clustering by herd and after accounting for other known risk factors, they examined the associations between exposure to sulfur dioxide, volatile organic compounds measured as benzene and toluene, hydrogen sulfide, and well-site density, and the risks of abortion and stillbirth. There was no evidence across the measured range of exposures that emissions of sulfur dioxide, hydrogen sulfide, volatile organic compounds measured as benzene or toluene, or well-site density increased the risk of either abortion or stillbirth in these beef herds.

Keywords

Authors

Waldner, CL

Volume	Issue	Pages	Date Published	Times Cited
64	SI	29-45	2009	1

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The influence of diesel exhaust on polycyclic aromatic hydrocarbon-induced DNA damage, gene expression, and tumor initiation in Sencar mice in vivo

Publication / Journal

Cancer Letters

Abstract

The carcinogenic effects of individual polycyclic aromatic hydrocarbons (PAH) are well established. However, their potency within an environmental complex mixture is uncertain. We evaluated the influence of diesel exhaust particulate matter oil PAH-induced cytochrome P450 (CYP) activity, PAH-DNA adduct formation, expression of certain candidate genes and the frequency Of tumor initiation in the two-stage Sencar mouse model. To this end, we monitored the effects of treatment of mice with diesel exhaust, benzo[a]pyrene (BP), dibenzo[a,l]pyrene (DBP), or a combination of diesel exhaust with either carcinogenic PAH. The applied diesel particulate matter (SRM1975) altered the tumor initiating potency of DBP: a statistically significant decrease in overall tumor and carcinoma burden was observed following 25 weeks of promotion with 12-O-tetradecanoylphorbol-13-acetate (TPA), compared with DBP exposure alone. From those mice that were treated at the beginning of the observation period with 2 nmol DBP all survivors developed tumors (9 out of 9 animals, 100%). Among all tumors counted at the end, nine carcinomas were detected and all overall tumor incidence of 2.6 tumors per tumor-bearing animal (TBA) was determined. By contrast, co-treatment of DBP with 50 mg SRM1975 led to a tumor rate of only 66% (19 out of 29 animals), occurrence of only three carcinomas in 29 animals and an overall rate of 2.1 tumors per TBA (P = 0.04). In contrast to the results with DBP, the tumor incidence induced by 200 nmol BP was found slightly increased when co-treatment With SRM1975 occurred (71% vs. 85%) after 25 weeks). Despite this difference in tumor incidence, the numbers of carcinomas and tumors per TBA did not differ statistically significant between both treatment groups possibly due to the small size of the BP treatment group. Since bioactivation of DBP, but not BP, predominantly depends on CYP1B1 enzyme activity, SRM1975 affected PAH-induced carcinogenesis in an antagonistic manner when CYP1B1-mediated bioactivation was required. The explanation most likely lies in the much stronger inhibitory effects of certain PAHs present in diesel exhaust on CYP1B1 compared to CYP1A1. In the present study we also found molecular markers such as highly elevated AKR1C21 and TNFRSF21 gene expression levels in tumor tissue derived from animals co-treated with SRM1975 plus DBP. Therefore we validate microarray data as a source to uncover transcriptional signatures that may provide insights into molecular pathways affected following exposure to environmental complex mixtures such as diesel exhaust particulates.

Keywords

Authors

Courter, LA; Luch, A; Musafia-Jeknic, T; Arlt, VM; Fischer, K; Bildfell, R; Pereira, C; Phillips, DH; Poirier, MC; Baird, WM

Volume	Issue	Pages	Date Published	Times Cited
265	1	135-147	2008	

Digital Object Identifier (DOI)

10.1016/j.canlet.2008.02.017

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		

Lichen/Moss	☐	Other Abiotic Medium	☐
Microbes	☐		
Other Biotic Medium	☐		

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Environmentally persistent free radicals decrease cardiac function and increase pulmonary artery pressure

Publication / Journal

American Journal of Physiology - Heart and Circulatory Physiology

Abstract

Epidemiological studies have consistently linked inhalation of particulate matter (PM) to increased cardiac morbidity and mortality, especially in at risk populations. However, few studies have examined the effect of PM on baseline cardiac function in otherwise healthy individuals. In addition, airborne PM contain environmentally persistent free radicals (EPFR) capable of redox cycling in biological systems. The purpose of this study was to determine whether nose-only inhalation of EPFRs (20 min/day for 7 days) could decrease baseline left ventricular function in healthy male Sprague-Dawley rats. The model EPFR tested was 1,2-dichlorobenzene chemisorbed to 0.2-mu m-diameter silica/CuO particles at 230 degrees C (DCB230). Inhalation of vehicle or silica particles served as controls. Twenty-four hours after the last exposure, rats were anesthetized (isoflurane) and ventilated (3 l/min), and left ventricular function was assessed using pressure-volume catheters. Compared with controls, inhalation of DCB230 significantly decreased baseline stroke volume, cardiac output, and stroke work. End-diastolic volume and end-diastolic pressure were also significantly reduced; however, ventricular contractility and relaxation were not changed. DCB230 also significantly increased pulmonary arterial pressure and produced hyperplasia in small pulmonary arteries. Plasma levels of C-reactive protein were significantly increased by exposure to DCB230, as were levels of heme oxygenase-1 and SOD2 in the left ventricle. Together, these data show that inhalation of EPFRs, but not silica particles, decreases baseline cardiac function in healthy rats by decreasing cardiac filling, secondary to increased pulmonary resistance. These EPFRs also produced systemic inflammation and increased oxidative stress markers in the left ventricle.

Keywords

Authors

Mahne, S; Chuang, GC; Pankey, E; Kiruri, L; Kadowitz, PJ; Dellinger, B; Varner, KJ

Volume	Issue	Pages	Date Published	Times Cited
303	9	H1135-H1142	November 2012	4

Digital Object Identifier (DOI)

10.1152/ajpheart.00545.2012

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Effects of sulfur dioxide on expressions of p53, bax and bcl-2 in lungs of asthmatic rats

Publication / Journal

INHALATION TOXICOLOGY

Abstract

Inhibition of cell apoptosis is an increasingly important factor in modulating airway inflammation in asthma, which is related to environmental pollutants. To investigate the effects of sulfur dioxide (SO2) on the mRNA and protein expressions of apoptosis-related genes in lungs from asthmatic rats, male Wistar rats were challenged by ovalbumin (OVA) or SO2 (2 ppm) inhalation alone or together. Examinations were performed 24 h after the last treatment. The mRNA and protein levels of p53, bax, and bcl-2 were analyzed in lungs using real-time reverse transcription-polymerase chain reaction (RTPCR) assay and Western blot analysis, respectively. The results indicated that increases of bcl-2 or decreases of p53 and bax mRNA and protein levels were not significant in lungs of rats exposed to SO2 alone, compared with controls, but elevated or reduced levels of these genes appeared in lungs of asthmatic rats exposed to SO2 plus OVA, compared with controls, suggesting that SO2 exposure could result in OVA-induced increases or decreases of transcription and translation levels of these apoptosis-related genes in rat lungs, and may have relations to airway inflammation in asthma. The regulation mechanism of apoptosis in asthma disease exposure to SO2 needs further study.

Keywords

Authors

Xie, JF; Li, RJ; Fan, RJ; Meng, ZQ

Volume: 21

Issue: 8-11

Pages: 952-957

Date Published: July 2009

Times Cited: 4

Digital Object Identifier (DOI)

10.1080/08958370802629602

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Exposure of mice to concentrated ambient particulate matter results in platelet and systemic cytokine activation

Publication / Journal

INHALATION TOXICOLOGY

Abstract

Increasingly, evidence suggests a role for a systemic procoagulant state in the pathogenesis of cardiac dysfunction subsequent to inhalation of airborne particulate matter. The authors evaluated blood cell parameters and markers of platelet activation in mice exposed to concentrated ambient particulate matter (CAPs) from the San Joaquin Valley of California, a region with severe particulate matter (PM) pollution episodes. The authors exposed mice to an average of 88.5 mu g/m<SU3</SU of CAPs in a size range less than 2.5 mu m for 6 h/day for 5 days per week for 2 weeks. Platelets were analyzed by flow cytometry for relative size, shape, aggregation, fibrinogen binding, P-selectin, and lysosomal-associated membrane protein-1 (LAMP-1) expression. Serum cytokines were analyzed by bead-based immunologic assays. CAPs-exposed mice had elevations in macrophage inflammatory protein (MIP)-1 alpha, MIP-1 beta, interleukin (IL)-6, IL-10, tumor necrosis factor alpha (TNF alpha), macrophage colony-stimulating factor (M-CSF), granulocyte-macrophage colony-stimulating factor (GM-CSF), platelet-derived growth factor (PDGF)-bb, and RANTES (regulated upon activation, normally T-expressed, and presumably secreted). Platelets were the only peripheral blood cells that were significantly elevated in number in CAPs-exposed mice. Flow cytometric analysis of unstimulated platelets from CAPs-exposed mice indicated size and shape changes, and platelets from CAPs-exposed animals had a 54% increase in fibrinogen binding indicative of platelet priming. Stimulation of platelets by thrombin resulted in up-regulation of LAMP-1 expression in CAPs-exposed animals and an increased microparticle population relative to control animals. These findings demonstrate a systemic proinflammatory and procoagulant response to inhalation of environmentally derived fine and ultrafine PM and suggests a role for platelet activation in the cardiovascular and respiratory effects of particulate air pollution.

Keywords

Authors

Wilson, DW; Aung, HH; Lame, MW; Plummer, L; Pinkerton, KE; Ham, W; Kleeman, M; Norris, JW; Tablin, F

Volume	Issue	Pages	Date Published	Times Cited
22	4	267-276	March 2010	16

Digital Object Identifier (DOI)

10.3109/08958370903278069

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Chemopreventive activity of compounds extracted from Casearia sylvestris (Salicaceae) Sw against DNA damage induced by particulate matter emitted by sugarcane burning near Araraquara, Brazil

Publication / Journal

Toxicology and Applied Pharmacology

Abstract

Ethanolic extract of Casearia sylvestris is thought to be antimutagenic. In this study, we attempted to determine whether this extract and casearin X (a clerodane diterpene from C. sylvestris) are protective against the harmful effects of airborne pollutants from sugarcane burning. To that end, we used the Tradescantia micronucleus test in meiotic pollen cells of Tradescantia pallida, the micronucleus test in mouse bone marrow cells, and the comet assay in mouse blood cells. The mutagenic compound was total suspended particulate (TSP) from air. For the Tradescantia micronucleus test, T. pallida cuttings were treated with the extract at 0.13, 0.25, or 0.50 mg/ml. Subsequently, TSP was added at 0.3 mg/ml, and tetrads from the inflorescences were examined for micronuclei. For the micronucleus test in mouse bone marrow cells and the comet assay in mouse blood cells, Balb/c mice were treated for 15 days with the extract-3.9, 7.5, or 15.0 mg/kg body weight (BW)-or with casearin X-03, 0.25, or 12 mg/kg BW after which they received TSP (3.75 mg/kg BW). In T. pallida and mouse bone marrow cells, the extract was antimutagenic at all concentrations tested. In mouse blood cells, the extract was antigenotoxic at all concentrations, whereas casearin X was not antimutagenic but was antigenotoxic at all concentrations. We conclude that C. sylvestris ethanolic extract and casearin X protect DNA from damage induced by airborne pollutants from sugarcane burning.

Keywords

Authors

Prieto, AM; Santos, AG; Csipak, AR; Caliri, CM; Silva, IC; Arbex, MA; Silva, FS; Marchi, MRR; Cavalheiro, AJ; Silva, DHS; Bolzani, VS; Soares, CP

Volume: 265

Issue: 3

Pages: 368-372

Date Published: December 15, 20

Times Cited: 0

Digital Object Identifier (DOI): 10.1016/j.taap.2012.09.005

Media Category: Biotic

Generation Type: Biomass

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effect of growth on active biomonitoring with terrestrial mosses

Publication / Journal

Journal of Atmospheric Chemistry

Abstract

The effects of growth of autoirrigated, shaded transplants of Pseudoscleropodium purum on the quantification of tissue concentrations of Cd, Cu, Hg, V and Zn, were investigated in 4 exposure periods, each of 56 days, at 7 sampling sites (contaminated and uncontaminated). Concentrations of the elements in the basal portions of the moss shoots were compared with the concentrations in the portions of the shoots that grew during the exposure period. Mercury and V were present at lower concentrations in the new portions of the shoots than in the basal portions, whereas the opposite was true for Cd, Cu and Zn. The magnitude of error introduced by growth was not negligible, and in some cases was higher than 40%, relative to the results obtained by analysis of the whole shoot. Devitalization of moss prior to its use as transplant material is recommended to avoid growth of the plant during the exposure period.

Keywords

Authors

Fernandez, J.A.; Ares, A.; Rey-Asensio, A.; Carballeira, A.; Aboal, J.R.

Volume	Issue	Pages	Date Published	Times Cited
63	1	1-11	May 2011	0

Digital Object Identifier (DOI)

10.1007/s10874-010-9152-3

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Comparison of concentrations of mercury in ambient air to its accumulation by leafy vegetables: An important step in terrestrial food chain analysis

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

A biomonitoring network with leafy vegetables was established near a chlor-alkali plant in order to compare the accumulation of mercury to the atmospheric total gaseous mercury (TGM) concentration. Based on data obtained in the reference area the 'normal' mercury concentration in vegetables is between 0.6 and 5.4 mu g kg(-1) FW. The effect detection limits (EDLs) are between 1.2 and 11.0 mu g kg(-1) FW and the biological detection limits (BDLs), the lowest [TGM] that can be detected significantly, are between 3 and 4 ng m(-3). The accumulation rate is lowest for lettuce and high for curly kale that proved to be an excellent accumulator and as such it is very useful for biomonitoring purposes. A comparison made in the 1980s between biomonitoring results with grass and the mercury concentration in leafy vegetables from private gardens nearby proved to be valid when applied to the current biomonitoring results with vegetables.

Keywords

Authors

De Temmerman, L; Waegeneers, N; Claeys, N; Roekens, E

Volume: 157

Issue: 4

Pages: 1337-1341

Date Published: April 2009

Times Cited: 12

Digital Object Identifier (DOI): 10.1016/j.envpol.2008.11.035

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Aspergillus nidulans as a biological system to detect the genotoxic effects of mercury fumes on eukaryotes

Publication / Journal

GENETICS AND MOLECULAR RESEARCH

Abstract

Mercury (Hg) pollution is one of the most serious environmental problems. Due to public concern prompted by the symptoms displayed by people who consumed contaminated fish in Minamata, Japan in 1956, Hg pollution has since been kept under constant surveillance. However, despite considerable accumulation of knowledge on the noxious effects of ingested or inhaled Hg, especially for humans, there is virtually nothing known about the genotoxic effects of Hg. Because increased mitotic crossing over is assumed to be the first step leading to carcinogenesis, we used a sensitive short-term test (homozygotization index) to look for DNA alterations induced by Hg fumes. In one Aspergillus nidulans diploid strain (UT448//UT184), the effects of the Hg fumes appeared scattered all over the DNA, causing 3.05 times more recombination frequencies than the mean for other strains. Another diploid (Dp II- I//UT184) was little affected by Hg. This led us to hypothesize that a genetic factor present in the UT184 master strain genome, close to the nicB8 genetic marker, is responsible for this behavior. These findings corroborate our previous findings that the homozygotization index can be used as a bioassay for rapid and efficient assessment of ecotoxicological hazards.

Keywords

Authors

Sousa, GD; Zucchi, TD; Zucchi, FD; Miller, RG; Anjos, RMA; Poli, P; Zucchi, TMAD

Volume	Issue	Pages	Date Published	Times Cited
8	2	404-413	2009	3

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

An ecotoxicological protocol with caged mussels, Mytilus galloprovincialis, for monitoring the impact of an offshore platform in the Adriatic sea

Publication / Journal

MARINE ENVIRONMENTAL RESEARCH

Abstract

An ecotoxicological protocol with caged mussels, Mytilus galloprovincialis, was developed to evaluate the potential impact of an offshore gas platform in the central Adriatic Sea. Reference organisms were collected on a seasonal basis from an unpolluted site and transplanted for four weeks in both the sampling area and to the investigated platform. Chemical analyses of trace metals in mussel tissues were integrated with a multi-biomarker approach for the early detection of biological responses at several cellular targets. Induction of metallothioneins, peroxisomal proliferation and activity of acetylcholinesterase were measured as markers for specific classes of chemicals. Special attention was given to oxyradical metabolism and appearance of oxidative-mediated toxicity to reveal a more general onset of cellular disturbance. In addition to individual antioxidants (superoxide dismutase, catalase, glutathione S-transferases, glutathione reductase, Se-dependent and Se-independent glutathione peroxidases, and levels of total glutathione), the total oxyradical scavenging capacity (TOSC) allowed a quantification of the overall capability to neutralize specific forms of intracellular reactive oxygen species (ROS; i.e. peroxyl and hydroxyl radicals). Cellular damages were evaluated as lysosomal destabilization (membrane stability, accumulation of lipofuscin and neutral lipids), lipid peroxidation products (malondialdehyde) and DNA integrity (strand breaks and micronuclei); the air survival test was finally applied to evaluate the overall physiological condition of mussels. Concentration of trace metals (As, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn) revealed only limited variations in transplanted mussels during various experimental periods and such changes appeared partly related to natural fluctuations. Among biological responses, variations of antioxidants and lysosomal stability were confirmed as sensitive early warning signals for biological disturbance of both natural and anthropogenic origin. The presented protocol with caged mussels allowed marked biological effects caused by the investigated platform to be excluded, and represented a useful approach that is easy to extend for monitoring the impact of offshore activities in the Adriatic sea.

Keywords

Authors

Gorbi, S; Lamberti, CV; Notti, A; Benedetti, M; Fattorini, D; Moltedo, G; Regoli, F

Volume	Issue	Pages	Date Published	Times Cited
65	1	34-49	February 2008	65

Digital Object Identifier (DOI)

10.1016/j.marenvres.2007.07.006

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☑	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Biomonitoring of chemical elements in an urban environment using arboreal and bush plant species

Publication / Journal

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract

The aim of this work was to investigate the possibility of using several bush and arboreal plant species, usually present as ornamental plants in street and parks, as environmental indicators of pollution. This is a research paper that evaluates the real possibility of using a fast and low-cost procedure to evaluate the pollution degree through data obtained from plant species growing within an urban environment.
Leaves of six different bush and arboreal species were collected from different parts of Madrid (Spain), ranging from highly polluted considered areas to medium and low contaminated ones. A total of 66 chemical elements, from major to minor and trace, were determined for every leaf sample by inductively coupled plasma-mass spectrometry. Statistical analyses were carried out using mainly box and whisker plots, linear discriminant analysis and cluster analysis.
The pollution by different elements of the studied areas of Madrid cannot be considered generally dangerous for human health. The level detected for the contaminants, in general, is similar or lower than other urban cities. Pb and V concentrations in plant samples tend to increase as traffic density increases. The different studied plant species showed a different capability of accumulation of certain elements. Cedrus deodara accumulates specially Ag, Hg, Mo and V; Cupressus sempervirens, Zr; Pinus pinea, As and Sb; Nerium oleander Ni, Pb, Mo and Se; Ligustrum ovalifolium, Sc and V; and Pittosporum tobira, Ag, Cd, Rb and Sc.
The leaves and needles collected from bush and arboreal plants common in this city have demonstrated to be useful to evaluate the level of pollution not only through the chemical analysis but also through the recognition of the visual injury symptoms. The application of multivariate statistical techniques combined with determining of element concentration and correlation analysis has been proved to be an effective tool for reach the objectives of the present work. This allows visualising quickly the damages and leading the sampling through the points of high-level pollution, saving analysis, time and money.

Keywords

Authors

Rucandio, MI; Petit-Dominguez, MD; Fidalgo-Hijano, C; Garcia-Gimenez, R

Volume	Issue	Pages	Date Published	Times Cited
18	1	51-63	January 2011	7

Digital Object Identifier (DOI)

10.1007/s11356-010-0350-y

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Evaluation of DNA damage by the alkaline comet assay of the olfactory and respiratory epithelia of dogs from the city of Sao Paulo, Brazil

Publication / Journal

EXPERIMENTAL AND TOXICOLOGIC PATHOLOGY

Abstract

Animals kept as pets may be considered sentinels for environmental factors to which humans could be exposed. Olfactory and respiratory epithelia are directly subjected to airborne factors, which could cause DNA lesions, and the alkaline comet assay is considered a reliable tool for the assessment of DNA damage. The objective of this work is to evaluate the extent of DNA damage by the comet assay of the olfactory and respiratory epithelia of dogs from different regions of the city of sao Paulo, Brazil. Thirty-three clinically healthy dogs, aged 5 years or more, were used in the study, with 7 from the North region of Sao Paulo, 7 from the South region, 3 dogs from the East region, and 16 dogs from the West city region. Three dogs younger than 6 months were used as controls. DNA damage was analyzed by the alkaline comet assay. We observed no difference in histopathological analysis of olfactory and respiratory epithelia between dogs from different regions of Sao Paulo. Dogs older than 5 years presented significantly higher comet length in both olfactory and respiratory epithelia, when compared with controls, indicating DNA damage. When separated by regions, olfactory and respiratory epithelia presented similar DNA damage in dogs from different regions of Sao Paulo, corroborating with similar levels of particulate matter index (PM10) in all regions of the city. In this study, we report for the first time that the comet assay can be used to quantify the extent of DNA damage in dog olfactory and respiratory epithelia, and that comet length (DNA damage) increases with age, probably due to environmental factors. Air pollution, as measured by PM 10, can be responsible for this DNA damage.

Keywords

Authors

Kimura, KC; Fukumasu, H; Chaible, LM; Lima, CE; Horst, MA; Matsuzaki, P; Sanches, DS; Pires, CG; Silva, TC; Pereira, TC; Mello, ML; Matera, JM; Dias, RA; Monnereau, A; Sasco, AJ; Saldiva, PHN; Dagli, MLZ

Volume	Issue	Pages	Date Published	Times Cited
62	3	209-219	May 2010	0

Digital Object Identifier (DOI)

10.1016/j.etp.2009.03.008

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Use of bioindicators to evaluate air quality and genotoxic compounds in an urban environment in Southern Brazil

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

Biological indicators are widely used to monitor genotic compounds and air quality in urban environments. Parmotrema tinctorum and Teloschistes exilis have been used to verify the presence of pollutants and analyze morphophysiological alterations in the thallus of species caused by their action. Species were exposed for seven months, in an urban area, in southern Brazil. Mutagenicity and cytotoxicity of PM10 organic extracts were assessed in the Salmonella/microsome assay at two stations. High concentrations of S, Pb, Cr, Zn and Hg were registered in the last period of exposure and more significant morphophysiological damages were verified in the lichens. Generally a higher mutagenic activity is observed in organic extracts of airborne particulate matter during the first months and in the third period of exposure of lichens. In addition, nitro compounds was detected through nitro-sensitive strains. Lichens and mutagenic biomarkers enabled the evaluation of air quality and the presence of environmentally-aggressive compounds.

Keywords

Authors

Kaffer, MI; Lemos, AT; Apel, MA; Rocha, JV; Martins, SMD; Vargas, VMF

Volume	Issue	Pages	Date Published	Times Cited
163		24-31	April 2012	1

Digital Object Identifier (DOI)

10.1016/j.envpol.2011.12.006

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Comparative Toxicity of Size-Fractionated Airborne Particulate Matter Collected at Different Distances from an Urban Highway

Publication / Journal

ENVIRONMENTAL HEALTH PERSPECTIVES

Abstract

BACKGROUND: Epidemiologic studies have reported an association between proximity to highway traffic and increased cardiopulmonary illnesses.
OBJECTIVES: We investigated the effect of size-fractionated particulate matter (PM), obtained at different distances from a highway, on acute cardiopulmonary toxicity in mice.
METHODS: We collected PM for 2 weeks in July-August 2006 using a three-stage (ultrafine, < 0.1 mu m; fine, 0.1-2.5 mu m; coarse, 2.5-10 mu m) high-volume impactor at distances of 20 m [near road (NR)] and 275 m [far road (FR)] from an interstate highway in Raleigh, North Carolina. Samples were extracted in methanol, dried, diluted in saline, and then analyzed for chemical constituents. Female CD-1 mice received either 25 or 100 mu g of each size fraction via oropharyngeal aspiration. At 4 and 18 hr postexposure, mice were assessed for pulmonary responsiveness to inhaled methacholine, biomarkers of lung injury and inflammation; ex vivo cardiac pathophysiology was assessed at 18 hr only.
RESULTS: Overall chemical composition between NR and FR PM was similar, although NR samples comprised larger amounts of PM, endotoxin, and certain metals than did the FR samples. Each PM size fraction showed differences in ratios of major chemical classes. Both NR and FR coarse PM produced significant pulmonary inflammation irrespective of distance, whereas both NR and FR ultrafine PM induced cardiac ischemia-reperfusion injury.
CONCLUSIONS: On a comparative mass basis, the coarse and ultrafine PM affected the lung and heart, respectively. We observed no significant differences in the overall toxicity end points and chemical makeup between the NR and FR PM. The results suggest that PM of different size-specific chemistry might be associated with different toxicologic mechanisms in cardiac and pulmonary tissues

Keywords

Authors

Cho, SH; Tong, HY; McGee, JK; Baldauf, RW; Krantz, QT; Gilmour, MI

Volume	Issue	Pages	Date Published	Times Cited
117	11	1682-1689	November 2009	27

Digital Object Identifier (DOI)

10.1289/ehp.0900730

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Mutagenic properties of PM2.5 air pollution in the Padana Plain (Italy) before and in the course of XX Winter Olympic Games of "Torino 2006"

Publication / Journal

ENVIRONMENT INTERNATIONAL

Abstract

PM2.5 is one of the most important aspects of environmental health. This air pollutant is breathable and it is implicated in several chronic adverse health effects such as the decrease of respiratory functionality and cancer. Several in vitro bioassays are able to predict the mutagenic/carcinogenic activity of the environmental pollutants and mixtures of them. In this study PM2.5 air pollution was daily monitored in three cities located in the Northern part of Italy and the mutagenic properties of the PM2.5 organic extracts were also assessed. Samplings lasted 14 months and cover the period of the Winter Olympic Games of "Torino 2006". In this work, the levels of PM2.5, its mutagenic properties (detected with Salmonella typhimurium assay), the role of the Olympic Games as environmental factor and some meteorological data are discussed. The mean concentration of PM2.5 measured in Torino was 45.4 (+/- 30.6) mu g/m(3), in Pavia 37.6 (+/- 25.6) mu g/m(3), in Verona 43.1 (+/- 28.5) mu g/ m(3). Findings of the monthly pool bioassay were in Torino 107 (+/- 104) net revertans/m(3), in Pavia 108 (+/- 89) net revertans/m(3), in Verona 128 (+/- 109) net revertans/m(3). The Olympic Games period data show that PM2.5 pollution and its load of mutagenic potential are different and partially independent phenomena. The Olympic Games had not a great impact on the PM2.5 pollution. The exclusive PM2.5 gravimetric analysis shows a potential human risk if compared with the latest international guide values but it does not describe exhaustively the human health risk associated to the presence of this particular air pollutant. Moreover, the chemical and biological activity qualification of the PM organic extracts as a whole, can instead improve the knowledge.

Keywords

Authors

Traversi, D; Degan, R; De Marco, R; Gilli, G; Pignata, C; Ponzio, M; Rava, M; Sessarego, F; Villani, S; Bono, R

Volume	Issue	Pages	Date Published	Times Cited
34	7	966-970	October 2008	9

Digital Object Identifier (DOI)

10.1016/j.envint.2008.02.007

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Development of a two-site enzyme immunoassay based on monoclonal antibodies to measure airborne exposure to (1 -> 3)-beta-D-glucan

Publication / Journal

JOURNAL OF IMMUNOLOGICAL METHODS

Abstract

(1 -> 3)-beta-D-glucan is found in cell walls of some fungi, bacteria and plants. It plays a crucial role in bioaerosol-induced inflammatory reactions. To estimate the level of airborne (1 -> 3)-beta-D-glucan exposure, a monoclonal antibody-based two-site enzyme immunoassay (mAb-EIA) was developed. The results obtained with the mAb-EIA were compared with the results of a Limulus amoebocyte lysate-based assay for (1 -> 3)-beta-D-glucan. Three mAbs produced by mouse immunization with bovine serum albumin-conjugated laminarin were enriched by in vitro production in a modular minifermenter and affinity purified. Two mAbs were selected for the development of a two-site EIA specific for (1 -> 3)-beta-D-glucan. Different polysaccharides, fungal and plant seed extracts, and airborne inhalable dust from workplaces (poultry farms, pig stables, grain storage houses, and a laboratory animal facilility) were sampled with portable pumps and measured with both the mAb-EIA and Glucatell ® assay.
Using carboxymethylated curdlan as a standard, the mAb-EIA gave a steep dose-response curve for concentrations between 0.36-15 ng/ml. The mAb-EIA was specific for (1 -> 3)-beta-D-glucan and was sufficiently sensitive to detect (1 -> 3)-beta-D-glucan in airborne dust samples. In comparing the EIA results to the values obtained with the Glucatell ® assay, the correlation was found to be high (coefficient of correlation r(2) =0.91), and the mean ratio of the values was 1.7. Depending on the dust source, either the Glucatell ® assay or the mAb-ElA gave higher results. The mAb-EIA is sensitive enough to detect (1 -> 3)-D-glucan in airborne dust samples collected with portable pumps. Thus, the assay is suited for the investigation of the health effects induced by exposure to this class of biologically active molecules.

Keywords

Authors

Sander, I; Fleischer, C; Borowitzki, G; Bruning, T; Raulf-Heimsoth, M

Volume	Issue	Pages	Date Published	Times Cited
337	1	55-62	August 2008	14

Digital Object Identifier (DOI)

10.1016/j.jim.2008.05.010

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

A refined biomonitoring study of airborne particulate matter pollution in Rome, with magnetic measurements on Quercus Ilex tree leaves

Publication / Journal

GEOPHYSICAL JOURNAL INTERNATIONAL

Abstract

Elevated levels of airborne particulate matter (PM) are a current problem for air quality in many major metropolitan areas. Many European cities have tightened the PM limits in the air, due to advances in monitoring PM levels. In order to establish guidelines for monitoring and curbing anthropogenic PM output, a better understanding of its origin, composition and diffusion is required. Biomonitoring of magnetic properties of tree leaves has been suggested previously to be a good approach to measure pollution levels in cities both in space and time. We report on a magnetic biomonitoring study of PM in the city of Rome, conducted from 2005 October to December. We collected approximately 180 different sample sets of tree leaves of Quercus ilex, an evergreen oak widely distributed in Rome, at 112 different locations. Specific magnetic susceptibility chi of the leaf is used as a fast, easy and cost-effective proxy to assess levels of primary anthropogenic airborne PM pollution. Highly polluted areas correlate with high traffic areas, with an average susceptibility value of chi = 3.2 x 10(-7) m(3) kg(-1). Low traffic zones are characterized by values more than an order of magnitude lower at chi = 1.4 x 10(-8) m(3) kg(-1), and the background magnetic susceptibility is around chi = 2.6 x 10(-9) m(3) kg(-1). The data show that distance dependence from the source is the most significant factor for the concentration of magnetic PM, and that pollution levels and sources can be reliably delineated by measuring magnetic susceptibility values on tree leaf samples of Q. ilex. A new protocol for magnetic susceptibility measurements is proposed, in order to account for changes due to water evaporation in the leaves as a function of time after collection of the samples. Additional magnetic analyses, such as acquisition of artificial remanences and hysteresis properties, were used to characterize the mineralogy and grain size of the magnetic PM. The results indicate that the population of ferrimagnetic phases have a homogenous composition and grain size throughout the investigated area.

Keywords

Authors

Szonyi, M; Sagnotti, L; Hirt, AM

Volume	Issue	Pages	Date Published	Times Cited
173	1	127-141	April 2008	28

Digital Object Identifier (DOI)

10.1111/j.1365-246X.2008.03715.x

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

A preliminary characterization of the mutagenicity of atmospheric particulate matter collected during sugar cane harvesting using the Salmonella/microsome microsuspension assay.

Publication / Journal

Environmental and Molecular Mutagenesis

Abstract

During sugar cane harvesting season, which occurs from May to November of each year, the crops are burnt, cut, and transported to the mills. There are reports showing that mutagenic activity and PAH content increase during harvesting season in some areas of Sao Paulo State in comparison with nonharvesting periods. The objective of this work was to preliminarily characterize the mutagenic activity of the total organic extracts as well as corresponding organic fractions of airborne particulate matter (PM) collected twice from two cities, Araraquara (ARQ) and Piracicaba (PRB), during sugar cane harvesting season using the Salmonella/microsome microsuspension assay. One sample collected in Sao Paulo metropolitan area was also included. The mutagenicity of the total extracts ranged from 55 to 320 revertants per cubic meter without the addition of S9 and from not detected to 57 revertants per cubic meter in the presence of S9 in areas with sugar cane plantations. Of the three fractions analyzed, the most polar ones (nitro and oxy) were the most potent. A comparison of the response of TA98 with YG1041 and the increased potencies without S9 indicated that nitro compounds are causing the observed effect. More studies are necessary to verify the sources of the mutagenic activity such as burning of vegetal biomass and combustion of heavy duty vehicles used to transport the sugar cane to the mills. The Salmonella/microsome assay can be an important tool to monitor the atmosphere for mutagenicity during sugar cane harvesting season.

Keywords

Authors

Umbuzeiro, G. de A.; Franco, A.; Magalhaes, D.; Castro, F. J. V. de; Kummrow, F.; Rech, C. M.; Carvalho, L. R. F. de; Vasconcellos, P. de C.

Volume: 49

Issue: 4

Pages: 249-255

Date Published: 2008

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

PCA and multidimensional visualization techniques united to aid in the bioindication of elements from transplanted Sphagnum Palustre moss exposed in the Gdansk city area

Publication / Journal

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract

Goal, Scope and Background. During the last decades, a technique for assessing atmospheric deposition of heavy elements was developed based on the principle that samples of moss are able to accumulate elements and airborne particles from rain, melting snow and dry deposition. Despite a broad interest in bioindication there are still ongoing works aimed at the preparation of a standard procedure allowing for a comparison of research carried out in various areas. This is why the comparison of living and dry moss of the same species and growth site seems to be interesting, logical and promising. A most reliable approach seems to be the application of bioindication connected with multivariate statistics and efficient visualization techniques in the interpretation of monitoring data. The aim of this study was: (i) to present cumulative properties of transplanted Sphagnum palustre moss with differentiation into dry and living biomaterial; (ii) to determine and geographically locate types of pollution sources responsible for a structure of the monitoring data set; (iii) to visualize geographical distribution of analytes in the Gdansk metropolitan area and to identify the high-risk areas which can be targeted for environmental hazards and public health.
Materials and Methods. A six month air pollution study based on Sphagnum palustre bioindication is presented and a simplified procedure of the experiment is given. The study area was located at the mouth of the Vistula River on the Baltic Sea, in Gdansk City (Poland). Sphagnum palustre was selected for research because of its extraordinary morphological properties and its ease in being raised. The capability of dry and living moss to accumulate elements characteristic for anthropogenic and natural sources was shown by application of Principal Component Analysis. The high-risk areas and pollution profiles are detected and visualized using surface maps based on Kriging algorithm.
Results. The original selection of elements included all those that could be reliably determined by Neutron Activation Analysis in moss samples. Elimination of variables covered the elements whose concentrations in moss were lower than the reported detection limits for INAA for most observations or in cases where particular elements did not show any variation. Eighteen elements: Na, Ca, Sc, Fe, Co, Zn, As, Br, Mo, Sb, Ba, La, Ce, Sm, Yb, Lu, Hf, Th, were selected for the research presented.
Discussion. Two runs of PCA were performed since, in the first-run a heavy polluted location (Stogi - 'Sto') understood as outlier in the term of PCA approach was detected and results in the form of block diagrams and surface maps were presented. As ensues from the first-run PCA analysis, the factor layout for both indicators is similar but not identical due to the differences in the elements accumulation mechanism. Three latent factors ('phosphatic fertilizer plant impact', 'urban impact' and 'marine impact') explain over 89% and 82% of the total variance for dry and living moss respectively. In the second-run PCA three latent factors are responsible for the data structure in both moss materials. However, in the case of dry moss analysis these factors explain 85% of the total variance but they are rather hard to interpret. On the other hand living moss shows the same pattern as in first-run PCA. Three latent factors explain over 84% of the total variance in this case. The pollution profiles extracted in PCA of dry moss data differ tremendously between both runs, while no deterioration was found after removal of Stogi from data set in case of living moss. Performance of the second-run PCA with exception of Stogi as a heavy polluted location has led to the conclusion that living moss shows better indication properties than dry one.
Conclusions. While using moss as wet and dry deposition sampler it is not possible to calculate deposition values since the real volume of collected water and dust is hard to estimate due to a splash effect and irregular surface. Therefore, accumulation values seam to be reasonable for moss-based air pollution surveys. Both biomaterials: dry and living Sphagnum palustre show cumulative properties relative to elements under interest. Dry moss has a very loose collection of the atmospheric particles, which can also easily get lost upon rinsing with rainwater running through exposed dry moss material. The living moss may, on the contrary, incorporate the elements in its tissue, thus being less susceptible to rinsing and thus better reflecting the atmospheric conditions. Despite the differences in element uptake and uphold capabilities dry and living moss reflect characteristic anthropogenic and natural profiles. Visible differences in impacts' map coverage exist mostly due to the accumulation mechanisms differentiating dry from living moss. However, in case of each indicator 'phosphatic fertilizer plant impact' is recognized as the strongest pollution source present in examined region.
Recommendations and Perspectives. General types of pollution sources responsible for a structure of monitoring data set

were determined as high-risk/low-risk areas and visualized in form of geographic distribution maps. These locations can be targeted for environmental hazards and public health. Chemometric results in the form of easy defined surface maps can became a powerful instrument in hands of decision-makers working in the field of sustainable development implementation.

Keywords

Authors

Astel, A; Astel, K; Biziuk, M

Volume	Issue	Pages	Date Published	Times Cited
15	1	41-50	January 2008	10

Digital Object Identifier (DOI)

10.1065/espr2007.05.422

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Clays and bacteria carry important role to release Hg from small scale Au mine near Lake Victoria, Tanzania

Publication / Journal

Science Reports of Kanazawa University

Abstract

Pollution of Hg has attracted much attention in Au mines at North America, Africa, and South America, because Minamata-diseases are still increasing in the 21st century. Mercury fragments influence on not only human but also air and soil environments including natural microbial systems. Studies on bacterial mineralization have received much attention as well. However, only few studies have been conducted on the Au mine in relation to the long-term bioremediation study. In this study, mineralogical properties of clay minerals, goethite, quartz, and calcite associated with heavy metals, such as Fe, Au, Ag, Hg, Ba, Sb, and Pb from the small-scale Au mine, Geita, near Lake Victoria, Tanzania, have been studied using electron micro techniques. The lateritic reddish mud samples were collected from 7 locations of Hg panning ponds whereas air dusts were collected from 35 locations from Dar Es Salaam to Geita for about 1000 km away. Both the wet mud and air dust samples are mainly composed of clay minerals (smectite, halloysite, kaolinite), calcite, and goethite, associated with ppb ordered Hg on the surface or the structures. Observation of FE-TEM electron microscopy and elemental distribution maps revealed that the clay particles, calcite grains, and bacterial colonies contain relatively high Hg and Fe on the surface and/or the structures, indicating Hg pollution release from the panning ponds in the Au mine after heating treatment of Au-Hg amalgam. Volatilization of Hg carry to the air dusts associated with dried fine clays at all over the land in Tanzania. The highest Hg content in the dust was about 7785 ppb in Muguli, Southern parts of Lake Victoria. The soils near Hg panning pond contains relatively high Hg as 1576 ppb in Muhama and 1183 ppb in Rwamagaza. The results suggest that biodegradation of heavy metals by microorganisms associated with clays is one of the primary ways by which heavy metals are eliminated from contaminated sites. The finding of heavy metals-degrading bacteria and clay minerals in the Au mine may have a significant effect on the weathering processes during the long-term bioremediation in Tanzania.

Keywords

Authors

Tazaki, K.; Asada, R.; Watanabe, H.; Shiraki, K.; Iwai, T.; Wakimoto, R.; Songo, M.A.M.; Muhongo, S.M.

Volume	Issue	Pages	Date Published	Times Cited
52		1-26	2008	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Water, heat, and airborne pollutants effects on transpiration of urban trees

Publication / Journal

Environmental Pollution

Abstract

Transpiration rates of six urban tree species in Beijing evaluated by thermal dissipation method for one year were correlated to environmental variables in heat, water, and pollutant groups. To sort out colinearity of the explanatory variables, their individual and joint contributions to variance of tree transpiration were determined by the variation and hierarchical partitioning methods. Majority of the variance in transpiration rates was associated with joint effects of variables in heat and water groups and variance due to individual effects of explanatory group were in comparison small. Atmospheric pollutants exerted only minor effects on tree transpiration. Daily transpiration rate was most affected by air temperature, soil temperature, total radiation, vapor pressure deficit, and ozone. Relative humidity would replace soil temperature when factors influencing hourly transpiration rate was considered.

Keywords

Authors

Wang, H; Ouyang, ZY; Chen, WP; Wang, XK; Zheng, H; Ren, YF

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Issue: 8-9

Pages: 2127-2137

Date Published: August - Septem

Times Cited: 4

Digital Object Identifier (DOI): 10.1016/j.envpol.2011.02.031

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Composition and mutagenicity of PAHs associated with urban airborne particles in Cordoba, Argentina

Publication / Journal

Environmental Pollution

Abstract

The comet assay and micronucleous test were used to assess the genotoxicity of organic compounds associated with particulate material collected in the city of Cordoba, Argentina. Samples were collected on fiber glass filters and their organic extracts were analyzed by GC-MS. These extracts were used for the comet assay on human lymphocytes and for the MCN test with Tradescantia pallida. The concentrations of polycyclic aromatic hydrocarbons as well as some of their nitro derivates were higher during winter. Their composition suggested that their main emission sources were gasoline and diesel vehicles. We observed genotoxic effects of these organic extracts due to the presence of both direct and indirect acting mutagens. We found a good agreement between the two test systems employed, which encourages the further use of plant bioassays for air pollution monitoring, especially in developing countries, due to their flexibility, low cost and efficiency.

Keywords

Authors

Carreras, HA; Calderon-Segura, ME; Gomez-Arroyo, S; Murillo-Tovar, MA; Amador-Munoz, O

Volume	Issue	Pages	Date Published	Times Cited
17		403-410	July 2013	0

Digital Object Identifier (DOI)

10.1016/j.envpol.2013.03.016

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Trace elements present in airborne particulate matter-Stressors of plant metabolism

Publication / Journal

Ecotoxicology and Environmental Safety

Abstract

Changes of amino acid concentrations (glutamic acid, glutamine, asparagine, aspartate, proline, tryptophan, alanine, glycine, valine and serine), gas-exchange parameters (net photosynthetic rate, transpiration rate, stomatal conductance and intercellular CO2 concentration) and nitrate levels in Lactuca serriola L under airborne particulate matter (PM) contamination reported here reveal their role in plant chronic stress adaptation. Results of the pot experiment confirmed the toxic effect of trace elements present in PM for lettuce. PM applied to soil or on the lettuce leaves were associated with the strong inhibition of above-ground biomass and with the enhancement of plant trace element contents. The significant changes of amino acid levels and leaf gas-exchange parameters of the plants showed strong linear dependences on PM contamination (R-2=0.60-0.99). PM application on leaves intensified toxic effect of trace elements (As, Pb, Cr and Cd) originating from PM by shading of the leaf surface. The plant accumulation of nitrate nitrogen after PM contamination confirmed to block nitrate assimilation.

Keywords

Authors

Pavlik, M; Pavlikova, D; Zemanova, V; Hnilicka, F; Urbanova, V; Szakova, J

Volume	Issue	Pages	Date Published	Times Cited
79		101-107	May 1, 2012	2

Digital Object Identifier (DOI)

10.1016/j.ecoenv.2011.12.009

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Exposure to particulate hexavalent chromium exacerbates allergic asthma pathology

Publication / Journal

Toxicology and Applied Pharmacology

Abstract

Airborne hexavalent chromate, Cr(VI), has been identified by the Environmental Protection Agency as a possible health threat in urban areas, due to the carcinogenic potential of some of its forms. Particulate chromates are produced in many different industrial settings, with high levels of aerosolized forms historically documented. Along with an increased risk of lung cancer, a high incidence of allergic asthma has been reported in workers exposed to certain inhaled particulate Cr(VI) compounds. However, a direct causal association between Cr(VI) and allergic asthma has not been established. We recently showed that inhaled particulate Cr(VI) induces an innate neutrophilic inflammatory response in BALB/c mice. In the current studies we investigated how the inflammation induced by inhaled particulate Cr(VI) might alter the pathology of an allergic asthmatic response. We used a well-established mouse model of allergic asthma. Groups of ovalbumin protein (OVA)-primed mice were challenged either with OVA alone, or with a combination of OVA and particulate zinc chromate, and various parameters associated with asthmatic responses were measured. Co-exposure to particulate Cr(VI) and OVA mediated a mixed form of asthma in which both eosinophils and neutrophils are present in airways, tissue pathology is markedly exacerbated, and airway hyperresponsiveness is significantly increased. Taken together these findings suggest that inhalation of particulate forms of Cr(VI) may augment the severity of ongoing allergic asthma, as well as alter its phenotype. Such findings may have implications for asthmatics in settings in which airborne particulate Cr(VI) compounds are present at high levels.

Keywords

Authors

Schneider, BC; Constant, SL; Patierno, SR; Jurjus, RA; Ceryak, SM

Volume	Issue	Pages	Date Published	Times Cited
25	1	38-44	February 15, 201	1

Digital Object Identifier (DOI)

10.1016/j.taap.2011.12.001

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Characterization and Mutagenicity Assessment of PM2.5 and PM10 PAH at Agra, India

Publication / Journal

Polycyclic Aromatic Compounds

Abstract

Fine airborne particulate matter and bound chemical compounds are potential mediators of adverse health effects. In this study, PM2.5 and PM10 were characterized for bound polycyclic aromatic hydrocarbons (PAHs) and the mutagenic potential of extracts was assessed. PM2.5 and PM10 samples were collected on glass fiber filters at Agra from July to December 2010 using a fine particulate sampler (Envirotech, APM 550). The content of PAH was analyzed by gas chromatography and the extract were tested for mutagenicity by the Ames test without using S-9. Individual PAH concentration varied from 13-172 ng m(-3) with concentration for Chrysene and a dominance of low molecular weight compounds. Both PM and PAH concentrations were higher in the winter and were negatively correlated with temperature and wind speed. Diagnostic ratio analysis indicated contributions from vehicular exhaust and emissions from combustion of domestic fuel like coal and wood. Mutagenicity assays indicated the presence of mutagens capable of causing base pair and frame shift mutagenicity; however, within the range of tested concentrations no significant toxic effects were detected.

Keywords

Authors

Singla, V; Pachauri, T; Satsangi, A; Kumari, KM; Lakhani, A

Volume	Issue	Pages	Date Published	Times Cited
32	2	199-220	2012	0

Digital Object Identifier (DOI)

10.1080/10406638.2012.657740

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Study on some factors affecting survivability of airborne fungi

Publication / Journal

Science of the Total Environment

Abstract

The aim of the present study was to investigate the effect of some air pollutants and meteorological parameters on the survivability of airborne fungi. Fungi were collected by using a slit impactor sampler calibrated to draw 20 L/min, for 3 min. Nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter (PM), relative humidity (RH %), temperature (T degrees C) and wind speed (WS) were also measured. Air samples were taken during the period from March 2006 to February 2007. Fungal concentrations ranged between 45 and 451 CFU/m(3) with an annual mean concentration of 216 CFU/m(3). The lowest fungal concentration was found in the summer, however the highest one was found in the autumn. NO2 SO2 and PM averaged 83.66 mu g/m(3), 67.01 mu g/m(3), and 237.69 mu g/m(3), respectively. T degrees C was positively and negatively correlated with Aspergillus (P=0.000) and Penicillium (P=0.007), respectively. RH% was positively correlated with total fungi (P=0.001), Aspergillus (P=0.002) and Cladosporium (P=0.047). Multiple regression analysis showed that T degrees C and RH% were the most predicted variants. Non-significant correlations were found between fungal concentrations and air pollutants. Meteorological parameters were the critical factors affecting fungal survivability.

Keywords

Authors

Hameed, AAA; Khoder, MI; Ibrahim, YH; Saeed, Y; Osman, ME; Ghanem, S

Volume	Issue	Pages	Date Published	Times Cited
414		696-700	January 1, 2012	1

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2011.10.042

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Biomonitoring the environmental impact of atmospheric emissions from the Avonmouth zinc smelter, United Kingdom

Publication / Journal

ECOTOXICOLOGY

Abstract

This paper examines the impact of an industrial point-source atmospheric emission on the feeding of early life stages of a terrestrial invertebrate. Larvae of a bagworm moth, Luffia ferchaultella [Stephens], were fed terrestrial epiphytic algae (Desmococcus viridis [Menegh]) collected from five sites located along a 16 km transect around the Avonmouth zinc smelter. After 10 days of exposure symptoms of lethal and sublethal toxicity (mortality and paralysis) were observed. Reductions in the amount of faecal material (frass) produced were also identified, and these correlated with distance downwind of the smelter. The elevated concentrations of lead, mercury, arsenic, antimony, copper, cadmium, lead and nickel present in the algae could account for these symptoms of toxicity. Similar symptoms were observed when larvae were fed algae spiked with inorganic mercury. These results are consistent with other studies of soil toxicity conducted around the Avonmouth smelter. However, the current study suggests that the impacted area exceeds this 16 km transect and demonstrates the value of bagmoth larvae as sensitive biomonitors of metallic atmospheric pollutants above the rhizosphere.

Keywords

Authors

Sims, I; Crane, M; Johnson, I; Credland, P

Volume	Issue	Pages	Date Published	Times Cited
18	7	961-970	October 2009	3

Digital Object Identifier (DOI)

10.1007/s10646-009-0382-6

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☑	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Air pollution impairs cognition, provokes depressive-like behaviors and alters hippocampal cytokine expression and morphology

Publication / Journal

Molecular Psychiatry

Abstract

Particulate matter air pollution is a pervasive global risk factor implicated in the genesis of pulmonary and cardiovascular disease. Although the effects of prolonged exposure to air pollution are well characterized with respect to pulmonary and cardiovascular function, comparatively little is known about the impact of particulate matter on affective and cognitive processes. The central nervous system may be adversely affected by activation of reactive oxygen species and pro-inflammatory pathways that accompany particulate matter pollution. Thus, we investigated whether long-term exposure to ambient fine airborne particulate matter (< 2.5 mu m (PM(2.5))) affects cognition, affective responses, hippocampal inflammatory cytokines and neuronal morphology. Male mice were exposed to either PM(2.5) or filtered air (FA) for 10 months. PM(2.5) mice displayed more depressive-like responses and impairments in spatial learning and memory as compared with mice exposed to FA. Hippocampal pro-inflammatory cytokine expression was elevated among PM(2.5) mice. Apical dendritic spine density and dendritic branching were decreased in the hippocampal CA1 and CA3 regions, respectively, of PM(2.5) mice. Taken together, these data suggest that long-term exposure to particulate air pollution levels typical of exposure in major cities around the globe can alter affective responses and impair cognition.

Keywords

Authors

Fonken, LK; Xu, X; Weil, ZM; Chen, G; Sun, Q; Rajagopalan, S; Nelson, RJ

Volume	Issue	Pages	Date Published	Times Cited
16	10	987-995	October 2011	17

Digital Object Identifier (DOI)

10.1038/mp.2011.76

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Genotoxic effects and oxidative stress induced by organic extracts of particulate matter (PM10) collected from a subway tunnel in Seoul, Korea

Publication / Journal

Mutation Research - Genetic Toxicology and Environmental Mutagenesis

Abstract

Particulate matter (PM) has become an important health risk factor in our society. PM can easily deposit in the bronchi and lungs, causing diverse diseases such as respiratory infections, lung cancers and cardiovascular diseases. In recent days, more and more toxicological studies have been dealing with air particles in distinctive areas including industrial areas, transportation sites, or indoors. Studies on subway PM in particular, have been recognizing PM as an important health risk factor because many people use subways as a major mode of public transportation (4 million people a day in Korea). The main aim of the present study was to evaluate the genotoxic effects of organic extract (OE) of subway PM10 and potential attribution of PAHs to these effects. Particles were collected in the subway tunnel at Kil-eum station (Line 4) for one month and then extracted with Dichloromethane (DCM). Chinese Hamster Ovary cells (CHO-K1) and human normal bronchial cells (BEAS-2B) were exposed to OE, and MN and Comet assays were conducted to analyze the genotoxicity. The results showed that OE increased DNA or chromosome damages in both cell lines. In the modified Comet assay and MN assay with free radical scavengers, we confirmed that the genotoxic effect of OE was partially due to the oxidative damage on DNA. DCFH-DA assay also indicated that OE induced ROS generation in BEAS-2B cells. PAHs [benzo(a)anthracene, benzo(k)fluoranthrene, etc.], the most well-known carcinogens in polluted air, were detected in Kil-eum PM10. In conclusion, our findings confirmed that OE of subway PM10 has genotoxic effects on normal human lung cells, and oxidative stress could be one of the major mechanisms of these genotoxic effects. In addition, some genotoxic and carcinogenic PAHs were detected in OE by GC/MS/MS, even though PAHs level was not enough to increase CYP1A1 gene. Therefore, we suggest that additive or synergistic effects by unidentified chemicals as well as PAHs contained in OE of subway PM10 may induce genotoxic effects and further researches are needed to identify the genotoxic compounds in subway PM.

Keywords

Authors

Jung, MH; Kim, HR; Park, YJ; Park, DS; Chung, KH; Oh, SM

Volume	Issue	Pages	Date Published	Times Cited
749	1-2	39-47	December 12, 20	2

Digital Object Identifier (DOI)

10.1016/j.mrgentox.2012.08.002

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mutagenic activity of airborne particulate matter (PM10) in a sugarcane farming area (Araraquara city, southeast Brazil)

Publication / Journal

Environmental Research

Abstract

Brazil contains 25% of the total land planted with sugarcane in the world and is thus one of the major producers. The annual burning of sugarcane fields prior to harvesting emits huge amounts of pyrogenic particles. Biomass burning is an important primary and secondary source of aerosol particles. The presence of carbonaceous particles in the inhalable size range makes it important to study this fraction in view of the possible effects on human health and the climate. In this study, the mutagenic activity associated with inhalable airborne particulate matter (PM10) collected on air filters in a sugarcane-growing area near the city of Araraquara (SE Brazil) was determined. The extracts were dissolved in dimethylsulfoxide and tested for mutagenicity by the Ames plate incorporation test with Salmonella typhimurium YG1024 in the presence and absence of the S9 mixture. To assess the association between mutagenicity and PM10, samples were collected in sugarcane harvesting and non-harvesting periods of the year. Significant mutagenicity was detected in organic solvent extracts of all samples, with differences between the two periods. The highest values of mutagenic potency (13.45 and 5.72 revertants/m(3) of air in the absence and presence of the S9 mixture, respectively) were observed during the harvest. In this period, a Teflon (TM)-coated glass-fiber air filter trapped 67.0 mu g of particulate matter per m(3) of air. In the non-harvest period, on the same type of filter, only 20.9 mu g of particulate matter was found per m(3). The mutagenic potencies at this time were 1.30 and 1.04 revertants/m(3) of air, in the absence and presence of the S9 mixture, respectively. Period, concentration of PM10 and mutagenicity were associated with each other. For routine monitoring of mutagenicity in the atmosphere, the use of YG1024 tester strain without metabolic activation (S9) is recommended.

Keywords

Authors

de Andrade, SJ; Varella, SD; Pereira, GT; Zocolo, GJ; de Marchi, MRR; Varanda, EA

Volume	Issue	Pages	Date Published	Times Cited
111	4	545-550	May 2011	1

Digital Object Identifier (DOI)

10.1016/j.envres.2011.03.004

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: A

Title

Physical-Chemical and Microbiological Characterization, and Mutagenic Activity of Airborne PM Sampled in a Biomass-Fueled Electrical Production Facility

Publication / Journal

Environmental and Molecular Mutagenesis

Abstract

Biomass combustion is used in heating and electric power generation in many areas of the world. Airborne particulate matter (PM) is released when biomass is brought to a facility, stored, and combusted. Occupational exposure to airborne PM within biomass-fueled facilities may lead to health problems. In March and August of 2006, airborne PM was collected from a biomass-fueled facility located in Denmark. In addition, source-specific PM was generated from straw and wood pellets using a rotating drum. The PM was analyzed for polycyclic aromatic hydrocarbons (PAHs), metals, microbial components, mutagenic activity, and ability to generate highly reactive oxygen species (hROS) in cell-free aqueous suspensions. PM collected from the boiler room and the biomass storage hall had higher levels of mutagenic activity, PAHs and metals, and a higher hROS generating potential than the source specific PM. The mutagenic activity was generally more potent without S9 activation, and on the metabolically enhanced strain YG1041, relative to TA98. Significant correlations were found between mutagenicity on YG1041 (without S9) and PAH concentration and mutagenicity on YG1041 (with S9) and hROS generating ability. PM collected in March was more toxic than PM collected in August. Overall, airborne PM collected from the facility, especially that from the boiler room, were more toxic than PM generated from straw and wood chips. The results suggest that exposure to combustion PM in a biomass-fueled facility, which likely includes PM from biomass combustion as well as internal combustion vehicles, may contribute to an elevated risk of adverse health effects.

Keywords

Authors

Cohn, CA; Lemieux, CL; Long, AS; Kystol, J; Vogel, U; White, PA; Madsen, AM

Volume: 52

Issue: 4

Pages: 319-330

Date Published: May 2011

Times Cited: 1

Digital Object Identifier (DOI): 10.1002/em.20628

Media Category: Biotic

Generation Type: Biomass

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

In vitro biological effects of airborne PM2.5 and PM10 from a semi-desert city on the Mexico-US border

Publication / Journal

Chemosphere

Abstract

Compelling evidence indicates that exposure to urban airborne particulate matter (PM) affects health. However, how PM components interact with PM-size to cause adverse health effects needs elucidation, especially when considering soil and anthropogenic sources. We studied PM from Mexicali. Mexico, where soil particles contribute importantly to air pollution, expecting to differentiate in vitro effects related to PM-size and composition. PM samples with mean aerodynamic diameters <= 2.5 mu m (PM2.5) and <= 10 mu m (PM10) were collected in Mexicali (October 2005-March 2006) from a semi-urban (expected larger participation of soil sources) and an urban (predominately combustion sources) site. Samples were pooled by site and size, analyzed for elemental composition (particle-induced X-ray emission) and tested in vitro for: induction of human erythrocytes membrane disruption (hemolysis) (colorimetrically); inhibition of cell proliferation (ICP) (crystal violet) and TNF alpha/IL-6 secretion (ELISA) using J774.A1 murine monocytic cells; and DNA degradation using Balb/c3T3 cell naked DNA (electrophoretically). Results of PM elemental composition principal component analysis were used in associating cellular effects. Sixteen elements identified in PM grouped in two principal components: Component(1) (C-1): Mg, Al, Si. P. Cl, K, Ca, Ti, V. Cr, Fe, and Component(2) (C-2): Cu, Zn. Hemolysis was predominately induced by semi-urban-PM10 ($p < 0.05$) and was associated with urban-PM10 C-1 ($r = 0.62$, $p = 0.003$). Major ICP resulted with semi-urban PM2.5 ($p < 0.05$). TNF alpha, was mainly induced by urban samples regardless of size ($p < 0.05$) and associated with urban-PM2.5 C-2 ($r = 0.48$, $p = 0.02$). Both PM10 samples induced highest DNA degradation ($p < 0.05$), regardless of location. We conclude that PM-size and PM-related soil or anthropogenic elements trigger specific biological-response patterns.

Keywords

Authors

Osornio-Vargas, AR; Serrano, J; Rojas-Bracho, L; Miranda, J; Garcia-Cuellar, C; Reyna, MA; Flores, G; Zuk, M; Quintero, M; Vazquez, I; Sanchez-Perez, Y; Lopez, T; Rosas, I

Volume	Issue	Pages	Date Published	Times Cited
83	4	618-626	April 2011	14

Digital Object Identifier (DOI)

10.1016/j.chemosphere.2010.11.073

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Assessing the tolerance of the terrestrial moss Pseudoscleropodium purum to high levels of atmospheric heavy metals: A reciprocal transplant study

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

We measured the concentrations of Cd, Cu, Hg, Pb and Zn in samples of the terrestrial moss Pseudoscleropodium purum reciprocally transplanted between an unpolluted and two polluted sampling sites. At the beginning of the experiment, the concentrations of all these elements differed significantly between mosses from the unpolluted site and mosses from the polluted sites. In general, the concentrations of the heavy metals in mosses from both polluted sites transplanted to the unpolluted site decreased until they reached the same levels as in autotransplants at this site (after 480-840 days). However, the concentrations of all heavy metals in mosses transplanted from the unpolluted site to both polluted sites increased to. higher levels than in the autotransplants (except for Cu, Hg and Pb at one of the sampling sites). These results led us to conclude that mosses that have been continuously exposed to high atmospheric deposition of heavy metals undergo an adaptive response (probably genotypic) to such conditions. We therefore recommend active rather than passive biomonitoring of air quality in industrial environments because atmospheric deposition could be underestimated, and also recommend further investigation into the mechanisms involved in this response.

Keywords

Authors

Boquete, MT; Fernandez, JA; Carballeira, A; Aboal, JR

Volume: 461

Issue:

Pages: 552-559

Date Published: September 2013

Times Cited: 1

Digital Object Identifier (DOI): 10.1016/j.scitotenv.2013.05.039

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The linear accumulation of atmospheric mercury by vegetable and grass leaves: Potential biomonitors for atmospheric mercury pollution

Publication / Journal

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract

One question in the use of plants as biomonitors for atmospheric mercury (Hg) is to confirm the linear relationships of Hg concentrations between air and leaves. To explore the origin of Hg in the vegetable and grass leaves, open top chambers (OTCs) experiment was conducted to study the relationships of Hg concentrations between air and leaves of lettuce (Lactuca sativa L.), radish (Raphanus sativus L.), alfalfa (Medicago sativa L.) and ryegrass (Lolium perenne L.). The influence of Hg in soil on Hg accumulation in leaves was studied simultaneously by soil Hg-enriched experiment. Hg concentrations in grass and vegetable leaves and roots were measured in both experiments. Results from OTCs experiment showed that Hg concentrations in leaves of the four species were significantly positively correlated with those in air during the growth time ($p < 0.05$), while results from soil Hg-enriched experiment indicated that soil-borne Hg had significant influence on Hg accumulation in the roots of each plant ($p < 0.05$), and some influence on vegetable leaves ($p < 0.05$), but no significant influence on Hg accumulation in grass leaves ($p > 0.05$). Thus, Hg in grass leaves is mainly originated from the atmosphere, and grass leaves are more suitable as potential biomonitors for atmospheric Hg pollution. The effect detection limits (EDLs) for the leaves of alfalfa and ryegrass were 15.1 and 22.2 ng g(-1), respectively, and the biological detection limit (BDL) for alfalfa and ryegrass was 3.4 ng m(-3).

Keywords

Authors

Niu, ZC; Zhang, XS; Wang, S; Ci, ZJ; Kong, XR; Wang, ZW

Volume	Issue	Pages	Date Published	Times Cited
20	9	6337-6343	September 2013	1

Digital Object Identifier (DOI)

10.1007/s11356-013-1691-0

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

The inflammatory response in lungs of rats exposed on the airborne particles collected during different seasons in four European cities

Publication / Journal

Journal Of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering

Abstract

Epidemiological studies have reported associations of ambient particulate air pollution, especially particulate matter (PM) less than 10 mu m with exacerbations of asthma and chronic obstructive pulmonary disease. In an in vivo model, we have tested the toxicity of urban airborne particles collected during spring, summer, and winter seasons in four cities (Amsterdam, Lodz, Oslo, and Rome) spread across Europe. The seasonal differences in inflammatory responses were striking, and almost all the study parameters were affected by PM. Coarse fractions of the urban particle samples were less potent per unit mass than the fine fractions in increasing cytokine [macrophage inflammatory protein (MIP)-2 and tumor necrosis factor (TNF)-alpha] levels and in reducing Clara-cell secretory protein (CC16) levels. This study shows that PM collected at 4 contrasting sites across Europe and during different seasons have differences in toxic potency. These differences were even more prominent between the fine and coarse fractions of the PM.

Keywords

Authors

Halatek, T ; Stepnik, M; Stetkiewicz, J; Krajnow, A; Kur, B; Szymczak, W; Rydzynski, K; Dybing, E; Cassee, FR

Volume: 46

Issue: 13

Pages: 1469-1481

Date Published: 2011

Times Cited: 4

Digital Object Identifier (DOI): 10.1080/10978526.2011.609064

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Radical-Containing Particles Activate Dendritic Cells and Enhance Th17 Inflammation in a Mouse Model of Asthma

Publication / Journal

American Journal of Respiratory Cell and Molecular Biology

Abstract

We identified a previously unrecognized component of airborne particulate matter (PM) formed in combustion and thermal processes, namely, environmentally persistent free radicals (EPFRs). The pulmonary health effects of EPFRs are currently unknown. In the present study, we used a model EPFR-containing pollutant-particle system referred to as MCP230. We evaluated the effects of MCP230 on the phenotype and function of bone marrow-derived dendritic cells (BMDCs) in vitro and lung dendritic cells (DCs) in vivo, and the subsequent T-cell response. We also investigated the adjuvant role of MCP230 on airway inflammation in a mouse model of asthma. MCP230 decreased intracellular reduced glutathione (GSH) and the GSH/oxidized glutathione ratio in BMDCs, and up-regulated the expression of costimulatory molecules CD80 and CD86 on DCs. The maturation of DCs was blocked by inhibiting oxidative stress or the uptake of MCP230. BMDCs exposed to MCP230 increased their antigen-specific T-cell proliferation in vitro. In a model of asthma, exposure to MCP230 exacerbated pulmonary inflammation, which was attributed to the increase of neutrophils and macrophages but not eosinophils. This result correlated with an increase in Th17 cells and cytokines, compared with non-MCP230-treated but ovalbumin (OVA)-challenged mice. The percentage of Th2 cells was comparable between OVA and OVA 1 MCP230 mice. Our data demonstrate that combustion-generated, EPFR-containing PM directly induced the maturation of DCs in an uptake-dependent and oxidative stress-dependent manner. Furthermore, EPFR-containing PM induced a Th17-biased phenotype in lung, accompanied by significant pulmonary neutrophilia. Exposure to EPFR-containing PM may constitute an important and unrecognized risk factor in the exacerbation and development of a severe asthma phenotype in humans.

Keywords

Authors

Wang, PL; Thevenot, P; Saravia, J; Ahlert, T; Cormier, SA

Volume	Issue	Pages	Date Published	Times Cited
45	5	977-983	November 2011	6

Digital Object Identifier (DOI)

10.1165/rcmb.2011-00010C

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Cardiopulmonary response to inhalation of secondary organic aerosol derived from gas-phase oxidation of toluene

Publication / Journal

Inhalation Toxicology

Abstract

The biological response to inhalation of secondary organic aerosol (SOA) was determined in rodents exposed to SOA derived from the oxidation of toluene, a precursor emitted from anthropogenic sources. SOA atmospheres were produced to yield 300 mu g.m(-3) of particulate matter (PM) plus accompanying gases. Whole-body exposures were conducted in mice to assess both pulmonary and cardiovascular effects. ApoE(-/-) mice were exposed for 7 days and measurements of TBARS and gene expression of heme-oxygenase-1 (HO-1), endothelin-1 (ET-1), and matrix metalloproteinase-9 (MMP-9) were made in aorta. Pulmonary inflammatory responses in both species were measured by bronchoalveolar lavage fluid (BALF) cell counts. No pulmonary inflammation was observed. A mild response was observed in mouse aorta for the upregulation of ET-1 and HO-1, with a trend for increased MMP-9 and TBARS, and. Overall, toluene-derived SOA revealed limited biological response compared with previous studies using this exposure protocol with other environmental pollutants.

Keywords

Authors

McDonald, JD; Doyle-Eisele, M; Kracko, D; Lund, A; Surratt, JD; Hersey, SP; Seinfeld, JH; Rohr, AC; Knipping, EM

Volume	Issue	Pages	Date Published	Times Cited
24	11	689-697	September 2012	

Digital Object Identifier (DOI)

10.3109/08958378.2012.712164

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Evaluation of the Effect of Pollution and Fungal Disease on Pinus radiata Pollen Allergenicity

Publication / Journal

INTERNATIONAL ARCHIVES OF ALLERGY AND IMMUNOLOGY

Abstract

Background: Pollutants and other stressing factors like mold infection might increase the production of pathogen-related proteins in plants. Since this is invoked as one of the causes for the high prevalence of allergic diseases in developed countries, we aimed to determine the potential effect of environmental pollution, with or without mold infection of the trees, on the allergenic potency of pine pollen (Pinus radiata). Methods: Pine pollen samples were recovered from three selected areas: low polluted (A), highly polluted (B) and highly polluted and infected with fungi (Spheropsis sapinea) (C). The allergenic potency of pollen from areas A, B or C were compared in vivo in 35 pine pollen-allergic patients by skin prick test and specific IgE (sIgE) quantification. Pollen was also analyzed in vitro by SDS-PAGE immunoblotting, RAST inhibition and cDNA-AFLP (amplified fragment length polymorphism) to compare differences in proteins and mRNA expression. Results: The allergenic potency measured by prick test, sIgE and RAST inhibition was greater in pollen A, which was exposed to smaller amounts of NOx, PM10 and SO2 but greater amounts of O-3. No differences were found in IgE-binding bands in immunoblotting or densitometry of the bands. In cDNA-AFLP, three homologous transcript-derived fragments were expressed in samples B only, with an expressed sequence tag related with stress-regulated gene expression. Conclusions: A greater allergenic potency, in terms of skin tests and sIgE, is observed in pine pollen coming from unpolluted areas. We consider that this fact might be related to a higher exposure to ozone, resulting in a greater expression of allergenic proteins.

Keywords

Authors

Garcia-Gallardo, MV; Algorta, J; Longo, N; Espinel, S; Aragones, A; Lombardero, M; Bernaola, G; Jauregui, I; Aranzabal, A; Albizu, MV; Gastaminza, G

Volume	Issue	Pages	Date Published	Times Cited
160	3	241-250	2013	0

Digital Object Identifier (DOI)

10.1159/000341368

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

ST Depression, Arrhythmia, Vagal Dominance, and Reduced Cardiac Micro-RNA in Particulate-Exposed Rats

Publication / Journal

American Journal of Respiratory Cell and Molecular Biology

Abstract

Recently, investigators demonstrated associations between fine particulate matter (PM)-associated metals and adverse health effects. Residual oil fly ash (ROFA), a waste product of fossil fuel combustion from boilers, is rich in the transition metals Fe, Ni, and V, and when released as a fugitive particle, is an important contributor to ambient fine particulate air pollution. We hypothesized that a single-inhalation exposure to transition metal-rich PM will cause concentration-dependent cardiovascular toxicity in spontaneously hypertensive (SH) rats. Rats implanted with telemeters to monitor heart rate and electrocardiogram were exposed once by nose-only inhalation for 4 hours to 3.5 mg/m(3), 1.0 mg/m(3), or 0.45 mg/m(3) of a synthetic PM (dried salt solution), similar in composition to a well-studied ROFA sample consisting of Fe, Ni, and V. Exposure to the highest concentration of PM decreased T-wave amplitude and area, caused ST depression, reduced heart rate (HR), and increased non-conducted P-wave arrhythmias. These changes were accompanied by increased pulmonary inflammation, lung resistance, and vagal tone, as indicated by changes in markers of HR variability (increased root of the mean of squared differences of adjacent RR intervals [RMSSD], low frequency [LF], high frequency [HF], and decreased LF/HF), and attenuated myocardial micro-RNA (RNA segments that suppress translation by targeting messenger RNA) expression. The low and intermediate concentrations of PM had less effect on the inflammatory, HR variability, and micro-RNA endpoints, but still caused significant reductions in HR. In addition, the intermediate concentration caused ST depression and increased QRS area, whereas the low concentration increased the T-wave parameters. Thus, PM-induced cardiac dysfunction is mediated by multiple mechanisms that may be dependent on PM concentration and myocardial vulnerability (this abstract does not reflect the policy of the United States Environmental Protection Agency).

Keywords

Authors

Farraj, AK; Hazari, MS; Haykal-Coates, N; Lamb, C; Winsett, DW; Ge, Y; Ledbetter, AD; Carll, AP; Bruno, M; Ghio, A; Costa, DL

Volume	Issue	Pages	Date Published	Times Cited
44	2	185-196	February 2011	

Digital Object Identifier (DOI)

10.1165/rcmb.2009-0456OC

Media Category	Generation Type	CoalType	BiomassType
Biotic	Coal		

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

PM 2.5 collected in a residential area induced Th1-type inflammatory responses with oxidative stress in mice

Publication / Journal

Environmental Research

Abstract

Epidemiologists have tried to establish an association between human health and exposure to particulate matter (PM). In addition, many researchers have investigated the adverse effects of PM as a trigger of cardiovascular and pulmonary diseases. It is known that a number of environmental contaminants are attached to PM and the toxicity of PM may depend on the sources. We investigated the effects of PM collected in a residential area of Seoul on the immunotoxic responses including cytokine production in BAL fluid and in blood after a single intratracheal instillation in mice with the characterization of physico-chemical properties of PM 2.5 samples. As results, pro-inflammatory cytokines (IL-1, TNF-alpha, and IL-6). Th0-type cytokine (IL-2), and Th1-type cytokines (IL-12 and IFN-gamma) were increased by a dose-dependent manner. Cell infiltration in the alveolar area and phagocytosis by macrophage was observed until day 28 after instillation. The expressions of oxidative stress-related genes (HSP 1a, HSP 8, and SOD) and tissue damage-related genes (MMP-15, -19, and Slpi) were time-dependently increased. PM 2.5 also induced an increase of T cell distribution in lymphocyte and decreased the CD4+/CD8+ ratio. Based on the results, we suggest that PM 2.5 collected in a residential area of Seoul may induce Th1 type-inflammatory responses with oxidative stress and trigger adverse effects in human health.

Keywords

Authors

Park, EJ; Roh, J; Kim, Y; Park, K; Kim, DS; Yu, SD

Volume	Issue	Pages	Date Published	Times Cited
11	3	348-355	April 2011	

Digital Object Identifier (DOI)

10.1016/j.envres.2010.11.001

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Health effects of subchronic inhalation exposure to simulated downwind coal combustion emissions

Publication / Journal

Inhalation Toxicology

Abstract

Objective: This was the fourth study by the National Environmental Respiratory Center to create a database for responses of animal models to combustion-derived pollutant mixtures, to identify causal pollutants--regardless of source.
Methods: F344 and SHR rats and A/J, C57BL/6, and BALB/c mice were exposed 6 h/day 7 days/week for 1 week to 6 months to three concentrations of a mixture simulating key components of ""downwind"" coal combustion emissions, to the highest concentration filtered to remove particulate matter (PM), or to clean air. Emissions from low-sulfur subbituminous coal were modified to create a mixture recommended by an expert workshop. Sulfur dioxide, nitrogen oxides, and PM were the dominant components. Nonanimal-derived PM mass concentrations of nominally 0, 100, 300, and 1000 mu A mu g/m<SU3</SU were mostly partially neutralized sulfate.
Results: Only17 of 270 species-gender-time-outcome comparisons were significantly affected by exposure; some models showed no effects. There was strong evidence that PM participated meaningfully in only three responses.
Conclusion: On a total mass or PM mass basis, this mixture was less toxic overall than diesel and gasoline exhausts or wood smoke. The largely sulfate PM contributed to few effects and was the sole cause of none. The study did not allow identification of causal pollutants, but the potential role of NOx in some effects is suggested by the literature.

Keywords

Authors

Mauderly, JL; Barrett, EG; Gigliotti, AP; McDonald, JD; Reed, MD; Seagrave, J; Mitchell, LA; Seilkop, SK

Volume	Issue	Pages	Date Published	Times Cited
23	6	349-362	May 2011	

Digital Object Identifier (DOI)

10.3109/08958378.2011.572932

Media Category	Generation Type	CoalType	BiomassType
Biotic	Coal	Subbitumous Coal	

Mammals	☑	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Relative proportions of FAs in the seed oils of Peristrophe bicalyculata and Ruellia tuberosa as affected by air pollution

Publication / Journal

Journal of Food Agriculture & Environment

Abstract

Effects of environmental degradation on secondary metabolites of therapeutic significance are yet to be duly investigated and understood. This study explores the effect of coal-smoke pollution, created by emissions of a thermal power plant in the Uttar Pradesh state of India and comprising mainly of CO(2), SO(2), NO(x) and particulate matters, on the oil contents and the fatty acid (FA) proportions in seed oils of two medicinal herbs, namely, Peristrophe bicalyculata (Retz.) Nees and Ruellia tuberosa Linn. Under the pollution stress, the oil content was significantly increased in P. bicalyculata but decreased in R. tuberosa. In the Peristrophe oil, the relative proportion of lignoseric acid decreased, whereas those of other FAs increased. In the Ruellia oil, the proportions of caprylic and lauric acid increased, while those of others decreased at the polluted site. These findings are suggestive of investigating whether changes in chemical composition of oils, such as these, may have a bearing on the therapeutic properties of the oil concerned.

Keywords

Authors

Iqbal, M; Mahmooduzzafar; Nighat, F; Aref, IM

Volume	Issue	Pages	Date Published	Times Cited
9	3-4	1101-1104	July-October 201	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic	Coal		

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Regulation of the arachidonic acid mobilization in macrophages by combustion-derived particles

Publication / Journal

Particle and Fibre Toxicology

Abstract

Background: Acute exposure to elevated levels of environmental particulate matter (PM) is associated with increasing morbidity and mortality rates. These adverse health effects, e. g. culminating in respiratory and cardiovascular diseases, have been demonstrated by a multitude of epidemiological studies. However, the underlying mechanisms relevant for toxicity are not completely understood. Especially the role of particle-induced reactive oxygen species (ROS), oxidative stress and inflammatory responses is of particular interest. In this in vitro study we examined the influence of particle-generated ROS on signalling pathways leading to activation of the arachidonic acid (AA) cascade. Incinerator fly ash particles (MAF02) were used as a model for real-life combustion-derived particulate matter. As macrophages, besides epithelial cells, are the major targets of particle actions in the lung murine RAW264.7 macrophages and primary human macrophages were investigated.
Results: The interaction of fly ash particles with macrophages induced both the generation of ROS and as part of the cellular inflammatory responses a dose-and time-dependent increase of free AA, prostaglandin E(2)/thromboxane B(2) (PGE(2)/TXB(2)), and 8-isoprostane, a non-enzymatically formed oxidation product of AA. Additionally, increased phosphorylation of the mitogen-activated protein kinases (MAPK) JNK1/2, p38 and ERK1/2 was observed, the latter of which was shown to be involved in MAF02-generated AA mobilization and phosphorylation of the cytosolic phospolipase A(2). Using specific inhibitors for the different phospolipase A(2) isoforms the MAF02-induced AA liberation was shown to be dependent on the cytosolic phospholipase A(2), but not on the secretory and calcium-independent phospholipase A(2). The initiation of the AA pathway due to MAF02 particle exposure was demonstrated to depend on the formation of ROS since the presence of the antioxidant N-acetyl-cysteine (NAC) prevented the MAF02-mediated enhancement of free AA, the subsequent conversion to PGE(2)/TXB(2) via the induction of COX-2 and the ERK1/2 and JNK1/2 phosphorylation. Finally we showed that the particle-induced formation of ROS, liberation of AA and PGE(2)/TXB(2) together with the phosphorylation of ERK1/2 and JNK1/2 proteins was decreased after pre-treatment of macrophages with the metal chelator deferoxamine mesylate (DFO).
Conclusions: These results indicate that one of the primary mechanism initiating inflammatory processes by incinerator fly ash particles seems to be the metal-mediated generation of ROS, which triggers via the MAPK cascade the activation of AA signalling pathway.

Keywords

Authors

Fritsch-Decker, S; Both, T; Mulhopt, S; Paur, HR; Weiss, C; Diabate, S

Volume	Issue	Pages	Date Published	Times Cited
8			August 2, 2011	

Digital Object Identifier (DOI)

10.1186/1743-8977-8-23

Media Category	Generation Type	CoalType	BiomassType
Biotic	Biomass		

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐

Benthic Invertebrates	☐	Humidity	☐
Lichen/Moss	☐	Other Abiotic Medium	☐
Microbes	☐		
Other Biotic Medium	☐		

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Susceptibility to Inhaled Flame-Generated Ultrafine Soot in Neonatal and Adult Rat Lungs

Publication / Journal

Toxicological Sciences

Abstract

Over a quarter of the U.S. population is exposed to harmful levels of airborne particulate matter (PM) pollution, which has been linked to development and exacerbation of respiratory diseases leading to morbidity and mortality, especially in susceptible populations. Young children are especially susceptible to PM and can experience altered anatomic, physiologic, and biological responses. Current studies of ambient PM are confounded by the complex mixture of soot, metals, allergens, and organics present in the complex mixture as well as seasonal and temporal variance. We have developed a laboratory-based PM devoid of metals and allergens that can be replicated to study health effects of specific PM components in animal models. We exposed 7-day-old postnatal and adult rats to a single 6-h exposure of fuel-rich ultrafine premixed flame particles (PFPs) or filtered air. These particles are high in polycyclic aromatic hydrocarbons content. Pulmonary cytotoxicity, gene, and protein expression were evaluated at 2 and 24 h postexposure. Neonates were more susceptible to PFP, exhibiting increased lactate dehydrogenase activity in bronchoalveolar lavage fluid and ethidium homodimer-1 cellular staining in the lung in situ as an index of cytotoxicity. Basal gene expression between neonates and adults differed for a significant number of antioxidant, oxidative stress, and proliferation genes and was further altered by PFP exposure. PFP diminishes proliferation marker PCNA gene and protein expression in neonates but not adults. We conclude that neonates have an impaired ability to respond to environmental exposures that increases lung cytotoxicity and results in enhanced susceptibility to PFP, which may lead to abnormal airway growth.

Keywords

Authors

Chan, JKW; Fanucchi, MV; Anderson, DS; Abid, AD; Wallis, CD; Dickinson, DA; Kumfer, BM; Kennedy, IM; Wexler, AS ; Van Winkle, LS

Volume: 124

Issue: 2

Pages: 472-486

Date Published: December 2011

Times Cited:

Digital Object Identifier (DOI): 10.1093/toxsci/kfr233

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Different effects of polycyclic aromatic hydrocarbons in artificial and in environmental mixtures on the free living nematode C. elegans

Publication / Journal

Journal of Applied Toxicology

Abstract

Polycyclic aromatic hydrocarbons (PAHs) are known to exert mutagenic and carcinogenic effects. Research on extracted organic matter (EOM) from environmental mixtures has indicated several mechanisms of intracellular damage in living organisms. The toxic effect of environmental pollutants is usually assessed on cell systems or in single species. We used the model organism Caenorhabditis elegans to compare the effect of synthetic PAHs with that of the EOM from environmental mixtures. The biological effect was measured by monitoring the expression level of some crucial genes, sensitive parameters of the organism's response. The results indicate the ability of C. elegans to counteract damage by mounting a stress-response only in the presence of EOM. On the other hand the exposure of C. elegans to a mixture of synthetic PAHs determines the silencing of the transcriptional machinery, thus preventing the synthesis of proteins that are important for both the damage repair mechanism and survival itself. The results strongly indicate that the study of environmental toxicant effects at the molecular level may provide information on their mechanism of action.

Keywords

Authors

Liuzzi, VC; Daresta, BE; de Gennaro, G; De Giorgi, C

Volume	Issue	Pages	Date Published	Times Cited
32	1	45-50	January 2012	

Digital Object Identifier (DOI)

10.1002/jat.1634

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☑	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of Fetal Exposure to Urban Particulate Matter on the Immune System of Male Mouse Offspring

Publication / Journal

Biological and Pharmaceutical Bulletin

Abstract

Urban particulate matter (UPM) has been shown to have an aggravating effect on Th2-associated immune systems in adult mice. However, the effects of fetal exposure to UPM on immune response in offspring have not been elucidated. In the present study, we administered UPM (200 mu g/animal) by intratracheal injection to pregnant dams on days 7 and 14 of gestation. Subsequently, 9- and 24-week-old male offspring were intratracheally injected with ovalbumin (OVA) (four times at 2-week intervals) to create a mouse model of bronchial asthma. We then evaluated the progression of allergic manifestations in the offspring through histological findings, the number of inflammatory cells in bronchoalveolar lavage fluid (BALF), and protein concentration of cytokines and chemokines in BALF 5, 10, 15, and 30 weeks after birth. Histological examination showed that fetal exposure to UPM alone caused slight eosinophil and lymphocyte infiltration in the submucosa of the airway and bronchial epithelium and significant increases in the number of macrophages. Moreover, postnatal intratracheal administration of OVA to offspring exposed to UPM in utero caused significant increases in the numbers of macrophages, eosinophils, and lymphocytes and in the concentrations of their relevant cytokines and chemokines, showing that fetal exposure to UPM aggravated the chemically sensitized immune system of male offspring.

Keywords

Authors

Yoshida, S; Takano, H; Nishikawa, M; Miao, H; Ichinose, T

Volume	Issue	Pages	Date Published	Times Cited
35	8	1238-1243	August 2012	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Efficiency of log wood combustion affects the toxicological and chemical properties of emission particles

Publication / Journal

Inhalation Toxicology

Abstract

Context: Particulate matter (PM) has been identified as a major environmental pollutant causing severe health problems. Large amounts of the harmful particulate matter (PM) are emitted from residential wood combustion, but the toxicological properties of wood combustion particles are poorly known.
Objective: To investigate chemical and consequent toxicological characteristics of PM1 emitted from different phases of batch combustion in four heating appliances.
Materials and methods: Mouse RAW264.7 macrophages and human BEAS-2B bronchial epithelial cells were exposed for 24 h to different doses (15-300 mu g/mL) of wood combustion particles. After the exposure, cytotoxicity, genotoxicity, production of the inflammatory mediators (TNF-alpha and MIP-2) and effects on the cell cycle were assessed. Furthermore, the detected toxicological responses were compared with the chemical composition of PM1 samples including PAHs, metals and ions.
Results: All the wood combustion samples exerted high cytotoxicity, but only moderate inflammatory activity. The particles emitted from the inefficient phase of batch combustion in the sauna stove (SS) induced the most extensive cytotoxic and genotoxic responses in mammalian cells. Polycyclic aromatic hydrocarbons (PAHs) and other organic compounds in PM1 samples might have contributed to these effects. Instead, water-soluble metals seemed to participate in the cytotoxic responses triggered by the particles from more efficient batch combustion in the masonry heaters. Overall, the toxicological responses were decreased when the combustion phase was more efficient.
Conclusion: Efficiency of batch combustion plays a significant role in the harmfulness of PM even under incomplete wood combustion processes.

Keywords

Authors

Tapanainen, M; Jalava, PI; Maki-Paakkanen, J; Hakulinen, P; Lamberg, H; Ruusunen, J; Tissari, J; Jokiniemi, J; Hirvonen, MR

Volume	Issue	Pages	Date Published	Times Cited
24	6	343-355	May 2012	

Digital Object Identifier (DOI)

10.3109/08958378.2012.671858

Media Category	Generation Type	CoalType	BiomassType
Biotic	Biomass		

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Effects of Combined Pollution of SO2 and PAHs on Seed Germination and Growth of Wheat Seedlings in Shanxi Industrial and Mining Area

Publication / Journal

Asian Journal of Ecotoxicology

Abstract

Seed germination, plant height, root elongation and underground biomass of wheat seedlings in fresh mixed- loess soils contaminated by sulfur dioxide (SO2) and polycyclic aromatic hydrocarbons (PAHs) with different concentrations were studied to reveal the ecotoxical effects of combined pollution of SO2 and PAHs. The results indicated that seed germination was not sensitive to single or combined pollution of PAHs and SO2. Root elongation and plant height were affected by single pollution of PAHs or SO2 to different extents. Wheat seedlings growth was slightly improved at lower concentrations, while inhibited at higher concentrations. Plant height of wheat seedlings were correlated well with SO2 concentrations ($r = 0.954$, $P < 0.05$), but the correlation was not well with the concentrations of PAHs. Under combined pollution conditions, the joint action of SO2 and PAHs on plant height or root elongation reflected multiple synergism. Specifically, in the case of low concentration SO2 (<500 mg.kg(-1)), it showed synergistic stimulation, while the concentration of SO2 ranged from 500 similar to 1 000 mg.kg(-1), it showed synergistic inhibition. By single pollution of PAHs or SO2, underground biomass of wheat seedlings significantly correlated with concentrations of PAHs or SO2 ($r(PAHs) = - 0.953$, $r(SO2) = - 0.916$, $P < 0.05$). The combined effects of PAHs and SO2 on underground biomass of wheat seedlings showed synergistic stimulation when the concentration of SO2 was at 10 mg.kg(-1). It was showed synergistic inhibition when the concentration of SO2 was up to 1 000 mg.kg(-1) and the concentration of PAHs was up to 50 similar to 100 mg.kg(-1). By using the stepwise regression method, it was showed that plant height or root elongation of wheat seedlings were subject to the combined effect of PAHs and SO2. Meanwhile, SO2 was the main factor which affected the underground biomass of wheat seedlings under combined pollution conditions.

Keywords

Authors

Zhang Jun; Li Suqing; Di Xiaoyan; Wu Dongmei

Volume: 7

Issue: 6

Pages: 646-656

Date Published: December 2012

Times Cited: 1

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Occurrence and effects of tire wear particles in the environment - A critical review and an initial risk assessment

Publication / Journal

Environmental Pollution

Abstract

This review summarizes the existing knowledge on the occurrence of tire wear particles in the environment, and their ecotoxicological effects. A meta-analysis on tire components in the environment revealed that tire wear particles are present in all environmental compartments, including air, water, soils/sediments, and biota. The maximum Predicted Environmental Concentrations (PECs) of tire wear particles in surface waters range from 0.03 to 56 mg l(-1) and the maximum PECs in sediments range from 0.3 to 155 g kg(-1) d.w. The results from our previous long-term studies with Ceriodaphnia dubia and Pseudokirchneriella subcapitata were used to derive Predicted No Effect Concentrations (PNECs). The upper ranges for PEC/PNEC ratios in water and sediment were > 1, meaning that tire wear particles present potential risks for aquatic organisms. We suggest that management should be directed towards development and production of more environmentally friendly tires and improved road runoff treatment.

Keywords

Authors

Wik, A; Dave, G

Volume	Issue	Pages	Date Published	Times Cited
157	1	1-11	January 2009	

Digital Object Identifier (DOI)

10.1016/j.envpol.2008.09.028

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Respiratory consequences of red sludge dust inhalation in rats

Publication / Journal

Toxicology Letters

Abstract

The environmental disaster following flooding by red sludge in the Ajka region in Hungary poses a serious public health threat with particular concern regarding the potentially adverse respiratory effects of the inhalation of red sludge dust (RSD). The respiratory consequences of the inhalation of RSD obtained from field samples were investigated in rats. Rats were either exposed to RSD at a high concentration (2 weeks. 8 h/day), or kept in room air. After the exposures, the airway resistance (R-aw) and the respiratory tissues mechanics were measured under baseline condition, and following methacholine (MCh) challenges with the aim of establishing airway hyper-responsiveness (AH). Histopathology was performed to assess lung morphologic alterations. The physical properties and the chemical composition of the RSD were also characterized. The size distribution, chemical composition and topology of the RSD particles applied in our experiments were similar to those observed at the site of the disaster. The inhalation of RSD did not alter the basal respiratory mechanics, whereas it led to greater MCh-induced responses in R-aw, demonstrating the progression of mild AH. Histopathological investigations revealed fine, granular particles in the alveolar macrophages, as evidence that RSD had reached the lower respiratory tract and induced mild inflammation around the alveoli and the pulmonary vasculature. The mild respiratory symptoms that developed following short-term exposure of healthy individuals to high concentrations of airborne RSD do not appear to pose a greater respiratory hazard than the inhalation of urban dust at a comparable concentration.

Keywords

Authors

Czovek, D; Novak, Z; Somlai, C; Asztalos, T; Tiszlavicz, L; Bozoki, Z; Ajtai, T; Utry, N; Filep, A; Bari, F; Petak, F

Volume	Issue	Pages	Date Published	Times Cited
209	2	113-120	March 7, 2012	

Digital Object Identifier (DOI)

10.1016/j.toxlet.2011.12.006

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Impact of ambient air on physiology, pollen tube growth, pollen germination and yield in pepper (Capsicum annuum L.)

Publication / Journal

PAKISTAN JOURNAL OF BOTANY

Abstract

Pepper (Capsicum annuum L.) plants were exposed in open top-chambers to non-filtered ambient air (NFAA) and to charcoal filtered air (FA) to study the effect of ambient air on physiological parameters, growth, yield, as well as pollen tube and pollen growth of plants. NFAA caused reductions in net photosynthetic rates (19%), stomatal conductance (26%), yield components (29% and 25% losses in fresh weight and number of fruits/plant, respectively) as well as degradation of epicuticular wax of its leaves. Moreover, pollen collected from plants grown in NFAA showed lower germination rates and reductions in pollen tube length (41 and 10%, respectively). Our results showed that detrimental effects of O3 on reproductive growth and development are compromising current crop yields and the fitness. Fresh weight of pods was reduced by 29% due to exposure to NFAA. The significance of pollutant-induced impairment of pollen germination and growth for reproductive development are discussed. To the best of our knowledge, this is the first report demonstrating the marked reduction in pollen germination rates and pollen tube length and their significance to crop physiology and yield from the environment in the developing world.

Keywords

Authors

Taia, W; Basahi, J; Hassan, I

Volume	Issue	Pages	Date Published	Times Cited
45	3	921-926	May 2013	1

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Low levels of residual oil fly ash (ROFA) impair innate immune response against environmental mycobacteria infection in vitro

Publication / Journal

Toxicology In Vitro

Abstract

Epidemiological studies have shown that pollution derived from industrial and vehicular transportation provokes adverse health effects causing broad spectrum of ambient respiratory diseases. Therefore, air pollution should be taken into account when microbial diseases are evaluated. Environmental mycobacteria (EM) are opportunist pathogens in a variety of immunocompromised patients eliciting significant impact on human morbidity and mortality. The aim of this study was to evaluate the in vitro effects of residual oil fly ash (ROFA) on the alveolar macrophages (AMs) response to opportunistic bacteria.
AMs from young Wistar rats were obtained by bronchoalveolar lavage and co-cultured with Mycobacterium phlei (MOI 10). We exposed AM cultures to ROFA to characterize the effect of low ROFA concentrations (0.2.5, and 5 mu g/ml) and evaluated the response of pre-exposed AM against the bacilli. Low ROFA concentrations induced superoxide anion and nitrites production ($p < 0.001$). Pre-exposure to ROFA (2.5 and 5 mu g/ml) caused a significant reduction on TNF alpha ($p < 0.001$) and superoxide anion ($p < 0.001$) production but, did not modify the nitrite production when AM were co-cultured with M. phlei. In addition, ROFA significantly diminished AM killing ability in culture ($p < 0.001$). Hence, our results indicate that pre-exposure to low levels of ROFA modifies the innate pulmonary defence mechanisms against environmental mycobacteria.

Keywords

Authors

Delfosse, VC; Gioffre, AK; Tasat, DR

Volume	Issue	Pages	Date Published	Times Cited
26	6	1001-1006	September 2012	

Digital Object Identifier (DOI)

10.1016/j.tiv.2012.04.018

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Tumor necrosis factor-alpha mediates interactions between macrophages and epithelial cells underlying proinflammatory gene expression induced by particulate matter

Publication / Journal

Toxicology

Abstract

Ambient particulate matter (PM) exposure is known to have adverse effects on respiratory health, but the underlying mechanisms remain obscure. We tested the hypothesis that macrophages and epithelial cells synergize to produce maximal cytokine release in response to PM exposure, thereby promoting inflammatory responses. We developed a co-culture model using MLE-12 (mouse lung epithelial) cells and RAW 264.7 (mouse monocyte/macrophage) cells. MLE-12 cells produced KC (Cxcl1) but not tumor necrosis factor-alpha (TNF), and KC was upregulated only at high levels of urban particulate matter (UPM; NIST 1648a). RAW 264.7 cells produced TNF but not KC, and TNF production was increased by treatment with UPM. In contrast, KC production was upregulated by co-culture of MLE-12 and RAW 264.7 cells, and it was further increased by treatment with a concentration of UPM that had no effect on MLE-12 cells alone. Multiplex cytokine assay revealed a similar pattern of synergistic production of MIG (Cxcl9) and IP-10 (Cxcl10) in co-cultures in response to UPM. TNF was implicated as mediating the synergistic increase in KC production because TNF upregulated KC production in MLE-12 cells, and UPM-induced KC production in co-cultures could be inhibited by a TNF blocking antibody. Intratracheal instillation of UPM into both wild-type and TNF receptor knockout mice resulted in increased TNF production in lavage fluid and increased TNF mRNA expression in cells recovered from lavage fluid. Additionally, UPM instillation into wild-type mice resulted in increased neutrophils and KC in lavage fluid, and these were inhibited in UPM-exposed TNF receptor knockout mice. These results are consistent with a model in which PM activates TNF production in macrophages which in turn stimulates epithelial cells to produce proinflammatory cytokines such as KC. The findings suggest a potential mechanism by which inhaled PM induces inflammation in the lung.

Keywords

Authors

Musah, S; DeJarnett, N; Hoyle, GW

Volume	Issue	Pages	Date Published	Times Cited
299	2-3	125-132	September 28, 2	

Digital Object Identifier (DOI)

10.1016/j.tox.2012.05.014

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Effect of Sulphur Dioxide Toxicity on Seed Germination of Alstonia scholaris R. Br.

Publication / Journal

Advances in Plant Sciences

Abstract

Alstonia scholaris R. Br. is a traditionally important medicinal plant. The plant is used traditional ayurvedic, unani, Homeopathic medicine system against different ailments. In the present study, toxic effects of SO2 on seed germination were determined. The seeds were pre soaked in distell water and treated with respective doses of SO2 0.25, 0.50 and 1.00 ppm because SO2 is acidic pollutant and when it comes in contact of cotyledons it damage the enzymes and reduces the germination percentage. SO2 is a major phytotoxic pollutant which enters in to the seeds and causes chronic injuries as well as decrease the total germination percentage. The effect of SO2 on seed germination have been discussed by several workers. Exposure of seed SO2 had no significant effect. However, seed germination was significantly reduced may be due to the SO2 exposure inflicted heavy damage to proteins in the cells, which may damage the enzyme activity also. Earlier studies reported that SO2 is responsible for destruction of proteins. Furthermore it can be concluded that reduction in protein contents in caused by SO2 (Asada et al., 1987). In the present study the effort has been made to understand the effect of SO2 on germination of Alstonia scholaris R. Br. seeds.

Keywords

Authors

Khan, M. R.

Volume: 26

Issue: 1

Pages: 115-116

Date Published: June 2013

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The effects of particulate ambient air pollution on the murine umbilical cord and its vessels: A quantitative morphological and immunohistochemical study

Publication / Journal

Reproductive Toxicology

Abstract

Previous studies have shown that particulate matter (PM) compromise birth weight and placental morphology. We hypothesized that exposing mice to ambient PM would affect umbilical cord (UC) morphology. To test this, mice were kept in paired open-top exposure chambers at the same location and ambient conditions but, in one chamber, the air was filtered (F) and, in the other, it was not (NF). UCs were analysed stereologically and by immunohistochemistry to localize isoprostane and endothelin receptors. The cords of mice from NF chambers were smaller in volume due to loss of mucoid connective tissue and decrease in volume of collagen. These structural changes and in umbilical vessels were associated with greater volumes of regions immunostained for isoprostane, ETAR and ETBR. Findings indicate that the adverse effects of PM on birth weight may be mediated in part by alterations in UC structure or imbalances in the endogenous regulators of vascular tone and oxidative stress.

Keywords

Authors

Veras, MM; Guimaraes-Silva, RM; Caldini, EG; Saldiva, PHN; Dolhnikoff, M; Mayhew, TM

Volume	Issue	Pages	Date Published	Times Cited
34	4	598-606	December 2012	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

SO2 inhalation causes synaptic injury in rat hippocampus via its derivatives in vivo

Publication / Journal

CHEMOSPHERE

Abstract

SO2 remains a common air pollutant, almost half of the world's population uses coal and biomass fuels for domestic energy. Limited evidence suggests that exposure to SO2 may be associated with neurotoxicity and increased risk of hospitalization and mortality of many brain disorders. However, our understanding of the mechanisms by which SO2 causes harmful insults on neurons remains elusive. To explore the molecular mechanism of SO2-induced neurotoxic effects in hippocampal neurons, we evaluated the synaptic plasticity in rat hippocampus after exposure to SO2 at various concentrations (3.5 and 7 mg m(-3), 6 h d(-1), for 90 d) in vivo, and in primary cultured hippocampal neurons (DIV7 and DIV14) after the treatment of SO2 derivatives in vitro. The results showed that SYP, PSD-95, NR-2B, p-ERK1/2 and p-CREB were consistently inhibited by SO2/SO2 derivatives in more mature hippocampal neurons in vivo and in vitro, while the effects were opposite in young hippocampal neurons. Our results indicated that in young neurons, SO2 exposure produced neuronal insult is similar to ischemic injury; while in more mature neurons, SO2 exposure induced synaptic dysfunctions might participate in cognitive impairment. The results implied that SO2 inhalation could cause different neuronal injury during brain development, and suggested that the molecular mechanisms might be involved in the changes of synaptic plasticity.

Keywords

Authors

Yun, Y; Yao, GY; Yue, HF; Guo, L; Qin, GH; Li, GK; Sang, N

Volume	Issue	Pages	Date Published	Times Cited
93	10	2426-2432	November 2013	0

Digital Object Identifier (DOI)

10.1016/j.chemosphere.2013.08.063

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Signal regulation involved in sulfur dioxide-induced guard cell apoptosis in Hemerocallis fulva

Publication / Journal

ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY

Abstract

Chronic and acute exposure to SO2 is associated with increased risks of various damages to plants. In the present study, epidermal strip experiment was employed to investigate SO2-induced guard cells apoptosis and the signal regulation in Hemerocallis fulva. The results showed that with the increase of treatment concentrate of SO2 derivates (a mixture of sodium sulfite and sodium bisulfite, 3:1, mmol L-1/mmol L-1, 1.0-5.0 mmol L-1), the physiological activity of the guard cells declined and cell death occurred. While the concentration of SO2 derivatives exceeded 2.0 mmol L-1, the percentage of cell death increased significantly ($P < 0.05$). Typical features of apoptosis including nuclear condensation, nuclear elongation, fragmentation etc. were found. Meanwhile, concomitant presence of nitric oxide (NO), reactive oxygen species (ROS) and Ca2+ level increment appeared. However, SO2-induced cell death can be effectively blocked by either of the following substances with their respective optimal concentrations: antioxidant ascorbic acid (Asc; 0.05 mmol L-1) or catalase (CAT; 200 U mL(-1)), nitric oxide (NO) scavenger 2-(4-carboxyphenyl)-4, 4, 5, 5- tetramethylmidiazoline-1-oxyl-3-oxide (c-PTIO; 0.20 mmol L-1), nitrate reductase inhibitor NaN3 (0.20 mmol L-1), Ca2+ chelating agent EGTA (0.05 mmol L-1) or plasma membrane Ca2+ channel blocker LaCl3 (0.05 mmol L-1). In addition to a significant decrease in cell death rate, a reduction in the levels of reactive oxygen species (ROS), NO and Ca2+ was observed. Further study showed that compared to treatment with SO2 alone, Asc treatment led to a decrease in NO and Ca-2 levels and NaN3 treatment led to a decrease in ROS and Ca2+ levels, but the NO and ROS levels of the LaCl3 treatment changed little. All results suggested that NO, ROS and Ca2+ were involved in the apoptosis induced by SO2 in H. fulva. The process might be related to the burst of NO or ROS, which would activate the plasma Ca2+ channel and result in the increase of intercellular Ca-2.

Keywords

Authors

Wei, AL; Xin, XJ; Wang, YS; Zhang, C; Cao, DM

Volume	Issue	Pages	Date Published	Times Cited
98		41-45	December 2013	0

Digital Object Identifier (DOI)

10.1016/j.ecoenv.2013.09.029

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Age-Specific Effects on Rat Lung Glutathione and Antioxidant Enzymes after Inhaling Ultrafine Soot

Publication / Journal

American Journal of Respiratory Cell and Molecular Biology

Abstract

Vehicle exhaust is rich in polycyclic aromatic hydrocarbons (PAHs) and is a dominant contributor to urban particulate pollution (PM). Exposure to PM is linked to respiratory and cardiovascular morbidity and mortality in susceptible populations, such as children. PM can contribute to the development and exacerbation of asthma, and this is thought to occur because of the presence of electrophiles in PM or through electrophile generation via the metabolism of PAHs. Glutathione (GSH), an abundant intracellular antioxidant, confers cytoprotection through conjugation of electrophiles and reduction of reactive oxygen species. GSH-dependent phase II detoxifying enzymes glutathione peroxidase and glutathione S-transferase facilitate metabolism and conjugation, respectively. Ambient particulates are highly variable in composition, which complicates systematic study. In response, we have developed a replicable ultrafine premixed flame particle (PFP)-generating system for in vivo studies. To determine particle effects in the developing lung, 7-day-old neonatal and adult rats inhaled 22 mu g/m(3) PFP during a single 6-hour exposure. Pulmonary GSH and related phase II detoxifying gene and protein expression were evaluated 2, 24, and 48 hours after exposure. Neonates exhibited significant depletion of GSH despite higher initial baseline levels of GSH. Furthermore, we observed attenuated induction of phase II enzymes (glutamate cysteine ligase, glutathione reductase, glutathione S-transferase, and glutathione peroxidase) in neonates compared with adult rats. We conclude that developing neonates have a limited ability to deviate from their normal developmental pattern that precludes adequate adaptation to environmental pollutants, which results in enhanced cytotoxicity from inhaled PM.

Keywords

Authors

Chan, JKW; Kodani, SD; Charrier, JG; Morin, D; Edwards, PC; Anderson, DS; Anastasio, C; Van Winkle, LS

Volume	Issue	Pages	Date Published	Times Cited
48	1	114-124	January 2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The Influence of Nrf2 on Cardiac Responses to Environmental Stressors

Publication / Journal

Oxidative Medicine and Cellular Longevity

Abstract

Nrf2 protects the lung from adverse responses to oxidants, including 100% oxygen (hyperoxia) and airborne pollutants like particulate matter (PM) exposure, but the role of Nrf2 on heart rate (HR) and heart rate variability (HRV) responses is not known. We hypothesized that genetic disruption of Nrf2 would exacerbate murine HR and HRV responses to severe hyperoxia or moderate PM exposures. Nrf2(-/-) and Nrf2(+/+) mice were instrumented for continuous ECG recording to calculate HR and HRV (low frequency (LF), high frequency (HF), and total power (TP)). Mice were then either exposed to hyperoxia for up to 72 hrs or aspirated with ultrafine PM (UF-PM). Compared to respective controls, UF-PM induced significantly greater effects on HR ($P < 0.001$) and HF HRV ($P < 0.001$) in Nrf2(-/-) mice compared to Nrf2(+/+) mice Nrf2(-/-) mice tolerated hyperoxia significantly less than Nrf2(+/+) mice (similar to 22 hrs; $P < 0.001$). Reductions in HR, LF, HF, and TP HRV were also significantly greater in Nrf2(-/-) compared to Nrf2(+/+) mice ($P < 0.01$). Results demonstrate that Nrf2 deletion increases susceptibility to change in HR and HRV responses to environmental stressors and suggest potential therapeutic strategies to prevent cardiovascular alterations.

Keywords

Authors

Howden, R; Gougian, E; Lawrence, M; Cividanes, S; Gladwell, W; Miller-DeGraff, L; Myers, PH; Rouse, DC; Devlin, RB; Cho, HY; Kleeberger, SR

Volume	Issue	Pages	Date Published	Times Cited
			2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Hypoxia Stress Test Reveals Exaggerated Cardiovascular Effects in Hypertensive Rats After Exposure to the Air Pollutant Acrolein

Publication / Journal

Toxicological Sciences

Abstract

Exposure to air pollution increases the risk of cardiovascular morbidity and mortality, especially in susceptible populations. Despite increased risk, adverse responses are often delayed and require additional stress tests to reveal latent effects of exposure. The goal of this study was to use an episode of "transient hypoxia" as an extrinsic stressor to uncover latent susceptibility to environmental pollutants in a rodent model of hypertension. We hypothesized that exposure to acrolein, an unsaturated aldehyde and mucosal irritant found in cigarette smoke, diesel exhaust, and power plant emissions, would increase cardiopulmonary sensitivity to hypoxia, particularly in hypertensive rats. Spontaneously hypertensive and Wistar Kyoto (normotensive) rats, implanted with radiotelemeters, were exposed once for 3 h to 3 ppm acrolein gas or filtered air in whole-body plethysmograph chambers and challenged with a 10% oxygen atmosphere (10 min) 24h later. Acrolein exposure increased heart rate, blood pressure, breathing frequency, and minute volume in hypertensive rats and also increased the heart rate variability parameter LF, suggesting a potential role for increased sympathetic tone. Normotensive rats only had increased blood pressure during acrolein exposure. The hypoxia stress test after acrolein exposure revealed increased diastolic blood pressure only in hypertensive rats and increased minute volume and expiratory time only in normotensive rats. These results suggest that hypertension confers exaggerated sensitivity to air pollution and that the hypoxia stress test is a novel tool to reveal the potential latent effects of air pollution exposure.

Keywords

Authors

Perez, CM; Ledbetter, AD; Hazari, MS; Haykal-Coates, N; Carll, AP; Winsett, DW; Costa, DL ; Farraj, AK

Volume: 132

Issue: 2

Pages: 467-477

Date Published: April 2013

Times Cited:

Digital Object Identifier (DOI):

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Environmental Particulate Matter Induces Murine Intestinal Inflammatory Responses and Alters the Gut Microbiome

Publication / Journal

PLOS ONE

Abstract

Background: Particulate matter (PM) is a key pollutant in ambient air that has been associated with negative health conditions in urban environments. The aim of this study was to examine the effects of orally administered PM on the gut microbiome and immune function under normal and inflammatory conditions.
Methods: Wild-type 129/SvEv mice were gavaged with Ottawa urban PM10 (EHC-93) for 7-14 days and mucosal gene expression analyzed using Ingenuity Pathways software. Intestinal permeability was measured by lactulose/mannitol excretion in urine. At sacrifice, segments of small and large intestine were cultured and cytokine secretion measured. Splenocytes were isolated and incubated with PM10 for measurement of proliferation. Long-term effects of exposure (35 days) on intestinal cytokine expression were measured in wild-type and IL-10 deficient (IL-10(-/-)) mice. Microbial composition of stool samples was assessed using terminal restriction fragment length polymorphism. Short chain fatty acids were measured in caecum.
Results: Short-term treatment of wild-type mice with PM10 altered immune gene expression, enhanced pro-inflammatory cytokine secretion in the small intestine, increased gut permeability, and induced hyporesponsiveness in splenocytes. Long-term treatment of wild-type and IL-10(-/-) mice increased pro-inflammatory cytokine expression in the colon and altered short chain fatty acid concentrations and microbial composition. IL-10(-/-) mice had increased disease as evidenced by enhanced histological damage.
Conclusions: Ingestion of airborne particulate matter alters the gut microbiome and induces acute and chronic inflammatory responses in the intestine.

Keywords

Authors

Kish, L; Hotte, N; Kaplan, GG; Vincent, R; Tso, R; Ganzle, M; Rioux, KP; Thiesen, A; Barkema, HW; Wine, E; Madsen, KL

Volume	Issue	Pages	Date Published	Times Cited
8	4		April 24, 2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Effect of nanoparticle-rich diesel exhaust on testicular and hippocampus steroidogenesis in male rats

Publication / Journal

Inhalation Toxicology

Abstract

Background: Nanoparticle-rich diesel exhaust (NR-DE) has potentially adverse effects on testicular steroidogenesis. However, it is unclear whether NR-DE influences steroidogenic systems in the brain.
Objective: To investigate the effect of NR-DE on hippocampal steroidogenesis of adult male rats in comparison with its effect on the testis.
Methods: F344 male rats (8-week-old) were randomly divided into four groups (n = 8 or 9 per group) and exposed to clean air with 4.6 +/- 3.2 mu g/m(3) in mass concentration, NR-DE with 38 +/- 3 mu g/m(3) (a level nearly equivalent to the environmental standard in Japan (low NR-DE)), NR-DE with 149 +/- 8 mu g/m(3) (high NR-DE), or filtered diesel exhaust with 3.1 +/- 1.9 mu g/m(3) (F-DE), for 5 hours/day, 5 days/week, for 1, 2 or 3 months. F-DE was prepared by removing only particulate matters from high NR-DE with an HEPA filter.
Results: Exposures to the high NR-DE for 1 month, and low NR-DE for 2 months, significantly increased or tended to increase plasma and testicular testosterone levels compared to clean air exposure, which might have resulted from the increased expression of mRNA of steroidogenic acute regulatory protein and its protein in the testes of rats. In the hippocampus, high NR-DE exposure for 1 month significantly increased the androstendione level compared to the clean air exposure, while no significant difference was observed in the steroidogenesis between fresh air exposure and any exposure to NR-DE or F-DE.
Conclusion: NR-DE may influence steroidogenic enzymes in the testis, but not those in the hippocampus.

Keywords

Authors

Yamagishi, N; Ito, Y; Ramdhan, DH; Yanagiba, Y; Hayashi, Y; Wang, D; Li, CM; Taneda, S; Suzuki, AK; Taya, K; Watanabe, G; Kamijima, M; Nakajima, T

Volume	Issue	Pages	Date Published	Times Cited
24	8	459-467	July 2012	

Digital Object Identifier (DOI)

10.3109/08958378.2012.688225

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The negative inotropic effects of gaseous sulfur dioxide and its derivatives in the isolated perfused rat heart

Publication / Journal

ENVIRONMENTAL TOXICOLOGY

Abstract

Epidemiological investigations have revealed that sulfur dioxide (SO2) exposure is linked to cardiovascular diseases. The present study was designed to investigate the negative inotropic effects of gaseous SO2 and its derivatives in the isolated perfused rat heart and the possible mechanisms involved in their effects. The results showed that both SO2 and SO2 derivatives elicited a negative inotropic effect in a dose-dependent manner, and SO2 produced a higher negative effect than SO2 derivatives. The mechanism of SO2-induced negative inotropic effects at low concentrations was different from that at high concentrations. At low concentrations, the mechanism of SO2-induced negative inotropic effects might occur through promoting the activities of protein kinase C (PKC), cycloxygenase, and cGMP, while the mechanism of SO2 derivatives-induced effects might be related to the opening of ATP-sensitive K+ (KATP) channel and the inhibition of Ca2+ influx via L-type calcium-channel. At high concentrations, the mechanisms of SO2 and SO2 derivatives-induced negative inotropic effects were similar, which might be related to the KATP channel and L-type calcium-channel as well as the possible alterations in PKC, cycloxygenase, and cGMP. Further work is needed to determine the relative contribution of each pathway in SO2-mediated inotropic effect.

Keywords

Authors

Zhang, QX; Meng, ZQ

Volume	Issue	Pages	Date Published	Times Cited
27	3	175-184	March 2012	10

Digital Object Identifier (DOI)

10.1002/tox.20628

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Benzo[a]pyrene exposed to solar-simulated light inhibits apoptosis and augments carcinogenicity

Publication / Journal

Chemico-Biological Interactions

Abstract

Polycyclic aromatic hydrocarbons (PAHs) such as benzo[a]pyrene (BaP) are widespread environmental pollutants and several lines of experimental evidence have suggested a role in carcinogenesis. PAHs in the environment are exposed to sunlight and photomodified PAHs have been detected in contaminated sediment and air particulate matter; however, the carcinogenicity of photomodified PAHs is not well understood. In this study, we found that solar-simulated light-irradiated BaP (LBaP) inhibited apoptosis, leading to cancer. LBaP suppressed apoptosis induced by cell detachment and serum depletion in a dose and light-irradiated time-dependent manner. The antiapoptotic effect was related to the production of reactive oxygen species from degraded BaP. The cells that survived apoptosis by LBaP treatment. were transformed having the ability to form colonies in soft agar and tumors in nude mice. These capabilities were specific to LBaP, not BaP itself. The results suggested that the carcinogenicity of PAHs may be attributable not only to the genetic damage induced by their metabolites, but also to the antiapoptotic effects of oxidative products on exposure to sunlight.

Keywords

Authors

Teranishi, M; Toyooka, T; Ohura, T; Masuda, S; Ibuki, Y

Volume	Issue	Pages	Date Published	Times Cited
185	1	4-11	April 15, 2010	

Digital Object Identifier (DOI)

10.1016/j.cbi.2010.02.044

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

SO2-Induced Neurotoxicity Is Mediated by Cyclooxygenases-2-Derived Prostaglandin E-2 and its Downstream Signaling Pathway in Rat Hippocampal Neurons

Publication / Journal

TOXICOLOGICAL SCIENCES

Abstract

Sulfur dioxide (SO2) pollution in atmospheric environment is involved in neurotoxicity and increased risk for hospitalization and mortality of many brain disorders; however, our understanding of the mechanisms by which SO2 caused harmful insults on neurons remains elusive. Here, we show that SO2 exposure produced a neuronal insult, and the neurotoxic effect was likely via stimulating cyclooxygenase-2 (COX-2) elevation by activation of nuclear factor-kappa B (NF-kappa B) activity and its acting on the promoter-distal NF-kappa B-binding site of COX-2 promoter. The action of SO2 on elevating COX-2 ultimately appeared to be dependent on the increased production of arachidonic acid-derived prostaglandins, mainly prostaglandin E-2 (PGE(2)), and functioning of its EP2/4 receptors. Also, the molecular modulating process might be triggered by free radical attack from SO2 metabolism in vivo and followed by activating cyclic adenosine monophosphate/protein kinase A pathway and enhancing probability of the release of glutamate, upregulating N-methyl-D-aspartic acid receptor expression and causing neuronal apoptosis. Our results reveal a mechanistic basis for exploring an association between SO2 inhalation and increased risk for neurological disorders and opening up therapeutic approaches of treating, ameliorating, or preventing brain injuries resulting from SO2 exposure in atmospheric polluting environment.

Keywords

Authors

Sang, N; Yun, Y; Yao, GY; Li, HY; Guo, L; Li, GK

Volume	Issue	Pages	Date Published	Times Cited
124	4	400-413	December 2011	5

Digital Object Identifier (DOI)

10.1093/toxsci/kfr224

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Atherosclerosis lesion progression during inhalation exposure to environmental tobacco smoke: A comparison to concentrated ambient air fine particles exposure

Publication / Journal

Inhalation Toxicology

Abstract

Environmental tobacco smoke (ETS) and ambient air fine particulate matter (PM(2.5)) are both complex mixtures that have important adverse effects on the cardiovascular system. Although exposures to these complex mixtures have been studied individually, direct comparisons between the two has not been performed. In this study, the authors employed a novel, noninvasive ultrasound biomicroscopy method (UBM) to assess the effects of long-term, low-concentration inhalations of side-stream smoke (SS) and concentrated ambient PM(2.5) (CAPs) on plaque progression. ApoE(-/-) mice (n = 8/group) on high-fat chow (HFC), or normal chow (NC), were exposed to SS (PM = 450 mu g/m(3)) or filtered air (FA) for 6 h/day, 5 days/week, for 6 months; CAPs exposure was at 134 mu g/m(3) (NC only). Mortality during the SS exposure was greater in the HFC than in the NC, and SS significantly enhanced the effects of diet. No mortality was observed in CAPs-exposed mice. At 4 and 6 months, SS produced the greatest change in plaque area in the left common carotid artery (CCA) in HFC as compared to FA or NC, but not in the brachiocephalic artery. In contrast, CAPs exposure significantly enhanced plaque areas in brachiocephalic and left CCA at 3 and 6 months of exposure. The effect of SS was comparable in magnitude to that produced by CAPs at an average PM(2.5) mass concentration that was only 30% as high. In light of the employment of the same animal model, uniform inhalation exposure protocols, time schedules, a noninvasive monitoring protocol, and a parallel study design, these findings have broad applicability.

Keywords

Authors

Chen, LC; Quan, CL; Hwang, JS; Jin, XM; Li, QA; Zhong, MH; Rajagopalan, S; Sun, QH

Volume: 22

Issue: 6

Pages: 449-459

Date Published: May 2010

Times Cited:

Digital Object Identifier (DOI): 10.3109/08958370903373845

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The effect of air pollution and other environmental stressors on leaf fluctuating asymmetry and specific leaf area of Salix alba L

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

We aimed at evaluating the effect of low-level air pollution on leaf area fluctuating asymmetry (FAA) and specific leaf area (SLA) of Salix alba L, taking into account other environmental factors. Cuttings were grown in standardized conditions in the near vicinity of air quality measuring stations in Belgium. Variability of SLA and FAA between measuring stations explained 83% and 7.26%, respectively, of the total variability. FAA was not influenced by air pollution or environmental factors such as shading, herbivory, air temperature and humidity. SLA was increased by an increase in shadow, while NO(x) and O(3) concentrations had only a marginal influence. The influence of SO(2) concentration was negligible. Although our data analysis suggests a relationship between SLA and NO(x)/O(3) concentration, the absence of a straightforward relationship between FAA and SLA and air pollution still questions the usefulness of these bio-indicators for monitoring air pollution.

Keywords

Authors

Wuytack, T; Wuyts, K; Van Dongen, S; Baeten, L; Kardel, F; Verheyen, K; Samson, R

Volume	Issue	Pages	Date Published	Times Cited
159	10	2405-2411	October 2011	6

Digital Object Identifier (DOI)

10.1016/j.envpol.2011.06.037

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Effects of sulfur dioxide pollution on the translocation and accumulation of heavy metals in soybean grain

Publication / Journal

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract

Open-top chambers were used to study the impact of simultaneous exposure to atmospheric SO(2) pollution and heavy metal contamination in soils on the metal contents and productivity of soybean plant.
Plants were exposed at ambient levels as control SO(2) (1.2 ppb), low SO(2) (97 ppb), and high SO(2) (490 ppb) over the whole growing season while simultaneously being exposed to either Cd (0.5 mg kg(-1)), Pb (250 mg kg(-1)), Cu (100 mg kg(-1)), or Zn (150 mg kg(-1)) in soil.
This experimental study covering the whole growth season has shown that SO(2) has a synergistic effect in enhancing the heavy metal contents in aboveground tissues of soybean plant, and the effects of high SO(2) treatment were found to be highly significant, showing increases of 42% and 29% for Cu and Cd content of grain, respectively.
The research findings are of practical significance in the environmental control for the combined pollution of air and soil to ensure the quality of agricultural products and therefore benefits for human health.

Keywords

Authors

Li, PJ; Wang, X; Allinson, G; Li, XJ; Stagnitti, F; Murray, F; Xiong, XZ

Volume: 18

Issue: 7

Pages: 1090-1097

Date Published: August 2011

Times Cited: 1

Digital Object Identifier (DOI)

10.1007/s11356-011-0454-z

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Central Neuroplasticity and Decreased Heart Rate Variability after Particulate Matter Exposure in Mice

Publication / Journal

Environmental Health Perspectives

Abstract

BACKGROUND: Epidemiologic studies show that exposure to fine particulate matter [aerodynamic diameter <= 2.5 mu m (PM(2.5))] increases the total daily cardiovascular mortality. Impaired cardiac autonomic function, which manifests as reduced heart rate variability (HRV), may be one of the underlying causes. However, the cellular mechanism(s) by which PM(2.5) exposure induces decreased HRV is not known.
OBJECTIVES: We tested the hypothesis that exposure to PM(2.5) impairs HRV by decreasing the excitability of the cardiac vagal neurons in the nucleus ambiguus. We also detemined the effect of iron on PM-exposure-induced decrease in HRV.
METHODS: We measured 24-hr HRV in time domains from electrocardiogram telemetry recordings obtained in conscious, freely moving mice after 3 days of exposure to PM(2.5) in the form of soot only or iron-soot. In parallel studies, we determined the intrinsic properties of identified cardiac vagal neurons, retrogradely labeled with a fluorescent dye applied to the sinoatrial node.
RESULTS: Soot-only exposure decreased short-term HRV (root mean square of successive difference). With the addition of iron, all HRV parameters were significantly reduced. In nonexposed mice, vagal blockade significantly reduced all HRV parameters, suggesting that HRV is, in part, under vagal regulation in mice. Iron-soot exposure had no significant effect on resting membrane potential but decreased spiking responses of the identified cardiac vagal neurons to depolarizations ($P < 0.05$). The decreased spiking response was accompanied with a higher minimal depolarizing current required to evoke spikes and a lower peak discharge frequency.
CONCLUSIONS: The data suggest that PM-induced neuroplasticity of cardiac vagal neurons may be one mechanism contributing to the cardiovascular consequences associated with PM(2.5) exposure seen in humans.

Keywords

Authors

Pham, H; Bonham, AC; Pinkerton, KE; Chen, CY

Volume	Issue	Pages	Date Published	Times Cited
117	9	1448-1453	September 2009	

Digital Object Identifier (DOI)

10.1289/ehp.0900674

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Mutagenic properties of PM2.5 urban pollution in the Northern Italy: The nitro-compounds contribution

Publication / Journal

Environment International

Abstract

PM2.5 is the breathable fraction of the particulate matter and some adverse health effects, such as respiratory functionality, cardiological diseases and cancer, can be in some measure attributable to this risk factor exposure. Some of the most carcinogen compounds transported by PM2.5 are nitro-compounds. In this study, a strengthened in vitro bioassay - able to predict the mutagenic/carcinogenic activity of the environmental mixtures - was conducted on PM2.5 organic extracts to define the nitro-compounds burden. PM2.5 air pollution was daily monitored, during 2006, in three cities located in the Northern part of Italy (Torino, Pavia and Verona) and the mutagenic properties of the PM2.5 organic extracts were assessed with the Ames test. The bacterial used in this study were three Salmonella typhimurium strains: TA98. nitroreductase-less mutant TA98NR and YG1021 carrying a nitroreductase-producing plasmid. The annual PM2.5 mean level measured in Torino was 46.5 (+/- 31.6) mu g/m(3), in Pavia 34.8 (+/- 25.1) mu g/m(3), and in Verona 37.3 (27.8) mu g/m(3), while the mutagenicity expressed as TA98 net reverants/m(3) was 28.0 (22.1), 28.3 (24.9), and 34.2 (30.9) respectively. Monthly pool bioassays, conducted with the three different strains, showed a greater mutagenic response of the YG1021 in each city. The relationship among the mutagenic answers for YG1021:TA98:TA98NR was about 6:3:1 ($p < 0.001$). Over nitroreductase activity enhanced the response of 2.2, 2.0 and 1.7 times for Torino, Pavia, and Verona (ANOVA Torino $p < 0.05$) respectively. Without nitroreductase activity the genotoxicity was limited. These biological findings are able to describe a relevant role played by the nitro compounds in the mutagenic properties of the urban PM2.5 in the Padana plain; moreover the bacterial nitroreductase plays a predominant role in DNA interaction primarily for Torino PM2.5 extracts.

Keywords

Authors

Traversi, D; Degan, R; De Marco, R; Gilli, G; Pignata, C; Villani, S; Bono, R

Volume: 35

Issue: 6

Pages: 905-910

Date Published: August 2009

Times Cited:

Digital Object Identifier (DOI): 10.1016/j.envint.2009.03.010

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effect of prolonged exposure to diesel engine exhaust on proinflammatory markers in different regions of the rat brain

Publication / Journal

Particle and Fibre Toxicology

Abstract

Background: The etiology and progression of neurodegenerative disorders depends on the interactions between a variety of factors including: aging, environmental exposures, and genetic susceptibility factors. Enhancement of proinflammatory events appears to be a common link in different neurological impairments, including Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, and multiple sclerosis. Studies have shown a link between exposure to particulate matter (PM), present in air pollution, and enhancement of central nervous system proinflammatory markers. In the present study, the association between exposure to air pollution (AP), derived from a specific source (diesel engine), and neuroinflammation was investigated. To elucidate whether specific regions of the brain are more susceptible to exposure to diesel-derived AP, various loci of the brain were separately analyzed. Rats were exposed for 6 hrs a day, 5 days a week, for 4 weeks to diesel engine exhaust (DEE) using a nose-only exposure chamber. The day after the final exposure, the brain was dissected into the following regions: cerebellum, frontal cortex, hippocampus, olfactory bulb and tubercles, and the striatum.

Results: Baseline levels of the pro-inflammatory cytokines tumor necrosis factor alpha (TNF-alpha) and interleukin-1 alpha (IL-1 alpha) were dependent on the region analyzed and increased in the striatum after exposure to DEE. In addition, baseline level of activation of the transcription factors (NF-kappa B) and (AP-1) was also region dependent but the levels were not significantly altered after exposure to DEE. A similar, though not significant, trend was seen with the mRNA expression levels of TNF-alpha and TNF Receptor-subtype I (TNF-RI).

Conclusions: Our results indicate that different brain regions may be uniquely responsive to changes induced by exposure to DEE. This study once more underscores the role of neuroinflammation in response to ambient air pollution, however, it is valuable to assess if and to what extent the observed changes may impact the normal function and cellular integrity of unique brain regions.

Keywords

Authors

Gerlofs-Nijland, ME; van Berlo, D; Cassee, FR; Schins, RPF; Wang, K; Campbell, A

Volume	Issue	Pages	Date Published	Times Cited
7			May 17, 2010	

Digital Object Identifier (DOI)

10.1186/1743-8977-7-12

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Impact of air pollution on physiological and morphological characteristics of Eucalyptus camaldulensis Den.

Publication / Journal

JOURNAL OF FOOD AGRICULTURE & ENVIRONMENT

Abstract

The increasing anthropogenic activity intensifies the emission of various pollutants into the environment and introduces different types of harmful substances into the atmosphere. Air pollution is aesthetically offensive and can be a genuine health hazard to humans as well as to plants. The present paper describes air pollution effects on some physiological and morphological characteristics of Eucalyptus camaldulensis Dehnh. Leaf samples were collected from Gamboeh park in southwest Ahvaz (clean region) and Foolad industrial company of Ahvaz (polluted region), southwest Iran. The morphological and physiological characteristics such as leaf area, stomata number, length of leaf and petiole, width of leaf, levels of chlorophyll a, chlorophyll b, total chlorophyll and carotenoids, soluble carbohydrate rates and proline were investigated. The results showed that the amount of chlorophyll a, chlorophyll b, total chlorophyll, carotenoids, soluble sugar and proline in Eucalypus camaldulensis increased in polluted region. In addition, the morphological traits of Eucalypus camaldulensis leaves were reduced in polluted area compared with clean region.

Keywords

Authors

Assadi, A; Pirbalouti, AG; Malekpoor, F; Teimori, N; Assadi, L

Volume	Issue	Pages	Date Published	Times Cited
9	2	676-679	April 2011	2

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Mutagenicity of Airborne Particulates Assessed by Salmonella Assay and the SOS Chromotest in Wroclaw, Poland

Publication / Journal

Journal of the Air & Waste Management

Abstract

Ambient air particulate matter less than 2.5 mu m in aerodynamic diameter (PM(2.5)) samples were collected during summer and autumn using a Staplex high-volume air sampler. They were later extracted with dichloromethane in a Soxhlet apparatus. Polyaromatic hydrocarbon (PAH) content in extracts was determined by the high-performance liquid chromatography technique using fluorescence detection, whereas the nitro-PAH content was determined by gas chromatography using mass detection. Four Salmonella typhimurium strains (TA98, TA100, YG1041, and YG1042) were used in assays conducted with and without metabolic activation. The extracts were also tested with the SOS chromotest supplied by Environmental Biodetection Products Incorporated. The obtained results confirmed the Salmonella assay and the SOS chromotest usability for the purpose of atmospheric pollution monitoring within an urban agglomeration. The atmospheric pollution extracts under examination differed among each other regarding total content and percentage of individual compounds, depending on the season of sampling. The highest total PAH content and the highest nitro-PAH content in the tested samples as well as the most extensive range of detected compounds were found in the autumn season (heating season). The highest mutagenicity was noted for PM(2.5) samples collected in autumn. The high values of mutagenicity ratios and induction factors were obtained from assays carried out with and without metabolic activation, which is an argument for the presence of promutagens and direct mutagens. The YG1041 strain proved to be the most effective in detection of mutagenicity of the suspended dust extracts because of its notably high sensitivity to nitro-aromatic compounds. The SOS chromotest was very sensitive to a large spectrum of geno-toxic air pollutants and showed a high degree of similarity with the results of the Salmonella assay. In comparison with the frequently used Ames test, the SOS chromotest enables quick analysis of the genotoxic effects of samples using only one tester strain. In addition, its miniaturized design decreases the consumption of tested samples.

Keywords

Authors

Piekarska, K

Volume	Issue	Pages	Date Published	Times Cited
60	8	993-1001	August 2010	

Digital Object Identifier (DOI)

10.3155/1047-3289.60.8.993

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Long-term monitoring of environmental change in German towns through the use of lichens as biological indicators: comparison between the surveys of 1970, 1980, 1985, 1995, 2005 and 2010 in Wetzlar

Publication / Journal

Environmental Sciences Europe

Abstract

Background: In the years 1970, 1980, 1985, 1995, 2005 and 2010, lichen mapping in the towns of Wetzlar and Giessen in Hesse was performed. The aim was to show the effects of immission load. Despite the application of modified test methods during the study period, the results can still be compared directly because they could be adapted to the requirements of the guidelines of the Association of German Engineers. Even the earlier study results could be interpreted partly within the scope of the guidelines. Parallel to the lichen mapping, comparative examinations of pH on tree bark were carried out.Results: In both towns, the pH of the tree bark has been increasing continuously, presently almost reaching pre-industrial values. The increase was stronger in Wetzlar than in Giessen. In 1970, the lichen vegetation showed a complete depletion. Since then the number of species has risen significantly. This development happened faster and more intensely in Wetzlar. The comparison of the lichen vegetation between 1970 and 2010 also shows an increased existence of species that are favored by hypertrophic air contaminants. In the 2010 survey, some species considered as being promoted by global warming were found for the first time.Conclusions: The increase of the bark pH can be explained by the decreasing acid pollution, primarily SO2. This is also assumed to be the main cause for the increasing number of lichen species. An explanation for Wetzlar's advantage is that the acid pollutants had been neutralized by a local industrial emittent of lime dust. With the reduction of dust emissions in Wetzlar due to the installation of filters, the bark pH in both towns steadily converged in the reference period. An examination of pre-industrial lichen studies shows that in both towns the original state of lichen vegetation has not been restored yet.

Keywords

Authors

Kirschbaum, Ulrich; Cezanne, Rainer; Eichler, Marion; Hanewald, Klaus; Windisch, Ute

Volume: 24

Issue:

Pages: Article No.: 19

Date Published: 2012

Times Cited: 0

Digital Object Identifier (DOI): 10.1186/2190-4715-24-19

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Sulfur dioxide inhalation stimulated mitochondrial biogenesis in rat brains

Publication / Journal

TOXICOLOGY

Abstract

Sulfur dioxide (SO2) is a common environmental pollutant. Mitochondria play essential roles in energy metabolism, generation of reactive oxygen species, and regulation of apoptosis in response to neuronal brain injury. It is of interest to observe the effect of SO2 on mitochondrial function in brain. In the present study, male Wistar rats were housed in exposure chambers and treated with 3.5, 7 and 14 mg/m(3) SO2 for 4 h/day for 30 days, while control rats were exposed to filtered air in the same condition. Mitochondrial membrane potential (MMP) was assessed in cerebral mitochondria using the lipophilic cationic probe JC-1. The amount of ATP was measured by the luciferinluciferase method. Analyses of mitochondrial replication and transcription were performed by real time PCR. The protein levels were detected using Western blotting. Our results showed that cerebral mtDNA content was markedly increased in rats after SO2 exposure. Paralleling the change in mtDNA content, MMP, ATP content, MDA level, CO1 & 4 and ATP6 & 8 expression, and cytochrome c oxidase activity were increased in rat cortex after SO2 inhalation. Moreover, mitochondrial biogenesis was accompanied by increased expression of NRF1 and TFAM, whereas PGC-1 alpha was not changed. We report for the first time increased mitochondrial biogenesis in brain of rats exposed to SO2, which might be an adaptive response to mitochondrial depletion by oxidant damage.

Keywords

Authors

Qin, GH; Wang, JX; Huo, YJ; Yan, HX; Jiang, CC; Zhou, JX; Wang, X; Sang, N

Volume	Issue	Pages	Date Published	Times Cited
300	1-2	67-74	October 2009	0

Digital Object Identifier (DOI)

10.1016/j.tox.2012.05.026

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Potential adjuvant effect of intranasal urban aerosols in mice through induction of dendritic cell maturation

Publication / Journal

Toxicology Letters

Abstract

Urban air pollution is a crucial environmental problem in industrialized and developing countries. Although epidemiologic studies have associated exposure to urban aerosols with exacerbations of allergic airway diseases, the underlying mechanism of toxicity is largely unknown. Here, we evaluated the effect of urban aerosols from China, on the induction of allergic diseases in vivo and on the function of dendritic cells (DCs) in vitro. Mice were intranasally given urban aerosol plus ovalbumin (OVA), and the levels of OVA-specific antibodies in the plasma were determined. Urban aerosol induced higher OVA-specific immunoglobulin (Ig) G and IgE responses than OVA alone. Furthermore, urban aerosol plus OVA induced high levels of histamine production, indicating that exposure to the aerosol could cause serious allergic symptoms. Next, we examined the effect of urban aerosol on DCs. The aerosol enhanced cell-surface expression of co-stimulatory molecules such as CD80 and CD86 and the production of interleukin (IL)-1 beta and IL-6 on DCs. In addition, allogeneic T-cell-stimulation assay showed that the urban aerosol could activate T cells through maturation of DCs. These results indicate that urban aerosols can induce allergic airway diseases through activation of DCs.

Keywords

Authors

Yoshida, T; Yoshioka, Y; Fujimura, M; Yamashita, K; Higashisaka, K; Nakanishi, R; Morishita, Y; Kayamuro, H; Nabeshi, H; Nagano, K; Abe, Y; Kamada, H; Tsunoda, S; Yoshikawa, T; Itoh, N; Tsutsumi, Y

Volume	Issue	Pages	Date Published	Times Cited
199	3	383-388	December 15, 20	

Digital Object Identifier (DOI)

10.1016/j.toxlet.2010.10.002

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

The time course of vasoconstriction and endothelin receptor A expression in pulmonary arterioles of mice continuously exposed to ambient urban levels of air pollution

Publication / Journal

Environmental Research

Abstract

The present study aimed to verify the time course of the effects of environmental levels of urban air pollution toxicity on lung arterioles. BALB/c mice (n = 56) were continuously exposed to selective chambers equipped with (filtered, F) or without (non-filtered, NF) filter devices for particles and toxic gases for 24 h/day, over 14, 21, 30 or 45 days. After exposure, we evaluated the lumen-wall relationship (an estimator of arteriolar narrowing), endothelial nitric oxide synthase (eNOS) and endothelin type A receptor (ETAr) expression in the vascular wall and inflammatory influx of the peribronchiolar area. Concentrations of fine particulate matter (PM <= 2.5 mu g/m(3)), nitrogen dioxide (NO(2)), black smoke (BS), humidity and temperature in both the environment and inside the chambers were measured daily. Filters cleared 100% of BS and 97% of PM inside the F chamber. The arteriole wall of the lungs of mice from NF chamber had an increased ETAr expression (p <= 0.042) concomitant to a decrease in the lumen/wall ratio (p = 0.02) on the early days of exposure, compared to controls. They also presented a progressive increment of inflammatory influx in the peribronchiolar area during the study (p = 0.04) and decrement of the eNOS expression on the 45th day of exposure in both vascular layers (p <= 0.03). We found that after 14 days of exposure, the ambient levels of air pollutants in Sao Paulo induced vasoconstriction that was associated with an increase in ETAr expression. These vascular results do not appear to be coupled to the progressive inflammatory influx in lung tissue, suggesting a down-regulation of vasoconstrictive mechanisms through an imbalance in the cytokines network. It is likely that these responses are protective measures that decrease tissue damage brought about by continuous exposure to air pollutants.

Keywords

Authors

Matsumoto, G; Nakagawa, NK; Vieira, RD; Mauad, T; da Silva, LFF; de Andre, CDS; Carvalho-Oliveira, R; Saldiva, PHN; Garcia, MLB

Volume	Issue	Pages	Date Published	Times Cited
110	3	237-243	April 2010	

Digital Object Identifier (DOI)

10.1016/j.envres.2010.01.003

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Activation of Pulmonary Dendritic Cells and Th2-Type Inflammatory Responses on Instillation of Engineered, Environmental Diesel Emission Source or Ambient Air Pollutant Particles in vivo

Publication / Journal

Journal of Innate Immunity

Abstract

The biological effects of acute particulate air pollution exposure in host innate immunity remain obscure and have relied largely on in vitro models. We hypothesized that single acute exposure to ambient or engineered particulate matter (PM) in the absence of other secondary stimuli would activate lung dendritic cells (DC) in vivo and provide information on the early immunological events of PM exposure and DC activation in a mouse model naive to prior PM exposure. Activation of purified lung DC was studied following oropharyngeal instillation of ambient particulate matter (APM). We compared the effects of APM exposure with that of diesel-enriched PM (DEP), carbon black particles (CBP) and silver nanoparticles (AgP). We found that PM species induced variable cellular infiltration in the lungs and only APM exposure induced eosinophilic infiltration. Both APM and DEP activated pulmonary DC and promoted a Th2-type cytokine response from naive CD4+T cells ex vivo. Cultures of primary peribronchial lymph node cells from mice exposed to APM and DEP also displayed a Th2-type immune response ex vivo. We conclude that exposure of the lower airway to various PM species induces differential immunological responses and immunomodulation of DC subsets. Environmental APM and DEP activated DC in vivo and provoked a Th2 response ex vivo. By contrast, CBP and AgP induced altered lung tissue barrier integrity but failed to stimulate CD4+T cells as effectively. Our work suggests that respirable pollutants activate the innate immune response with enhanced DC activation, pulmonary inflammation and Th2-immune responsiveness.

Keywords

Authors

Bezemer, GFG; Bauer, SM; Oberdorster, G; Breysse, PN; Pieters, RHH; Georas, SN; Williams, MA

Volume	Issue	Pages	Date Published	Times Cited
3	2	150-166	2011	

Digital Object Identifier (DOI)

10.1159/000321725

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Chronic exposure to fine particulate matter emitted by traffic affects reproductive and fetal outcomes in mice

Publication / Journal

Environmental Research

Abstract

Air pollution is an important environmental health risk factor that can result in many different gestational and reproductive negative outcomes. In this study, we have investigated the effects of two different times of exposure (before conception and during pregnancy) to urban ambient particulate matter on reproductive and pregnancy outcomes in mice. Using exposure chambers receiving filtered (F) and non-filtered (NF) air, we observed that exposed females exhibited changes in the length of estrus cycle and extended estrus and, therefore, a reduction in the number of cycles during the studied period (F2.6 +/- 0.22 and NF 1.2 +/- 0.29, p = 0.03). The mean number of antral follicles declined by 36% (p = 0.04) in NF mice (75 +/- 35.2) compared to F mice (118.6 +/- 18.4). our results further indicate a significant increase in time necessary for mating and decreased fertility and pregnancy indices (p = 0.003) in NF couples. Mean post-implantation loss rates were increased by 70% (p <= 0.005) in the NF2 group (exposed before and during pregnancy to NF air) compared to the F1 group (exposed before and during pregnancy to F air) and were influenced by both pre-gestational (p < 0.004) and gestational (p < 0.01) period exposure. Fetal weight was significantly higher in the F1 group when compared with the other groups (p < 0.001), at a 20% higher weight in the F1 group (0.86 +/- 0.18 g) than in the NF2 group (0.68 +/- 0.10g). Furthermore, fetal weight was influenced by both pre-gestational and gestational period exposure, and a significant interaction between these two factors was found (p < 0.001). This study demonstrated that exposure to ambient levels of urban traffic-generated particulate matter negatively affects different functions and stages of the reproductive process. Our results also reinforce the idea that maternal exposure to air pollution is linked to negative pregnancy outcomes, even if the exposure occurs only before conception.

Keywords

Authors

Veras, MM; Damaceno-Rodrigues, NR; Silva, RMG; Scoriza, JN; Saldiva, PHN; Caldini, EG; Dolhnikoff, M

Volume	Issue	Pages	Date Published	Times Cited
109	5	536-543	July 2009	

Digital Object Identifier (DOI)

10.1016/j.envres.2009.03.006

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Comparative Microarray Analysis and Pulmonary Changes in Brown Norway Rats Exposed to Ovalbumin and Concentrated Air Particulates

Publication / Journal

Toxicological Sciences

Abstract

The interaction between air particulates and genetic susceptibility has been implicated in the pathogenesis of asthma. The overall objective of this study was to determine the effects of inhalation exposure to environmentally relevant concentrated air particulates (CAPs) on the lungs of ovalbumin (ova) sensitized and challenged Brown Norway rats. Changes in gene expression were compared with lung tissue histopathology, morphometry, and biochemical and cellular parameters in bronchoalveolar lavage fluid (BALF). Ova challenge was responsible for the preponderance of gene expression changes, related largely to inflammation. CAPs exposure alone resulted in no significant gene expression changes, but CAPs and ova-exposed rodents exhibited an enhanced effect relative to ova alone with differentially expressed genes primarily related to inflammation and airway remodeling. Gene expression data was consistent with the biochemical and cellular analyses of the BALF, the pulmonary pathology, and morphometric changes when comparing the CAPs-ova group to the air-saline or CAPs-saline group. However, the gene expression data were more sensitive than the BALF cell type and number for assessing the effects of CAPs and ova versus the ova challenge alone. In addition, the gene expression results provided some additional insight into the TGF-beta-mediated molecular processes underlying these changes. The broad-based histopathology and functional genomic analyses demonstrate that exposure to CAPs exacerbates rodents with allergic inflammation induced by an allergen and suggests that asthmatics may be at increased risk for air pollution effects.

Keywords

Authors

Heidenfelder, BL; Reif, DM; Harkema, JR; Hubal, EAC; Hudgens, EE; Bramble, LA; Wagner, JG; Morishita, M; Keeler, GJ; Edwards, SW; Gallagher, JE

Volume	Issue	Pages	Date Published	Times Cited
108	1	207-221	March 2009	

Digital Object Identifier (DOI)

10.1093/toxsci/kfp005

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Differential expression of Arabidopsis defense-related genes in response to sulfur dioxide

Publication / Journal

CHEMOSPHERE

Abstract

Sulfur dioxide (SO2) is one of the most common and harmful air pollutants. To analyze cellular responses to SO2, we investigated the transcript alterations, antioxidant enzyme activities and reactive oxygen species (ROS) levels in Arabidopsis thaliana (Col-0) exposed to SO2. Transcriptional profiling using Affymetrix GeneChip technology identified 494 genes differentially expressed (>= 2-fold change) in plants exposed to 30 mg M-3 SO2 for 72 h, including up-regulation of some defense-related genes encoding antioxidant enzymes and heat shock proteins. Moreover, numerous genes encoding pathogenesis-related proteins and enzymes required for the phenylpropanoid pathway and for cell wall modification were highly activated upon SO2 exposure. We selected eight of the significantly differentially expressed defense-related genes for analysis using semi-quantitative RT-PCR and confirmed that their expression was up-regulated under SO2 stress. In addition, SO2 exposure caused the enhancement of ROS production, and also increased activities of antioxidant enzymes (superoxide dismutase, peroxidase, glutathione peroxidase and glutathione S-transferase) in Arabidopsis plants. Our results indicated that increased ROS may act as a signal to induce defense responses, which provide enhanced defense capacity to protect plants against SO2 and other environmental stress. This is the first transcriptional profiling that identifies novel genes and pathways involved in SO2 stress responses in plant cells. These data will be helpful for better understanding the molecular basis for plant adaptation to SO2 stress.

Keywords

Authors

Li, LH; Yi, HL

Volume	Issue	Pages	Date Published	Times Cited
87	7	718-724	May 2012	3

Digital Object Identifier (DOI)

10.1016/j.chemosphere.2011.12.064

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Changes in diversity of soil macrofauna in industrial pollution gradient

Publication / Journal

Russian Entomological Journal

Abstract

We have investigated the changes in the soil macrofauna populations in a gradient of industrial pollution (heavy metals combined with sulfur dioxide) by Middle Ural copper smelter. Invertebrate abundance decreased strongly in highly polluted area: the number of spiders was reduced from 220 to 30 ind./m(2), centipedes - from 240 to 30, Staphylinidae - from 145 to 55, Elateridae - from 85 to 25, and other hexapods - from 295 to 90 ind./m(2). Abundant in the background areas earthworms (260 ind./m(2), nearly 1000 ind./m2 including cocoons), Enchytraeidae (170 ind./m(2)) and Mollusca (300 ind./m(2)) disappeared completely. The decrease in abundance (or total disappearance) of various invertebrate taxa was likely induced by a combination of direct effects of toxicants and indirect influence through the deterioration of habitats. Industrial pollution leads to the transformation in the trophic structure of the communities. In the area of maximum pollution the proportion of saprotrophic groups (saprophagous and saprophytophagous) decreased from 65 to 10%, while the proportion of biotrophic (zoophagous and phytophagous) groups increased from 30 to 80%. In total, 8 species of earthworms, 48 species of spiders, 5 species of Opiliones, 8 species of Myriapoda, 54 species of Staphylinidae, 7 species of Elateridae and 11 species of Mollusca were revealed. For all taxa studied, the species richness decreased with increasing pollution. However, this decrease likely does not reflect the extinction of species per se, but rather the decrease in their abundance, which leads to the strong underestimation of species richness when using standard sampling effort. The total extinction can be confidently suggested for Oligochaeta and Mollusca, which are extremely sensitive to chemical contamination.

Keywords

Authors

Vorobeichik, E. L.; Ermakov, A. I.; Zolotarev, M. P.; Tuneva, T. K.

Volume	Issue	Pages	Date Published	Times Cited
21	2	203-218	June 2012	1

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☑	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Investigation of Uptake and Retention of Atmospheric Hg(II) by Boreal Forest Plants Using Stable Hg Isotopes

Publication / Journal

Environmental Science & Technology

Abstract

Although there is now a general consensus among mercury (Hg) biogeochemists that increased atmospheric inputs of inorganic Hg(II) to lakes and watersheds can result in increased methylmercury (MeHg) concentrations in fish, researchers still lack kinetic data describing the movement of Hg from the atmosphere, through watershed and lake ecosystems, and into fish. The use of isotopically enriched Hg species in environmental studies now allows experimentally applied new Hg to be distinguished from ambient Hg naturally present in the system. Four different enriched stable Hg(II) isotope “spikes” were applied sequentially over four years to the ground vegetation of a microcatchment at the Experimental Lakes Area (ELA) in the remote boreal forest of Canada to examine retention of Hg(II) following deposition. Areal masses of the spikes and ambient THg (all forms of Hg in a sample) were monitored for eight years, and the pattern of spike retention was used to estimate retention of newly deposited ambient Hg within the ground vegetation pool. Fifty to eighty percent of applied spike Hg was initially retained by ground vegetation. The areal mass of spike Hg declined exponentially over time and was best described by a first-order process with constants (k) ranging between 9.7 × 10−4 day−1 and 11.6 × 10−4 day−1. Average half-life (t1/2) of spike Hg within the ground vegetation pool (±S.D.) was 704 ± 52 days. This retention of new atmospheric Hg(II) by vegetation delays movement of new Hg(II) into soil, runoff, and finally into adjacent lakes. Ground-applied Hg(II) spikes were not detected in tree foliage and litterfall, indicating that stomatal and/or root uptake of previously deposited Hg (i.e., “recycled” from ground vegetation or soil Hg pools) were likely not large sources of foliar Hg under these experimental conditions.

Keywords

Authors

Grayson, JA; St. Louis, VL; Hintelmann, H; Lindberg, SE; Sandilands, KA; Rudd, JW; Kelly, CA; Tate, MT, Krabbenhoft, DP; and Lehnherr, I.

Volume: 43

Issue: 13

Pages: 4960–4966

Date Published: 2009

Times Cited:

Digital Object Identifier (DOI): 10.1021/es900357s

Media Category: Both

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Spatial and Temporal Patterns of Bioindicator Mercury in Pennsylvania Oak Forest

Publication / Journal

JOURNAL OF ENVIRONMENTAL QUALITY

Abstract

We monitored spatial and temporal patterns of total Hg in forest bioindicators to assess possible local, regional, and global changes in atmospheric Hg deposition. Total Hg concentrations were monitored in leaves and fresh litterfall of northern red oak (Quercus rubra L.), on an epiphytic moss (Dicranum montanum Hedw.) on northern red oak stems, and in surface soil organic matter (O-e and O-a horizons) in Pennsylvania oak-dominated forests. Variously configured plots were used to monitor Hg deposition near local coal-fired generating stations and an industrial city and along an extended regional transect. Linearly decreasing temporal trends in Hg concentrations occurred in leaves, litterfall, moss, and soil O-e and O-a. Mean annual Hg concentrations were often greater near local emissions sources compared with remote areas, especially in the initial monitoring period. Decreasing time trends for different impact areas tended to converge due to greater rates of Hg decrease where initial bioindicator Hg levels were higher. Fresh litter and soil O-e showed the greatest overall potential as Hg bioindicators. We conclude that Hg deposition has been significantly decreasing over time throughout the study area as a result of locally and regionally declining Hg emissions. Reductions in Hg emissions are likely a co-benefit of the 1990 Clean Air Act regulations and changing industrial activities. Recent leveling of several bioindicator Hg time trends may foretell a shift in Hg depositional patterns. Mercury monitoring studies such as this fulfill a need for documenting local and regional effects of emissions reduction.

Keywords

Authors

McClenahen, JR; Hutnik, RJ; Davis, DD

Volume: 42

Issue: 2

Pages: 305-311

Date Published: March/April 201

Times Cited: 0

Digital Object Identifier (DOI)

10.2134/jeq2012.0237

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Research on the eco-purification function of urban forests in Beijing

Publication / Journal

JOURNAL OF FOOD AGRICULTURE & ENVIRONMENT

Abstract

The eco-purification functions of urban forests, such as increasing negative air ions, absorbing and sequestering pollutants, reducing noise and sequestering dust, were measured by methods of nature monitoring and laboratory analysis in Beijing. The result showed the following: The presence of garden flora can significantly increase the concentration of negative air ions, and the annual average concentration of air ions can be sorted in descending order as Xiangshan Park (630.25 pc./cm(3)), the Beijing Botanical Garden (502.49 pc./cm(3)), the Summer Palace (414.68 pc./cm(3)), clearings (170.50 pc./cm(3)) and downtown (45.08 pc./cm(3)). The temporal and spatial variation in the concentration of negative air ions was quite obvious in different habitats in the order of autumn, summer, spring and winter from the most to the least variation. However, it showed a single peak curve monthly. The maximum value appeared in September. The larger values appeared at 9: 00 and 15: 00 in the daytime, and the emergence of the minimum varied but was generally approximately 19: 00. With the increase of the vertical observation gradient, a single-peak variation trend emerged. Among the environmental impact factors, the relative humidity and the temperature were dominant, and the wind speed and the canopy density were relatively minor. In this paper, we assessed the air quality of each observation area according to the concentration distribution of negative air ions. 1) The ability to absorb pollutants varies greatly by tree species. The content of pollution elements in different tree leaves can be generally sorted in descending order as S, Cl, Zn, Cu, Cr, Pb, As, Hg and Cd.2) The ability of different tree species to absorb dust (based on the dry weight of dust in their leaves) can be sorted in descending order as purple leaf barberry, Chinese scholartree, euonymus fortunei, buxus microphylla, euonymus, Chinese red pine, oriental arborvitae, poplar, pear, peach, apricot, apple and cherry. 3) For the forest belt of the 3rd, 4th and 5th ring roads, the effect of noise reduction is best at the points that are 10 m, 150 m and 50 m from the road, with noise reduction rates of 8.39%, 5.81% and 6.91%, respectively. There is a significant cubic function regression relationship between the noise reduction capacity of the forest belt of the ring roads and the distance.

Keywords

Authors

Li, SN; Lu, SW; Pan, QH; Zhang, YP; Chen, B; Yang, XB

Volume	Issue	Pages	Date Published	Times Cited
11	2	1247-1254	2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☑	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Runoff of genotoxic compounds in river basin sediment under the influence of contaminated soils

Publication / Journal

Ecotoxicology and Environmental Safety

Abstract

Contaminated sites must be analyzed as a source of hazardous compounds in the ecosystem. Contaminant mobility in the environment may affect sources of surface and groundwater, elevating potential risks. This study looked at the genotoxic potential of samples from a contaminated site on the banks of the Taquari River, RS, Brazil, where potential environmental problems had been identified (pentachlorophenol, creosote and hydrosalt CCA). Samplers were installed at the site to investigate the drainage material (water and particulate soil matter) collected after significant rainfall events. Organic extracts of this drained material. sediment river samples of the Taquari River (interstitial water and sediment organic extracts) were evaluated by the Salmonella/microsome assay to detect mutagenicity and by Allium cepa bioassays (interstitial water and whole sediment samples) to detect chromosomal alterations. Positive mutagenicity results in the Salmonella/microsome assay of the material exported from the area indicate that contaminant mixtures may have drained into the Taquari River. This was confirmed by the similarity of mutagenic responses (frameshift indirect mutagens) of organic extracts from soil and river sediment exported from the main area under the influence of the contaminated site. The Allium cepa test showed significant results of cytotoxicity, mutagenic index and chromosome aberration in the area under the same influence. However, it also showed the same similarity in positive results at an upstream site, which probably meant different contaminants. Chemical compounds such as PAHs, PCF and chromium, copper and arsenic were present in the runoff of pollutants characteristically found in the area. The strategy employed using the Salmonella/microsome assay to evaluate effects of complex contaminant mixtures, together with information about the main groups of compounds present, allowed the detection of pollutant dispersion routes from the contaminated site to the Taquari River sediment.

Keywords

Authors

da Costa, TC; de Brito, KCT; Rocha, JAV; Leal, KA; Rodrigues, MLK; Minella, JPG; Matsumoto, ST; Vargas, VMF

Volume	Issue	Pages	Date Published	Times Cited
75		63-72	January 1, 2012	1

Digital Object Identifier (DOI)

10.1016/j.ecoenv.2011.08.007

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☑	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Anatomy of leaves of Betula pendula (Roth.) affected by air emissions in industrial area of Kemerovo city

Publication / Journal

Middle East Journal of Scientific Research

Abstract

Modeling of air pollution of the industrial zone of Kemerovo city using a special module of the ERA software complex. The complex index of air pollution by priority pollutants (nitrogen oxides, sulfur dioxide, carbon monoxide and polycyclic aromatic hydrocarbons, including benzopyrene and suspended solids) was calculated using the modeling data. It is determined that the zone of maximum pollution from emissions sources reaches 4 km in the prevailing wind direction. Anatomic and morphological characteristics of common birch Betula pendula (Roth.) leaves affected by emissions of the industrial zone of Kemerovo city were investigated. The maximum changes in these characteristics were identified at a distance of 1 km from the industrial zone. The most clear negative changes appeared as the reduction in the thickness of the cuticle and width of the lower epidermis cells. A statistically significant increase in the thickness of the pallisade and spongy mesophyll, thickness of a lamina and thickness of the upper epidermis tissue were determined as the adaptive changes. There are significant correlations of the complex index of air pollution with anatomic-morphological characteristics of birch lamina: thickness of lamina, thickness of the lower epidermis, thickness of pallisade and spongy mesophyll. The study results revealed the significant effect of emissions of industrial zones on the anatomical and morphological transformations of the lamina of Betula pendula (Roth.).

Keywords

Authors

Neverova, O. A.; Legoshchina, O. M.; Bykov, A. A.

Volume: 17

Issue: 3

Pages: 354-358

Date Published: 2013

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

The pollution characteristics and potential ecological risk of heavy metals in PM 2.5 during heating season in Tianjin.

Publication / Journal

China Environmental Science

Abstract

To explore the pollution characteristics and the potential ecological risk of heavy metals in PM 2.5 of Tianjin, the main heavy metals such as Zn, Ti, Mn, Pb, Cu, Cr, Co, As, Cd and Hg were detected, and the pollution status was evaluated with enrichment factors and Hakanson potential ecological risk index, respectively. The results showed that the pollution degree of the heavy metals followed the order Zn > Ti > Mn > Pb > Cu > Cr > Co > As > Cd > Hg at the urban and Zn > Ti > Pb > Mn > Cr > Cu > Co > As > Cd > Hg at Wuqing. The ecological risk assessment of heavy metals showed that the ecological risk of Ti and Mn were basically pollution-free. As, Cr and Co existed certain pollution. The potential ecological risk of Cu, Zn, Pb and Cd was high, while ecological harm degree of Cd was extremely strong, the whole potential ecological risk degree (1381.1 at the urban and 1251.1 at Wuqing) was very strong.

Keywords

Authors

Yao Qing; Han SuQin; Cai ZiYing

Volume	Issue	Pages	Date Published	Times Cited
33	9	1596-1600	2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Inhalable particulate matter and fine particulate matter: their basic characteristics, monitoring methods, and forest regulation functions

Publication / Journal

The journal of applied ecology

Abstract

Both inhalable particulate matter (PM10) and fine particulate matter (PM2.5) are not only one of the main causes of air pollution, but also the primary pollutants in most cities. Based on the analysis of the impacts of PM10 and PM2.5 on the environment and human health, this paper summarized the components, sources, and mass concentration variations of PM10 and PM2.5 and related affecting factors, and introduced the network layout of PM10 and PM2.5 monitoring and its principles and features. The research methods on the removal of PM10 and PM2.5 by forests, the removal rates of PM10 and PM2.5 by different forests, and the related affecting mechanisms were summed up at regional and individual scales, and the existed problems in this research field were discussed. Due to the lack of the comparable observation studies on the atmospheric PM10 and PM2.5 along different gradients and in background areas, the joint effects of multiple factors on the PM10 and PM2.5 concentrations are not revealed. It was suggested that to make a rational network layout of PM10 and PM2.5 monitoring, to correctly select proper monitoring methods, and to compare and calibrate the observed results from classical manual methods would be the bases to guarantee the validity of PM10 and PM2.5 monitoring data. At present, there are few reports about the PM2.5 removal by forests, and it's not clear about the physiological processes and ecological mechanisms of PM10 and PM2.5 removal at cell, tissue, organ, and individual level.

Keywords

Authors

Wang, Hua; Lu, Shao-Wei; Li, Shao-Ning; Pan, Qing-Hua; Zhang, Yu-ping

Volume	Issue	Pages	Date Published	Times Cited
24	3	869-877	March 2013	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

The toxicology of climate change: Environmental contaminants in a warming world

Publication / Journal

ENVIRONMENT INTERNATIONAL

Abstract

Climate change induced by anthropogenic warming of the earth's atmosphere is a daunting problem. This review examines one of the consequences of climate change that has only recently attracted attention: namely, the effects of climate change on the environmental distribution and toxicity of chemical pollutants. A review was undertaken of the scientific literature (original research articles, reviews, government and intergovernmental reports) focusing on the interactions of toxicants with the environmental parameters, temperature, precipitation, and salinity, as altered by climate change. Three broad classes of chemical toxicants of global significance were the focus: air pollutants, persistent organic pollutants (POPs), including some organochlorine pesticides, and other classes of pesticides. Generally, increases in temperature will enhance the toxicity of contaminants and increase concentrations of tropospheric ozone regionally, but will also likely increase rates of chemical degradation. While further research is needed, climate change coupled with air pollutant exposures may have potentially serious adverse consequences for human health in urban and polluted regions. Climate change producing alterations in: food webs, lipid dynamics. ice and snow melt, and organic carbon cycling could result in increased POP levels in water, soil, and biota. There is also compelling evidence that increasing temperatures could be deleterious to pollutant-exposed wildlife. For example, elevated water temperatures may alter the biotransformation of contaminants to more bioactive metabolites and impair homeostasis. The complex interactions between climate change and pollutants may be particularly problematic for species living at the edge of their physiological tolerance range where acclimation capacity may be limited. In addition to temperature increases, regional precipitation patterns are projected to be altered with climate change. Regions subject to decreases in precipitation may experience enhanced volatilization of POPs and pesticides to the atmosphere. Reduced precipitation will also increase air pollution in urbanized regions resulting in negative health effects, which may be exacerbated by temperature increases. Regions subject to increased precipitation will have lower levels of air pollution, but will likely experience enhanced surface deposition of airborne POPs and increased run-off of pesticides. Moreover, increases in the intensity and frequency of storm events linked to climate change could lead to more severe episodes of chemical contamination of water bodies and surrounding watersheds. Changes in salinity may affect aquatic organisms as an independent stressor as well as by altering the bioavailability and in some instances increasing the toxicity of chemicals. A paramount issue will be to identify species and populations especially vulnerable to climate-pollutant interactions, in the context of the many other physical, chemical, and biological stressors that will be altered with climate change. Moreover, it will be important to predict tipping points that might trigger or accelerate synergistic interactions between climate change and contaminant exposures.

Keywords

Authors

Noyes, PD; McElwee, MK; Miller, HD; Clark, BW; Van Tiem, LA; Walcott, KC; Erwin, KN; Levin, ED

Volume	Issue	Pages	Date Published	Times Cited
35	6	971-986	August 2009	113

Digital Object Identifier (DOI)

10.1016/j.envint.2009.02.006

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐

Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Mercury isotopes in a forested ecosystem: Implications for air-surface exchange dynamics and the global mercury cycle

Publication / Journal

GLOBAL BIOGEOCHEMICAL CYCLES

Abstract

Forests mediate the biogeochemical cycling of mercury (Hg) between the atmosphere and terrestrial ecosystems; however, there remain many gaps in our understanding of these processes. Our objectives in this study were to characterize Hg isotopic composition within forests, and use natural abundance stable Hg isotopes to track sources and reveal mechanisms underlying the cycling of Hg. We quantified the stable Hg isotopic composition of foliage, forest floor, mineral soil, precipitation, and total gaseous mercury (THg(g)) in the atmosphere and in evasion from soil, in 10-year-old aspen forests at the Rhinelander FACE experiment in northeastern Wisconsin, USA. The effect of increased atmospheric CO2 and O-3 concentrations on Hg isotopic composition was small relative to differences among forest ecosystem components. Precipitation samples had delta Hg-202 values of -0.74 to 0.06 parts per thousand and Delta Hg-199 values of 0.16 to 0.82 parts per thousand. Atmospheric THg(g) had delta Hg-202 values of 0.48 to 0.93 parts per thousand and Delta Hg-199 values of -0.21 to -0.15 parts per thousand. Uptake of THg(g) by foliage resulted in a large (-2.89 parts per thousand) shift in delta Hg-202 values; foliage displayed delta Hg-202 values of -2.53 to -1.89 parts per thousand and Delta Hg-199 values of -0.37 to -0.23 parts per thousand. Forest floor samples had delta Hg-202 values of -1.88 to -1.22% and Delta Hg-199 values of -0.22 to -0.14%. Mercury isotopes distinguished geogenic sources of Hg and atmospheric derived sources of Hg in soil, and showed that precipitation Hg only accounted for similar to 16% of atmospheric Hg inputs. The isotopic composition of Hg evasion from the forest floor was similar to atmospheric THg(g); however, there were systematic differences in delta Hg-202 values and MIF of even isotopes (Delta Hg-200 and Delta Hg-204). Mercury evasion from the forest floor may have arisen from air-surface exchange of atmospheric THg(g), but was not the emission of legacy Hg from soils, nor re-emission of wet-deposition. This implies that there was net atmospheric THg(g) deposition to the forest soils. Furthermore, MDF of Hg isotopes during foliar uptake and air-surface exchange of atmospheric THg(g) resulted in the release of Hg with very positive delta Hg-202 values to the atmosphere, which is key information for modeling the isotopic balance of the global mercury cycle, and may indicate a shorter residence time than previously recognized for the atmospheric mercury pool

Keywords

Authors

Demers, JD; Blum, JD; Zak, DR

Volume	Issue	Pages	Date Published	Times Cited
27	1	222-238	2013	3

Digital Object Identifier (DOI)

10.1002/gbc.20021

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Genotoxicity of Polycyclic Aromatic Hydrocarbons and Nitro-Derived in Respirable Airborne Particulate Matter Collected from Urban Areas of Rio de Janeiro (Brazil)

Publication / Journal

Biomed Research International

Abstract

Air pollution toxic effects are mainly attributed to small inhalable particulates with an aerodynamic diameter of less than 2.5 mu m (PM 2.5). Our objective was to investigate mutagenic and clastogenic activity in PM samples collected in Rio de Janeiro. Samples were collected using a high-volume sampler at three sites: with low traffic and (2) and (3) with a heavy traffic. Six polycyclic aromatic hydrocarbons (PAHs) were quantified by gas chromatography/mass spectrometry (GC/MS). Salmonella typhimurium TA98 and the derivative strains YG1021 and YG1024 were used in mutagenicity assays in the presence of organic extracts (10-50 mu g/plate) with and without exogenous metabolization. Allium cepa test was performed to evaluate possible cytotoxic and clastogenic activities. The highest PM 2.5 mu m (132.73 mu m/m(3)) and PAH values (1.22 ng/m(3) for benzo(a) pyrene) were detected at site 3. High mutagenic frameshift responses in absence and presence of metabolic activation were detected at site 3. The participation of nitroarenes and dinitroarenes was detected in the total mutagenicity of the extracts studied. The cytotoxic effect and the abnormalities detected by Allium cepa test can be attributed to the PAH nitroderivatives in the organic extracts. Evaluation of the genotoxicity of urban airborne particulate matter is important as a basis for decision making by regulatory authorities.

Keywords

Authors

de Rainho, CR; Correa, SM; Mazzei, JL; Aiub, CAF; Felzenszwalb, I

Volume	Issue	Pages	Date Published	Times Cited
			2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☑				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	A

Title

Effects of thermal power plant on envronment

Publication / Journal

Scientific Reviews & Chemical Communications

Abstract

Thermal Power Plants have been found to affect Environmental segments of the surrounding region very badly. Environmental deterioration is attributed to emission of large amount of Sox, Nox & SPM & RSPM which disperse over 25 Kms radius and cause respiratory and related ailments to human beings and animal kingdom. It also affects photosynthesis process, balance of minerals & micro and major nutrients in the plants, soil strata, structures & buildings get affected due to corrosive reactions.

Keywords

Coal, Thermal power impact, Environment

Authors

Pokale, WK

Volume	Issue	Pages	Date Published	Times Cited
2	3	212-215	2012	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☑	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Environment Impact Assessment of Thermal Power Plant for Sustainable Development

Publication / Journal

International Journal of Environmental Engineering and Management

Abstract

Thermal Power plants are the major source of generation of electricity for any developing country. Around 60% of electricity generation in our country is met by thermal power plants. Fuel is blown into the combustible chamber of the boiler where it is burnt at high temperature where Heat energy converts water into steam. High energy steam is passed through the turbine and the steam creates force on the turbine causing the shaft to rotate at high speed. A generator is coupled at one end of the turbine shaft which generates power. The thermal power plant has serious impacts on land , soil, air and various social impacts the thermal power plant are also said to emit large amount of mercury and generate large quantity of fly ash which destroys the surrounding environment. These plants also consume a large amount of water. Due to these problems they require a proper Environmental impact assessment before commencement of the project which is not done judiciously in our country. Various mitigation measures for the control of pollution caused by thermal power plants along with some new technologies are discussed.

Keywords

Thermal Powerplant, Environment Impact assessment, Open cycle system, Close cycle system, SOx, Nox

Authors

Kumar, S; Katoria, D; Sehgal, D

Volume	Issue	Pages	Date Published	Times Cited
4	6	567-527	2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Evaluating threats to an endangered species by proxy: air pollution as threat to the blue swallow (Hirundo atrocaerulea) in South Africa

Publication / Journal

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Abstract

The blue swallow (Hirundo atrocaerulea) is one of the most threatened bird species in southern Africa. Among terrestrial birds, its plumage is known to be the most water repellent, an adaptation to foraging on the wing in dense fog. Despite this unique adaptation, the nesting success of the blue swallow at the Blue Swallow Natural Heritage Site (BSNHS) is lower during years with high incidence of fog. As the phenomenon is not observed at other nesting sites, we hypothesized that this is due to changes in the air chemistry at the BSNHS. In the immediate proximity of the BSNHS, plantations of exotic trees (e.g., pines and eucalypts), rich in volatile organic compounds (VOCs), are dominant features. In addition, air pollution from the Johannesburg area is transported with the surface winds and mix with VOCs released from exotic trees. Together with the high humidity and high elevation, these conditions may result in the formation of sulphonates. Sulphonates are strong detergents, and the presence of these in the fog could lead to decreased water repellence of the plumage. This study was performed in order to determine the occurrence and distribution of sulphonates in the BSNHS and to compare these with sulphonates formed in other locations in South Africa. Because the blue swallow is endangered, pine needles were used as proxy to detect formation of sulphonates.

We sampled pine needles with different exposure to air pollutants, in climates with different humidity, and at different elevation and analyzed these for sulphonates using mass spectrometry.

Pine needles from high elevations and the BSNHS, with high humidity, and exposure to air pollution contained significantly higher concentrations of sulphonates than pine needles from low elevations or from high elevations with a dryer climate or a different combination of air pollutants.

These findings lead to two conclusions. First, the occurrence and distribution of sulphonates may be explained by chemical reactions between sulphur dioxide and organic compounds in the humid air induced by ultraviolet radiation. Second, elevated concentrations of sulphonates in the fog could affect the water repellence of the blue swallow plumage, possibly decreasing their capacity to forage in the fog. We cannot prove conclusively that this is the reason why the number of blue swallows at the BSNHS has decreased dramatically, but for endangered species, we may have to rely on proxies to draw conclusions about outside threats. All such information should be valuable in devising protection plans for species under threat.

The use of proxies to elucidate threats to endangered species should be evaluated in a broad scale. The mist-belt habitat in general is threatened by many human activities. These findings indicate that air pollution and the proximity of volatile organic compound (VOC) sources close to mist-belt habitat refuges may be an unrecognised conservation threat to the animals inhabiting them.

Keywords

Authors

Kylin, H; Bouwman, H; Evans, SW

Volume	Issue	Pages	Date Published	Times Cited
18	2	282-290	February 2011	3

Digital Object Identifier (DOI)

10.1007/s11356-010-0369-0

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☑	Soil	☐	Sulphur dioxide	☐

Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Characteristics of Environmental Effects in the Landscape Shelter Forest along the Aerodrome Road in Guangzhou

Publication / Journal

Forest Research

Abstract

The function on reducing the heat island effect and contaminated gases on road surface was studied by means of multiCpoint synchronous observation method on horizontal scale of the landscape protection forest along an aerodrome road in Guangzhou. The results showed that the forest stand had a vertically 4-storey community structure by 2.39 of Shannon (H), and 0.76 of uniformity index and its canopy density attained to 0.68. Its vertical structure incarnates the multi-hierarchy collocation with the upper-storey of 12.6 m (Eucalyptus species), the middle storey of 6.3 m (hardwood species), the shrub storey of 3.2 m and herbage storey of 0.6 m. The shelterbelt stretches along the road with the width 30 m to 50 m. The results of a six-day observation in September 2006 showed that the daily mean concentration of SO2 and NO2 was 0.150 mg . m(-3) and 0.083 mg . m(-3) on road surface while that of in the forest belt with 20 m in width was reduced to lesser than 0.05 mg . m-3. At the same time, the air temperature of the road surface decreased by 2.0 degrees C and the air humidity of road surface increased 2.4 % by the forest belt with 20 m in width. In fine weather, the air temperature in the area 20 m and 30 m inside forest belt was 2.0 degrees C lower compared with that on the road surface from 13 :00 to 15:00. Concurrently, the air humidity in the area 10 m to 30 m inside forest belt increased from 5.0% to 7.1%. The results of a observation of September 11-16, 2008 showed the SO2 concentration in the air was <= 0.05 mg . m(-3) for 8.3-9.0 hours in the forest with a width of 20 m to 30 m, and the NO2 Concentration in the air was <= 0.05 mg . m(-3) and could last for 8.3 hours in the forest with a width of 30 m to 40 M. The shelter communities along the aerodrome road have marked ecological function on reducing the heat island effect and contaminated gases of road surface. Using trend surface regression method, the temporal and spatial distribution fitting equation of SO2 and NO2 concentrations from the road to forest obtained a good fitting result.

Keywords

Authors

Chen Bu-feng; Pan Yong-jun; Xiao Yi-hua; Wu Min; Yang Hong-yu

Volume: 25

Issue: 3

Pages: 278-284

Date Published: March 2012

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

To What Extent Can Biogenic SOA be Controlled?

Publication / Journal

Environmental Science & Technolocy

Abstract

The implicit assumption that biogenic secondary organic aerosol (SOA) is natural and can not be controlled hinders effective air quality management. Anthropogenic pollution facilitates transformation of naturally emitted volatile organic compounds (VOCs) to the particle phase, enhancing the ambient concentrations of biogenic secondary organic aerosol (SOA). It is therefore conceivable that some portion of ambient biogenic SOA can be removed by controlling emissions of anthropogenic pollutants. Direct measurement of the controllable fraction of biogenic SOA is not possible, but can be estimated through 3-dimensional photochemical air quality modeling. To examine this in detail, 22 CMAQ model simulations were conducted over the continental U.S. (August 15 to September 4, 2003). The relative contributions of five emitted pollution classes (i.e., NOx, NH3, SOx, reactive non methane carbon (RNMC) and primary carbonaceous particulate matter (PCM)) on biogenic SOA were estimated by removing anthropogenic emissions of these pollutants, one at a time and all together. Model results demonstrate a strong influence of anthropogenic emissions on predicted biogenic SOA concentrations, suggesting more than 50% of biogenic SOA in the eastern U.S. can be controlled. Because biogenic SOA is substantially enhanced by controllable emissions, classification of SOA as biogenic or anthropogenic based solely on VOC origin is not sufficient to describe the controllable fraction.

Keywords

Authors

Carlton, A.G.; Pinder, R.W.; Bhave, P.V.; Pouliot, G.A.

Volume	Issue	Pages	Date Published	Times Cited
44	9	3376-3380	April 2010	

Digital Object Identifier (DOI)

10.1021/es903506b

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Bioavailable Mercury Cycling in Polar Snowpacks

Publication / Journal

ENVIRONMENTAL SCIENCE & TECHNOLOGY

Abstract

Polar regions are subject to contamination by mercury (Hg) transported from lower latitudes, severely impacting human and animal health. Atmospheric Mercury Depletion Events (AMDEs) are an episodic process by which Hg is transferred from the atmospheric reservoir to arctic snowpacks. The fate of Hg deposited during these events is the subject of numerous studies, but its speciation remains unclear, especially in terms of environmentally relevant forms such as bioavailable mercury (BioHg). Here, using a bacterial mer-lux biosensor, we report the fraction of newly deposited Hg at the surface and at the bottom of the snowpack that is bioavailable. Snow samples were collected over a two-month arctic field campaign in 2008. In surface snow, BioHg is related to atmospheric Hg deposition and snow fall events were shown to contribute to higher proportions of BioHg than AMDEs. Based on our data, AMDEs represent a potential source of 20 ty(-1) of BioHg, while wet and dry deposition pathways may provide 135-225 ty(-1) of BioHg to Arctic surfaces.

Keywords

Authors

Larose, C; Dommergue, A; Marusczak, N; Coves, J; Ferrari, CP; Schneider, D

Volume: 45

Issue: 6

Pages: 2150-2156

Date Published: March 2011

Times Cited: 8

Digital Object Identifier (DOI): 10.1021/es103016x

Media Category: Both

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Methylmercury in arctic Alaskan mosquitoes: implications for impact of atmospheric mercury depletion events

Publication / Journal

ENVIRONMENTAL CHEMISTRY

Abstract

Atmospheric Mercury Depletion Events (AMDE)-phenomena in which elemental Hg is oxidised and stripped from the atmosphere over an 8-12-week period following polar sunrise-appear to increase Hg deposition to environs near the Arctic Ocean with a lesser impact inland. A key concern is whether such events lead to enhanced production and uptake of the toxic methylmercury (MeHg) species into arctic food webs. Here, we used mosquitoes, which are sensitive and site-specific bioindicators of Hg loadings, to assess the impact of AMDE on ecosystem MeHg contamination along a 200-km transect between the Arctic Ocean coast and foothills of the Brooks Range, where gross atmospheric Hg deposition appears to be similar to 20-fold less than that near the coast. This preliminary survey revealed little variation and no gradient in mosquito MeHg levels, which suggests comparable ecosystem impact. This may also point to significant cycling and reemission (e.g. via photoreduction) of Hg deposited during AMDE from the snow and ice pack to the atmosphere.

Keywords

Authors

Hammerschmidt, CR; Fitzgerald, WF

Volume	Issue	Pages	Date Published	Times Cited
5	2	127-130	2008	8

Digital Object Identifier (DOI)

10.1071/EN08003

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Atmospheric mercury exchange with a tallgrass prairie ecosystem housed in mesocosms

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

This study focused on characterizing air-surface mercury Hg exchange for individual surfaces (soil, litter-covered soil and plant shoots) and ecosystem-level flux associated with tallgrass prairie ecosystems housed inside large mesocosms over three years. The major objectives of this project were to determine if individual surface fluxes could be combined to predict ecosystem-level exchange and if this low-Hg containing ecosystem was a net source or sink for atmospheric Hg. Data collected in the field were used to validate fluxes obtained in the mesocosm setting. Because of the controlled experimental design and ease of access to the mesocosms, data collected allowed for assessment of factors controlling flux and comparison of models developed for soil Hg flux versus environmental conditions at different temporal resolution (hourly, daily and monthly). Evaluation of hourly data showed that relationships between soil Hg flux and environmental conditions changed over time, and that there were interactions between parameters controlling exchange. Data analyses demonstrated that to estimate soil flux over broad temporal scales (e.g. annual flux) coarse-resolution data (monthly averages) are needed. Plant foliage was a sink for atmospheric Hg with uptake influenced by plant functional type and age. individual system component fluxes (bare soil and plant) could not be directly combined to predict the measured whole system flux (soil, litter and plant). Emissions of Hg from vegetated and litter-covered soil were lower than fluxes from adjacent bare soil and the difference between the two was seasonally dependent and greatest when canopy coverage was greatest. Thus, an index of plant canopy development (canopy greenness) was used to model Hg flux from vegetated soil. Accounting for ecosystem Hg inputs (precipitation, direct plant uptake of atmospheric Hg) and modeled net exchange between litter-and-plant covered soils, the tallgrass prairie was found to be a net annual sink of atmospheric Hg.

Keywords

Authors

Stamenkovic, J; Gustin, MS; Arnone, JA; Johnson, DW; Larsen, JD; Verburg, PSJ

Volume	Issue	Pages	Date Published	Times Cited
406	1-2	227-238	November 2008	11

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2008.07.047

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: White

Source: Scientific Paper

Relevance Ranking: B

Title

Fluctuations in foliar nutrient contents in different tree species induced by thermal power plant emissions in Angul District, Orissa, India. Changes in foliar nutrient content of plants induced by thermal power plant emission

Publication / Journal

Journal of Tropical Forestry

Abstract

The impact of thermal power plant emissions on foliar elemental concentration was assessed in this study. In addition to direct effects of deposition of air pollutants, soil mediated processes can also bring deterioration in plant growth due to altered soil characteristics. Fluctuations in pH range were noticed as a function of stack height, dispersion mechanism, wind direction and neutralizing capacity of the fly ash particulates. Fly ash emitted from power plant gets deposited on the foliar canopy affecting the normal growth of plants. Lower nitrogen and phosphorous content indicated reduced nitrogen metabolism and phosphorylation due to adverse impact on soil micro organisms and reduced photosynthetic activities. Accumulation of inorganic sulphur content shows sulphur accumulation in the plants in excess of metabolic demand. Fluctuations in foliar elemental concentrations create significant imbalances in plant metabolism due to the synergistic effect of air pollutants. These effects are further dependent upon differences in species, climate and distances from sources of pollution. Plant nutrient fluctuation data can serve as bio-monitors of air pollution in similar areas.

Keywords

Authors

Rekha Nayak; Rupnarayan Sett; Debasis Biswal

Volume: 27

Issue: 3

Pages: 1-17

Date Published: 2011

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Coal an Impure Fuel Source: Radiation Effects of Coal-fired Power Plants in Turkey

Publication / Journal

Hacettepe Journal of Bioloby and Chemistry

Abstract

Turkish coal is generally poor quality and the levels of chemical and radiological toxic traceelements in it are higher with respect to mean values of activity concentrations given inUnited Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)Report. The main pathways through which the population living around soal-fired power plant (CFPP) is exposed to natural radionuclides are external and internal (ingestion andinhalation) dose and fly ash particles are the major component of the risk. It is estimatedthat the people working or living near the CFPP in Turkey receive a dose in between 0.1mSv to 1 mSv extra from CFPP because nearly all the region of Turkey uranium (U) andthorium (Th) content in the coal are higher than 5 ppm to 7 ppm and around 25 ppm to 40ppm respectively. Continuous monitoring is essential to determine occupational exposurelevels in all stages of the coal fuel-cycle and proper measures should be taken to preventdirect contact of the ash pile with the top soil and local drainage systems.

Keywords

Radiation, Coal, Coal-fired power plant, Pollution, Radioactivity, Turkey

Authors

Uslu, I; Gokmese, F

Volume	Issue	Pages	Date Published	Times Cited
38	4	259-268	2010	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both	Coal		

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	C

Title

Does urban vegetation mitigate air pollution in northern conditions?

Publication / Journal

ENVIRONMENTAL POLLUTION

Abstract

It is generally accepted that urban vegetation improves air quality and thereby enhances the well-being of citizens. However, empirical evidence on the potential of urban trees to mitigate air pollution is meager, particularly in northern climates with a short growing season. We studied the ability of urban park/forest vegetation to remove air pollutants (NO_2, anthropogenic VOCs and particle deposition) using passive samplers in two Finnish cities. Concentrations of each pollutant in August (summer; leaf-period) and March (winter, leaf-free period) were slightly but often insignificantly lower under tree canopies than in adjacent open areas, suggesting that the role of foliage in removing air pollutants is insignificant. Furthermore, vegetation-related environmental variables (canopy closure, number and size of trees, density of understorey vegetation) did not explain the variation in pollution concentrations. Our results suggest that the ability of urban vegetation to remove air pollutants is minor in northern climates.

Keywords

Authors

Setala, H; Viippola, V; Rantalainen, AL; Pennanen, A; Yli-Pelkonen, V

Volume	Issue	Pages	Date Published	Times Cited
183	SI	104-112	December 2013	2

Digital Object Identifier (DOI)

10.1016/j.envpol.2012.11.010

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Effects of atmospheric environmental changes on annual ring growth of Cryptomeria japonica in Southern Korea

Publication / Journal

Journal of Ecology and Environment

Abstract

Annual ring formation is considered a source of information to investigate the effects of environmental changes caused by temperature, air pollution, and acid rain on tree growth. A comparative investigation of annual ring growth of cryptomeria japonica in relation to environmental changes was conducted at two sites in southern Korea (Haenam and Jangseong). Three wood disks from each site were collected from stems at breast height and annual ring growth was analyzed. Annual ring area at two sites increased over time ($p > 0.05$). Tree ring growth rate in Jangseong was higher than that in Haenam. Annual ring area increment in Jangseong was more strongly correlated with environmental variables than that in Haenam; annual ring growth increased with increasing temperature ($p < 0.01$) and a positive effect of NO_2 concentration on annual ring area ($p < 0.05$) could be attributed to nitrogen deposition in Jangseong. The correlation of annual ring growth increased with decreasing SO_2 and CO_2 concentrations ($p < 0.01$) in Jangseong. Variation in annual growth rings in Jangseong could be associated with temperature changes and N deposition. In Haenam, annual ring growth was correlated with SO_2 concentration ($p < 0.01$), and there was a negative relationship between precipitation pH and annual ring area ($p < 0.01$) which may reflect changes in nutrient cycles due to the acid rain. Therefore, the combined effects of increased CO_2, N deposition, and temperature on tree ring growth in Jangseong may be linked to soil acidification in this forest ecosystem. The interactions between air pollution (SO_2) and precipitation pH in Haenam may affect tree growth and may change nutrient cycles in this site. These results suggested that annual tree ring growth in Jangseong was more correlated with environmental variables than that in Haenam. However, the further growth of C. japonica forest at two sites is at risk from the long-term effects of acid deposition from fossil fuel combustion.

Keywords

Authors

Luong, Thi-Hoan; Jang, Kyoung-Soo; Choi, Woo-Jung; Lee, Kye-Han

Volume	Issue	Pages	Date Published	Times Cited
36	1-4	31-38	March-Decembe	0

Digital Object Identifier (DOI)

10.5141/ecoenv.2013.004

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Establishing past environmental conditions and tracking long-term environmental change in the Canadian Maritime provinces using lake sediments

Publication / Journal

ENVIRONMENTAL REVIEWS

Abstract

Freshwater lakes in the Canadian Maritime provinces have been detrimentally influenced by multiple, often synergistic, anthropogenically-sourced environmental stressors. These include surface-water acidification (and a subsequent decrease in calcium loading to lakes); increased nutrient inputs; watershed development; invasive species; and climate change. While detailed studies of these stressors are often hindered by a lack of predisturbance monitoring information; in many cases, these missing data can be determined using paleolimnological techniques, along with inferences on the full extent of environmental change (and natural variability), the timing of changes, and linkages to probable causes for change. As freshwater resources are important for fisheries, agriculture, municipal drinking water, and recreational activities, among others, understanding long-term ecological changes in response to anthropogenic stressors is critical. To assess the impacts of the major water-quality issues facing freshwater resources in this ecologically significant region, a large number of paleolimnological studies have recently been conducted in Nova Scotia and southern New Brunswick. These studies showed that several lakes in southwestern Nova Scotia, especially those in Kejimkujik National Park, have undergone surface-water acidification (mean decline of 0.5 pH units) in response to local-source SO2 emissions and the long-range transport of airborne pollutants. There has been no measureable chemical or biological recovery since emission restrictions were enacted. Lakewater calcium (Ca) decline, a recently recognized environmental stressor that is inextricably linked to acidification, has negatively affected the keystone zooplankter Daphnia in at least two lakes in Nova Scotia (and likely more), with critical implications for aquatic food webs. A consistent pattern of increasing planktonic diatoms and scaled chrysophytes was observed in lakes across Nova Scotia and New Brunswick, suggesting that the strength and duration of lake thermal stratification has increased since pre-industrial times in response to warming temperatures (similar to 1.5 degrees C since 1870). These include three lakes near Bridgewater, Nova Scotia, that are among the last known habitat for critically endangered Atlantic whitefish (Coregonus huntsmani). Overall, these studies suggest that aquatic ecosystems in the Maritime Provinces are being affected by multiple anthropogenic stressors and paleolimnology can be effective for inferring the ecological implications of these stressors.

Keywords

Authors

Korosi, JB; Ginn, BK; Cumming, BF; Smol, JP

Volume	Issue	Pages	Date Published	Times Cited
21	1	15-27	2013	0

Digital Object Identifier (DOI)

10.1139/er-2012-0041

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		

Lichen/Moss	☐	Other Abiotic Medium	☐
Microbes	☐		
Other Biotic Medium	☑		

Literature Type: White

Source: Scientific Paper

Relevance Ranking: C

Title

Environmental impact of coal industry and thermal power plants in India.

Publication / Journal

Journal of Environmental Radioactivity

Abstract

Coal is the only natural resource and fossil fuel available in abundance in India. Consequently, it is used widely as a thermal energy source and also as fuel for thermal power plants producing electricity. India has about 90,000 MW installed capacity for electricity generation, of which more than 70% is produced by coal-based thermal power plants. Hydro-electricity contributes about 25%, and the remaining is mostly from nuclear power plants (NPPs). The problems associated with the use of coal are low calorific value and very high ash content. The ash content is as high as 55-60%, with an average value of about 35-40%. Further, most of the coal is located in the eastern parts of the country and requires transportation over long distances, mostly by trains, which run on diesel. About 70% oil is imported and is a big drain on India's hard currency. In the foreseeable future, there is no other option likely to be available, as the nuclear power programme envisages installing 20,000 MWe by the year 2020, when it will still be around 5% of the installed capacity. Hence, attempts are being made to reduce the adverse environmental and ecological impact of coal-fired power plants. The installed electricity generating capacity has to increase very rapidly (at present around 8-10% per annum), as India has one of the lowest per capita electricity consumptions. Therefore, the problems for the future are formidable from ecological, radio-ecological and pollution viewpoints. A similar situation exists in many developing countries of the region, including the People's Republic of China, where coal is used extensively. The paper highlights some of these problems with the data generated in the author's laboratory and gives a brief description of the solutions being attempted. The extent of global warming in this century will be determined by how developing countries like India manage their energy generation plans. Some of the recommendations have been implemented for new plants, and the situation in the new plants is much better. A few coal washeries have also been established. It will be quite some time before the steps to improve the environmental releases are implemented in older plants and several coal mines due to resource constraints.

Keywords

Authors

Mishra, UC

Volume: 72

Issue: 1-2

Pages: 35-40

Date Published: 2004

Times Cited:

Digital Object Identifier (DOI)

10.1016/S0265-931X(03)00183-8

Media Category: Both

Generation Type: Coal

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

Assessing the ecosystem service of air pollutant removal by urban trees in Guangzhou (China)

Publication / Journal

JOURNAL OF ENVIRONMENTAL MANAGEMENT

Abstract

In Chinese cities, air pollution has become a serious and aggravating environmental problem undermining the sustainability of urban ecosystems and the quality of urban life. Besides technical solutions to abate air pollution, urban vegetation is increasingly recognized as an alternative ameliorative method by removing some pollutants mainly through dry deposition process. This paper assesses the capability and monetary value of this ecosystem service in Guangzhou city in South China. The results indicated an annual removal of SO2, NO2 and total suspended particulates at about 312.03Mg, and the benefits were valued at RMB90.19 thousand (US$1.00 = RMB8.26). More removal was realized by recreational land use due to a higher tree cover. Higher concentration of pollutants in the dry winter months induced more removal. The lower cost of pollution abatement in China generated a relatively subdued monetary value of this environmental benefit in comparison with developed countries. Younger districts with more extensive urban trees stripped more pollutants from the air, and this capacity was anticipated to increase further as their trees gradually reach final dimensions and establish a greater tree cover. Tree cover and pollutant concentration constitute the main factors in pollutant removal by urban trees. The efficiency of atmospheric cleansing by trees in congested Chinese cities could be improved by planting more trees other than shrubs or grass, diversifying species composition and biomass structure, and providing sound green space management. The implications for greenery design were discussed with a view to maximizing this ecosystem service in Chinese cities and other developing metropolises.

Keywords

Authors

Jim, CY; Chen, WY

Volume	Issue	Pages	Date Published	Times Cited
88	4	665-676	September 2008	38

Digital Object Identifier (DOI)

10.1016/j.jenvman.2007.03.035

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

How does climate change influence arctic mercury?

Publication / Journal

SCIENCE OF THE TOTAL ENVIRONMENT

Abstract

Recent studies have shown that climate change is already having significant impacts on many aspects of transport pathways, speciation and cycling of mercury within Arctic ecosystems. For example, the extensive loss of sea-ice in the Arctic Ocean and the concurrent shift from greater proportions of perennial to annual types have been shown to promote changes in primary productivity; shift foodweb structures, alter mercury methylation and demethylation rates, and influence mercury distribution and transport across the ocean-sea-ice-atmosphere interface (bottom-up processes). In addition, changes in animal social behavior associated with changing sea-ice regimes can affect dietary exposure to mercury (top-down processes). In this review, we address these and other possible ramifications of climate variability on mercury cycling, processes and exposure by applying recent literature to the following nine questions; 1) What impact has climate change had on Arctic physical characteristics and processes? 2) How do rising temperatures affect atmospheric mercury chemistry? 3) Will a decrease in sea-ice coverage have an impact on the amount of atmospheric mercury deposited to or emitted from the Arctic Ocean, and if so, how? 4) Does climate affect air-surface mercury flux, and riverine mercury fluxes, in Arctic freshwater and terrestrial systems, and if so, how? 5) How does climate change affect mercury methylation/demethylation in different compartments in the Arctic Ocean and freshwater systems? 6) How will climate change alter the structure and dynamics of freshwater food webs, and thereby affect the bioaccumulation of mercury? 7) How will climate change alter the structure and dynamics of marine food webs, and thereby affect the bioaccumulation of marine mercury? 8) What are the likely mercury emissions from melting glaciers and thawing permafrost under climate change scenarios? and 9) What can be learned from current mass balance inventories of mercury in the Arctic? The review finishes with several conclusions and recommendations.

Keywords

Authors

Stern, GA; Macdonald, RW; Outridge, PM; Wilson, S; Chetelat, J; Cole, A; Hintelmann, H; Loseto, LL; Steffen, A; Wang, FY; Zdanowicz, C

Volume	Issue	Pages	Date Published	Times Cited
414		22-42	January 2012	17

Digital Object Identifier (DOI)

10.1016/j.scitotenv.2011.10.039

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
White	Scientific Paper	B

Title

An update on the natural sources and sinks of atmospheric mercury

Publication / Journal

APPLIED GEOCHEMISTRY

Abstract

This paper summarizes recent advances in the understanding of the exchange of Hg between the atmosphere and natural terrestrial surfaces including substrates (soil, rocks, litter-covered surfaces and weathered lithological material) and foliage. Terrestrial landscapes may act as new sources of atmospheric Hg, and as repositories or temporary residences for anthropogenically and naturally derived atmospheric Hg. The role of terrestrial surfaces as sources and sinks of atmospheric Hg must be quantified in order to develop regional and global Hg mass balances, and to assess the efficacy of regulatory controls on anthropogenic point sources in reduction of human Hg exposure.

Continued field research has allowed for refinement of emission estimates for geothermal and volcanic, and Hg mineralized areas in the western USA to similar to 1.2-3.0, and 10-20 Mg/a, respectively. The emission estimate for areas of Hg mineralization in the western USA includes only identified Hg deposits and occurrences, and since other areas of geologic Hg enrichment such as Au and Ag deposits are not considered, the range in values is most likely an underestimate. Laboratory and field measurements have improved understanding of air-surface Hg exchange associated with soils with low or natural background concentrations of Hg (< 100 ppb), litter-covered forest floors, and foliar surfaces, all of which have large spatial coverage. Deposition of atmospheric Hg and re-emission are important processes occurring at these surfaces on diel and seasonal time scales. Foliage is a significant sink for atmospheric elemental Hg, however, the net flux associated with low Hg containing soils is uncertain. Mass balances developed for soil-air exchange using measured fluxes and estimated deposition indicate that over a year background soils may exhibit no net flux. This suggests that the residence time for elemental Hg in the air is on the order of hours to weeks. Short term exchange would result in a homogenous air Hg concentration due to constant mixing and in an apparent calculated residence time that is most likely too long (one year). Recycling of atmospheric Hg between natural background soils and foliar surfaces also provides a mechanism for long-term atmospheric contamination and continued deposition in pristine ecosystems well after anthropogenic sources are controlled.

Keywords

Authors

Gustin, MS; Lindberg, SE; Weisberg, PJ

Volume	Issue	Pages	Date Published	Times Cited
23	3	482-493	March 2008	45

Digital Object Identifier (DOI)

10.1016/j.apgeochem.2007.12.010

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
Grey	Non-government Report	B

Title

Program on Technology Innovation: Literature Review of Issues Related to the Atmospheric Impacts of Natural Gas Power Plants

Publication / Journal

Electric Power Research Institute

Abstract

Natural gas is set to become an increasingly larger portion of the power generation fuel mix in the United States in upcoming years. The EIA estimates that 96.65 gigawatts (GW) of new electricity capacity will be added in the United States between 2009 and 2015. With the renewed interest in the use of this fuel in a variety of power plant designs, a review of recent research investigating the environmental impacts of natural gas power plants—in particular those from atmospheric emissions—was warranted.
This review was conducted using existing peer-reviewed literature, published reports, conference presentations, and discussions with researchers. The review focused on traditional and emerging air pollutants being considered in air quality management processes, such as criteria pollutants relevant to the National Ambient Air Quality Standards and hazardous air pollutants, as well as emerging issues in the air quality management community (for example, ultrafine particle number). It was found that particulate matter (PM) emissions, including ultrafine particle emissions, from natural gas power plants are quite uncertain. Emissions of organic compounds can be dramatically enhanced during poor combustion conditions, which may be present during plant cycling. In addition, upstream emissions from traditional or shale gas extraction could exacerbate the ozone problems in some parts of the country. Finally, little rigorous health impacts research related to natural gas power plants has been done at this time. The major findings from the review are summarized in this report.

Keywords

Air Quality; Environmental impacts; Natural gas combustion; Particulate matter (PM) emissions; Shale gas extraction; Ultrafine particles (UFPs)

Authors

Electric Power Research Institute

Volume	Issue	Pages	Date Published	Times Cited

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Natural Gas		

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	B

Title

Overview of the South American Biomass Burning Analysis (SAMBBA) Field Experiment

Publication / Journal

Source: NUCLEATION AND ATMOSPHERIC AEROSOLS; Book Series Title: AIP Conference Proceedings

Abstract

Biomass burning represents one of the largest sources of particulate matter to the atmosphere, which results in a significant perturbation to the Earth's radiative balance coupled with serious negative impacts on public health. Globally, biomass burning aerosols are thought to exert a small warming effect of 0.03 Wm(-2), however the uncertainty is 4 times greater than the central estimate. On regional scales, the impact is substantially greater, particularly in areas such as the Amazon Basin where large, intense and frequent burning occurs on an annual basis for several months (usually from August-October). Furthermore, a growing number of people live within the Amazon region, which means that they are subject to the deleterious effects on their health from exposure to substantial volumes of polluted air. Initial results from the South American Biomass Burning Analysis (SAMBBA) field experiment, which took place during September and October 2012 over Brazil, are presented here. A suite of instrumentation was flown on-board the UK Facility for Airborne Atmospheric Measurement (FAAM) BAe-146 research aircraft and was supported by ground based measurements, with extensive measurements made in Porto Velho, Rondonia. The aircraft sampled a range of conditions with sampling of fresh biomass burning plumes, regional haze and elevated biomass burning layers within the free troposphere. The physical, chemical and optical properties of the aerosols across the region will be characterized in order to establish the impact of biomass burning on regional air quality, weather and climate.

Keywords

Authors

Morgan, WT; Allan, JD; Flynn, M; Darbyshire, E; Hodgson, A; Johnson, T; Haywood, JM; Freitas, S; Longo, K; Artaxo, P; Coe, H

Volume	Issue	Pages	Date Published	Times Cited
1527		587-590	2013	0

Digital Object Identifier (DOI)

10.1063/1.4803339

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Biomass		

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☑		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	C

Title

Atmospheric emissions of one pulp and paper mill. Contribution to the air quality of Viana do Castelo

Publication / Journal

8th WSEAS International Conference on System Science and Simulation in Engineering

Abstract

One of the most sensitive environmental impact of the pulp and paper mills is associated with the atmospheric pollution namely with sulphur compounds, particulate matter and nitrogen oxides. The study undertaken aimed to evaluate the influence of one pulp and paper mill to the air quality of a Portuguese city located in the vicinity. A range of numerical models were used to produce the concentration maps: the ADMS-Urban model for the pollutants dispersion; the Hills model to calculate air flow and turbulence over complex terrain, including the effects of variable surface roughness and EPER data (The European Pollutant Emission Register) to estimate the emissions factors.

Keywords

Authors

Silva, LT; Mendes, JFG

Volume	Issue	Pages	Date Published	Times Cited
		21-26	2009	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Government Report

Relevance Ranking: B

Title

Results and Findings from the Joint Enhanced Ozone and PM Precursor - PM2.5 Technology Assessment and Characterization Study in New York (PMTACS-NY)

Publication / Journal

New York State Energy Research and Development Authority

Abstract

The Joint Enhanced Ozone and PM Precursor/PM2.5 Technology Assessment and Characterization Study in New York (PMTACS-NY) was designed: to improve our understanding of ozone/PM2.5-precursor relationships and to assess methods for tracking the effectiveness of emission control programs using new air quality monitoring systems.
The study was designed around three major objectives: 1) Measure the temporal and spatial distribution of the O3, PM2.5/ co-pollutant complex and its precursors to support regulatory requirements to develop cost effective mitigation strategies for O3, PM2.5 and its co-pollutants and to establish trends in the relevant precursor concentrations to assess the impact of recent and future emission reductions in terms of emission control effectiveness and air quality response; 2) Monitor the effectiveness of new emission control technologies [i.e. Compressed Natural Gas (CNG) bus deployment and Continuously Regenerating Technology (CRT)] introduced in New York City and its potential impact on ambient air quality; and 3) Test, evaluate and identify operationally robust new measurement technologies for future network operation that will improve understanding of atmospheric processes affecting air quality and support health based exposure assessments.
This report summarizes the key accomplishments and findings of the study and associated
published scientific results.

Keywords

Authors

Demerjian, KL; Schwab, JJ; Roychowdhury, U; Hogrefe, I

Volume | Issue | Pages | Date Published: July 2009 | Times Cited

Digital Object Identifier (DOI)

Media Category: Abiotic

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	B

Title

SO2 photoexcitation mechanism links mass-independent sulfur isotopic fractionation in cryospheric sulfate to climate impacting volcanism

Publication / Journal

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA

Abstract

Natural climate variation, such as that caused by volcanoes, is the basis for identifying anthropogenic climate change. However, knowledge of the history of volcanic activity is inadequate, particularly concerning the explosivity of specific events. Some material is deposited in ice cores, but the concentration of glacial sulfate does not distinguish between tropospheric and stratospheric eruptions. Stable sulfur isotope abundances contain additional information, and recent studies showa correlation between volcanic plumes that reach the stratosphere and mass-independent anomalies in sulfur isotopes in glacial sulfate. We describe a mechanism, photoexcitation of SO2, that links the two, yielding a useful metric of the explosivity of historic volcanic events. A plume model of S(IV) to S(VI) conversion was constructed including photochemistry, entrainment of background air, and sulfate deposition. Isotopologue-specific photoexcitation rates were calculated based on the UV absorption cross-sections of (SO2)-S-32, (SO2)-S-33, (SO2)-S-34, and (SO2)-S-36 from 250 to 320 nm. The model shows that UV photoexcitation is enhanced with altitude, whereasmass-dependent oxidation, such as SO2 + OH, is suppressed by in situ plume chemistry, allowing the production and preservation of amass-independent sulfur isotope anomaly in the sulfate product. The model accounts for the amplitude, phases, and time development of Delta S-33/delta S-34 and Delta S-36/delta S-33 found in glacial samples. We are able to identify the process controlling mass-independent sulfur isotope anomalies in the modern atmosphere. This mechanism is the basis of identifying the magnitude of historic volcanic events.

Keywords

Authors

Hattori, S; Schmidt, JA; Johnson, MS; Danielache, SO; Yamada, A; Ueno, Y; Yoshida, N

Volume	Issue	Pages	Date Published	Times Cited
110	44	17656-17661	October 2013	4

Digital Object Identifier (DOI)

10.1073/pnas.1213153110

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Government Report

Relevance Ranking: B

Title

Response of Adirondack Ecosystems to Atmospheric Pollutants and Climate Change at the Huntington Forest and Arbutus Watershed: Research Findings and Implications for Public Policy

Publication / Journal

New York State Energy Research and Development Authority

Abstract

Investigations at the Huntington Forest have done extensive evaluations of the effects of “acid rain” and climate change on terrestrial and aquatic ecosystems in the Adirondack Mountains of New York State. This is the only research site in the Adirondacks that includes a complete suite of field instruments for monitoring air quality, climatic effects and hydrological responses for both terrestrial and aquatic ecosystems. A combination of atmospheric deposition measurements from the National Atmospheric Deposition Program/National Trends Network (NADP/NTN), CASTNET (Clean Air Status and Trends Network) and MDN (Mercury Deposition Network) have been linked with hydrological, climatological and biogeochemical measurements. Deposition measurements have documented improvements in precipitation chemistry and watershed responses due to decreases in sulfur emission, but the contribution the atmospheric deposition of biologically available nitrogen continues to be elevated. The net retention or loss of this added nitrogen has been shown to be linked to climatic conditions as well as landscape features including topography, soil conditions and the composition of the forest vegetation. Results from intensive and extensive analyses within and among sites have been incorporated into modeling tools to provide information that is relevant to policy decisions with respect to the regulation of atmospheric emissions that influence air quality and climate in the United States.

Keywords

Biogeochemistry; watershed; Adirondack; Atmospheric Pollutants; Ecosystem; Climate Change; Long-term monitoring; soils

Authors

Mitchell, MJ; Raynal, DJ; Driscoll, CT

Volume:

Issue:

Pages:

Date Published: November 2009

Times Cited:

Digital Object Identifier (DOI):

Media Category: Abiotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Other	C

Title

Environmental issues: emissions, pollution control, assessment and management

Publication / Journal

The Coal Handbook: Towards Cleaner Production

Abstract

Coal utilisation in industry has a long and rich history as a provider of reliable energy for electricity production and industrial processing. The management of environmental issues arising from this use has become an increasingly central concern, and raises challenges for industry as it faces potential impacts on air and water quality, and climate, from the emissions associated with coal combustion and other industrial processes. The concerns include greenhouse gas emissions, acid gases, fine particles, and the leaching of toxic trace elements from ash and slag. In this chapter the nature of the emissions and their impacts, legislative approaches, and emissions and controls are described. Finally some observations on the future of coal use are made, and the impacts of advanced technologies on environmental issues associated with coal use are briefly discussed.

Keywords

coal; sulfur oxides; oxides of nitrogen; fine particles; emissions control; emissions regulations

Authors

Nelson, P.

Volume	Issue	Pages	Date Published	Times Cited
2		21-62	2013	

Digital Object Identifier (DOI)

10.1533/9781782421177.1.21

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Non-government Report	A

Title

Measuring Mercury Isotopes in the Atmosphere and Rainfall near a Coal-Fired Power Plant

Publication / Journal

Electric Power Research Institute

Abstract

Recent work has shown that the seven naturally occurring stable isotopes of mercury (Hg) undergo mass-dependent fractionation (MDF) and mass-independent fractionation (MIF) during transformation processes, especially during chemical oxidation and reduction (redox) reactions that can occur in the atmosphere. The isotopic patterns resulting from fractionation can be used to help trace the sources of Hg in the environment and to help clarify the mechanisms of Hg cycling. This project was designed with the following objectives:

- To develop methods for the collection and isotopic analysis of the dominant Hg species in the atmosphere—gaseous elemental mercury (GEM), reactive (oxidized) gaseous mercury (RGM), and particulate/aerosol bound mercury (Hg-p)—and Hg in rainfall.
- To improve our understanding of mercury's atmospheric fate and transport.
- To assess the impact of a local coal-fired power plant (CFPP) on atmospheric and rainfall Hg concentrations.

To that end, samples were collected from July 2010 through August 2012 at the Outlying Landing Field (OLF) site—a suburban coastal site near Pensacola, Florida, which is 15 kilometers west of CFPP Crist.

The Hg isotopic patterns for GEM at the site were not different from those observed elsewhere (that is, the Great Lakes region of the United States and Vulcano Island, Italy), but were different from those observed at a nearby site in Grand Bay, Mississippi. Strong seasonality in the Hg isotopic patterns for RGM was observed, with summer samples showing more MDF than winter/spring samples. The Hg isotopic patterns for RGM appear to reflect MDF and MIF from oxidation of the ambient GEM in some cases; in other cases, it appears that local or regional sources of RGM may be important. The Hg isotopic patterns for Hg-p appear to reflect MDF and MIF from adsorption of RGM while, in other cases, it appears that post-adsorption photochemical reduction of RGM in aerosols has contributed to additional MIF in the Hg-p. All of the samples collected for this study exhibit a strong MIF signal, indicating photochemical redox cycling of Hg.

The Hg isotopic patterns in rainfall at the OLF site could sometimes be explained by scavenging of the ambient RGM and Hg-p; in other cases, it appears that the scavengable RGM and Hg-p in the free troposphere must have a different Hg isotopic composition from that observed for the ambient RGM and Hg-p at ground level. In contrast to a study of rainfall Hg isotopes near another CFPP in Florida, no impact from CFPP Crist in Pensacola on the Hg isotopic patterns for GEM, RGM, Hg-p, or in rainfall was observed.

Keywords

Atmosphere
Coal-fired
Deposition
Emissions
Isotopes
Mercury
Atmosphere; Coal-fired; Deposition; Emissions; Isotopes; Mercury

Authors

Electric Power Research Institute

Volume	Issue	Pages	Date Published	Times Cited
			November 2013	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	B

Title

Aerosol Nucleation in Coal-Fired Power-Plant Plumes

Publication / Journal

NUCLEATION AND ATMOSPHERIC AEROSOLS

Abstract

New-particle nucleation within coal-fired power-plant plumes can have large effects on particle number concentrations, particularly near source regions, with implications for human health and climate. In order to resolve the formation and growth of particles in these plumes, we have integrated TwO-Moment Aerosol Sectional (TOMAS) microphysics in the System for Atmospheric Modelling (SAM), a large-eddy simulation/cloud-resolving model (LES/CRM). We have evaluated this model against aircraft observations for three case studies, and the model reproduces well the major features of each case. Using this model, we have shown that meteorology and background aerosol concentrations can have strong effects on new-particle formation and growth in coal-fired power-plant plumes, even if emissions are held constant. We subsequently used the model to evaluate the effects of SO2 and NOx pollution controls on newparticle formation in coal-fired power-plant plumes. We found that strong reductions in NOx emissions without concurrent reductions in SO2 emissions may increase new-particle formation, due to increases in OH formation within the plume. We predicted the change in new-particle formation due to changes in emissions between 1997 and 2010 for 330 coal-fired power plants in the US, and we found a median decrease of 19% in new-particle formation. However, the magnitude and sign of the aerosol changes depend greatly on the relative reductions in NOx and SO2 emissions in each plant. More extensive plume measurements for a range of emissions of SO2 and NOx and in varying background aerosol conditions are needed, however, to better quantify these effects.

Keywords

Authors

Stevens, R; Lonsdale, C; Brock, C; Makar, P; Knipping, E; Reed, M; Crawford, J; Holloway, J; Ryerson, T; Huey, LG; Nowak, J; Pierce, J

Volume	Issue	Pages	Date Published	Times Cited
1527		417-420	2013	0

Digital Object Identifier (DOI)

10.1063/1.4803292

Media Category	Generation Type	CoalType	BiomassType
Abiotic	Coal		

Mammals	☐	Air	☑	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Letter	A

Title

Comment on "Effect of coal-fired power generation on visibility in a nearby National Park (Terhorst and Berkman, 2010)"

Publication / Journal

Atmospheric Environment

Abstract

Few electricity generating stations received more environmental scrutiny during the last quarter of the twentieth century than did the Mohave Power Project (MPP), a coal-fired facility near Grand Canyon National Park. Terhorst and Berkman (2010) examine regional aerosol monitoring data collected before and after the plant's 2006 retirement for retrospective evidence of MPP's impact on visibility in the Park. The authors' technical analysis is thoughtfully conceived and executed, but is misleadingly presented as discrediting previous studies and their interpretation by regulators. In reality the Terhorst-Berkman analysis validates a consensus on MPP's visibility impact that was established years before its closure, in a collaborative assessment undertaken jointly by Federal regulators and MPP's owners.

Keywords

Authors

White, WH; Farber, RJ; Malm, WC; Nuttall, M; Pitchford, ML; Schichtel, BA

Volume	Issue	Pages	Date Published	Times Cited
55		173-178	August 2012	0

Digital Object Identifier (DOI)

10.1016/j.atmosenv.2012.02.076

Media Category	Generation Type	CoalType	BiomassType
Abiotic			

Mammals	☐	Air	☑	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Non-government Report

Relevance Ranking: B

Title

Pulmonary Effects of Inhaled Diesel Exhaust in Young and Old Mice: A Pilot Project

Publication / Journal

The Health Effects Institute

Abstract

This report explores the possible physiological basis for epidemiologic results suggesting that people over the age of 55 are more sensitive than younger people to the effects of exposure to particulate matter. Dr. Debra Laskin and colleagues hypothesized that this sensitivity resulted from the lung cells of the elderly producing less of the cytokine tumor necrosis factor-α (a cell protein involved in systemic inflammation), as compared with the lung cells of the young after exposure to air pollution. Before embarking on a full mechanistic study, the investigators made a preliminary assessment of TNF-α levels and markers of inflammation in alveolar macrophages of young and old mice exposed to diesel exhaust by inhalation.

Keywords

Authors

Laskin, DL; Mainelis, G; Turpin, BJ; Patel, KJ; Sunil,VR

Volume | Issue | Pages | Date Published: 2010 | Times Cited

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type

CoalType

BiomassType

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Non-government Report	B

Title

Mechanisms of Particulate Matter Toxicity in Neonatal and Young Adult Rat Lungs

Publication / Journal

The Health Effects Institute

Abstract

Research Report 135 describes a study to determine whether the biologic response to inhaled ultrafine particles depends on particle composition. Neonatal and young adult rats were exposed to laboratory-generated ultrafine metal particles, either alone or in combination with soot, and their lungs examined for oxidative stress, inflammation, and injury.

Keywords

Authors

Pinkerton, KE; Zhou, Y; Zhong, C; Smith, KR; Teague, SV; Kennedy, IM; Ménache MG

Volume	Issue	Pages	Date Published	Times Cited
			2008	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☑	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	C

Title

Use of plants for biomonitoring of airborne mercury in contaminated areas

Publication / Journal

ENVIRONMENTAL RESEARCH

Abstract

Biological methods provide a wide variety of possibilities to monitor mercury pollution in the environment. E.g., mosses and lichens give a good picture of the spatial distribution of mercury around pollution sources. On regional or global scale the accuracy is smaller and interpretation of the results more difficult. One reason for this is the long life-time and low reactivity of gaseous elemental mercury (He). At least temperature, light, concentration in air, speciation and biological factors affect the net deposition to or emission from vegetation. Different methods for estimating mercury fluxes between atmosphere and vegetation give different results. At contaminated sites the reaction types and fluxes most probably differ from those at uncontaminated sites. There are many pathways for mercury fluxes as well as physicochemical and biochemical reactions between different mercury species which makes it difficult to assess the fluxes in detail. Environmental conditions like temperature, light and humidity affect these fluxes. Compared to mechanical collectors biological monitors most probably give a more realistic picture of especially dry deposition but a lot of work has still to be done before we have accurate and reliable quantitative estimates of the deposition.

Keywords

Authors

Lodenius, M

Volume	Issue	Pages	Date Published	Times Cited
125	SI	113-123	August 2013	1

Digital Object Identifier (DOI)

10.1016/j.envres.2012.10.014

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Government Report	A

Title

Comparison of Reported Effects and Risks to Vertebrate Wildlife from Six Electricity Generation Types in the New York/New England Region

Publication / Journal

New York State Energy Research and Development Authority

Abstract

An assessment was conducted of the known and documented effects of electricity generation on vertebrate wildlife in the New York/New England (NY/NE) region. The focus of the literature review was peer-reviewed literature and scientifically accepted and published reports or documents regarding effects of electricity generation on wildlife. Results were used to construct a Comparative Ecological Risk Assessment in order to make objective comparisons among the six types of electricity generation important to the NY/NE region: coal, oil, natural gas, hydro, nuclear, and wind. All life cycles of electricity generation affect wildlife and, therefore, pose risks to wildlife individuals and populations. The degree and extent of the risks depend on the energy generation source. There are many ways to classify the impacts of electricity generation on wildlife. Effects can be direct and/or indirect; acute or chronic; individual or cumulative; and local, regional, or global. Each type of effect was explored in this study. Acidic deposition, climate change, and mercury bioaccumulation are identified as the three most significant and widespread stressors to wildlife from electricity generation from fossil fuels combustion in the NY/NE region. Risks to wildlife vary substantially by life cycle stage. Higher risks are generally associated with the resource extraction and power generation stages, as compared to other life cycle stages. Overall, non-renewable electricity generation sources, such as coal and oil, pose higher risks to wildlife than renewable electricity generation sources, such as hydro and wind. Based on the comparative amounts of SO2, NOx, CO2, and mercury emissions generation from coal, oil, natural gas, and hydro and the associated effects of acidic deposition, climate change, and mercury bioaccumulation, coal as an electricity generation source is by far the largest contributor to risks to wildlife found in the NY/NE region.

Keywords

Authors

Environmental Bioindicators Foundation, Inc. and Pandion Systems, Inc.

Volume	Issue	Pages	Date Published	Times Cited
			March 2009	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic	Coal		

Mammals	☑	Air	☐	Nitrogen oxides	☑
Birds	☑	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Other

Relevance Ranking: A

Title

Conversion of a forest affected by air pollution in the Trutnov region

Publication / Journal

Prestavba lesa zasazeneho imisemi na Trutnovsku

Abstract

With additional contributions by V. Balcar, V. Lochman and J. Nehyba, the author describes how, at the end of the 1950s, entire forest stands near Trutnov in the Hradec Kralove region in the north of the Czech Republic were damaged by emissions from coal-fired power stations. Measures for mitigating the effects of air pollution, primarily SO 2 emissions, were investigated following over 40 years of monitoring, and those which proved effective were applied on an operational scale in demonstration plots in a severely affected 3500 ha area of forest in the south-eastern foothills (380-740 m above sea level) of the Krkonose Mountains. The forest at the start of the project was 82% coniferous (67% spruce, 10% pine), 10% birch and 3% beech in the area affected by the Porici II power station (operating since 1957), with 90% spruce in the area directly affected by the Rtyne power station (operating 1912-1967). Information on the study and conversion of the pollution-affected forest is presented in chapters covering (a) the Trutnov polluted territory; (b) air pollution measurements; (c) effect of emissions on forest ecosystems; (d) methods of forest cultivation; and (e) the demonstration plots. Maps give details on the size and shape of the polluted areas. Damage to forests is expressed as the volume of incidental felling. Aspects covered include the dynamics of stand decomposition following monitoring of Norway spruce stands, the formation and management of young spruce stands, tolerance of tree species to the local air pollution load, and soil chemistry under spruce stands and after ploughing to a depth of 30 cm. The study showed that damage to the forest by emissions is a spontaneous process whose progress depends on the internal conditions of individual stands. The process can be decelerated through complex forest conversion in order to increase stand resistance to damage. In the Trutnov area, damage can be minimized in the future through the development of the forest based on beech, a species relatively tolerant to air pollution with a high potential to retain or restore ecological stability. A rational solution can include the ecological screening of stands by other forest stands (pollution-intercepting belts) of beech and larch. Replacement of destroyed or damaged forest with commercially valuable species requires a silvicultural system based on high energy inputs, which if unsupportable will lead to encroachment by pioneer species such as birch. However, birch can also be used to provide a relatively large volume of timber whose value can be improved by appropriate management. In plots particularly exposed to emissions, introduced tolerant conifer species such as eastern white pine can be used temporarily for forest regeneration. Conversion must take place rapidly in each plot to produce a forest with different age classes, but with even-aged stands situated next to each other.

Keywords

Authors

Tesar, V. (et al)

Volume | Issue | Pages | Date Published: 2011 | Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type: Coal

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐

Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Conference Proceedings

Relevance Ranking: B

Title

Mortality of silkworms due to air pollution: environmental indicators induced by ecological stress

Publication / Journal

ENVIRONMENTAL TOXICOLOGY II; WIT Transactions on Ecology and the Environment

Abstract

The present investigation is the first attempt in determining stress-induced changes in a soil-plant-insect ecosystem in an aluminum works zone to create a mathematical model. satisfactorily describing the process of silkworm destruction due to the harmful emissions of an aluminum works and to develop an algorithm for rating the ecological risk and measures of its prevention. The major objective of this research was to create scientifically based recommendations for predicting the level of damage to the surrounding ecosystems by the aluminum works and to take adequate measures to protect the Great Silk Road. The investigations have been conducted by the evaluation of toxic metal accumulation in the ecosystem components with the distance limit of the wind rose exposure. Concentrations of manganese, iron, cobalt, zinc, cadmium, chromium, rubidium, selenium, scandium antimony, strontium, lithium, lead, mercury, silver, aluminum, beryllium, molybdenum, nickel, tin and copper were detected by the atomic absorption spectrophotometry method. The fluoride content was determined by the alizarinechelatometry photometry method. The theoretical basis of the algorithm was the theory of the survival of organisms under conditions of stress based on Strehler-Mildvan's model. The data were processed by the ANOVA computer statistic tests. The real ecological process was successfully described by a forecast made on the basis of the obtained mathematical model. As a result, we have obtained the findings regarding the accumulation of zinc, nickel, mercury, antimony, etc. in the soils, silkworm excrements and the cocoons near the works. We have also obtained the threshold concentrations of the above mentioned elements in the ecosystem components leading to mortality of the silkworms and cocoons.

Keywords

Authors

Kamilova, E; Tsarev, B

Volume: 110

Issue:

Pages: 241-250

Date Published: 2008

Times Cited: 0

Digital Object Identifier (DOI): 10.2495/ETOX080261

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☑				

Literature Type: Grey

Source: Other

Relevance Ranking: C

Title

Air Quality and Ecological Impacts: Relating Sources to Effects

Publication / Journal

Developments in Environmental Science

Abstract

This 310-page book is part of a series on air quality and ecological impacts, relating sources to effects. The book is organized into twelve individually authored chapters. The first chapter deals with theory and application of atmospheric source apportionment. The second chapter deals with use of trace metals as source fingerprints. The third chapter deals with plants as accumulators of atmospheric emissions. The remaining chapters deals with negative vs positive functional plant responses to air pollution-a study establishing cause-effect relationships of SO2 and H2S, hormesis-its relevance in phytotoxicology, evaluating ozone effects on growth of mature forest trees with high-resolution dendrometer systems, methods for measuring atmospheric nitrogen deposition inputs in arid and montane ecosystems of Western North America, air quality changes in an urban region as inferred from tree-ring stable isotopes, lichen monitoring of urban air quality, Hamilton, Ontario, and ozone exposure-based growth response models for trembling aspen and white birch. The book highlights a list of contributors and their respective institutions. Each chapter contains a list of references. The text is written in English and indexed by subject with tables, and figures. Users of this book will include biochemists, geologists, and environmental scientists.

Keywords

Authors

Legge, AH (ed.)

Volume: 9

Issue:

Pages:

Date Published: 2009

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Biotic

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☑
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Conference Proceedings

Relevance Ranking: B

Title: Orally Ingested Urban Particulate Matter Induces a PRO-Inflammatory Response and Decreases Microflora Diversity

Publication / Journal: Gastroenterology

Abstract: N/A

Keywords:

Authors: Kish, L; Hotte, N; Cheng, E; Rioux, KP; Kaplan, GG; Vincent, R; Storr, M; Madsen, K

Volume	Issue	Pages	Date Published	Times Cited
140	5	S46-S47	May 2011	1

Digital Object Identifier (DOI):

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	B

Title

Evidence of recovery of Juniperus virginiana trees from sulfur pollution after the Clean Air Act

Publication / Journal

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA

Abstract

Using dendroisotopic techniques, we show the recovery of Juniperus virginiana L. (eastern red cedar) trees in the Central Appalachian Mountains from decades of acidic pollution. Acid deposition over much of the 20th century reduced stomatal conductance of leaves, thereby increasing intrinsic water-use efficiency of the Juniperus trees. These data indicate that the stomata of Juniperus may be more sensitive to acid deposition than to increasing atmospheric CO2. A breakpoint in the 100-y delta C-13 tree ring chronology occurred around 1980, as the legacy of sulfur dioxide emissions declined following the enactment of the Clean Air Act in 1970, indicating a gradual increase in stomatal conductance (despite rising levels of atmospheric CO2) and a concurrent increase in photosynthesis related to decreasing acid deposition and increasing atmospheric CO2. Tree ring delta S-34 shows a synchronous change in the sources of sulfur used at the whole-tree level that indicates a reduced anthropogenic influence. The increase in growth and the delta C-13 and delta S-34 trends in the tree ring chronology of these Juniperus trees provide evidence for a distinct physiological response to changes in atmospheric SO2 emissions since similar to 1980 and signify the positive impacts of landmark environmental legislation to facilitate recovery of forest ecosystems from acid deposition.

Keywords

Authors

Thomas, RB; Spal, SE; Smith, KR; Nippert, JB

Volume	Issue	Pages	Date Published	Times Cited
110	38	151319-15324	September 2013	2

Digital Object Identifier (DOI)

10.1073/pnas.1308115110

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	C

Title

Chemical contaminants in the arctic environment - are they a concern for wildlife?

Publication / Journal

Gyrfalcons and ptarmigan in a changing world: proceedings of a conference held February 2011, Boise, Idaho. Volume I.

Abstract

Environmental contaminants are a global problem, and their presence in the Arctic reflects the way in which the Arctic interacts with the rest of the world. Most contaminants are transported to the North on air and ocean currents from more southerly agricultural and industrial sources. Upon reaching the Arctic environment, many persistent contaminants bioaccumulate and biomagnify in the food web, making those species feeding at high trophic positions more vulner- able to contaminant exposure via their diet. By examining contaminant levels in wildlife, we can look for the arrival of new contaminants in the Arctic, as well as determine whether existing chem- ical contaminants of concern are increasing or decreasing. Historically, contaminants of concern included compounds such as the polychlorinated biphenyls (PCBs), and organochlorine pesticides such as dichlorodiphenyltrichloroethane (DDT). During the 1950s to 1970s, bioaccumulation of organochlorine compounds such as DDT and its degradation product, dichlorodiphenyl - dichloroethane (DDE), were associated with eggshell thinning and reduced reproduction rates in top predatory species such as the Peregrine Falcon (Falco peregrinus). The majority of these legacy persistent organic pollutants (POPs) have significantly declined in Arctic biota over the last several decades. However, more recently, newer compounds such as brominated flame retar- dants (BFRs) and perfluorinated compounds (PFCs) have been detected in a wide variety of biota including Arctic wildlife. Certain metals are also contaminating the Arctic environment. Elemental mercury (Hg0) is highly volatile, and gaseous Hg partitions readily into the atmosphere where it can undergo long-range atmospheric transport to the polar regions which are global sinks for Hg. Although Hg occurs naturally in the environment, anthropogenic sources have been postulated to contribute more significantly to the occurrence of Hg in the Arctic than natural emissions, result- ing in increasing Hg concentrations in a variety of Arctic biota, particularly in the Canadian Arctic and western Greenland. Recent warming ocean conditions and longer ice-free periods have also altered prey availability in some areas of the Arctic, affecting nutrition and chemical contaminant profiles. These changes in environmental conditions and contaminant exposure all contribute to the complexity of interpreting the contaminant profiles found in Arctic biota.

Keywords

Authors

Braune, Birgit M.

Volume	Issue	Pages	Date Published	Times Cited
1		133-145	2012	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
Grey	Other	C

Title

Lichen biomonitoring of air pollution: Issues for applications in complex environments

Publication / Journal

AIR QUALITY IN THE 21ST CENTURY

Abstract

Lichens have been widely used as biomonitoring of atmospheric pollution, because these organisms respond to phytotoxic gases (especially SO2 and NOx) at cellular, individual and community level. Nevertheless, due to the biological and ecological variability of the organisms, scientists often find difficult to discern the effects of pollution against a natural background noise. On the other hand, statistically supported responses are needed if we aim to include these techniques in decisional processes of environmental management. In this chapter we try to investigate this complex trade-off, by focusing the attention on bioindication techniques, based on the observation of a decreased richness of lichen communities, related to increasing concentration of atmospheric pollutants. In particular we present worked examples of biomonitoring applications in heterogeneous environments, to provide an overview of main sampling, analytical and statistical procedures, which can lead scientists and stakeholders to a better knowledge of the relationship between lichen diversity and air pollution. We take into account three main factors of variability for lichen communities across spatial and temporal scales.
In the first case, we investigate the different responses of lichens to atmospheric pollutants in relation to macroclimatic predictors. Because of close dependence on the atmosphere for their metabolic processes, lichens are strongly influenced by climate-related variables (e.g. rainfall and temperature). It was shown how, under the same level of air pollution, lichen diversity is higher in areas with higher rainfall. We present results from dry vs. humid bioclimatic areas in Italy and we discuss how synergistic and antagonistic relations among pollutants, lichen and climate may significantly vary, together with the predictive power of biomonitoring methods. Modern approach to environmental assessments includes an evaluation of the pollution impact not only on human health, but also on natural heritage. Hence, lichen biomonitoring was used to detect the effects of gaseous pollutants on natural ecosystems. In the second example, we show that, in the framework of lichen biomonitoring in natural forests, habitat-related variables may play a major role on lichen diversity and more caution should be taken when interpreting these data in terms of direct effects of pollution.
At a more detailed spatial scale, the variability of lichen diversity can be very high and consequently the level of uncertainty in the interpretation of data may arise considerably. This should be taken into account when higher scale surveys are planned, by considering an adequate sampling intensity at within-site scale. In the third working example we discuss this issue, showing data from intensive experiments and comparing the variability unrelated to atmospheric pollution at local scale in natural environments with that observed at higher scale in anthropized ones.

Keywords

Authors

Brunialti, G; Frati, L; Incerti, G; Rizzi, G; Vinci, M; Giordani, P

Volume	Issue	Pages	Date Published	Times Cited
		211-259	2010	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Biotic			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐

Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Government Report

Relevance Ranking: C

Title: Mercury in Adirondack Wetlands, Lakes and Terrestrial Systems (MAWLTS)

Publication / Journal: New York State Energy Research and Development Authority

Abstract:

Keywords:

Authors: Munson, R; Harris, R; Summers, K; Chen, L; Roy, SB; Driscoll, CT; Kalicin, M; McLaughlin, E; Lorey, P; Newton, RM; Pufall, A; Yavitt, J; Demers, J; Sutherland, J; Engstrom, DR

Volume:

Issue:

Pages:

Date Published: November 2008

Times Cited:

Digital Object Identifier (DOI):

Media Category: Both

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Non-government Report	

Title

Poisoning the great lakes: Mercury Emissions from Coal-Fired Power Plants In the Great Lakes Region

Publication / Journal

Natural Resources Defense Council

Abstract

Airborne mercury from coal-fired power plants in the Great Lakes Region harms our health, and the benefits of reducing mercury emissions are well worth the cost. The purpose of this report is to inform the public of the extent and impact of airborne mercury pollution, and to quantify mercury emissions from coal-fired power plants. This type of power plant is the largest man-made source of airborne mercury emissions in the United States, accounting for 50 percent of all mercury emitted into the air from anthropogenic sources. Roughly 20 percent of these airborne mercury emissions are deposited locally, in soil, rivers, and lakes, where bacteria convert the mercury into its most toxic form—methylmercury. This toxic chemical is a known neurotoxin that affects brain development and can cause a host of other health issues. Persistent methylmercury is consumed by fish and accumulates in the aquatic food chain, putting all species that eat fish, including humans, at risk. The EPA has recently issued rules that will require coalfired power plants to reduce emissions of mercury and other air toxics. These rules are called the Mercury and Air Toxics Standards or "MATS" for power plants. A recent report issued by the Biodiversity Institute and the Great Lakes Commission, which summarizes numerous recent scientific studies of the impacts of mercury in the Great Lakes region, found a "strong connection between mercury loadings to the region and mercury emissions in the region" (see the Press Release for the Great LakesMercury Connections Report at ww.briloon.org/mercuryconnections/greatlakes). Thus, the EPA's MATS rule requiring that coal-fired power plants significantly reduce mercury emissions will be of enormous benefit to the people, the wildlife, and ecosystems of the Great Lakes region. The technology to comply with these rules exists; the health benefits gained, including the elimination of between 4,200 and 11,000 premature deaths in the United States annually, will far outweigh the costs of installing controls. The EPA has projected that by 2016 the health benefits of the mercury and air toxics rule will be $37 to $90 billion dollars, while the costs for implementation are estimated to be $9.6 billion dollars. The EPA also projected that the eastern United States, which includes the Great Lakes region, will incur the majority of these benefits.

Keywords

Authors

Stamper, V; Copeland, C; Williams, M; Spencer, T

Volume	Issue	Pages	Date Published	Times Cited
			June 2012	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both	Coal		

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				

Other Biotic Medium ☐

Literature Type	Source	Relevance Ranking
Grey	Non-government Report	C

Title

Mercury in the Environment

Publication / Journal

Electric Power Research Institute

Abstract

Abstract
EPRI periodically issues updates on critical research on environmental mercury, discussing scientific findings of crucial interest for a complete understanding of mercury sources, transport, fate, cycling, human exposure, and health effects. This document is part of that EPRI series, focusing on several critical reviews of mercury sources and impacts.
Objective

The continuing national interest in environmental mercury—its sources and its impacts on public health—requires a critical examination of the quantitative impacts of particular mercury sources on the environment and a clear picture of the human health consequences of those impacts. This depiction of mercury's role from multiple sources is needed to allow an unbiased evaluation of the need, rate of introduction, and targeted sources for mercury controls to produce meaningful and effective improvements to public health. These key research findings address critical issues on those topics and are the culmination of EPRI research programs continuing to probe critical environmental questions with societal impacts. Stakeholders in these issues have remarked on the critical nature of these topics and the importance of producing publicly available results for wide distribution in informing the public and public decisionmakers.
Approach

The project team intended to bring together into a single package some key findings from research carried out in 2006 and early 2007 related to the most current critical areas of mercury research. Report segments were selected because of the maturity of the findings, their consensus acceptance in initial form by the scientific community, and their direct relevance to the question of whether management steps can and should be taken.
Results

The research covered in this report is primarily in the critical areas of mercury sources, mercury atmospheric fate and transport, mercury exposure, and mercury health effects. Briefly, the findings show the importance of background and natural mercury sources in the global balance; question the basis for claims that mercury may produce adult cardiovascular health effects; and analyze the striking, and unexplained, continuing drop in exposure of U.S. women to mercury as measured by blood levels of mercury in women consuming fish.
Application, Value and Use

The work on mercury in the environment will continue as measurement and modeling methods improve in their verisimilitude and precision. With those improvements, finer and finer gradations of effect and thresholds for effect will be discernible, but attribution methods in source-receptor relationships will improve in parallel. The result is likely to be quantum leaps in the complexity of analysis methods and attribution techniques for impacts, while management steps themselves can be more finely tuned to fit particular source areas most relevant to impact measurements.
EPRI Perspective

The EPRI research portfolio has been traditionally designed around critical needs and unbiased investigation of contributing factors to environmental issues. The recognized leadership of EPRI in research in science and technology allows EPRI studies to be quickly incorporated into paradigms for societal understanding of significant factors contributing to environmental issues. By maintaining this role of impartial excellence, EPRI is able to bring the weight of evidence to bear in the consideration of environmental management steps.

Keywords

Authors

Electric Power Research Institute

Volume	Issue	Pages	Date Published	Times Cited
			March 2007	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Conference Proceedings	C

Title

Atmospheric Ammonia:DETECTING EMISSION CHANGES AND ENVIRONMENTAL IMPACTS

Publication / Journal

UNECE Expert Workshop on Atmospheric Ammonia - Detecting Emission Changes and Environmental Impacts

Abstract

This 462-page book presents and describes Atmospheric Ammonia, in which it reviews linkages between ammonia emissions and the resulting environmental impacts. The book is organized into 5 major parts, which are further divided into 28 individually authored chapters. The first part deals with ammonia critical thresholds, in which reassessment of critical levels for atmospheric ammonia, potential for the further development and application of critical levels to assess the environmental impacts of ammonia, application of transects to assess the effects of ammonia on woodland groundflora, and macrolichens on twigs and trunks as indicators of ammonia concentrations. The second part deals with temporal trends in atmospheric ammonia, in which linking ammonia emission trends to measured concentrations and deposition of reduced nitrogen, assessment of ammonia and ammonium trends, and review of published studies estimating the abatement efficacy of reduced-emission slurry spreading techniques. Remaining parts include analysis of ammonia hotspots, regional modelling of atmospheric ammonia, and conclusions and outlook. The book highlights a list of contributors and their respective institutions. Each chapter contains a list of references. The text is written in English. Users of this book will include environmental biologists, biochemists, and ecologists.

Keywords

Authors

Sutton, MA; Reis, S; Baker, SMH (eds.)

Volume	Issue	Pages	Date Published	Times Cited
			2009	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Other

Relevance Ranking: C

Title

End report Ecological Conditions project.

Publication / Journal

Wageningen University and Research Centre

Abstract

Data for the Ecological Conditions database were collected during 1936-2010 in the Netherlands. The database has resulted in the classification of indicator species (based on soil parameters) and habitats. Species responses to soil pH in Dutch beech forests were compared to those of other European countries. Data were also recorded on the relationships between responses of plant species to temperature, precipitation and deposition of sulfur, nitrate and ammonium; species responses over time; and importance of ground cover by mosses, lichens and annuals on indicator and Ellenberg values. Sulfur dioxide and nitrate deposition were good indicators in predicting plant species.

Keywords

Authors

Wamelink, G. W. W.; van Adrichem, M. H. C.

Volume:

Issue: 2195

Pages:

Date Published: 2011

Times Cited: 0

Digital Object Identifier (DOI)

Media Category: Both

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☑	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Other

Relevance Ranking:

Title: The Use of Snow, Soil and Lichens as Biomonitors of Contaminants in Airborne Particulate Matter in North-Eastern European Russia

Publication / Journal: Urban Airborne Particulate Matter: Origin, Chemistry, Fate and Health Impacts; Book Serites Title: Environmental Science and Engineering

Abstract: N/A

Keywords:

Authors: Walker, TR; Edited by: Zereini, F; Wiseman, CLS

Volume	Issue	Pages	Date Published	Times Cited
		453-466	2011	

Digital Object Identifier (DOI): 10.1007/978-3-642-12278-1_23

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☑	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☑	Other Abiotic Medium	☑		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Conference Proceedings

Relevance Ranking: C

Title

Overview of major processes and mechanisms affecting the mercury cycle on different spatial and temporal scales

Publication / Journal

Conference on European Research Course on Atmospheres (ERCA 9) - From the Global Mercury Cycle to the Discoveries of Kuiper Belt Objects

Abstract

Mercury emissions to the atmosphere and its transport, transformation and deposition to and re-emission from terrestrial and aquatic ecosystems on hemispherical and global scales has received increasing attention from both the scientific and the regulatory communities during the last twenty years. It is well known that the atmosphere is the major transport media through which mercury is redistributed on global scale once it is released from point and diffuse emission sources. A substantial amount of research has been carried out worldwide aiming to assess the relationships between emissions from natural vs. anthropogenic sources, inter-hemispherical atmospheric transport patterns, and atmospheric deposition to and re-emission from oceans, its bioaccumulation in fish, and evaluation of policy strategies to reduce the impact of mercury emissions on human health and ecosystems. This chapter provides a highlight of key aspects related to mercury contamination, including: a) major processes affecting the mercury cycle between the atmosphere and aquatic and terrestrial ecosystems, b) mercury emissions from natural and anthropogenic sources, c) spatial and temporal distributions and trends of mercury species over the northern and southern hemispheres, d) the chemical and physical processes affecting the transport and fate of atmospheric mercury, and e) major policy frameworks aiming to control the impact of mercury on human health and ecosystems.

Keywords

Authors

Pirrone, N; Hedgecock, IM; Cinnirella, S; Sprovieri, F

Volume: 9

Issue:

Pages: 3-33

Date Published: 2010

Times Cited: 1

Digital Object Identifier (DOI)

Media Category: Both

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Other	C

Title

Acid and Mercury Deposition Effects on Forest and Freshwater Aquatic Ecosystems

Publication / Journal

Encyclopedia of Biodiversity (Second Edition), Academic Press

Abstract

Acidic deposition is comprised of sulfuric and nitric acids and ammonium. Although released naturally to the atmosphere, humans greatly increase emissions of these compounds by the burning of fossil fuels and agricultural activities. Acidic deposition has impacted soils, forests, streams, and lakes in eastern North America, northern and central Europe, and southeastern China. Human activities have also increased atmospheric mercury deposition globally. Atmospheric deposition of ionic mercury can be converted to methyl mercury largely by bacteria that process sulfate. Methyl mercury bioaccumulates along aquatic and terrestrial food chains by a factor of a million to 10 million, resulting in exposure to humans and wildlife and potential health effects.

Keywords

Acid neutralizing capacity; Acidic deposition; Aluminum; Base saturation; Episodic acidification; Mercury; Methylation; Methyl mercury; Nitrate; Nitrogen oxides; Soil; Sulfate; Sulfur dioxide; Trophic transfer

Authors

Driscoll, C. T.

Volume	Issue	Pages	Date Published	Times Cited
			2013	

Digital Object Identifier (DOI)

10.1016/B978-0-12-384719-5.00303-

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Other

Relevance Ranking: B

Title

Ecological Effects of Acidic Deposition

Publication / Journal

Reference Module in Earth Systems and Environmental Sciences

Abstract

In this article, the ecological effects of atmospheric sulfur and nitrogen deposition (acid deposition, acid rain) on sensitive forest and freshwater resources are summarized. Acidic deposition comprises sulfuric and nitric acids, and ammonium derived from atmospheric emissions of sulfur dioxide, nitrogen oxides, and ammonia, respectively. These compounds are released to the atmosphere largely by the burning of fossil fuels and agricultural activities. Atmospheric deposition delivers acids and acidifying compounds to Earth's surface. The adverse ecological effects of acidic deposition on forests, streams, and lakes occur largely in eastern North America, northern and central Europe, and southwestern China. Acidic deposition has altered, and continues to alter, forest soil by accelerating the leaching of calcium and magnesium and increasing concentrations of dissolved inorganic aluminum in soil waters. At high concentrations, dissolved inorganic aluminum can hinder the uptake of water and essential nutrients by tree roots. The alteration of soils by acid deposition has serious consequences for acid-sensitive forest ecosystems. Soils that are compromised by acidic deposition are less able to neutralize additional inputs of strong acids, provide poorer growing conditions for plants, and delay the recovery of surface waters. Acidic deposition has impaired, and continues to impair, the water quality of lakes and streams in eastern North America and Europe by lowering pH (i.e., increasing the acidity), decreasing acid-neutralizing capacity, and increasing aluminum concentrations. Many surface waters in acid-sensitive regions impacted by acidic deposition exhibit chronic and/or episodic (i.e., short-term) acidification. High concentrations of aluminum and increased acidity have reduced the species diversity and abundance of aquatic life in many lakes and streams draining acid-sensitive regions. Fish have received the most attention to date, but entire food webs are also being negatively affected.

Keywords

Acidic deposition; Acidification; Acid-neutralizing capacity; Aluminum; Calcium; Critical loads; Episodic acidification; Fish; Nitrate; Nitrogen oxides; Nitrogen saturation; Soil; Sulfate; Sulfur dioxide; Trees; Watershed

Authors

Driscoll, C.

Volume:

Issue:

Pages:

Date Published: 2013

Times Cited:

Digital Object Identifier (DOI)

10.1016/B978-0-12-409548-9.00847-

Media Category: Both

Generation Type:

CoalType:

BiomassType:

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☑	Sulphur dioxide	☑
Reptiles	☐	Water	☑	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☑	Light	☐	Inorganic chemical	☑
Plants	☑	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Government Report	B

Title

Environmental Impacts of Power Plants

Publication / Journal

Public Service Commission of Wisconsin

Abstract

This Public Service Commission (PSC) brochure explores the environmental impacts and issues related to the construction and operation of electric generation facilities, or power plants. Included in this publication are some techniques used to avoid, reduce, or mitigate impacts.

Keywords

Authors

Public Service Commission of Wisconsin

Volume	Issue	Pages	Date Published	Times Cited
			2012	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Government Report

Relevance Ranking: B

Title

Assessment of Nitrogen and Acid Deposition Impacts to Terrestrial and Aquatic Ecosystems of the Tug Hill, 2005-2007

Publication / Journal

New York State Energy Research and Development Authority

Abstract

The purpose of this study was to assemble a two-year baseline dataset to assess the extent to which aquatic and terrestrial ecosystems of New York's Tug Hill region may be affected by excess nitrogen (N) and acidic deposition. First-order stream chemistry, forest soil chemistry, and canopy tree tissue chemistry were analyzed to compare various indices of ecosystem acidification and nitrogen accumulation.

Keywords

Authors

McGee, GG; Mitchell, MJ

Volume | Issue | Pages | Date Published: December 2010 | Times Cited

Digital Object Identifier (DOI)

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Other	B

Title

Mercury Fate and Transport in the Global Atmosphere

Publication / Journal

Abstract

Mercury Fate and Transport in the Global Atmosphere highlights major issues related to the interactions of mercury with terrestrial and aquatic ecosystems, and evaluates the relative contribution of anthropogenic and natural sources to the global atmospheric mercury budget. This book provides a state-of-the-art overview on different aspects related to mercury emissions from natural and anthropogenic sources, the evaluation of mercury concentrations and fluxes in different regions of the world, and global atmospheric mercury models currently used to assess spatial distributions of mercury compounds in ambient air and source-receptor relationships. The preparation of this book has been made possible thanks to the contributions of all members of the United Nations Environment Programme Global Partnership for Mercury Air Transport and Fate Research (UNEP-MFTP), and of more than 70 scientists from leading universities and research institutions recognized as worldwide experts on different aspects related to emissions, monitoring and modeling mercury in the atmosphere and other environmental compartments. Mercury Fate and Transport in the Global Atmosphere is intended to provide a scientific support to nations and the UNEP Governing Council that have been asked to shape the most efficient and economic concerted actions to reduce the impact of mercury contamination on human health and the environment.

Keywords

China; India; Japan; South Africa; ecosystem; ecosystems; ecotoxicology; emissions; environment; environmental sciences; mercury emissions; mercury monitoring; mining; polar regions; pollution

Authors

Pirrone, Nicola, Mason, Robert (Eds.)

Volume	Issue	Pages	Date Published	Times Cited
			2009	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Government Report	B

Title

Integrated Science Assessment (ISA) for Oxides of Nitrogen and Sulfur Ecological Criteria (Final Report)

Publication / Journal

United States Environmental Protection Agency

Abstract

Oxides of nitrogen and oxides of sulfur are two of six principal (or criteria) pollutants for which EPA has established national ambient air quality standards (NAAQS). The Clean Air Act requires EPA to periodically review the scientific basis for these standards by preparing an Integrated Science Assessment (ISA), formerly called an Air Quality Criteria Document (AQCD). The previous AQCDs for oxides of nitrogen and sulfur were released in 1993 and 1982, respectively.

This ISA was prepared as part of the joint review of the secondary or welfare-based NAAQS for oxides of nitrogen and sulfur. The ISA evaluates and integrates the newly available environmental evidence, and contains the key information and judgments formerly found in the AQCD. A series of Annexes to the ISA provides more extensive and detailed summaries of the most pertinent scientific literature. This is EPA's latest evaluation of the scientific literature on the potential adverse environmental effects resulting from exposures to oxides of nitrogen and sulfur. There are significant new data, particularly with regards to acidification and nitrogen enrichment, that strengthen the evidence for these effects since the last scientific review documents were released.

Keywords

Authors

U.S. EPA

Volume	Issue	Pages	Date Published	Times Cited
			December 2008	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Government Report	B

Title

Integrated Science Assessment for Particulate Matter (Final Report)

Publication / Journal

United States Environmental Protection Agency

Abstract

PM is one of six principal (or criteria) pollutants for which EPA has established NAAQS. Periodically, EPA reviews the scientific basis for these standards by preparing an ISA (formerly called an Air Quality Criteria Document). The ISA and supplementary annexes, in conjunction with additional technical and policy assessments, provide the scientific basis for EPA decisions on the adequacy of the current NAAQS and the appropriateness of possible alternative standards. The Clean Air Scientific Advisory Committee (CASAC), an independent science advisory committee whose existence and whose review and advisory functions are mandated by Section 109 (d) (2) of the Clean Air Act, is charged (among other things) with independent scientific review of EPA's air quality criteria.

The first and second drafts of the PM ISA were released on December 22, 2008 and July 31, 2009, respectively, for independent external peer review and public comment. These drafts were reviewed at public meetings of the CASAC PM Review Panel on April 1-2, 2009 and October 5-6, 2009, respectively. This final PM ISA has benefited from the expert comments received at the CASAC meetings and from public comments, and it has been revised accordingly.

Keywords

Authors

U.S. EPA

Volume	Issue	Pages	Date Published	Times Cited
			December 2009	

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Government Report

Relevance Ranking: C

Title

European research on environment and health funded by the Sixth Framework Programme: Snapshots of final results

Publication / Journal

European Commission, Directorate-General for Research and Innovation

Abstract

Sixty-six multidisciplinary pan-European research projects dealing with environment and health issues were funded by the European Commission's Research Directorate- General (now called DC Research and Innovation) in the Sixth Framework Programme of Research (2002- 2006). The main results are presented in this catalogue. All of these projects have now ended and have produced a wealth of new and interesting results that have improved the science base and that have the potential to support various EU policies. The projects presented addressed a multitude of issues ranging from health impacts of climate change to improved integrated environment and health risk assessment methodologies. This overview should be useful to many stakeholders including the scientific community and policy makers at national, EU and global level.

Keywords

Framework Programme for Research and Development, environmental research, medical research, climate change, public health, research results

Authors

European Commission, Directorate-General for Research and Innovation

Volume | Issue | Pages | Date Published | Times Cited

Digital Object Identifier (DOI)

10.2777/19018

Media Category: Both

Generation Type | CoalType | BiomassType

- [ ] Mammals
- [ ] Birds
- [ ] Reptiles
- [ ] Amphibians
- [ ] Aquatic
- [ ] Plants
- [ ] Invertebrates
- [ ] Benthic Invertebrates
- [ ] Lichen/Moss
- [ ] Microbes
- [ ] Other Biotic Medium

- [ ] Air
- [ ] Soil
- [ ] Water
- [ ] Sediment
- [ ] Light
- [ ] Noise
- [ ] Temperature
- [ ] Humidity
- [ ] Other Abiotic Medium

- [ ] Nitrogen oxides
- [ ] Sulphur dioxide
- [ ] Mercury
- [ ] Particulate Matter
- [ ] Inorganic chemical
- [ ] Organic chemical
- [ ] New substance

Literature Type: Grey

Source: Government Report

Relevance Ranking: B

Title

Air quality in Europe

Publication / Journal

European Environment Agency

Abstract

The present report provides an overview and analysis of air quality in Europe. The analysis covers up to 38 European countries (EEA-38) (1) and spans the two decades of data that countries have made officially available up to 2009. The evaluation of the status and trends of air quality is based on ambient air measurements and data on anthropogenic emissions and trends. Emissions of the main air pollutants in Europe declined significantly in the period 1990–2009, in particular sulphur dioxide (SO2) and lead (Pb), resulting in improved air quality across the region. These results notwithstanding, many European countries do not expect to comply with one or more pollutant-specific emission ceilings set under EU and United Nations (UN) agreements for 2010. Furthermore, due to complex links between emissions and ambient air quality, as well as a number of uncertainties associated with estimating emission data, emission reductions have not always produced a corresponding drop in atmospheric concentrations, especially for particulate matter (PM) and groundlevel ozone (O3). At present, PM and O3 are Europe's most problematic pollutants in terms of harm to health. Air pollution's most important effects on European ecosystems are eutrophication, acidification and vegetation damage resulting from exposure to O3. As sulphur emissions have fallen, ammonia (NH3) emitted from agricultural activity and nitrogen oxides (NOX) from combustion processes have become the predominant acidifying and eutrophying air pollutants. Several air pollutants are also climate forcers, having a potential impact on the planet's climate. Figure ES.1 shows the major air pollutants in Europe and their potential impact on human health, ecosystems and the climate.

Keywords

Authors

European Environment Agency

Volume | Issue | Pages | Date Published: 2011 | Times Cited

Digital Object Identifier (DOI)

10.2800/83213

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☑
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type: Grey

Source: Government Report

Relevance Ranking: A

Title

NYSERDA Environmental Research Program Plan Research Area 1: Ecological Effects of Deposition of Sulfur, Nitrogen, and Mercury

Publication / Journal

New York State Energy Research and Development Authority

Abstract

Electricity generation is responsible for adverse environmental and economic impacts including: degradation of lakes, streams, forests, and buildings from acid deposition; elevated levels of mercury in fish and other wildlife; human morbidity and mortality from poor air quality related to ozone and particulate matter; climatic changes that impact health, ecosystems and economy; and direct and indirect environmental effects from alternative energy development. Although emission reduction efforts have resulted in some improvements, these impacts continue to affect New York's sensitive ecosystems and vulnerable populations. The EMEP program's strategic objectives include supporting:

• Energy-related environmental policy accountability through analysis of long-term monitoring records and modeling.

• Research that will enhance the understanding of the source types, source regions, and specific pollution components contributing to major energy-related environmental problems in New York State.

• Efforts to examine the health and ecological co-benefits of alternative energy and technology solutions.

• An environmental research capability to better address the critical problems facing the State and region and to create opportunities for innovation.

Keywords

Authors

New York State Energy Research and Development Authority

Volume | Issue | Pages | Date Published: October 2013 | Times Cited

Digital Object Identifier (DOI)

Media Category: Both

Generation Type

CoalType

BiomassType

Mammals	☐	Air	☐	Nitrogen oxides	☑
Birds	☐	Soil	☐	Sulphur dioxide	☑
Reptiles	☐	Water	☐	Mercury	☑
Amphibians	☐	Sediment	☐	Particulate Matter	☐
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Literature Type	Source	Relevance Ranking
Grey	Other	C

Title

Urban Airborne Particulate Matter: Origin, Chemistry, Fate and Health Impacts

Publication / Journal

Environmental Science and Engineering:Environmental Engineering

Abstract

This 644-page book is part of a series on Environmental Science and Engineering, Urban Airborne Particulate Matter. The book is organized into six major parts. These parts are further divided individually authored chapters. The first part deals with airborne particulate matter-sources, composition and concentration, which include a comparative review of particulate matter levels, sources, and their likely fates in the eastern mediterranean region, and particulate emissions from on-road vehicles. The second part deals with metals and organic compounds in airborne particulate matter-analytical methods, which include ultra-trace analysis of palladium-state-of-the-art and future challenges, and direct determination of metals in PM10 filters by laser ablation-ICP-MS. The third part deals with airborne particulate matter-environmental pathways, behaviour and fate, which include secondary particle production in urban areas, and the effect of asian dust on urban airborne particulate matter in Japan. The remaining parts deals with bioavailability and toxicology of airborne particulate matter, and airborne particulate matter exposures and health risks. The book highlights a list of contributors and their respective institutions. Each chapter contains a list of references. The text is written in English and indexed by subject with tables and figures. Users of this book will include climatologists, atmospheric environmentalists, and geologists.

Keywords

Authors

Zereini, F; Wiseman, CLS (eds)

Volume	Issue	Pages	Date Published	Times Cited
			2010	0

Digital Object Identifier (DOI)

Media Category	Generation Type	CoalType	BiomassType
Both			

Mammals	☐	Air	☐	Nitrogen oxides	☐
Birds	☐	Soil	☐	Sulphur dioxide	☐
Reptiles	☐	Water	☐	Mercury	☐
Amphibians	☐	Sediment	☐	Particulate Matter	☑
Aquatic	☐	Light	☐	Inorganic chemical	☐
Plants	☐	Noise	☐	Organic chemical	☐
Invertebrates	☐	Temperature	☐	New substance	☐
Benthic Invertebrates	☐	Humidity	☐		
Lichen/Moss	☐	Other Abiotic Medium	☐		
Microbes	☐				
Other Biotic Medium	☐				

Number of records: 345