

# A BRIEF GUIDE TO ATMOSPHERIC POLLUTANTS

A number of different chemical entities, from a range of sources, can contribute towards atmospheric pollution, the consequences of which can include global warming and smog. This graphic looks at a selection of major groups of atmospheric pollutants, their major sources, and their effects.



## CARBON MONOXIDE

A gas generated by the incomplete combustion of fuels – primarily from road transport. Affects human health, as it reduces oxygen-carrying capacity of the blood. It also reacts with other atmospheric gases to produce acids.



## CARBON DIOXIDE

A gas generated by the burning of fossil fuels in the production of electricity. Also emitted by natural processes. Human emissions are linked with rising atmospheric CO<sub>2</sub> levels and anthropogenic global warming.



## NITROGEN OXIDES

Primarily created by combustion in road transport. Nitrous oxide is an important global warming contributor, whilst nitrogen dioxide is involved in ground level ozone-forming reactions, and is also a component of smog.



## SULFUR DIOXIDE

The primary source of sulfur dioxide is the burning of fossil fuels to generate electricity. It can contribute to smog, reacts with water to produce acid rain, and can also cause wheezing and breathing problems for asthmatics.



## AMMONIA

Ammonia's primary atmospheric source is from its use in agriculture, both as manure & fertilisers. It can react with other pollutants to produce particulate matter. It also has the ability to neutralise ecosystems with nitrogen.



## VOCs

VOCs (volatile organic compounds) are emitted naturally by vegetation. Amongst significant human sources is road transport, as well as solvents. They can contribute to formation of ground-level ozone and smog.



## OZONE

The ozone layer shields us from UV radiation, but ground-level ozone is a major pollutant. It's formed from other pollutants in the presence of sunlight. Ozone is a major component of smog, and can also cause health effects.



## POPs

POPs (persistent organic pollutants) are volatile chemicals released into the atmosphere, often from agricultural or industrial uses. They persist in the environment and can have health effects on both wildlife & humans.



## PARTICULATE MATTER

Particulate matter is composed of a huge number of different components. Some are directly emitted, while others are generated by reactions in the atmosphere. They cause haze and can also cause lung problems if inhaled.



## HEAVY METALS

Heavy metals are released into the atmosphere from a range of sources, including burning of fossil fuels and road transport emissions. Some, such as mercury and lead, have toxic health effects on humans.



# Emissions Of Atmospheric Trace Compounds

**Danielle Sinnett, Nick Smith , Sarah  
Burgess**



## **Emissions Of Atmospheric Trace Compounds:**

Emissions of Atmospheric Trace Compounds Claire Granier,P. Artaxo,Claire E. Reeves,2012-12-06 The mathematical modelling of the transport and transformation of trace species in the atmosphere is one of the scientific tools currently used to assess atmospheric chemistry air quality and climatic conditions From the scientific but also from the management perspectives accurate inventories of emissions of the trace species at the appropriate spatial temporal and species resolution are required The chapter has discussed bottom up methodologies to estimate global and regional emissions These methodologies are based on activity data emission factors amount of emissions per unit activity and for some inventories additional parameters such as sulphur content of fuels To compile regional and global inventories researchers can either bring together estimates made at the national or sub national level by national experts or directly estimate emissions based on activity rates from reports compiled by multi national organizations such as the United Nations and the International Energy agency and on emission factors and other information available in the literature In all cases the data used must be checked for transparency consistency comparability completeness and accuracy These emissions estimates must now be given finer spatial usually gridded temporal and for some inventories species resolution The location of major stationary sources power plants industrial complexes is usually known so the emissions can be directly assigned to the appropriate grid cell

**Emissions of Atmospheric Trace Compounds** Claire Granier,P. Artaxo,Claire E. Reeves,2004-05-26 This book grows out of a 2001 workshop on Emission of Chemical Species and Aerosols into the Atmosphere The contents deal with inventories of emissions related to anthropogenic emissions or biomass burning emissions from vegetation and soils emissions of mineral and sea salt aerosols and emissions of sulphur compounds from the oceans Concluding chapters show how atmospheric observations have been used to improve our knowledge of emissions

**Emissions of Air Pollutants** Rainer Friedrich,Stefan Reis,2013-03-09 The scientific work described in this book is the result of an international cooperation of over 60 researchers from many different European countries over more than 10 years Considerable advances have been made in the development application and improvement of methods and models for the calculation of emissions Work on the quantification of uncertainties of emission data could be enhanced and carried out and uncertainty assessments conducted The developed methods present the current state of the art in this field Collaboration of teams has taken place under the EUROTRAC the EUREKA project on the transport and chemical transformation of trace constituents in the troposphere over Europe extensive and networks of joint research work could be established across Europe The editors wish to express their gratitude to all contributing authors and their teams for their cooperation without which this book could never have been compiled Furthermore authors and editors alike are much obliged to the International Scientific Secretariate ISS of EUROTRAC in particular Dr Pauline Midgley for outstanding support in the preparation of this book

**Chemistry of the Climate System** Detlev Möller,2025-01-27 Climate change is a major challenge facing modern society

Chemistry of the Climate System provides a physicochemical understanding of atmospheric processes. The chemical substances and reactions found in the earth's atmosphere are presented along with their influence on the global climate system, evaluating the effects of changing air compositions and possibilities for interference with these processes through the use of chemistry.

**Atmospheric Chemistry in a Changing World** Guy P. Brasseur, Ronald G. Prinn, Alexander A.P. Pszenny, 2012-12-06 Praise for Guy P. Brasseur's *Atmospheric Chemistry in a Changing World* American Meteorological Society This volume summarizes and integrates more than a decade of atmospheric chemistry research. During the period under consideration, great progress has been made in computing, modeling, and observational techniques, and methods have also improved. Here, suggestions for the highest priority research for the next decade are made, and important information is related regarding impacts on the environment.

*Biology, Controls and Models of Tree Volatile Organic Compound Emissions* Ülo Niinemets, Russell K. Monson, 2013-07-08 Plant-driven volatile organic compound (BVOC) emissions play a major role in atmospheric chemistry, including ozone and photochemical smog formation in the troposphere, and they extend the atmospheric lifetime of the key greenhouse gas methane. Furthermore, condensation of photo-oxidation products of BVOCs leads to formation of secondary organic aerosols with profound implications for the earth's solar radiation budget and climate. Trees represent the plant life form that most contributes to BVOC emissions, which gives global forests a unique role in regulating atmospheric chemistry. Written by leading experts in the field, the focus is on recent advancements in understanding the controls on plant-driven BVOC emissions, including efforts to quantitatively predict emissions using computer models, particularly on elicitation of emissions under biotic and abiotic stresses, molecular mechanisms of volatile synthesis and emission, and the role of emissions in plant stress tolerance.

**African Greenhouse Gas Emission Inventories and Mitigation Options: Forestry, Land-Use Change, and Agriculture** John F. Fitzgerald, 1995

Johannesburg, South Africa 29 May 2 June 1995

**Fundamentals of Environmental Chemistry, Third Edition** Stanley E. Manahan, 2011-03-05 Written by an expert using the same approach that made the previous two editions so successful, *Fundamentals of Environmental Chemistry, Third Edition* expands the scope of the book to include the strongly emerging areas broadly described as sustainability science and technology, including green chemistry and industrial ecology. The new edition includes increased emphasis on the applied aspects of environmental chemistry. Hot topics such as global warming and biomass energy are integrated with green chemistry and sustainability concepts throughout the text. More and updated questions and answers, including some that require Internet research, are provided. A Lecturers Pack on CD-ROM with solutions manual, PowerPoint presentations, and chapter figures is available upon qualifying course adoption. The book provides a basic course in chemical science, including the fundamentals of organic chemistry and biochemistry. The author uses real-life examples from environmental chemistry, green chemistry, and related areas while maintaining brevity and simplicity in his explanation of concepts. Building on this foundation, the book covers environmental chemistry broadly defined to include sustainability.

aspects green chemistry industrial ecology and related areas These chapters are organized around the five environmental spheres the hydrosphere atmosphere geosphere biosphere and the anthrosphere The last two chapters discuss analytical chemistry and its relevance to environmental chemistry Manahan s clear concise and readable style makes the information accessible regardless of the readers level of chemistry knowledge He demystifies the material for those who need the basics of chemical science for their trade profession or study curriculum as well as for readers who want to have an understanding of the fundamentals of sustainable chemistry in its crucial role in maintaining a livable planet

**Atmospheric Chemistry and Physics** John H. Seinfeld, Spyros N. Pandis, 2016-04-04 Expanded and updated with new findings and new features New chapter on Global Climate providing a self contained treatment of climate forcing feedbacks and climate sensitivity New chapter on Atmospheric Organic Aerosols and new treatment of the statistical method of Positive Matrix Factorization Updated treatments of physical meteorology atmospheric nucleation aerosol cloud relationships chemistry of biogenic hydrocarbons Each topic developed from the fundamental science to the point of application to real world problems New problems at an introductory level to aid in classroom teaching

**Handbook on Green Infrastructure** Danielle Sinnett, Nick Smith, Sarah Burgess, 2015-11-27 Green infrastructure encompasses many features in the built environment It is widely recognised as a valuable resource in our towns and cities and it is therefore crucial to understand create protect and manage this resource This Handbook sets the context for green infrastructure as a means to make urban environments more resilient sustainable liveable and equitable Including state of the art reviews that summarise the existing knowledge as well as research findings this Handbook provides current evidence for the beneficial impact of green infrastructure on health environmental quality and the economy It discusses the planning and design of green infrastructure as a strategic network down to the individual features in a neighbourhood and looks at the process of green infrastructure implementation emphasising the importance of collaboration across multiple professions and sectors This comprehensive volume operates at multiple spatial scales from strategic networks at the regional level to individual features in neighbourhoods with international case studies used throughout to illustrate key examples of good practice This collection of expert contributions will be invaluable to students and academics in the fields of planning urban studies and geography Practitioners and policy makers will also find the policy discussion and examples enlightening

**Reactive Hydrocarbons in the Atmosphere** C. Nicholas Hewitt, 1998-10-20 The vast family of volatile organic compounds plays a central role in the chemistry of the Earth s atmosphere Reactive Hydrocarbons in the Atmosphere provides comprehensive and up to date reviews covering all aspects of the behavior sources occurrence and chemistry of these compounds The book considers both biogenic and anthropogenic sources plus their effects in the atmosphere at local regional and global scales Covers a major component of atmospheric chemistry and air pollution Considers both natural background chemistry and pollution processes Provides authoritative reviews for a wide range of audiences

**Quantifying Reactive Biogenic Volatile Organic Compounds** Nicole Christine

Bouvier-Brown,2008      **Waste Treatment and Disposal** R E Hester,R M Harrison,2007-10-31 This Issue follows on from the review of waste incineration in Issue 2 providing a thorough and detailed review of other waste management options Waste generation affects everyone and its treatment and disposal are matters of increasing complexity and urgency This book examines the environmental impact of sewage and industrial effluent treatment on inland and coastal waters in the atmosphere and on land It also looks into current practice in the design engineering operation and control of landfill sites and the effect of changes in regulatory policy A wide range of waste management practices result in atmospheric discharges and this book reviews the localized impacts and mitigation of the discharge and the regulatory framework within which waste management has to operate The book also covers the general and technical issues facing the materials recycling industry looks into the factors affecting deep underground storage of radioactive fuel waste produced by nuclear reactors and provides data from a number of case studies in cost benefit analysis demonstrating the utility of a consistent economic theory of waste management      **Selected Water Resources Abstracts** ,1991      **Volcanism and Global Environmental Change** Anja Schmidt,Kirsten Fristad,Linda Elkins-Tanton,2015-01-08 Covering a key connection between geological processes and life on Earth this multidisciplinary volume describes the effects of volcanism on the environment by combining present day observations of volcanism and environmental changes with information from past eruptions preserved in the geologic record The book discusses the origins features and timing of volumetrically large volcanic eruptions methods for assessing gas and tephra release in the modern day and the palaeo record and the impacts of volcanic gases and aerosols on the environment from ozone depletion to mass extinctions The significant advances that have been made in recent years in quantifying and understanding the impacts of present and past volcanic eruptions are presented and review chapters are included making this a valuable book for academic researchers and graduate students in volcanology climate science palaeontology atmospheric chemistry and igneous petrology      *Atmospheric Research From Different Perspectives* Ralf Koppmann,2014-05-27 The book the first in a series arising from the research network The Reacting Atmosphere explains and outlines the aims of this ambitious cross disciplinary effort The central topic is air quality and climate change and the methods of atmospheric physics and chemistry applied mathematics and socio economic science are used to advance the understanding of the role of the atmosphere in global change      *Nitrogen Deposition, Critical Loads and Biodiversity* Mark A. Sutton,Kate E. Mason,Lucy J. Sheppard,Harald Sverdrup,Richard Haeuber,W. Kevin Hicks,2014-04-10 This volume brings together extended reviews and papers of new scientific research on atmospheric nitrogen deposition impacts globally While there is a wealth of evidence on the magnitude components and effects of nitrogen disposition on floral biodiversity in Europe and North America there is an obvious lack of information on impacts on above and below ground fauna and all impacts in other parts of the world with no clear overview of how the different strands of evidence fit together This overall synthesis is targeted at the international conventions but is equally readable for scientists environmental managers conservation

agencies and policy makers This timely book highlights the global nitrogen deposition problem Major regions of the world are exceeding sustainability thresholds for adverse effects on ecosystem function and biodiversity This highlights the importance of ongoing work including under the Convention on Biological Diversity in developing indicators and monitoring nitrogen deposition effects to enable appropriate measures This book presents a milestone towards this global goal as the international community works toward meeting the Aichi Biodiversity Targets especially Target 8 By 2020 pollution including from excess nutrients has been brought to levels that are not detrimental to ecosystem function and biodiversity Braulio Ferreira de Souza Dias Executive Secretary Convention on Biological Diversity This key volume highlights the global challenge to reduce atmospheric nitrogen pollution resulting from energy production transport and agricultural activities It takes forward the agenda recently launched in the UNEP commissioned report Our Nutrient World Dr Anjan Datta UNEP

Culture, Ecology, and Economy of Fire Management in North Australian Savannas Jeremy Russell-Smith, Peter J. Whitehead, Peter Cooke, 2009 In 12 multi authored chapters this book documents key challenges and novel options for addressing chronic landscape scale fire management issues in North Australian Savannas through development of both collaborative cross cultural approaches and commercially supported environment programs

**Volatile Organic Compounds in the Atmosphere** Ralf Koppmann, 2008-04-15 Every day large quantities of volatile organic compounds VOCs are emitted into the atmosphere from both anthropogenic and natural sources The formation of gaseous and particulate secondary products caused by oxidation of VOCs is one of the largest unknowns in the quantitative prediction of the earth's climate on a regional and global scale and on the understanding of local air quality To be able to model and control their impact it is essential to understand the sources of VOCs their distribution in the atmosphere and the chemical transformations which remove these compounds from the atmosphere In recent years techniques for the analysis of organic compounds in the atmosphere have been developed to increase the spectrum of detectable compounds and their detection limits New methods have been introduced to increase the time resolution of those measurements and to resolve more complex mixtures of organic compounds Volatile Organic Compounds in the Atmosphere describes the current state of knowledge of the chemistry of VOCs as well as the methods and techniques to analyse gaseous and particulate organic compounds in the atmosphere The aim is to provide an authoritative review to address the needs of both graduate students and active researchers in the field of atmospheric chemistry research

**Solar Radiation, Modelling and Remote Sensing** Dimitris Kaskaoutis, Jesús Polo, 2019-06-17 Accurate solar radiation knowledge and its characterization on the Earth's surface are of high interest in many aspects of environmental and engineering sciences Modeling of solar irradiance from satellite imagery has become the most widely used method for retrieving solar irradiance information under total sky conditions particularly in the solar energy community Solar radiation modeling forecasting and characterization continue to be broad areas of study research and development in the scientific community This Special Issue contains a small sample of

the current activities in this field Both the environmental and climatology community as the solar energy world share a great interest in improving modeling tools and capabilities for obtaining more reliable and accurate knowledge of solar irradiance components worldwide The work presented in this Special Issue also remarks on the significant role that remote sensing technologies play in retrieving and forecasting solar radiation information



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