Atmospheric Chemistry and Physics

Radiative forcing of the direct aerosol effect from AeroCom Phase II simulations

Researchers report on the AeroCom Phase II direct aerosol effect (DAE) experiment where 16 detailed global aerosol models have been used to simulate the changes in the aerosol distribution over the industrial era. All 16 models have estimated the radiative forcing of the anthropogenic DAE, and have taken into account anthropogenic sulphate, black carbon and organic aerosols from fossil fuel, biofuel, and biomass burning emissions.

Reference

Myhre, G. et al.: Radiative forcing of the direct aerosol effect from AeroCom Phase II simulations, *Atmos. Chem. Phys.*, 13, 1853–1877, 2013

Application of the Statistical Oxidation Model (SOM) to Secondary Organic Aerosol formation from photooxidation of C_{12} alkanes

This research applies the Statistical Oxidation Model of Cappa and Wilson (2012) to model the formation of the secondary organic aerosol from the formation of the four C_{12} alkanes, dodecane, 2-methyl undecane, cyclododecane and hexylcyclohexane, under both high- and low-NO_x conditions, based upon data from the Caltech chambers.

Reference

Cappa, C. D. et al.: Application of the Statistical Oxidation Model (SOM) to Secondary Organic Aerosol formation from photooxidation of C_{12} alkanes, *Atmos. Chem. Phys.*, 13, 1591–1606, 2013

Aerosol decadal trends – Part 1: In-situ optical measurements at GAW and IMPROVE stations

Since the aerosol variables are not normally distributed, three different methods (the seasonal Mann-Kendall test associated with the Sen's slope, the generalised least squares fit associated with an autoregressive bootstrap algorithm for confidence intervals, and the least-mean square fit applied to logarithms of the data) were applied to detect the long-term trends and their magnitudes.

Reference

Collaud Coen, M. et al.: Aerosol decadal trends – Part 1: In-situ optical measurements at GAW and IMPROVE stations, *Atmos. Chem. Phys.*, 13, 869–894, 2013

Aerosol decadal trends – Part 2: In-situ aerosol particle number concentrations at GAW and ACTRIS stations

This article describes an analysis of the trends of total aerosol particle number concentrations (N) measured at long-term measurement stations involved either in the Global Atmosphere Watch (GAW) and/or EU infrastructure project ACTRIS. The work provides a useful comparison analysis for modelling studies of trends in aerosol number concentrations.

Reference

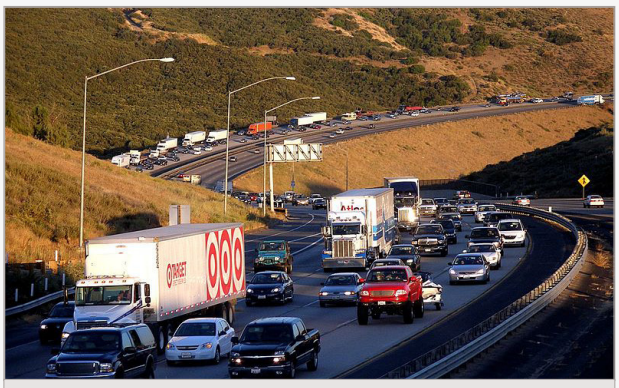
Asmi, A. et al.: Aerosol decadal trends – Part 2: In-situ aerosol particle number concentrations at GAW and ACTRIS stations, *Atmos. Chem. Phys.*, 13, 895–916, 2013

Efficient determination of vehicle emission factors by fuel use category using on-road measurements: downward trends on Los Angeles freight corridor I-710

Researchers describe how they developed an alternative method that links real-time on-road pollutant measurements from a mobile platform with real-time traffic data, and allows efficient calculation of both the average and the spread of vehicle emission factors for light-duty gasoline-powered vehicles and heavy-duty diesel-powered vehicles.

Reference

Hudda, N. et al.: Efficient determination of vehicle emission factors by fuel use category using on-road measurements: downward trends on Los Angeles freight corridor I-710, *Atmos. Chem. Phys.*, 13, 347–357, 2013



Traffic jams, and associated vehicle emissions, are a present problem in the Los Angeles area. (Credit: Coolcaesar/Wikimedia Commons)

Atmospheric Measurement Techniques

The effect of hygroscopicity on eddy covariance estimates of sea-spray aerosol fluxes: a comparison of high-rate and bulk correction methods

This paper describes a method of correcting aerosol spectra for relative humidity induced size variations at the high frequency (10 Hz) measurement timescale, where counting statistics are poor and the spectral shape cannot be well represented by a simple power law.

Reference

Sproson, D. A. J., Brooks, I. M., and Norris, S. J.: The effect of hygroscopicity on eddy covariance estimates of sea-spray aerosol fluxes: a comparison of high-rate and bulk correction methods, *Atmos. Meas. Tech.*, 6, 323–335, 2013

Sea-spray aerosol, generated through bubble bursting in whitecaps, is one of the most important natural aerosol systems. (Credit: Ioannis Daglis, distributed by EGU under a Creative Commons licence via imaggeo.net)

Biogeosciences

High-latitude cooling associated with landscape changes from North American boreal forest fires

In this paper, researchers simulated changes in forest composition due to altered burn area using a stochastic model of fire occurrence, historical fire data from national inventories, and succession trajectories derived from remote sensing.

Reference

Rogers, B. M., Randerson, J. T., and Bonan, G. B.: High-latitude cooling associated with landscape changes from North American boreal forest fires, *Biogeosciences*, 10, 699–718, 2013

Identifying urban sources as cause of elevated grass pollen concentrations using GIS and remote sensing

This paper examines the hypothesis that during flowering, the grass pollen concentrations at a specific site reflect the distribution of grass pollen sources within a few kilometres of this site. Researchers perform this analysis on data from a measurement campaign in the city of Aarhus (Denmark) using three pollen traps and by comparing these observations with a novel inventory of grass pollen sources.

Reference

Skjøth, C. A. et al.: Identifying urban sources as cause of elevated grass pollen concentrations using GIS and remote sensing, *Biogeosciences*, 10, 541–554, 2013

Management, regulation and environmental impacts of nitrogen fertilization in northwestern Europe under the Nitrates Directive; a benchmark study

Implementation of the Nitrates Directive (NiD) and its environmental impacts were compared for member states in the northwest of the European Union (Ireland, United Kingdom, Denmark, the Netherlands, Belgium, Northern France and Germany). The main sources of data were national reports for the third reporting period for the NiD (2004–2007) and results of the MITERRA-EUROPE model.

Reference

van Grinsven, H. J. M. et al.: Management, regulation and environmental impacts of nitrogen fertilization in northwestern Europe under the Nitrates Directive; a benchmark study, *Biogeosciences*, 9, 5143–5160, 2012

Internal respiration of Amazon tree stems greatly exceeds external CO_2 efflux

This article presents a study of gas exchange from stems of tropical forest trees using a new approach to better understand respiration in an ecosystem that plays a key role in the global carbon cycle.

Reference

Angert, A. et al.: Internal respiration of Amazon tree stems greatly exceeds external CO_2 efflux, *Biogeosciences*, 9, 4979–4991, 2012

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Climate of the Past

Biomass burning in southern Ecuador (Credit: Sandro Makowski, distributed by EGU under a Creative Commons licence via imaggeo.net)

What could have caused pre-industrial biomass burning emissions to exceed current rates?

Recent studies based on trace gas mixing ratios in ice cores and charcoal data surprisingly indicate that biomass burning emissions over the past millennium exceeded contemporary emissions by up to a factor of 4 for certain time periods. This paper analyses how emissions from several landscape biomass burning sources could have fluctuated to yield emissions that are in correspondence with recent results based on ice core mixing ratios of carbon monoxide and its isotopic signature measured at South Pole station.

Reference

van der Werf, G. R. et al.: What could have caused pre-industrial biomass burning emissions to exceed current rates?, *Clim. Past*, 9, 289–306, 2013

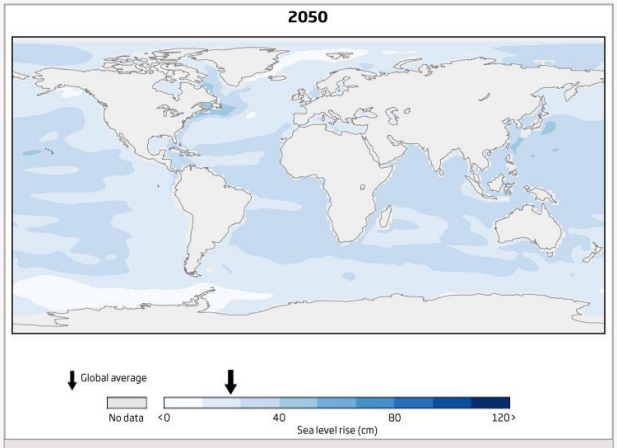
Earth System Dynamics

A scaling approach to project regional sea level rise and its uncertainties

This paper presents an alternative approach to derive regional sea level changes for a range of emission and land ice melt scenarios, combining probabilistic forecasts of a simple climate model (MAGICC6) with the new CMIP5 general circulation models. These regional sea level projections and the diagnosed uncertainties provide an improved basis for coastal impact analysis and infrastructure planning for adaptation to climate change.

Reference

Perrette, M. et al: A scaling approach to project regional sea level rise and its uncertainties, *Earth Syst. Dynam.*, 4, 11–29, 2013



Map showing sea level rise in 2050. See interactive version online. (Credit: New Scientist, based on data from Perrette et al., 2013)

Geoscientific Instrumentation, Methods and Data Systems

Development of stroboscopic muography

Conventional muon radiography has concentrated on non-destructive studies of stationary objects with relatively long exposure times required to achieve sufficient muon statistics. A muon detection system with real time readings and a high spatial resolution detector, enables the investigation of dynamic processes in a stroboscopic mode, where image frames are synchronised with the phases of the dynamic target.

Reference

Tanaka, H. K. M.: Development of stroboscopic muography, *Geosci. Instrum. Method. Data Syst.*, 2, 41–45, 2013

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Hydrology and Earth System Sciences

The importance of glacier and forest change in hydrological climate-impact studies

Changes in land cover alter the water balance components of a catchment, due to strong interactions between soils, vegetation and the atmosphere. Therefore, hydrological climate impact studies should also integrate scenarios of associated land cover change. To reflect two severe climate-induced changes in land cover, researchers applied scenarios of glacier retreat and forest cover increase that were derived from the temperature signals of the climate scenarios used in this study.

Reference

Köplin, N. et al.: The importance of glacier and forest change in hydrological climate-impact studies, *Hydrol. Earth Syst. Sci.*, 17, 619–635, 2013

On the nature of rainfall intermittency as revealed by different metrics and sampling approaches

Results of this work may be useful to improve the calibration of stochastic algorithms used to downscale coarse rainfall predictions of climate and weather forecasting models, as well as the parameterization of intensity-duration-frequency curves, adopted for land planning and design of civil infrastructures.

Reference

Mascaro, G., Deidda, R., and Hellies, M.: On the nature of rainfall intermittency as revealed by different metrics and sampling approaches, *Hydrol. Earth Syst. Sci.*, 17, 355–369, 2013

Similarity of climate control on base flow and perennial stream density in the Budyko framework

Perennial stream density (D_P), which is obtained from the high-resolution National Hydrography Dataset for 185 watersheds declines monotonically with climate aridity index, and an inversely proportional function is proposed to model the relationship between D_P and the ratio of potential evaporation to precipitation.

Reference

Wang, D. and Wu, L.: Similarity of climate control on base flow and perennial stream density in the Budyko framework, *Hydrol. Earth Syst. Sci.*, 17, 315–324, 2013

Prediction, time variance, and classification of hydraulic response to recharge in two karst aquifers

Many karst aquifers are rapidly filled and depleted and therefore are likely to be susceptible to changes in short-term climate variability. This paper explores methods that could be applied to model site-specific hydraulic responses, with the intent of simulating these responses to different climate scenarios.

Reference

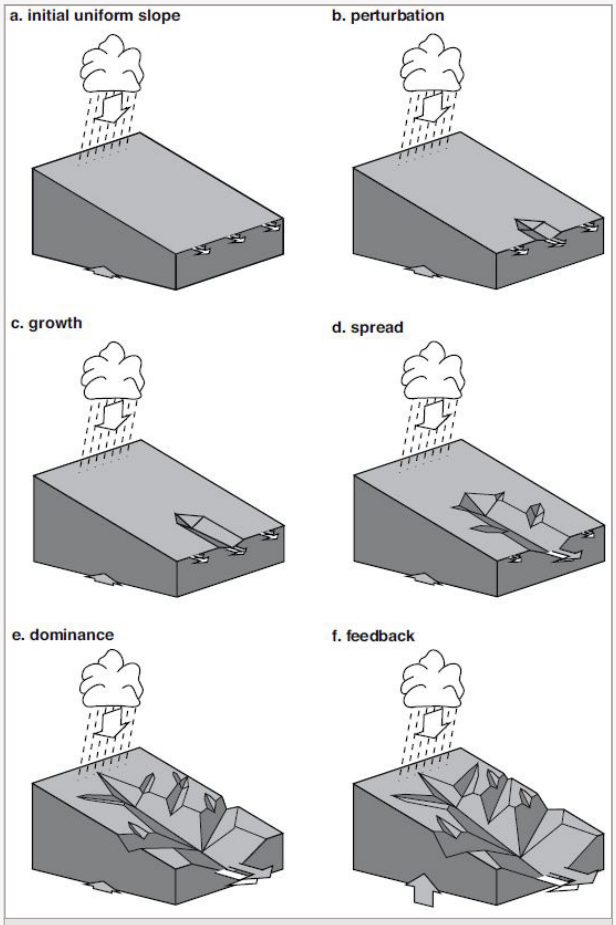
Long, A. J. and Mahler, B. J.: Prediction, time variance, and classification of hydraulic response to recharge in two karst aquifers, *Hydrol. Earth Syst. Sci.*, 17, 281–294, 2013

Thermodynamics, maximum power, and the dynamics of preferential river flow structures at the continental scale

The article describes the organisation and dynamics of drainage systems using thermodynamics, focusing on the generation, dissipation and transfer of free energy associated with river flow and sediment transport.

Reference

Kleidon, A., et al.: Thermodynamics, maximum power, and the dynamics of preferential river flow structures at the continental scale, *Hydrol. Earth Syst. Sci.*, 17, 225–251, 2013



Six stages of structure formation that reflect increasing levels of disequilibrium and ability to generate free energy and drive sediment transport. (Credit: Kleidon et al., 2013)

Natural Hazards and Earth System Sciences

English Channel from above. (Credit: NASA)

Tide-surge interaction in the English Channel

The English Channel is characterised by strong tidal currents and a wide tidal range, such that their influence on surges is expected to be non-negligible. In order to better assess storm surges in this zone, tide-surge interactions are investigated.

Reference

Idier, D., Dumas, F., and Muller, H.: Tide-surge interaction in the English Channel, *Nat. Hazards Earth Syst. Sci.*, 12, 3709–3718, 2012

Nonlinear Processes in Geophysics

Time scale of the largest imaginable magnetic storm

The depression of the horizontal magnetic field at Earth's equator for the largest imaginable magnetic storm has been estimated (Vasyliunas, 2011a) as –Dst ~ 2500 nT. The obvious related question, analysed in this paper, is how long it would take the solar wind to supply the energy content of this largest storm.

Reference

Vasyliunas, V. M.: Time scale of the largest imaginable magnetic storm, *Nonlin. Processes Geophys.*, 20, 19–23, 2013

Stratospheric winds, transport barriers and the 2011 Arctic ozone hole

This paper considers the issue of what constitutes suitable environmental conditions for the formation and maintenance of a polar ozone hole. The discussion focuses on the importance of the stratospheric wind field.

Reference

Olascoaga, M. J. et al.: Brief communication "Stratospheric winds, transport barriers and the 2011 Arctic ozone hole", *Nonlin. Processes Geophys.*, 19, 687–692, 2012

The Cryosphere

Expansion of meltwater lakes on the Greenland Ice Sheet

Forty years of satellite imagery reveal that meltwater lakes on the margin of the Greenland Ice Sheet have expanded substantially inland to higher elevations with warming. These lakes are important because they provide a mechanism for bringing water to the ice bed, causing sliding.

Reference

Howat, I. M. et al.: Brief Communication "Expansion of meltwater lakes on the Greenland Ice Sheet", *The Cryosphere*, 7, 201–204, 2013

The stability of grounding lines on retrograde slopes

The stability of marine ice sheets grounded on beds that slope upwards in the overall direction of flow is investigated numerically in two horizontal dimensions. This paper gives examples of stable grounding lines on such retrograde slopes illustrating that marine ice sheets are not unconditionally unstable in two horizontal dimensions.

Reference

Gudmundsson, G. H. et al.: The stability of grounding lines on retrograde slopes, *The Cryosphere*, 6, 1497–1505, 2012

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