

Contents in Context

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Methane formation in aerobic environments

Frank Keppler, Mihály Boros, Christian Frankenberg, Jos Lelieveld, Andrew McLeod, Anna Maria Pirttilä, Thomas Röckmann and Jörg-Peter Schnitzler

Environ. Chem. **2009**, 6, 459

Methane is an important greenhouse gas and its atmospheric concentration has drastically increased since pre-industrial times. Until recently biological methane formation has been associated exclusively with anoxic environments and microbial activity. In this article we discuss several alternative formation pathways of methane in aerobic environments and suggest that non-microbial methane formation may be ubiquitous in terrestrial and marine ecosystems.

Contact metamorphism, halocarbons, and environmental crises of the past

Henrik Svensen, Norbert Schmidbauer, Marco Roscher, Frode Stordal and Sverre Planke

Environ. Chem. **2009**, 6, 466

What caused the biggest known mass extinction on Earth ~252 million years ago? A possible killer mechanism was the release of specific gases into the atmosphere, which eventually led to destruction of the ozone layer. This is now supported by new laboratory experiments in which ozone-destructing gases were generated when heating rocks from East Siberia (Russia) – reconstructing what happened naturally in Siberia during explosive gas eruptions 252 million years ago.

Quantification of natural DOM from UV absorption at two wavelengths

Edward Tipping, Heather T. Corbishley, Jean-Francois Koprivnjak, Daniel J. Lapworth, Matthew P. Miller, Colin D. Vincent and John Hamilton-Taylor

Environ. Chem. **2009**, 6, 472

Dissolved organic matter (DOM) is part of the global carbon cycle, ecologically and geochemically active, and costly to remove in water treatment. Spectroscopic monitoring at a single wavelength provides some indication of DOM concentration, but variations in optical properties mean that accurate determinations currently rely on slow and costly laboratory methods. We show that for water samples containing non-anthropogenic DOM, ultraviolet absorbance at two wavelengths can quantify DOM rapidly, cheaply and accurately, and also indicate its quality.

Understanding small-scale features in DGT measurements in sediments

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Environ. Chem. **2009**, 6, 477

Observations, using the technique of diffusive gradients in thin-films (DGT), of pronounced, small-scale (millimetre) maxima in concentrations of sulfide and metals in the pore water of sediments, have emphasised the importance of processes occurring in microniches. Modelling of the interactions between microniche sources and DGT devices within a sediment environment demonstrates how these sharp features arise and provides a basis for their quantitative interpretation.

Selenite enhances arsenate toxicity in *Thunbergia alata*

Katharina Bluemlein, Elizabeth Klimm, Andrea Raab and Jörg Feldmann

Environ. Chem. **2009**, 6, 486

Arsenic and selenium are two elements ubiquitously distributed in our environment. While selenium is not known to be essential to plants, it is certainly toxic as is arsenic. On the other hand selenium is known to be essential for mammals and an increase in selenium concentration in plants when used as feed or food may be beneficial for mammals in regions of low selenium concentration. The wide distribution of these two elements in the soil might result in elevated co-exposure of plants. So far no interactions of those elements in plants have ever been studied, although this might be mandatory when nutritionists would like to increase the selenium concentrations in crops, which are already challenged by elevated levels of arsenic.

Seasonal variations of volatile organic compounds in the coastal Baltic Sea

Anna Orlikowska and Detlef E. Schulz-Bull

Environ. Chem. **2009**, 6, 495

Volatile organic compounds (VOCs) play a significant role in the global climate and are engaged in several atmospheric reactions. Relatively large amounts of VOCs are emitted from coastal waters, which is why these zones are expected to have significant impact on the atmospheric chemistry. The abundance of a single compound depends on its source and removal processes as well as on environmental parameters. Thus, seasonal changes can greatly affect the occurrence and behaviour of these trace gases.

Postfrontal nanoparticles at Cape Grim: observations*John L. Gras, Salah I. Jimi, Steven T. Siems and Paul B. Krummel**Environ. Chem.* **2009**, 6, 508

Clouds and the factors controlling cloud properties are essential components in understanding and accurately predicting global climate change. This work examines nanometre-sized atmospheric particles, particularly bursts of enhanced particle concentrations following cold fronts over the Southern Ocean. The properties of these events have been established to enable modelling of their significance as a source of cloud-droplet-forming nuclei.

Postfrontal nanoparticles at Cape Grim: impact on cloud nuclei concentrations*John L. Gras**Environ. Chem.* **2009**, 6, 515

Accurate prediction of climate change requires good knowledge of all the contributing processes; those processes controlling clouds and cloud properties are of particular importance. In this study the growth of bursts of nanometre-sized particles observed following cold fronts over the Southern Ocean was modelled to assess their importance as a source of cloud droplet nuclei. This showed that these post-frontal events were responsible for ~8% of the cloud nucleus population in winter but much less in summer.

Spatial and temporal variations and factors controlling the concentrations of hydrogen peroxide and organic peroxides in rivers*Khan M. G. Mostofa and Hiroshi Sakugawa**Environ. Chem.* **2009**, 6, 524

Hydrogen peroxide (H_2O_2) and organic peroxides (ROOH) are ubiquitously present in natural waters and primarily essential for several redox reactions. This study examines the effects of various dissolved organic substances on the formation of H_2O_2 and ROOH and their relationship with different water quality parameters in two Japanese rivers. This study suggests that fulvic acid is primarily responsible for production of H_2O_2 and ROOH in river waters.

Copper adsorption on humic acid coated gibbsite: comparison with single sorbent systems*Juan Antelo, Sarah Fiol, Silvia Mariño, Florencio Arce, Dora Gondar and Rocio Lopez**Environ. Chem.* **2009**, 6, 535

Adsorption processes control the mobility and bioavailability of nutrients and contaminants in soils, sediments and aquatic systems. Natural organic matter and aluminium oxides are important reactive materials present in natural systems and their mutual interaction may alter the surface properties of both materials, playing an important role on the fate of different contaminants, such as copper, in the environment. The present study illustrates the importance of these interactions, showing that the presence of natural organic matter has a synergic effect on the copper adsorption on the aluminium oxide surface.

Empirical model for predicting concentrations of refractory hydrophobic organic compounds in digested sludge from municipal wastewater treatment plants*Randhir P. Deo and Rolf U. Halden**Environ. Chem.* **2009**, 6, 544

Tens of thousands of manmade chemicals are discharged into municipal wastewaters on a continual basis by consumers around the world but surprisingly little is known about the occurrence and fate of these substances in the environment. The present study furnishes an easily applicable model that can help to predict the presence and concentration of manmade chemicals in digested municipal sludge (biosolids) destined for disposal on land. The new tool can be used to prescreen and identify in chemical databases potential environmental pollutants.

Dissolution kinetics of meta-torbernite under circum-neutral to alkaline conditions*Dawn M. Wellman, Bruce K. McNamara, Diana H. Bacon, Elsa A. Cordova, Ruby M. Ermi and Laken M. Top**Environ. Chem.* **2009**, 6, 551

Uranium-phosphate minerals have been identified as a long-term controlling phase that limit the mobility of uranium to groundwater in many contaminated subsurface environments. Complex, coupled processes confound the ability to isolate the rates attributed to individual processes. Results of this investigation provide the necessary information to refine current prediction on the release and long-term fate of uranium in subsurface environments.