

## Contents in Context

### *Environmental Chemistry, Vol. 5(2), 2008*

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#### **Mercury cycling in the Arctic – does enhanced deposition flux mean net-input?**

*Ralf Ebinghaus*

*Environ. Chem. 2008, 5, 87*

Mercury has unique physico-chemical characteristics that include long-range atmospheric transport, transformation into highly toxic methylmercury species, and the bioaccumulation of these compounds, especially in the marine environment. This has motivated intense international research on mercury as a pollutant of global concern. With respect to Polar regions, scientific interest and research activities were even accelerated after the discovery of the so-called atmospheric mercury depletion events (AMDEs), which are supposed to lead to enhanced mercury deposition flux into these pristine environments in the ecologically very sensitive period in polar spring.

#### **A mass balance inventory of mercury in the Arctic Ocean**

*P. M. Outridge, R. W. Macdonald, F. Wang, G. A. Stern and A. P. Dastoor*

*Environ. Chem. 2008, 5, 89*

Mercury (Hg) occurs at high concentrations in Arctic marine wildlife, posing a possible health risk to northern peoples who use these animals for food. We find that although the dramatic Hg increases in Arctic Ocean animals since pre-industrial times can be explained by sustained small annual inputs, recent rapid increases probably cannot because of the existing large oceanic Hg reservoir (the 'flywheel' effect). Climate change is a possible alternative force underpinning recent trends.

#### **Methylmercury exposure and health effects in humans**

*Anna L. Choi and Philippe Grandjean*

*Environ. Chem. 2008, 5, 112*

Dietary intake of fish and other seafood products is the dominant source of human exposure to methylmercury, a toxicant that can have serious adverse effects on the developing nervous system and may promote heart diseases. The existing evidence of human toxicity should inspire prudent choices in maintaining fish intakes to secure an ample supply of essential nutrients, while at the same time choosing species that are low in mercury concentrations. The combination of essential nutrients and avoidance of this toxic contaminant will benefit brain development and human health in general. In addition, current contamination levels suggest that intensified efforts are needed to reduce and eliminate mercury release to the environment.

#### **Sources, fate and transport of atmospheric mercury from Asia**

*Dan Jaffe and Sarah Strobe*

*Environ. Chem. 2008, 5, 121*

Mercury is a global problem and more than half of all anthropogenic emissions are from Asia. In this paper we review the sources of mercury coming from Asia, the environmental fate of these emissions and their global transport. Asian emissions of mercury are responsible for a small, but significant share of the mercury that deposits throughout the world, especially in the northern hemisphere.

#### **Methylmercury in arctic Alaskan mosquitoes: implications for impact of atmospheric mercury depletion events**

*Chad R. Hammerschmidt and William F. Fitzgerald*

*Environ. Chem. 2008, 5, 127*

Recent research suggests that gross mercury deposition in the Arctic is increased significantly as a result of springtime Atmospheric Mercury Depletion Events (AMDE). A primary environmental and human health concern is whether mercury deposited with these events leads to enhanced production and uptake of the toxic methylmercury species in polar ecosystems. Here, we present an initial assessment of potential impact from AMDE utilising mosquitoes as bioindicators of methylmercury accumulation in freshwater and terrestrial food webs within 200 km of the Arctic Ocean.

#### **Chasing quicksilver northward: mercury chemistry in the Arctic troposphere**

*Ian M. Hedgecock, Nicola Pirrone and Francesca Sprovieri*

*Environ. Chem. 2008, 5, 131*

'Mercurial storms rage over the Arctic' wrote Fred Pearce in *New Scientist* in June of 1997: he was referring to the recent discovery by Bill Schroeder and his colleagues (*Nature*, Vol. 394, 1998) of periods soon after Arctic dawn when the concentration of mercury in the atmosphere literally plummets to levels so low that they can be undetectable, even by the most sensitive of modern instruments. A decade and many measurement campaigns later, we think we understand how these so-called depletion events occur, if not all the mechanisms that go towards providing the conditions for them to happen. Nor do we really know what happens to the mercury removed from the atmosphere; the fear is that it is deposited and enters the Arctic ecosystem, where it is potentially extremely harmful. The present study questions whether that fear is grounded.

## **Macro and micro nutrient limitation of microbial productivity in oligotrophic subtropical**

### **Atlantic waters**

*Joanna L. Dixon*

*Environ. Chem.* **2008**, 5, 135

The subtropical oceans comprise ~70% of the world's ocean surface and profoundly affect global biogeochemistry and climate. They are characteristically low-nutrient regions, but, owing to their large extent and often rapid nutrient turnover, may contribute to greater than 30% of the total marine primary production. However, there remains long-standing uncertainty as to what individual or combination of resources, e.g. macro (N, P) and micro (trace metals) nutrients, limit or co-limit marine productivity and thus total carbon fixation in these spatially dominant gyre systems.

## **High-resolution two-dimensional quantitative analysis of phosphorus, vanadium and arsenic, and qualitative analysis of sulfide, in a freshwater sediment**

*Anthony Stockdale, William Davison and Hao Zhang*

*Environ. Chem.* **2008**, 5, 143

Chemical characterisation of sediment microniches can reveal diagenetic processes that may not be detected by larger-scale analysis. With the development of a new preparation method for a binding phase gel, the technique of diffusive gradients in thin films has been used to demonstrate links between the diagenesis of sulfide, phosphorus, vanadium and arsenic at microniches. Knowledge of these processes may improve predictions of past deposition climates where trace elements are considered as paleoredox proxies.

## **Evaluation of affinity constants of Cu, Cd, Ca and H for active soil surfaces for a solid phase-controlled soil ligand model**

*Julien Rachou and Sébastien Sauvé*

*Environ. Chem.* **2008**, 5, 150

The speciation of metals in soils is controlled by the equilibrium between the solid and aqueous phases and by several parameters such as pH and total metal concentrations. The integration of affinity constants between several cations and active soil surfaces of different soils in the chemical equilibrium modelling software *MINEQL+* allows a good evaluation of the chemical speciation of the metals.

## **Adsorption and desorption of phosphate on Fe<sub>2</sub>O<sub>3</sub>: effect of fulvic acid and pH**

*Tsanangurayi Tongesayi, Eric J. Byam, Sarah B. Keysper and Michael J. Crounce*

*Environ. Chem.* **2008**, 5, 161

Adsorption controls the mobility of chemical species like nutrients in the soil and water environments and forms the basis for some of the methods of treating contaminated waters. Nutrients are introduced into environments where there are large quantities of humic substances adsorbed onto mineral oxides in the soil and sediments but no work has specifically focussed on the effect of adsorbed and free humic substances on the mobility of nutrients, and their adsorption and desorption mechanism on surface sites covered with adsorbed humic substances is still obscure. We believe that our findings and the proposed adsorption mechanism will help advance the technologies and methodologies for the removal of nutrients from wastewater.