

## Seasonal transformations of Hg and MeHg in relation to C, Fe and S biogeochemistry in a sub-oxic lake sediment in north Sweden

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A one-year input/output budget for a humic forest lake (Ängessjön, DOC  $\approx 30 \text{ mg L}^{-1}$ ) indicated a sink for MeHg/methylmercury imported from surrounding forests and wetlands. In contrast, the budget was in balance for Hg and DOC. From February to July, total concentrations of MeHg in sediment (3-20 cm) decreased 2-3 times as a consequence of net demethylation. In surface sediments (0-3 cm), MeHg concentrations were more stable. Potential demethylation rates (determined by isotope addition) in the lake sediment showed a maximum in July and potential methylation rates showed a maximum in August. During fall and winter, concentrations of MeHg increased back to levels in February. Iron(III)-reducing bacteria were indicated to be in control of Hg methylation in May-June, as reflected by maximum Fe(II) pore water concentrations and molybdate inhibition studies. Sulfate concentrations decreased in surface-sediment pore waters from 3 to 0.1  $\text{mg L}^{-1}$  between February and July. High water temperature (20°C) and input of organic carbon from phytoplankton to sediment fuelled dissimilatory reduction of iron(III) and sulfate, resulting in sub-oxic conditions in the sediment during July – August. Predominance of elemental S and organic, reduced S in the sediment (as determined by S XANES) and un-detectable FeS(s) and sulfide concentrations ( $< 0.5 \mu\text{M}$ ) in pore water may suggest that sulfide produced by sulfate-reducing bacteria was immediately oxidized by sulfur bacteria. Modelling of Log  $K_d$  indicates that Hg-polysulfides were in control of Hg solubility in equilibrium with solid-phase Hg-thiol complexes in the sediment. This was corroborated by Hg EXAFS spectroscopic studies.

## Using boron isotopic compositions to identify the origin of water: Contaminants from landfill site or geothermal activity

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This paper focuses on contaminated groundwater that flows through a site that is influenced by both geothermal activity and a pulp and paper landfill. The groundwater then flows into a major river, from which water is drawn to irrigate farmland downstream of the site. This preliminary study involved testing the boron concentration and the isotopic boron composition of samples taken from the groundwater on site, and the surface water and water associated with geothermal activity in the area. The results have provided an indication of boron isotopic signatures associated with the different types of water bodies which has shed some light on the ability to use boron isotopic composition as natural tracers in this area.