

Arsenic mobilization by anaerobic iron-dependent methane oxidation

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Arsenic contamination in groundwater and drinking water is a global threat to humans. One key mechanism suggested to be responsible for mobilization of arsenic from sediment into groundwater is the microbial reduction and dissolution of As-bearing Fe(III) oxyhydroxide minerals. Microbial reduction and dissolution of As-bearing Fe(III) oxyhydroxide minerals is known to be responsible for mobilization of arsenic from solids into groundwater. Surface-derived fresh biomass as well as older organic matter already present in the subsurface (e.g. from old peat lenses) has been suggested and in some cases even demonstrated to be involved as carbon source and electron donor for microbial Fe(III) mineral reduction and As mobilization. Although in some arsenic groundwater wells also methane has been observed at significant concentrations, its potential to function as electron donor for Fe(III) reduction in the context of arsenic mobilization has not been described so far. In this presentation we will show hydrogeochemical, isotope and microbial community data from microcosm experiments performed with arsenic-bearing sediments obtained from a drilling campaign near Hanoi/Vietnam. Our findings demonstrate arsenic mobilization into the water via a microbially mediated anaerobic methane oxidation coupled to reduction of As-bearing Fe(III) minerals. Since methane is commonly present in arsenic-contaminated aquifers, we suggest that methane-driven mobilization of arsenic should be investigated and considered in future studies also at other relevant field sites.