Potential role of CH_4 oxidation coupled to Fe(III) mineral reduction for As mobilization in a groundwater aquifer in Hanoi, Vietnam

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High concentrations of arsenic (As) in ground- and drinking water cause serious health problems for millions of people worldwide. Arsenic water contamination has specifically been reported for many countries in South- and Southeast Asia. Several mechanisms have been suggested and in some cases shown to be responsible for triggering the release of As from Fe(III) (oxyhydr)oxide-rich sediments to the groundwater, including competitive desorption (e.g. by phosphate) or complexation (by natural organic matter, NOM). However, in particular microbial reductive dissolution of As-bearing Fe(III) minerals has been identified as a key process responsible for As mobilization. The identity and source of the electron donor(s) driving this reduction process is still unknown in many cases. Sources such as surface-derived NOM or sedimentary organic C have been suggested to play a role.

Here we investigate if and to what extent CH_4 oxidation is coupled to Fe(III) mineral reduction and As release from Fe(III) rich sediments in aquifers in Hanoi, Vietnam. A high abundance of methanogens and consequently high concentrations of CH_4 in the groundwater together with Fe(III)-rich sediments and anoxic conditions create suitable conditions for this process to occur. 16S rRNA gene sequencing confirmed the presence of archaea belonging to the putative Fe(III)-reducing CH_4-oxidizer *Candidatus Methanoperedens* in our aquifer. Microcosm incubation experiments with As-loaded Fe(III)-rich aquifer sediments amended with CH_4 have been carried out. Fe(III) reduction rates, As mobilization, and changes in the microbial community are currently followed over time and first results will be shown.