Hydrochemical investigations on Arsenic (im)mobilisation in groundwater: example of Van Phuc, Vietnam

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Mobilisation and retardation of Arsenic

Exposure to groundwater contaminated by arsenic (As) constitutes a major health risk for millions of people worldwide. Therefore, the biogeochemical and physical processes responsible for the release, transport and retardation of As in groundwater need to be identified to optimise groundwater management strategies.

To this purpose, we chose a the site of Van Phuc, Red River delta region in Vietnam, with an advectively induced steady groundwater flow from a highly iron-reducing Holocene aquifer (high As) into a much less reducing Pleistocene aquifer (low As).

Sampling campaigns were carried out in 2017 and 2018. Comprehensive hydrochemical analyses will be presented, with particular focus on the relevance of iron redox cycling on As (im)mobilisation and the interactions with manganese, phosphorus and sulphur.

Stable isotopes - H, O, C, N - to constrain As cycling

Despite advancements in the hydrochemical site characterisation, a quantitative assessment of As (im)mobilisation remains challenging, due to the complex interactions of iron minerals in sediments with several natural and anthropogenic sources of water (river, channels, ponds) and organic matter (peat intercalations, fresh riverbank sediments, ponds).

Water isotope signatures (δ^2H and $\delta^{18}O$) were analysed to better constrain the site hydrology. Further, $\delta^{13}C$ and $\delta^{15}N$ of dissolved organic matter and ammonium were determined to assess the potential hotspots of biogeochemical reactions leading to As mobilisation. The latest results of the isotopic studies will be discussed in the frame of site hydrochemical characterisations.