

Aquitard constraints on degassing in an arsenic contaminated aquifer

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The extent to which aquitards contribute to arsenic mobilization in contaminated aquifers is still unknown. Many studies suggest aquitards can be an important source of organic carbon, which fuels the As mobilisation in contaminated aquifers. Further, the link between CH₄ and As motivates simultaneously the study of CH₄ gas dynamics in affected aquifers. In cases where CH₄ oversaturates, a free gas phase can be formed resulting in the degassing of dissolved species, and the potential disruption of groundwater flow.

In our specific study site, ~15km south-east of Hanoi, CH₄ is observed to be at in-situ saturation concentrations in groundwater wells situated just below the capping aquitard of an arsenic contaminated aquifer. A sediment core of around 15m was taken through this overlying aquitard with the aim to understand both solute input into the aquifer, and the underlying degassing processes already reported at this site. Pore water in the core was analysed for noble gases at a resolution of 0.5 - 1m. The initial processing of samples from this core, revealed that a large part of the pore space was in-fact not saturated with water, but filled instead with air/gas. The pore space was shown to be unsaturated in two separate layers for a significant part of the core (at least ~30%), between depths of 7.5 - 15m, indicating the presence of perched groundwater.

These first findings mean that for this part of the aquifer, the hydrostatic pressure is lower than previous estimates have assumed, and therefore accumulation of CH₄ is highly likely to result in gas phase formation. The finding also suggests potential new pathways for younger groundwater to infiltrate the contaminated aquifer, which may provide additional input of solutes affecting the As mobilization process. Further analysis of this sediment core, we believe, will lead to an improved understanding in both the degassing process, which affects groundwater transport, and the solute input from the aquitard within the aquifer at the specific study site.