

Determination and quantification of arsenic sorption characteristics in the Pleistocene aquifer of Hanoi, Vietnam

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Arsenic contamination in Van Phuc, located in the vicinity of Hanoi, has been intensively studied for its source, spatial variability as well as hydrological and sedimentary controls [1] [2]. A recent study established a 16 to 20 fold retardation in the extent of the arsenic contamination relative to the lateral movement of groundwater across the boundaries of Holocene and Pleistocene aquifers [3]. However, to date this estimate has not been underpinned by any comprehensive experimental evidence of arsenic sorption onto aquifer sediments collected from the Van Phuc field site.

The present study was carried out to determine the arsenic sorption characteristics of sediments from the Pleistocene aquifer under variable hydrochemical conditions. Representative sediment samples were obtained from a location which has low groundwater arsenic concentrations, but is potentially downstream to a high arsenic plume migrating with the groundwater flow induced by the pumping for the municipal water supply of Hanoi [3].

Sorption experiments were carried out with arsenite in a dark and anaerobic set-up. The results were used to develop and calibrate a site-specific non-electrostatic surface complexation model. The calibration relied on a newly developed particle swarm optimisation algorithm in PEST software suite [4]. Apparent equilibrium constants (logKs) were derived for surface complexation reactions of arsenite and the distribution of arsenite onto different types of surface sites was used to characterise different types of minerals taking part in arsenic sorption.

- [1] Berg *et al* (2008) *Chemical Geology* **249(1–2)**, 91-112. [2] Eiche *et al* (2008) *Applied Geochemistry* **23(11)**, 3143-3154. [3] van Geen, A., *et al* (2013) *Nature* **501(7466)**, 204-207. [4] Siade *et al* (2015) *Water Resources Research* – under review.