Controlling arsenic solubility by iron mineral formation in a heavily contaminated coastal aquifer

Alyssa Barron[1], Stefania Passaretti[2], Chiara Sbarbati[2], Jing Sun[1], Henning Prommer[1], Marco Petita[2] and Maurizio Barbieri[2]

[1]School of Earth Sciences, University of Western Australia, Crawley, WA, Australia
[2]Dept. of Earth Sciences, "Sapienza" University of Roma, Roma, Italy

Groundwater arsenic (As) contamination adversely impacts groundwater resources globally. Industrial activities have siginificantly increased the incidence and spread of As pollution. Current clean-up tehnologies are often inefficient, requiring large displacement of sediment/groundwater and long periods of operation. Stimulated development of Fe minerals in affected aquifers presents an *in-situ* remedial technique. Among many Fe minerals, magnetite (Fe_3O_4) has become a target mineral for As retention based on its stability in a wide range of geochemical conditions. Its formation was previously successfully achieved in laboratory trials using additions of Fe(II) and nitrate. Here, we assess the potential of *in-situ* magnetite formation and As sequestion in a heavily contaminated coastal aquifer (As levels as high as 430 mg/L) using microcosm experiment. Phosphate, a known sorption competitor with As, is amongst the contaminants in groundwater. Furthermore, both fresh and saline conditions exist at this site. Therefore, the nitrate-Fe(II) microcosms were carried out, in conditions of varying salinity and phosphate concentration. Sample analysis has not yet been completed, but initial results show enchanced As sequestion in nitrate-Fe(II) treated microcosms contrasted to controls. Salinity shows no effect while phosphate appears to inhibit As sorption even increasing its dissolution. Geochemical modeling will be conducted to discern the processes occurring and inform the design of next stage experiments.