Influence of Varying Redox Conditions on Arsenic Release and Retention from the Yangtze River Basin Sediments

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The comsumption of arsenic (As) contaminated groundwater affects the health of almost 20 million people in China[1]. Research has historically focused on arsenic contamination in the Yellow River basins of northern China, however recent studies in the Yangtze River Basin of southern China have shown that arsenic concentrations there may vary by an order of magnitude seasonally[2-3]. In order to decipher the cause of seasonal release and retention of As between sediments and groundwater, we conducted batch sediment incubations under varying (imposed) redox conditions. Incubations were conducted under both N_2 and O_2 gas purges, and the purge gas was varied over time to simulate changes observed within the field.

In all cases, As release to solution prevailed under anoxic conditions while As was removed from solution under oxic conditions. These experiments confirm that anoxia is a prerequisite for As mobilization into groundwater from sediments in the Jianghan Plain, but more importantly, that *in situ* aquifer sediments at depths >15 m could release As through multiple redox cycles without an exogenous electron donor (carbon source). The low concentrations of reactive organic matter in the sediments are sufficient to support As mobilization via reductive processes at depth. These results provide direct evidence for previously described mechanisms explaining the observed seasonal variation of groundwater As concentrations in the central Yangtze River Basin, Jianghan Plain, where seasonal changes in surface and groundwater levels drive changes in redox conditions and thus As concentrations.

[1] Rodríguez-Lado et al (2013) *Science* 341(6148): 866-868.

[2] Schaefer et al (2016) *Environ. Sci. Technol.* 50(7): 3521-3529.

[3] Duan et al (2015) *J. Geochem. Explor.* 149: 106-119.