Spatial Distribution of arsenic in groundwater of the Jianghan Plain, central China

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Differences in climate, geological background and anthropogenic activities make investigations of high arsenic groundwater in the Jianghan Plain different from those in other regions [1]. In this study, a systematic survey of the groundwater quality was carried out, 657 groundwater samples were collected from the Jianghan Plain between the Yangtze and Han rivers. Major constituents, trace elements, dissolved organic carbon (DOC), and stable hydrogen and oxygen isotopic compositions were analyzed to characterize groundwater chemistry and evaluate the factors controlling arsenic concentration and distribution in the plain.

The results show that the groundwater is mainly HCO_3^- Ca•Mg type with circum-neutral pH. Negative Eh and high concentrations of DOC clearly indicate strongly reducing conditions with abundant organic matter in the groundwater aquifers. The characteristics of H/O stable isotopes demonstrate that the groundwater in the study area is recharged by local precipitation and there is a slow evaporation effect. About 54% of the groundwater samples had As concentrations exceeding the WHO recommended value of 10 μg/L, up to 2330 μg/L. Spatial distribution of arsenic in groundwater was highly heterogeneous, high arsenic groundwater was mainly distributed along the Dongjing and Tongshun rivers, including three high arsenic villages: Nanhong, Yaohe, and Tanzihu. Vertically, high arsenic concentrations mainly occurred between depths of 10 and 45 m below the ground, which is the depth of most residential wells in this region. High concentrations of dissolved Fe (maximum value, 33 mg/L) and Mn (maximum value, 7 mg/L) were also observed in groundwater. The main potential mechanism for the release of As is the reductive dissolution of Fe and Mn oxides/hydroxides under reducing conditions, while microbial degradation of organic matter also facilitate the release of arsenic into groundwater.

[1] Guo *et al* (2014) *Appl Geochem*. **41**:196-217.