



Variation of Arsenic in shallow aquifers of Bengal Delta Plain: Geochemistry and processes

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An understanding of the geochemical processes is important to explain the variation (spatial and vertical) of dissolved arsenic (As) in shallow aquifers(< 50 m) to implement safe drinking water supply among the affected population. The present investigation has been conducted at Chakdah area ,Nadia district , West Bengal. The two different sites (high AsT upto 146 ppb and low AsT 54 ppb) are selected for regular monitoring for 20 months. The isotopic signature indicates that the recharge of evaporative surface water to the aquifer. The hydrochemistry of major aqueous ions (Ca²⁺, Mg²⁺,Na⁺, K⁺ , HCO⁻ and Cl⁻) and electrical conductivity are relatively higher in the high As site when compared with low As side. Moreover, the major ions , Fe ,SO₄²⁻, electrical conductivity and stable isotopic signatures are revealed enrichment in the shallowest part (< 25 m) of the aquifer when compared with regard to deeper aquifer. This suggests that vertical layering of groundwater composition within the aquifer. The stronger sediment-water interaction has been observed in the shallow aquifer in comparisons to deeper part of the aquifer. It is interesting to note that the shallow aquifer is also enriched with Cl⁻ concentration because the anthropogenic recharge input possibly increased the Cl⁻ concentration in the said shallow aquifer. On the contrary, such enrichment and vertical laying are absent in the low As site of the delta plain aquifer. The possible explanation is the large scale groundwater abstraction. As a result, the sediment-water interaction is low with increased aquifer fluxing. This has been clearly reflected in the groundwater chemistry of the low As site. For example, the low As aquifer is the absence of vertical layering ,low electrical conductivity and low major ion concentration. This long-term monitoring investigation supports that the reductive dissolution of Fe oxyhydroxides where As variation is regulating by competitive PO₄³⁻. Finally, the role of fresh biotite, participation of secondary mineral phases are playing important role with regard to decoupling of As and Fe enrichment of the Bengal delta aquifer.