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Groundwater Geochemistry and radiocarbon dating of aquifer sediments of Bengal basin: Implications to arsenic pollution in West Bengal

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Arsenic contamination in groundwater has been a serious threat to millions of people in India and Bangladesh. It is now being increasingly believed that microbial reduction of iron oxy-hydroxide phases, occurring as a coating on sand grains of the aquifer, is responsible for the release of arsenic in the groundwater. To test (or otherwise) this hypothesis controlled experiments in piezometer nests have been undertaken in North 24 Parganas of West Bengal, India, a severe arsenic contaminated area. Our studies included detail elemental chemistry of water, ^{14}C dating of aquifer sediments and stable isotope compositions of groundwater both on seasonal and spatial scale. Both dissolved iron (Fe) and arsenic (As) shows prominent peak almost at the same depth of aquifer indicating a pronounced control of arsenic leaching by dissolution of iron oxy hydroxide phase. This is also supported by the depth variations in oxygen and hydrogen isotopic compositions of water. Cation (Na, K, Ca, Mg) and anion ($C1^-$, $SO_4^=$, PO_4^{3-}) chemistry of groundwater indicate a chemical stability of aquifer through seasons. Very low concentrations of $SO_4^=$ and PO_4^{3-} rules out pyrite oxidation and fertilizer hypothesis as reported earlier (McArthur et al., 2004, App. Geochem.). The release of As by iron oxy hydroxide leaching, however, is directly controlled by the thickness of organic rich peaty and clay layers in the basin. ^{14}C dating of this peaty layer indicates an age of ~7 k.yr and was probably deposited during the mid-Holocene transgressive phase in Bengal basin.

References

[1] McArthur et. al.,*Appl. Geochem,* **19**, 1255-1293 (2004)