

Role of Sedimentary and Dissolved Organic Matter in Arsenic Mobilization in Bengal Basin
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Organic matter (OM, dissolved and sedimentary) in shallow reducing aquifers of Bengal basin has been attributed to the arsenic (As) and other oxyanions mobilization by fueling and accelerating microbial reductive dissolution of trace element-bearing iron minerals. Specifically, concentrations of dissolved As and characteristics of DOM were measured at several locations (eleven in India and four in Bangladesh) where the shallow (< 40 m) groundwater contained elevated As levels. These sites span from shallow Holocene reducing aquifer with low As, deep Pleistocene oxidizing aquifers with low As and intertidal zones on the banks of major rivers like Meghna. The aquifer sediment samples were collected from sites in Bangladesh using coring (0 – 3m) and well drills (0 – 30 m) for sedimentary OM characterization. The groundwater As concentrations ranged between <1 to 643 μgL^{-1} across these sites, while the dissolved organic carbon (DOC) ranged between 0.65 to 9.6 mgL^{-1} and showed a strong correlation ($R = 0.94$) between them. The DOM in high As groundwater showed lower carbon to nitrogen (C:N) ratio while this ratio was found to be much greater in low As groundwater. Fluorescence spectroscopic analysis followed by parallel factor (PARAFAC) modeling showed that high As groundwaters usually contained higher concentrations of humic-like and terrestrially-derived (microbially processed), whereas the low As groundwaters contained protein-like and less microbially processed fractions of DOM. The analysis of bulk sedimentary OM, functional groups and its reactivity is currently underway. Previous studies have suggested that humic-like OM is involved in aqueous complexation, competitive sorption and electron shuttling that leads to acceleration of As mobilization. This study brings together the roles of DOM and sedimentary OM in As and like oxyanions mobilization in fluvial-deltaic basins and highlights the important processes that can help explain spatial and temporal heterogeneity of dissolved As distribution in the groundwater.