

Groundwater Salinity in Southern Ganges-Brahmaputra-Meghna Delta of Bangladesh: Origin and Mechanisms

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Summary

Deep groundwater, which is located deeper than 150 m below ground level (bgl), provides major freshwater supply in southern Ganges-Brahmaputra-Meghan (GBM) delta covering the coastal regions of Bangladesh. This groundwater is salty in some places, and the reasons of high salinity is not clear yet. We have been studying this issue by combining data and information with respect to surface environmental changes, geology and hydrogeology, geochemistry, and environmental isotopes for the Khulna city and its surroundings situated in the southwestern coastal region. Our results reveal that deep groundwater contains higher salinity in area where deep paleo-channel was formed due to erosion and incision during the last sea-level lowstands in the Upper Pleistocene (~117 to ~18 ka). During the transgression events after the Last Glacial Maximum (~21 to ~18 ka), this paleo-channel was filled with fine-grained sediments under estuarine conditions. Deep groundwater with relatively low salinity is located in paleo-interfluvial area capped with oxidized fine-grained sediments at around ~50 to ~60 m bgl. Seawater is predominant source of deep groundwater salinity with seawater proportion as high as ~13% in paleo-channel area and ~3% in paleo-interfluvial area. We invoke that (i) brackish water formed within the paleo-channels during the transgression events was invaded into and mixed with deep groundwater where overlying protective clay/silty clay aquitards were thin and/or absent due to deep incision in the paleo-channel area, and (ii) continuous pumping of deep groundwater with high capacity municipal production wells in the city under paleo-interfluvial area has been influencing horizontal migration of salinity from paleo-channel area. We are currently working for a better hydrogeological understanding of the processes controlling groundwater salinization in the study area.

Keywords: Deep groundwater salinity, Southern GBM delta, Khulna city, Paleo-channel, Paleo-interfluvial, Transgression, Brackish water, Municipal pumping.