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Role of hydrogeochemistry in the release of arsenic in 24 Parganas districts, West Bengal

Neha Singh, Ratan Sen, Chandrasekhar Azad Vishwakarma and Saumitra Mukherjee
Jawaharlal Nehru University, India

In West Bengal, arsenic contamination in groundwater is a crucial water quality problem. Various studies have reported different source of arsenic, but the source and mechanism of its release into groundwater is still not clear. In present study, based on the samples of the groundwater collected from North and South 24 Parganas districts of West Bengal, an attempt has been made to understand the hydrogeochemistry of the area. Durov and Schoeller diagram shows the dominance of bicarbonate, chloride, alkali and alkaline earth metals. The groundwater quality data was subjected to various conventional graphs for evaluation of hydrogeochemistry. Silicate weathering and ion exchange are the dominant processes in the area with carbonate weathering at some of the places. Calcium and magnesium in the water are replaced by sodium and potassium from the host rocks as chloro-alkaline indices are negative at most of the places. Arsenic was reported to be adsorbed on the surface of grains coated with iron oxyhydroxides and to iron hydroxide coated sand grain margins and also to clay minerals. Saturation index indicates that groundwater is oversaturated with iron containing minerals like Goethite, hematite, $\text{Fe}(\text{OH})_3$ and iron oxyhydroxides. Goethite forms through the weathering of various iron rich minerals in the zone of oxidation within the soil. Oversaturation of Goethite in groundwater indicates that the mineral may have formed in the subsurface in aerated zone within the aquifer created by the fluctuation in the water table due to increased use of it for irrigation purpose. Weathering of iron rich minerals in the aquifer thus may be responsible for the release of arsenic into the groundwater.

neha8277@gmail.com