Appraisal of sediment-groundwater interaction using PHREEQC based simulation in parts of active flood plains of Upper Yamuna basin, India.

A. SARKAR[1*] & SHASHANK SHEKHAR[2]

[1] Department of Geology, Delhi University, Delhi, India-110007(*corrospondence: adi_sarkar.com@rediffmail.com)

[2] Department of Geology, Delhi University, Delhi, India-110007 (shashankshekhar01@gmail.com)

The active flood plains of the Upper Yamuna basin comprise of coarser sediments such as sand, gravel, and pebbles intermixed with silt and clay units. These flood plains are known to have unconfined aquifers with fresh water zones overlying saline water. In recent years, parts of these active flood plains have seen a number of cases of deterioration in groundwater quality. Our study tries to discuss the impact of sediment-groundwater interaction in this deterioration of groundwater quality.

The study involves a simple PHREEQC based simulation that assumes a dynamic equilibrium between dissolved constituents in groundwater and sediments. The saturated indices of minerals commonly present in floodplain alluvium were calculated on this assumption. These calculations were then used to predict the possibility of reactivity of minerals present in the subsurface.

Based on our observations, we found that certain iron containing minerals like Goethite, and Hematite as well as other minerals such as Gibbsite, Calcite, Dolomite, Siderite etc were supersaturated with respect to the groundwater, hinting towards presence of these minerals in aquifer. On the other hand, the under saturation of minerals such as Undersaturated with Halite, Sylvite, Anhydrite, Siderite, Fluorite indicate absence of these minerals from subsurface material.

Although the results were found to be consistent to the bulk sediment analysis of the subsurface material using the XRD, the method itself has its limitations. One such limitation was non availability of data for dissolved silica in groundwater, due to which saturation indices of Quartz and other silicate minerals were calculated by giving different values.

To summarize, the simulation might not have given the most accurate results, but could be useful as a preliminary step in similar studies with limited input.