

Hydrochemical investigations of coastal aquifers and saltwater intrusion in severely affected areas of Satkhira and Bagerhat districts, Bangladesh

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ABSTRACT

In this study, saltwater intrusion and hydrochemical process in the coastal aquifer system of Satkhira and Bagerhat districts, Bangladesh, have been investigated. The studied two aquifer systems are mostly affected by saltwater. Overall processes have been applied on 120 samples (per study area 60) to specify the mixing condition of saltwater types in both study areas. This research was run based on the seawater mixing index (SMI), GIS technique of spatial distribution modeling, statistical process (principal component analysis, correlation matrix analysis), geochemical bivariate plot, and ionic proportions. According to the analytical results, the Bagerhat district has greater levels of Cl, Na, total dissolved solids (TDS), and electrical conductivity (EC) than the Satkhira district. Hydrochemical analysis has shown that most samples discovered in the Satkhira district have Na–Cl facies, although this percentage is lower than Bagerhat. The spatial distribution of SMI on the Satkhira district shows 29%, 31%, 23%, and 17%, whereas in the Bagerhat district, it shows 16%, 23%, 26%, and 35% of freshwater, brackish water, moderately saltwater, and high saltwater or mixing of saltwater, respectively. Therefore, the overall intrusion process has been affected by long-term hydrochemical processes, such as water–rock exchange, sediment reduction, anthropogenesis, and ion interaction.

KEYWORDS

Hydrogeochemical process; Saltwater intrusion; Coastal aquifer; Piper diagram; Gibbs diagram

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