

Comparison of monsoon variations over groundwater hydrochemistry changes in small Tropical Island and its repercussion on quality

ABSTRACT

Study on the spatial and temporal distribution of groundwater hydrochemistry in the small tropical islands is important as their insular character may expose the groundwater aquifer to too many sources of pollution, especially salinization. A total of 216 groundwater samples were collected from the monitoring boreholes during two different monsoon seasons; pre- and post-monsoon. As overall, data of groundwater concentration illustrated a trend of $\text{Ca} > \text{Na} > \text{Mg} > \text{K}$ and $\text{HCO}_3 > \text{Cl} > \text{SO}_4$ dominations with the major finding of two different groundwater types. Pre-monsoon reported Na-HCO₃ and Ca-HCO₃ types while post-monsoon were only dominated by the Ca-HCO₃ type. The statistical analysis shows the in situ parameters (Temp, pH, EC, Salinity, DO, TDS and Eh) and major ions (Ca, Mg, Na, K, HCO₃, Cl and SO₄) were strongly correlated with the monsoon changes ($p < 0.01$). From the analysis, it reveals that the seasonal changes have significantly affects the groundwater composition. While, the analytical calculations of the ionic ratio (Na vs. Cl; Cl/HCO₃ vs. Cl; Ca + Mg vs. SO₄ + HCO₃) describes the groundwater is influenced by the cation exchanges processes, simple mixing and water-rock interaction. Saturation indices of carbonate minerals shows strong correlation ($p < 0.01$) with Ca constituent indicating solubility on minerals, which led to dissolution or precipitation condition of water. Results of present study contribute to a better understanding of a complex groundwater system and the hydrochemical processes related.

Keyword: Groundwater hydrochemistry; Groundwater; Tropical islands; Monsoon