

Application of geochemical and geostatistical analyses in observing the controlling factors of groundwater compositions

ABSTRACT

The groundwater hydrogeochemistry assessment has been carried out based on physico-chemical parameters (which are in situ and major ions) to observe the hydrochemical mechanism that might occur and control the groundwater chemistry changes. A total of 216 groundwater samples from Kapas Island were collected bimonthly during two different monsoon seasons which were South West Monsoon known as pre-monsoon (August to October 2010) and North East Monsoon known as post-monsoon (February to April 2011). Geochemical data on dissolved major constituents in groundwater samples from the Kapas Island revealed the main processes responsible for their hydrogeochemical evolution. The abundance of major ions revealed $\text{Ca} > \text{Na} > \text{Mg} > \text{K}$ and $\text{HCO}_3 > \text{Cl} > \text{SO}_4$ dominations. Principal Component Analysis (PCA) extracts four (pre-monsoon) and three (post-monsoon) effective components which explained the origin of groundwater sources which have 81.6 and 78.9 % of total variances respectively. Component 1, pre-monsoon experienced slightly saline process while component 1 in post-monsoon consist of Mg, TDS, EC, Salinity, Ca, Na, pH, Eh and HCO_3 described the mineralization process of the geological matrix have taken place. Saturation indices of carbonate minerals were calculated using PHREEQC for window software; calcite, dolomite and aragonite solubility showed strong and positive correlation value ($p < 0.01$) with Ca constituent respectively, also indicating mineralization processes.

Keyword: PCA; Saturation index; Small island; Hydrochemistry