A comparative study of groundwater quality of various aquifer systems in Malaysia

ABSTRACT

Groundwater resource has been exploited to a certain extent in Malaysia mainly to augment water supply to various needs of domestic, industry and agriculture. Many works have been concentrated to explore the optimum yield of groundwater in this particular area. Groundwater quality observations are merely to ensure they are within the required water quality standards. Studies on groundwater quality in Malaysia have not been in depth in terms of its origin, relationship to different types of aquifers, interrelationship with surface water, contamination possibilities as well as intrusion of saline water into the aquifers. The main objective of this paper is to examine the characteristics of groundwater quality in Malaysia particularly in alluvium and in hard rock layers. The study area will cover the Peninsular and East Malaysia comprising of 428 monitoring wells of various locations, sizes and types. A total of 267 wells are from the alluvium, while 161 wells are from the hard rock areas. Most of the shallow monitoring wells are from Sabah and Sarawak (East Malaysia) while the rest are from deep alluvium of Kelantan, Pahang, Perak, Selangor and Terengganu (Peninsular Malaysia). Hard rock wells are monitored mainly at Johor, Kedah, Negeri Sembilan and Melaka with some at Perak, Terengganu and Sabah. AQUACHEM is used to classify the types of groundwater present in Malaysia. Hierarchical Cluster Analysis (HCA) is to group the data into different clusters. Principal Component Analysis (PCA) is applied to get information on the most meaningful parameters due to spatial and temporal variations which describe the whole data set. Discriminant Analysis (DA) is used to construct the best discriminant function for each group of aquifers. Distinct differences are observed from samples of alluvium or hard rock aquifers of Peninsular Malaysia with East Malaysia. Based on the PCA, the most prominent variables of water quality of hard rock aquifers in the Peninsular Malaysia are Na, Ca, Cl, Cu and Pb, while in the East Malaysia are Na, SO4, and Cl. For alluvial aquifers, the most prominent variables in the Peninsular Malaysia are Na, Mg and Cl, while in the East Malaysia are Na, K, Cl and CO3.

Keyword: Groundwater; Aquifer; Statistics