

Extenuation of saline solutes in shallow aquifer of a small tropical island: A case study of Manukan Island, North Borneo

Abstract

Intensive exploitation of groundwater from Manukan Island,s aquifer has disturbed the natural equilibrium between fresh and saline water and has resulted in the increase of groundwater salinity and the hydrochemical complexities of freshwater-seawater contact. It was observed that the mixing between freshwater-seawater has created diversity in the geochemical processes of Manukan Island,s aquifer and altered the freshwater and seawater mixture away from the theoretical composition line. The results from reactive transport modelling confirmed that the migration of seawater into the fresher parts of the aquifer apparently leads to a calcification of the aquifer despite the seawater being supersaturated for carbonate minerals and shows that the composition of the near coast zone and further landward area may vary and have a significant effect on the processes during the intrusion. It was observed that the effect of freshening aquifer in the landward area near the recharge zone of the study area has incriminated the calcite saturation states of the area. The accumulation of Ca as the interface travels landward up to 100 m from the coast leads to an increasing calcite supersaturation with travelled distance and possibly to the precipitation of calcite.

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