

Contribution to the Hydrogeochemical Investigations on the Wajid Aquifer System, Southwestern Part of Saudi Arabia

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Abstract : The arid climate, low rate of precipitations and population reflect the increasing of groundwater uses as the main source of water in Saudi Arabia. The Wajid Aquifer System represents a regional groundwater aquifer system along the edge of the crystalline Arabian Shield near the southwestern tip of the Arabian Peninsula. The aquifer extends across the border of Saudi Arabia and Yemen from the Asir -Yemen Highlands to the Rub al Khali Depression and possibly to the Gulf coast (at the southwestern tip). The present work is representing a hydrogeochemical investigation on the Wajid Aquifer System. The studied area is being classified into three zones. The 1st zone is West of Wadi Ad Dawasir (Northern part of the studied area), the 2nd is Najran-Asir Zone (southern part of the studied area), and the 3rd zone is the intermediate -central zone (occupying the central area between the last two zones). The groundwater samples were collected and chemically analyzed for physicochemical properties such as pH, electrical conductivity, total hardness (TH), alkalinity (pH), total dissolved solids (TDS), major ions (Ca^{2+} , Mg^{2+} , Na^+ , K^+ , HCO_3^- , SO_4^{2-} and Cl^-), and trace elements. Some parameters such as sodium adsorption ratio (SAR), soluble sodium percentage (Na%), potential salinity, residual sodium carbonate, Kelly's ratio, permeability index and Gibbs ratio, hydrochemical coefficients, hydrochemical formula, ion dominance, salt combinations and water types were also calculated in order to evaluate the quality of the groundwater resources in the selected areas for different purposes. The distribution of the chemical constituents and their interrelationships are illustrated by different hydrochemical graphs. Groundwater depths and the depth to water were measured to study the effect of discharge on both the water level and the salinity of the studied groundwater wells. A detailed comparison between the three studied zones according to the variations shown by the chemical and field investigations are discussed in detailed within the work.

Keywords : Najran-Asir, Wadi Ad Dawasir, Wajid Aquifer System, effect of discharge

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