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Assessing the effect of over-exploitation on the Abdan-Dayer coastal aquifer, Iran

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Abstract The impact of increasing abstraction on groundwater quality may be more critical than water table drawdown. The objective of this paper is to assess the effects of intensive exploitation on groundwater quality in the Abdan-Dayer Coastal Aquifer, Iran. In order to assess groundwater quality and quantity and to locate the most appropriate place for groundwater exploitation, groundwater level fluctuation, water budget and major element hydrochemistry have been studied. The result of water balance calculation indicates that outputs from the aquifer have been more than inputs for recent years, and so water level is falling. Groundwater samples were collected and analysed for major constituents (Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, SO_4^{2-}, and HCO_3^-). Different methods, including composite diagrams, saturation indices and multivariate statistical methods, were employed in assessing groundwater quality. The results show that the Na-Cl water type as the main hydrochemical facies represents 60%, while the $CaSO_4$ and $MgSO_4$ types represent 40% of the total sampled water. The results of factor analysis indicate that the variables underlying the first and the most important factor are mainly controlled by salt water intrusion. The second and third proposed sources for salinity are dissolution of fine grain alluvium and gypsum in Aghajari formation in surrounding elevations, and evaporation from groundwater, respectively. Over-exploitation is the cause of intensification of seawater intrusion in coastal parts of aquifer.

Key words hydrochemistry; multivariate analysis; saltwater; over-exploitation; Iran