



The hydrochemical characterization of the upper plains aquifers: case of the plain of F'kirina Ain-Beïda, Northeastern Algeria

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ABSTRACT

Groundwater is one of the main sources of drinking water supply for the population and crops irrigation in the F'kirina area, which is located in the northeastern part of Algeria, characterized by a semi-arid climate. This work aims to evaluate the hydrochemical characteristics of an aquifer located between carbonated formations and salt lake (Garâat Ettarf). Hydrochemical, multivariate statistical, and thermodynamics techniques were used to investigate the hydrochemical evolution within the aquifer. A total of 45 groundwater samples were collected from this area during May 2015 and analyzed for various physical and chemical parameters. The results indicate that this water is classified as Ca-HCO₃ water types in carbonate outcrops as Ca-SO₄ and Cl-Ca type in the Plio-Quaternary filling in the direction of the Sebkha. The hydrochemical study shows that the electrical conductivity of the water ranges from 220 to 6,700 µS/cm. Chemical tracing had focused on the major elements and some traces to the process responsible for water mineralization acquisition. The intersection of the major elements with the chloride ion showed that the salinity of the water is due to water–rock interaction, cation exchanges and anthropogenic pollution. The principal component analysis reveals three factors that express 61.8% of the total variance in water quality datasets. The first factor is salinization, which shows strong associations between SO₄²⁻, Cl⁻, CE, M, TH, K⁺, Ca²⁺, Mg²⁺ and Na⁺. The second factor represents the opposition of two poles, freshwater to polluted water, the first is constituted of bicarbonates HCO₃⁻ reflecting freshwater that opposes polluted water caused by nitrate. The third factor is determined in its positive part by temperature and in its negative part by pH. It should be noted that aquifers waters are oversaturated with respect to calcite, dolomite and aragonite, but they are rather undersaturated with respect to halite, gypsum and anhydrite.

Keywords: Groundwater; Water chemistry; Salinity; Saturation; F'kirina; PCA

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