

Geochemistry of thermal waters from various geothermal provinces of Algeria

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To improve our understanding of the origin of thermal water from North-Eastern Algeria, hydrochemical facies, isotopic characteristics to identify the major geochemical processes that affect water composition, for this purpose, a multidisciplinary approach was adopted, including hydrogeochemistry, isotope hydrology and principal component analysis (PCA).

Eleven samples collected from thermal springs in 2016 vary in temperature between 38 and 96 °C, a near neutral pH and very high values of electrical conductivity. Two groundwater types were identified: highly mineralized Na-Cl type representing the deep thermal waters and Ca-SO₄ type determined the presence of evaporite deposits (Triassic) along the circuit of upwelling.

The isotopic results (δ O18, δ D) (respectively -9.95 to -7.72 ‰ and from -61.99 to -38.20 ‰) fall on the Global Meteoric Water Line (GMWL) indicate a meteoric origin of the thermal water (rains at higher altitude). The highest estimated reservoir temperatures are indicated by the CCG and Na-K-Ca geothermometer, while slightly lower estimates are obtained using silica geothermometers.

In order to know the state of fluid-mineral equilibrium, saturation index (SI) was used; the most of the thermal waters have Chalcedony and quartz near or slightly above the saturation limit for equilibrium. In present study, multivariate statistical method - Principal component analysis PCA - is used; PC1 (41%) explains the minerality, (ionic composition), for which temperature is of secondary importance PC2 (18%).

In terms of these physicochemical properties, thermal water of eastern Algeria are highly effective for the treatment of various diseases, in particular respiratory and rheumatic diseases.