

# **Geochemical and Isotopic Characteristics of Geothermal Water of Algeria**

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The thermal water of Algeria has been used for over thousands of years starting in pre-Hispanic times and is famous for the treatment of various pathologies. There are more than 300 thermal springs in Algeria, most of these geothermal resources are located in the northeastern of the country.

In this work, innovative combination of geochemical, isotopic and geothermometry tools are used to identify, for the first time in origin of those water, geological context, processes, evolution and reservoir temperatures.

Sixteen water samples were collected from the thermal springs. Temperature of the hot springs range from 35 to 96 °C. The electrical conductivity (EC) values for the thermal spring waters are between 3000 - 9000  $\mu\text{S}/\text{cm}$ , high electrical conductivity which shows that it has interacted with the host rock for a long time. According to the Piper and Schoeller diagrams for the thermal spring water is classified as Na-Cl and Ca-SO<sub>4</sub> water types reflecting different extents of water-rock interactions or underground evaporation in the deep depths. Since the thermal springs have a different temperatures but similar chloride content, it seems that a conductive cooling mechanism is occurring in the geothermal system. Water-rock interaction, as well as mixing processes, in the process of long runoff path and the slower deep-water cycle is the main factor controlling the chemical composition of geothermal water. The  $\delta^{18}\text{O}$  and  $\delta\text{D}$  compositions indicated geothermal waters are recharged by meteoric water

The exchange temperature in the geothermal reservoir of Algeria is estimated between 160 and 200 °C using CCG and K-Na-Ca geothermometry, while other chemical geothermometers (Na-K, K-Mg, silica and chalcedony) provide unsuitable results. Geothermometry tools show the unexpected involvement of a common deep groundwater reservoir within this non-active zone. Through this study, we concluded the importance of geothermal energy potential for sustainable development by introducing geothermal energy instead of fossil energy and the extent of the effectiveness and availability of natural resources to invest in this energy in Algeria.