

## **Hydrogeochemistry evidences of water-rock interaction of a thermal system: Rancho Nuevo, Guanajuato, Mexico**

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Rancho Nuevo is a town located in east of the state of Guanajuato, Mexico. It zone is characterized by an intermittent thermal activity. In 2015, in the area occur a hydrothermal spring with emanation of gases whose discharge temperature is higher than 90°C. Therefore, Rancho Nuevo represents a new area of geothermal interest with no scientific studies.

The goal of this research is to carry out a hydrogeochemical study to verify the water-rock interaction, its relationship with hydrothermal activity in three different zones: Rancho Nuevo, Rancho La Machuca and Celaya.

The Piper diagrams show that there are three types of water in the region: 1) sodium bicarbonate wells in town of Rancho Nuevo and Rancho La Machuca; 2) sodium bicarbonate chloride, present only in the springs of Rancho Nuevo and; 3) calcium potassium bicarbonate in Celaya. From Stiff diagrams it is observed that in the water samples from Rancho Nuevo there are higher concentrations of total ions, mainly in the springs. It confirms that the reaction kinetics is major in Rancho Nuevo.

The results of stable isotopes of <sup>2</sup>H and <sup>18</sup>O indicate that the samples of Rancho Nuevo, particularly of the springs, are enriched with <sup>18</sup>O compared to the other zones, it verify that there are processes of evaporation at depth in the system caused mainly by thermal activity.

According to parameters measured and ionic concentration, it is considered that the water flow in the zone of Rancho Nuevo is intermediate and therefore the water residence at depth has allowed more water-rock interaction than a local flow. Results confirm there are chloride and <sup>18</sup>O isotopes enrichment caused by a faster kinetics reaction mainly due the characteristics of the thermal system.