Flow paths and water provenance of the Navalperal-Las Acebeas aquifer: an example of a low anthropic influence aquifer in SE Spain

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Abundant Cretaceous karstic aquifers associated with raised synclines can be found in the Sierra de Segura (SE Spain). This implies the existence of a series of perched inverted relief aquifer systems drained by numerous springs. We studied one of these karstic formations, the Navalperal-Las Acebeas aquifer, which is located in a rural area, with small villages, and high dependence of these groundwater resources.

The main objective of this study was to characterize the physical and chemical properties of the groundwater of this aquifer, as well as the rocks that the aquifer is made up, in order to identify the interaction water-rock.

To carry out this characterization, a monitoring network (14 water samples and 7 rock samples) has been designed. Major, minor and trace elements were determined in groundwater samples, and XRD and SEM analyses were carried out in the selected rocks for determining mineralogical and petrographical characterization.

A geochemical modelling based on getting the saturation indices was carried out using Phreeqc, a program for simulating chemical reactions and transport processes in water [1]. Thus, all samples are undersaturated for gypsum and halite and close to equilibrium or undersaturated for calcite, dolomite and aragonite.

The main conclusions of this study indicated that waters of the Navalperal aquifer are calcium and magnesium bicarbonate (Ca-(Mg)-HCO_3) facies, with low mineralization and a high chemical quality, according to the drinking Spanish law limits. Water composition is in relation to the mineralogical composition of the materials aquifer, mainly limestones and dolostones rich in Ca and Mg. No scarcity problems are detected in the district, since the precipitations are usually abundant during the year and there is slight anthropic pressure.

[1] Parkhurst DL, Appelo CAJ (1999) Water-Resources Investigations Report 99-4259, p 312