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Establishing complex compartments-aquifers connectivity via geochemical approaches towards hydrogeochemical conceptual model: Kasserine Aquifer System, Central Tunisia

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Abstract

Located in an arid region in Central Tunisia, the Kasserine Aquifer System (KAS) represents the most available source of water supply in the area. The main regional reservoir of the KAS is the deep aquifer of Miocene sandstone that extends into the northeast of Algeria. The system consists of four compartments, namely: Oum Ali-Thelepte (OT), Feriana-Skhirat (FS), the Plateau (PL) and the Plaine (PK) of Kasserine.

The challenge of this study is to investigate hydrogeochemical and isotopic data to highlight the mechanisms leading to connection between the different compartments of the KAS. The results of the hydrogeochemical assessment were integrated into a 3D geological model to develop a 3D hydrogeochemical conceptual model of the KAS. Besides, mixing between the four-groundwater compartments was also highlighted using a binary mixing hypothesis and an End Member Mixing Analysis method including two tracers Cl and $\delta^{18}O$ and three end-members.

These methods indicate the importance contribution of the upstream compartment of OT into the other aquifer units. It also allowed the estimation of direct recharge ratios in every compartment and the quantification of diffuse and concentrated recharge in the KAS. Hence, the main factors affecting the KAS studied in this paper are, mixing, dedolomisation and cation exchange processes.

This study helps understanding the hydrogeochemical processes of the KAS and informs groundwater managers where better targeted groundwater monitoring programs are required in the future.

Key words: mixing; transfer rate; arid region; interconnection; EMMA; isotopes