

Study of salinization and pollution of the coastal aquifer of Chott Meriem, Sahel of Sousse, Tunisia

M.F. BEN HAMOUDA^{1,*}, A J KONDASH², B. TRABELSI¹,
J. HARKNESS², N. LAUER², A. VENGOSH²

¹UMTN, Isotope Hydrology and Geochemistry Unit, CNSTN, Tunisia, f_benhamouda@yahoo.fr*

²Nicholas School of Environment, Duke University, Box 90227, Durham, NC, 27708, USA

Groundwater salinization and pollution are widespread processes that degrade water quality and endanger future water exploitation. The problem is intensified in coastal aquifers where human activities result in accelerating water quality deterioration, particularly in arid and semi-arid regions. The elevated salinity can also originate from other natural or anthropogenic processes, such as dissolution of halite and gypsum, evaporation of seawater, etc. In the Sahel region of Northern Tunisia, near the coast, water quantity and quality are major concerns. The Chott Meriem coastal aquifer system is no exception. It is located in a coastal saline wetland along the Mediterranean Sea surrounding the city of Sousse. The aquifer is mainly characterized by high salinity waters compared to the surrounding aquifers. This study applies geochemical analyses to distinguish between the different mechanisms of salinization in order to determine the origin of groundwater mineralization. Ionic ratios such as Na/Cl, Br/Cl, Ca/Mg, as well as the isotopic signatures of ¹⁸O, ²H can be used to identify seawater intrusion in coastal zones. The Chott Meriem aquifer system consists of a shallow main reservoir, with thickness between 30 and 60 m and consisting of Mio-Pliocene sandstone formations with interbedded gypsum lenses (Segui formation). This shallow groundwater aquifer has a flow direction from inland towards the coast (SW - NE). Geochemical (ions Na⁺/Cl⁻, Br⁻/Cl⁻, Ca²⁺/Cl⁻, B⁻/Cl⁻) and isotopic (¹⁸O, ²H) analyses were compared with the hydrodynamic information and salinity map for identifying the main processes involved in the increase in mineralization. Irrigation development that induces leaching of soils was identified as the main source of mineralization. However, it is not the only cause of the qualitative degradation as the salinity of the groundwater is also impacted by dissolution of evaporate rocks (gypsum and halite minerals) in the aquifer. There is no indication of presence of water enriched in ¹⁸O and ²H and indicating no a mixing with seawater.