



# Isotopic estimation of the anthropogenic effect on the quality of groundwater in the Skhira agricultural region -Sfax (Tunisia)

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Received: 3 September 2019 / Accepted: 3 June 2020  
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## Abstract

The Skhira region is an agricultural area with interesting groundwater reserves. This water is also used for domestic and industrial purposes which contribute to its contamination. The present paper evaluates the hydrogeochemical characteristics of groundwater of the Skhira zone to investigate the impact of anthropogenic and natural sources of contamination and their suitability for drinking and for crop irrigation. Groundwater samples were collected from 30 wells distributed in the agricultural areas of the Skhira region in the dry season (August 2017). In the laboratory, the cation, anion, heavy metal, and the bacteriological analyses were performed and results were compared with the WHO standard for drinkability to determine whether the water in this system is within the acceptable limit for human consumption and irrigation by using some calculated indexes. Moreover, a multi-isotopic approach was employed to identify the main sources of pollution affecting the groundwater resources of the area. Chlorinated and sulfated calcium facies (Cl-SO<sub>4</sub>-Ca) were found for the majority of samples except some wells that showed a sodium chloride facies (Na-Cl). The high electrical conductivity pleading for a high salinity level is related to Na-Cl dissolution or to a cation exchange process. The source of nitrate is attributed to soil-N, fertilizer overuse in agriculture and manure. In fact, most samples showed to be affected by some organic source related with fecal pollution, confirmed by bacteriological and boron isotope analyses. However, due to the location of some sampling points close to the seawater, boron from seawater or marine aerosol cannot be discarded. Also, dissolved sulfate analyses, the Cl<sup>-</sup> versus SO<sub>4</sub><sup>2-</sup>, and Cl<sup>-</sup> versus Na<sup>+</sup> showed a natural geogenic origin in the majority of samples. Overall, water quality was proved unsuitable for drinking in most sampling stations and for irrigation in some of them. The high concentrations of trace elements in these drinking waters have serious effects on the health of consumers. Therefore, it is advisable to study the trace element concentrations in this water and their relationship with health risk assessment.

**Keywords** Groundwater · Suitability for drinking · Suitability for irrigation · Salinity · Isotopic estimation

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Responsible Editor: Domenico M. Doronzo

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s12517-020-05527-z>) contains supplementary material, which is available to authorized users.

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