Multi-isotope Approach to Study the Problem of Salinity in two Coastal Aquifers of Sahel of Sousse, Tunisia

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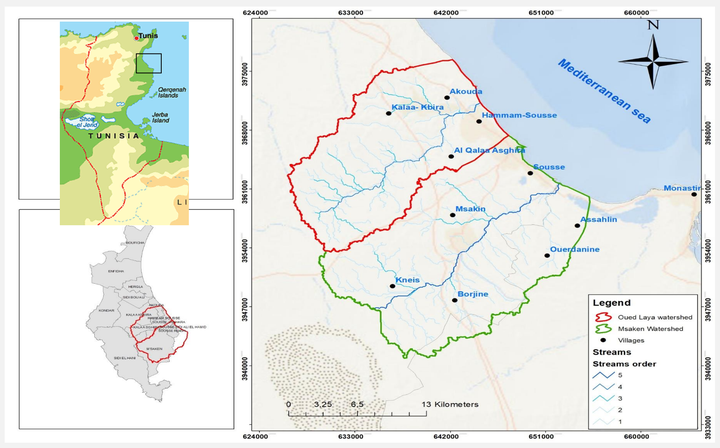
Introduction

At Sahel, near one of the seaside resorts available in Tunisia, the water quantity and quality is a major problem ever since northern/central of Tunisia. The Oued laya and Msaken Syncline coastal aquifers are no exception. They are located in a coastal saline wetland along the Mediterranean Sea in the surroundings of the city of Sousse, about 140 Km south of Tunis (Eastern Tunisia).

The landscape is a coastal plain slightly sloping (3%) towards the sea. The groundwater of the aquifer system occurs mainly at two levels, a shallow aquifer up to depths of about 60 m whose reservoir is consisted by sediments of the Mio-Pliocene and a confined deep aquifer between about 90 and 250 m located in the sandstone formations of Miocene.

Presentation of the study area

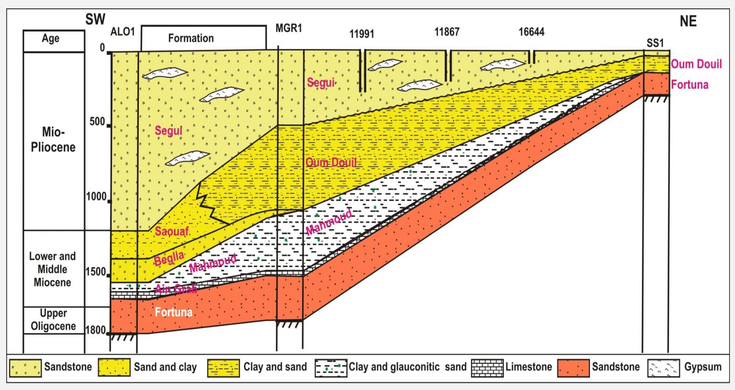
This study aims to characterize the geochemistry of the poorly known Oued Laya and Msaken aquifers and to elucidate the different geochemical processes responsible for groundwater mineralization and to compare the results with the hydrodynamic data of the coastal area.



Location map of the study area

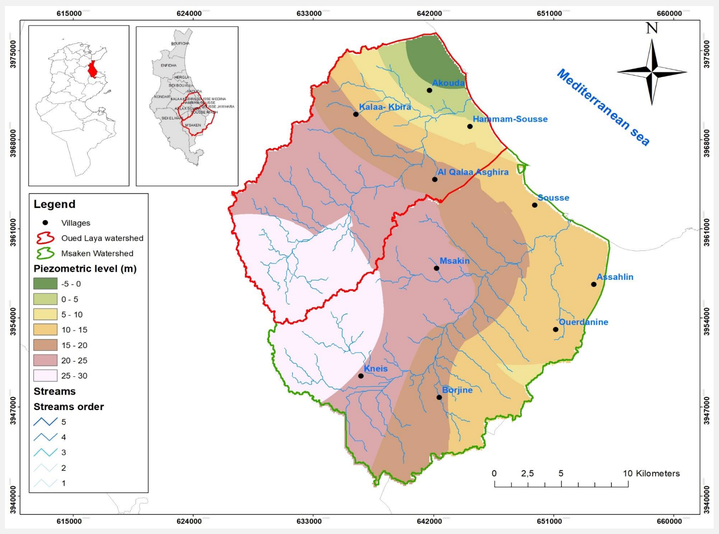
Material & Methods

To better understand the origin of salinity, two sampling campaigns were carried out during December 2020 and January 2021 of seventy wells and boreholes. Different methodologies using geochemistry (ions Na^+, Cl^-, SO_4^{2-}, Ca^{2+}, NO_3^-), stable isotopes ($\delta^{18}O$, δ^2H, $^{87}Sr/^{86}Sr$) were involved to identify the main cause of mineralization increase.

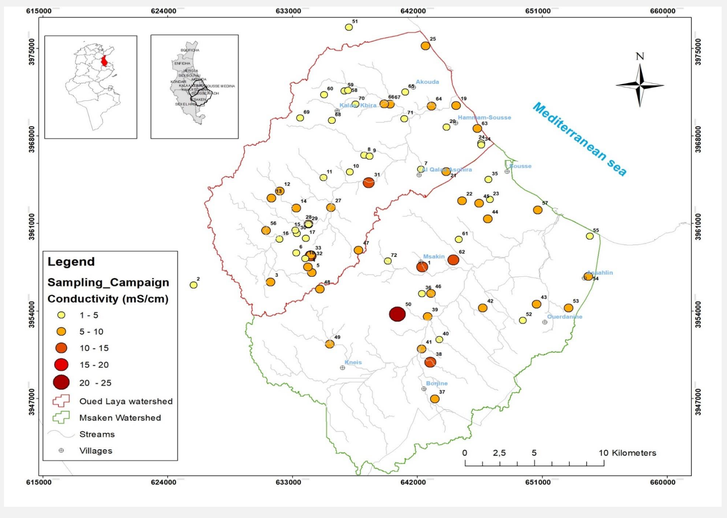


Hydrogeologiqcal cross-section SW-NE

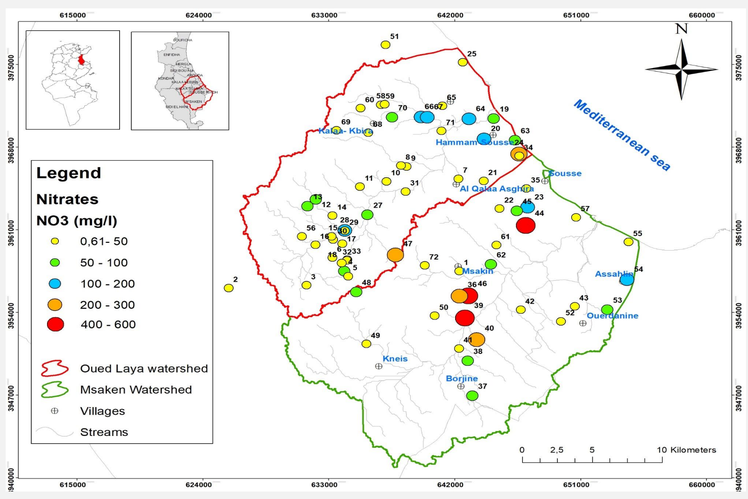
Results



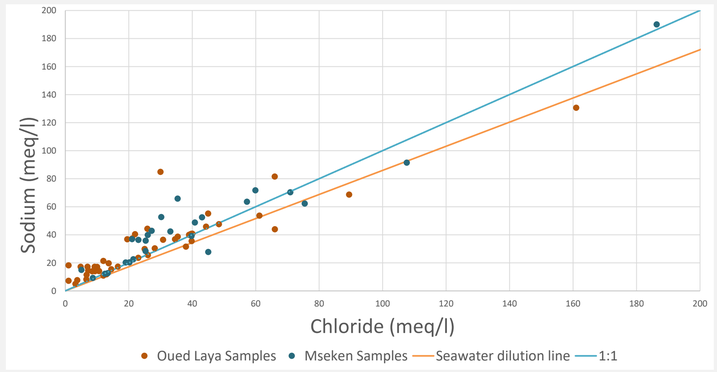
Piezometric map



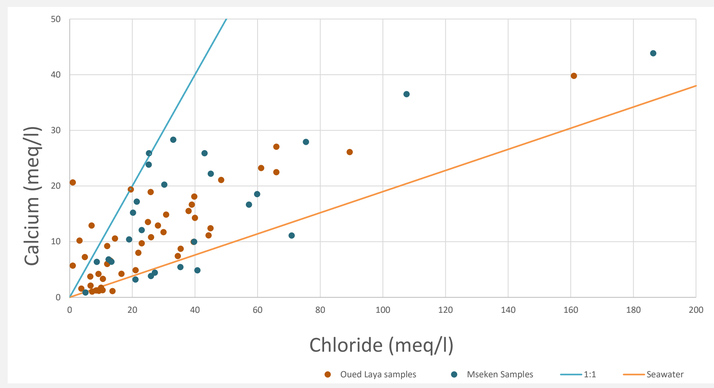
Distribution map of electrical conductivity



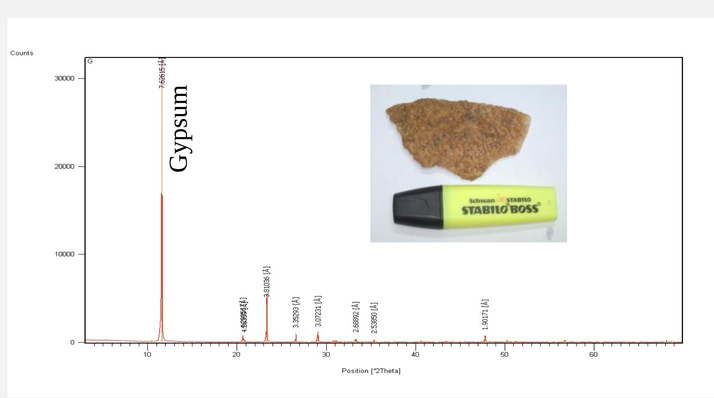
Spatial distribution map of nitrates



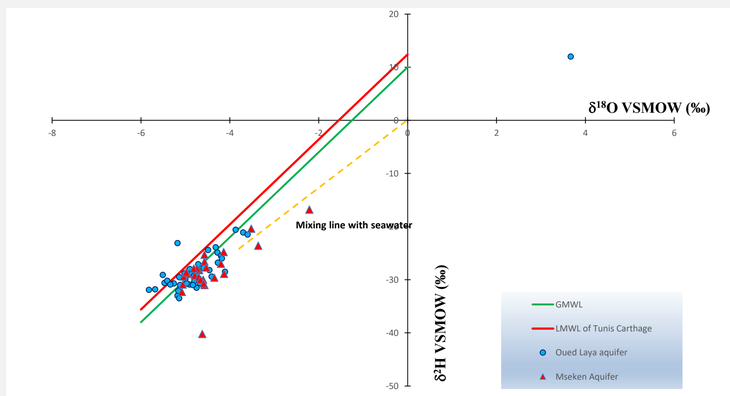
Plot Na^+ Vs Cl^-



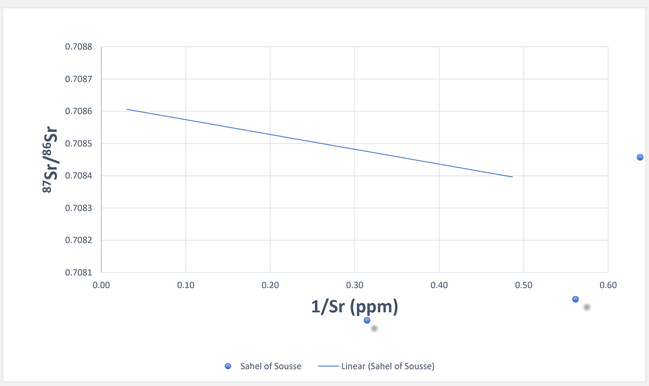
Plot Ca^{2+} Vs Cl-



XRD spectrum of gypsum mineral



Plot δ^2H Vs $\delta^{18}O$



Plot of $^{87}Sr/^{86}Sr$ Vs. 1/Sr

Conclusion

Groundwater mineralization seems to be acquired by dissolution of minerals in the aquifers systems especially halite and gypsum. Ion exchange processes likely play an important role in the groundwater mineralization.

The compilation of piezometric and geochemical results show the existence of a marine intrusion that invaded the region of Hammam Sousse.

The salinity of the groundwater is important, this increase in mineralization coincides with the direction of flow of the groundwater.

Sponsors / Partners:
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