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Geochemical and Isotopic Characterization of the Quality of Groundwater in the Jeffara Coastal Aquifer, Tunisia

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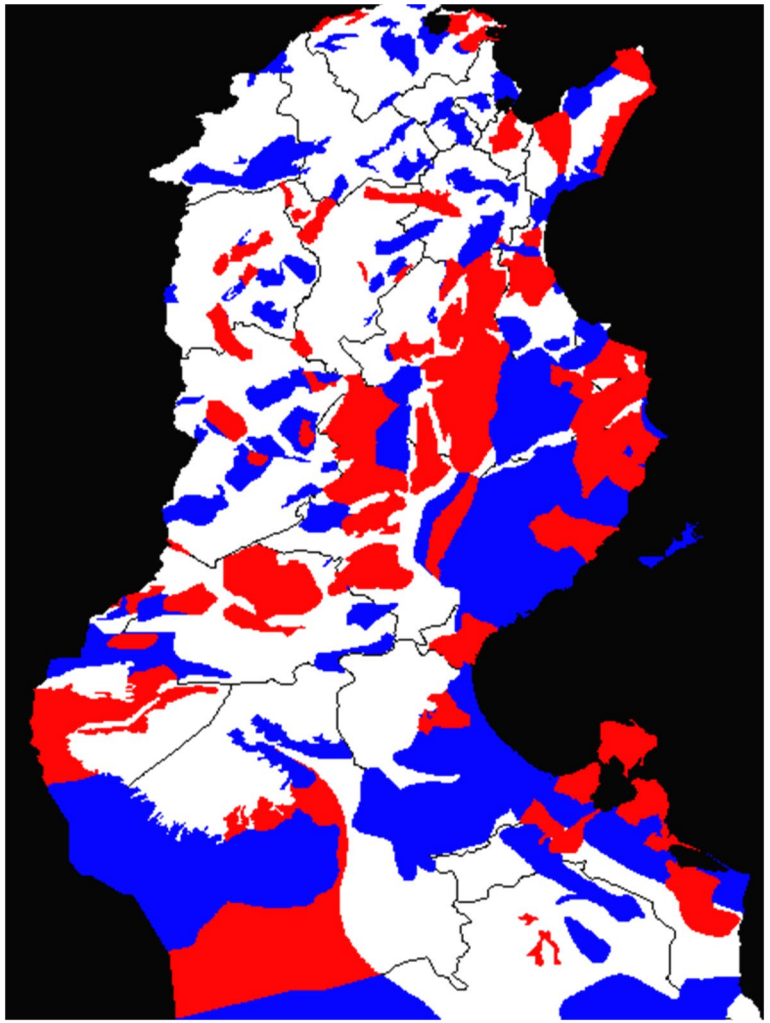
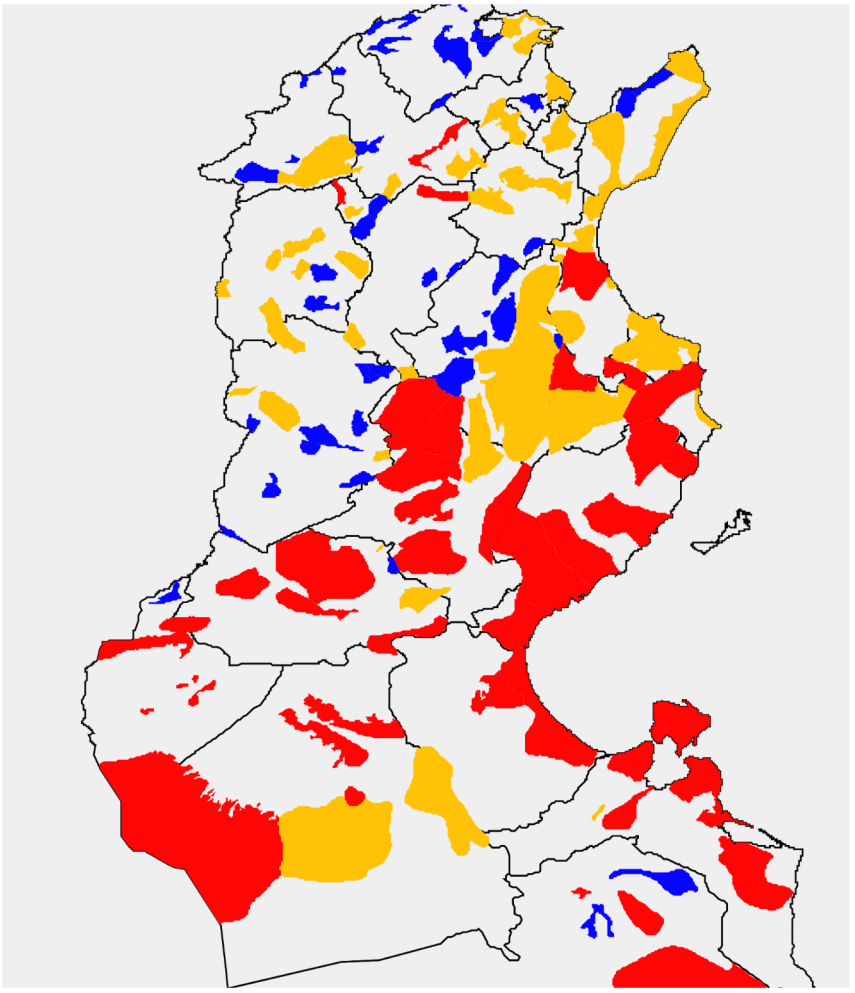
6. CRDA of Medenine, Tunisia

1. Background



Overexploited Aquifers in red



Salinity of shallow aquifers

(< 1.5 g/L; 1.5 to 3; > 3 g/L)

2.Location of the study area

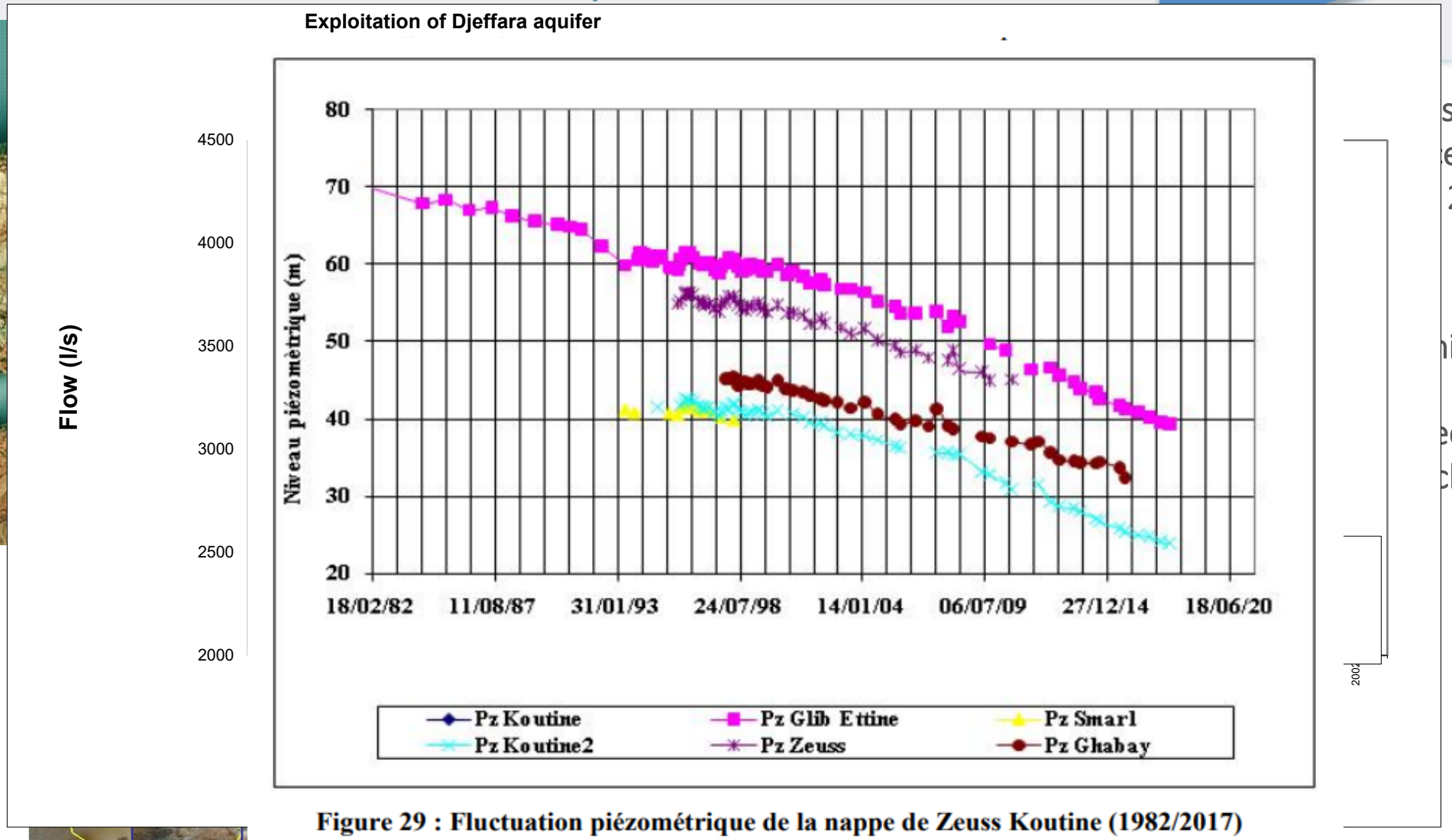
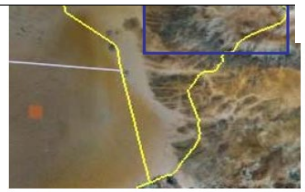
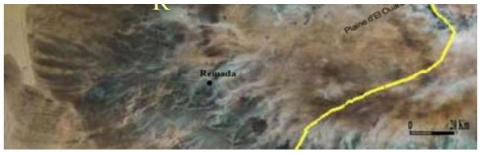
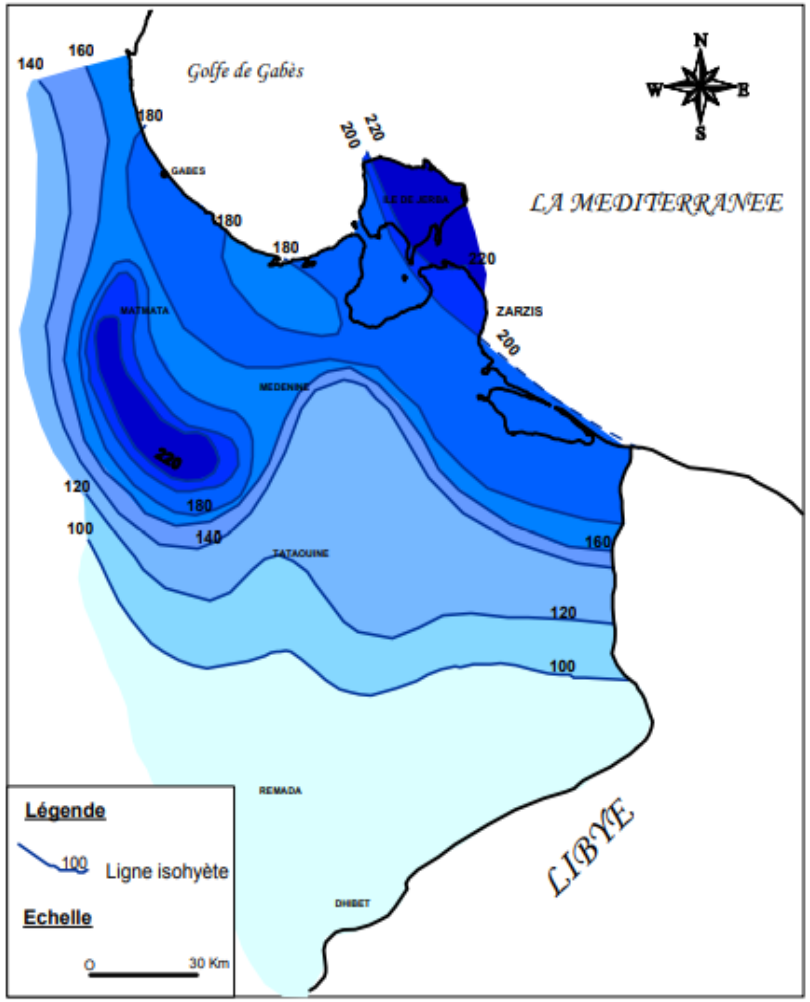


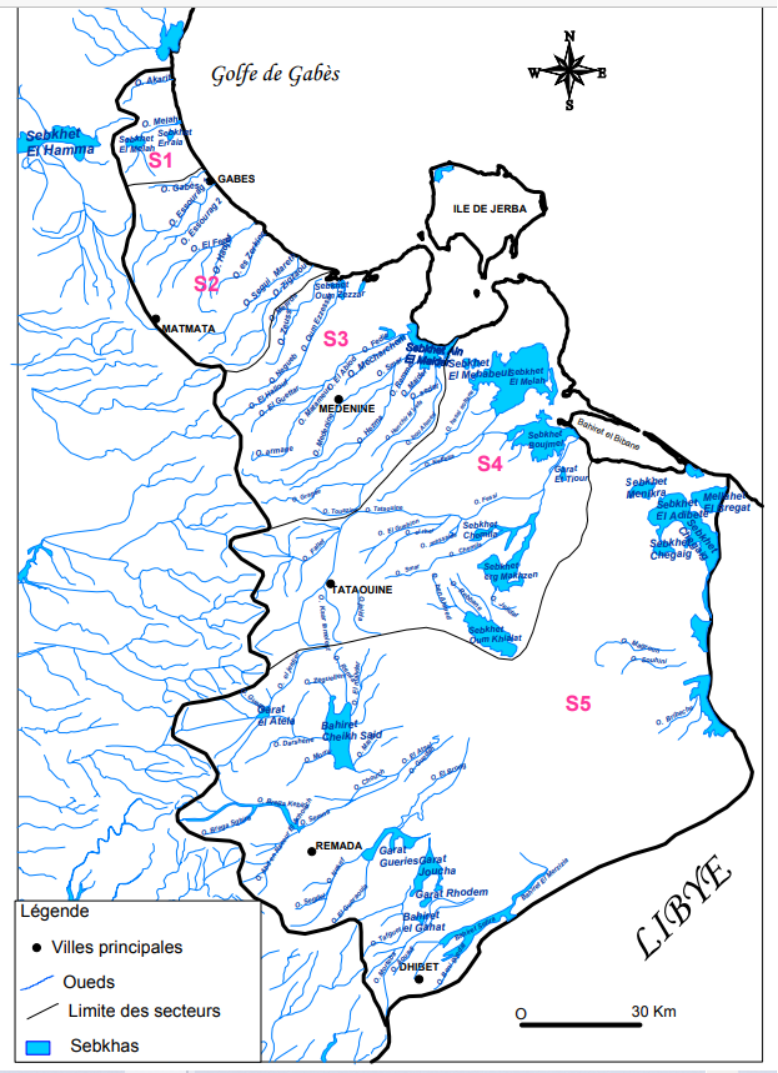
Figure 29 : Fluctuation piézométrique de la nappe de Zeuss Koutine (1982/2017)



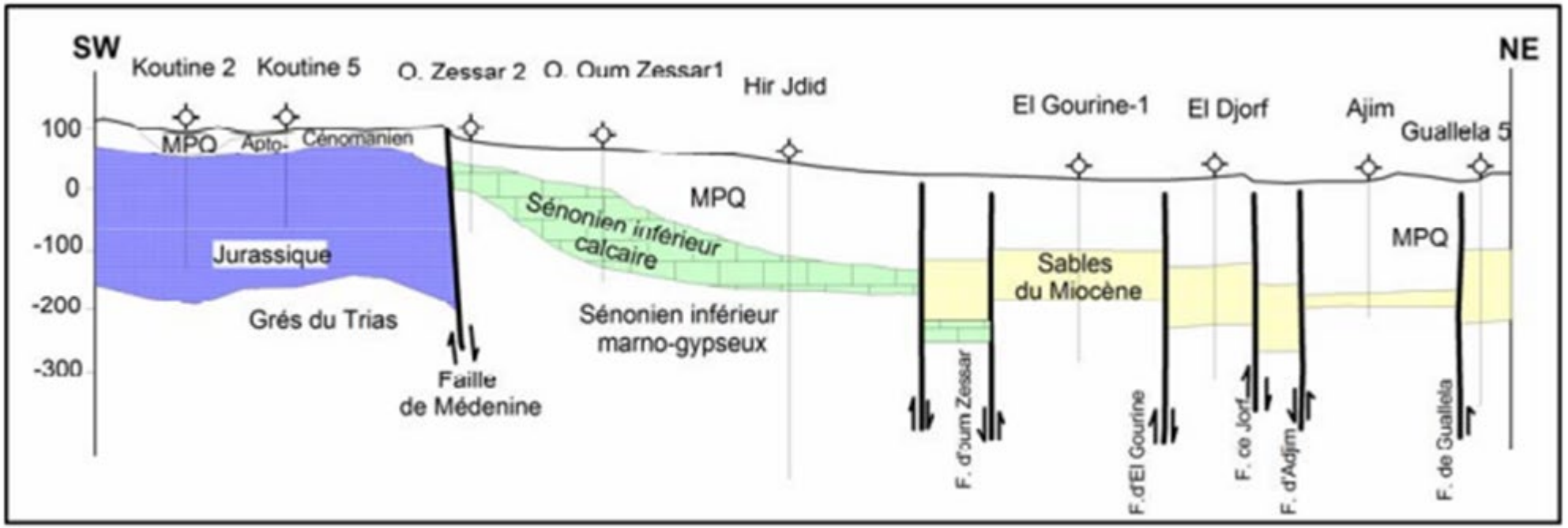


3. Climate & Watershed Hydrology

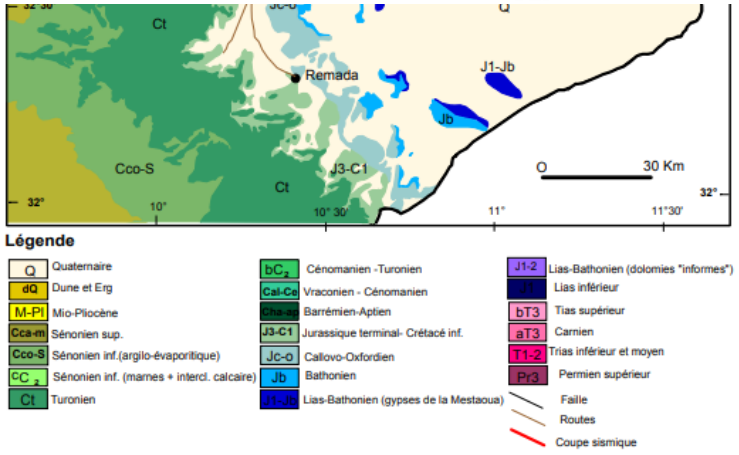




4. Hydro-geological settings

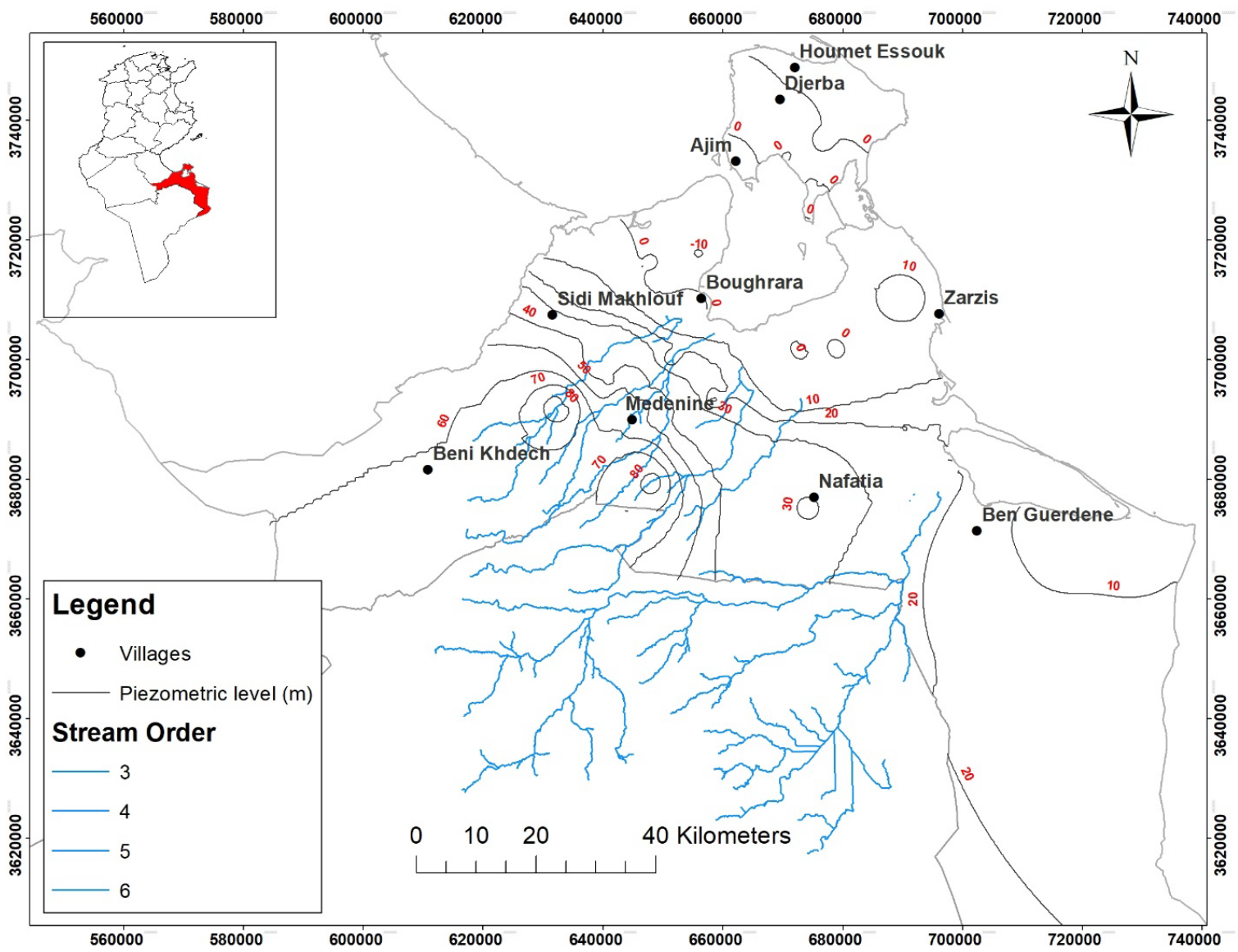


Coupe C4 Koutine- Guellala (Ben Baccar, 1982 modifiée)

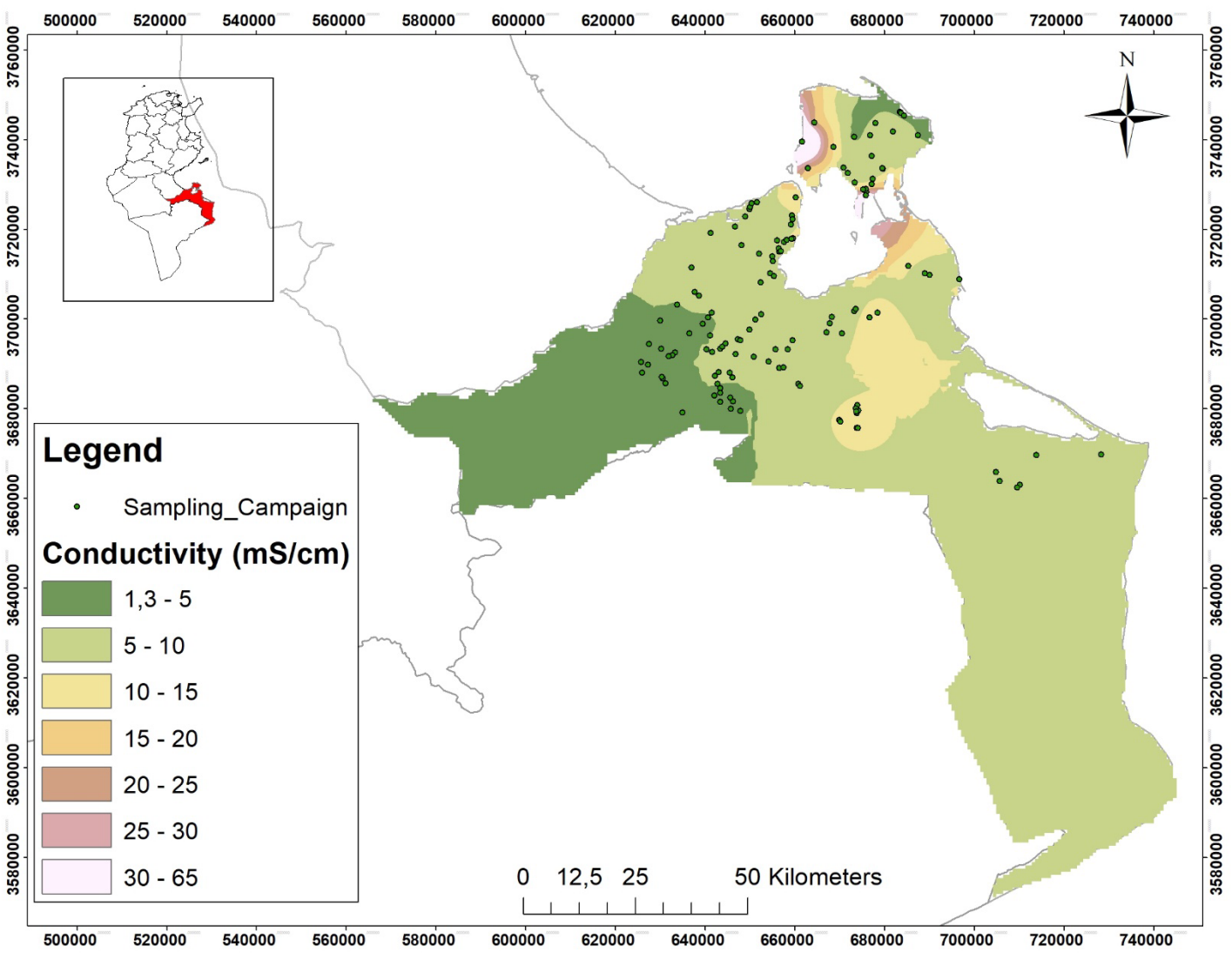


A multilayered aquifer system, composed by four aquifers of the Mio-Plio-Quaternary (MPQ), the sandy Miocene (M), Jurassic Zeuss-Koutine (ZK) and the sandstone Tiassic of Sahel El Ababsa (TSA).

5. Piezometric map



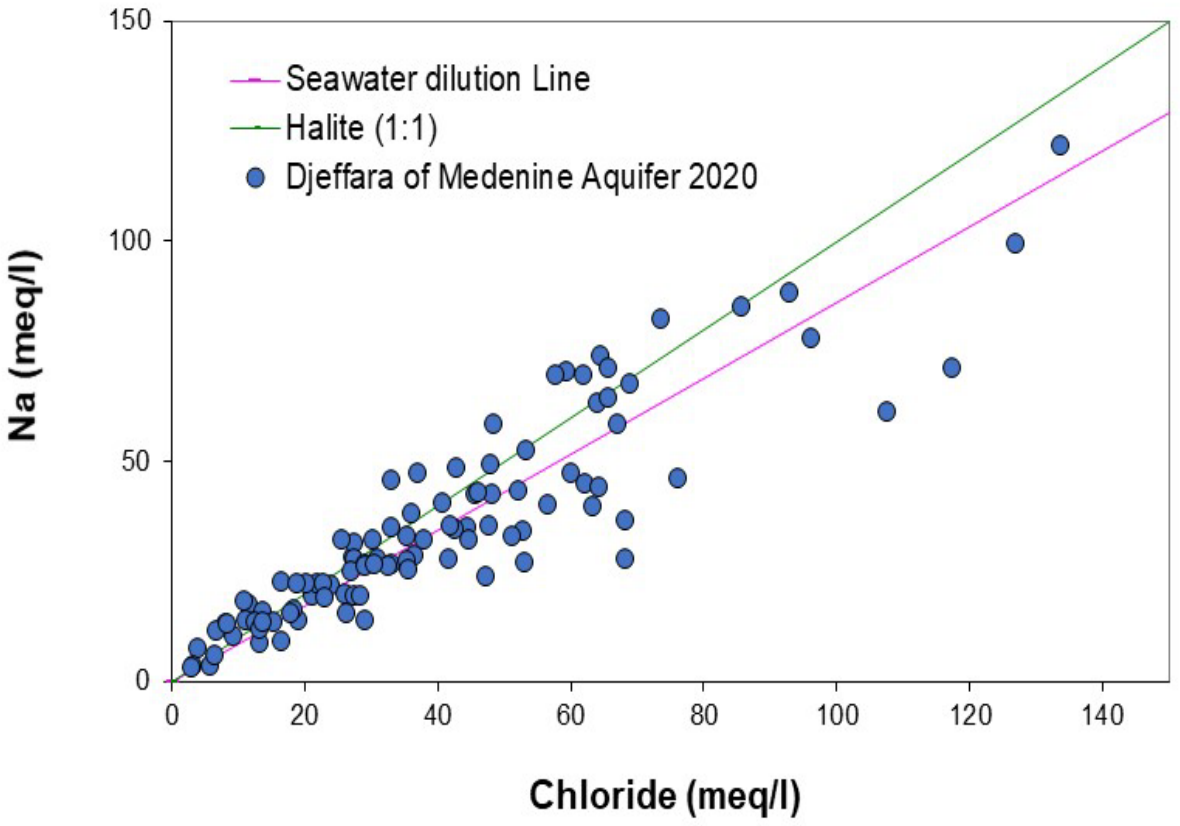
6. Salinity distribution map



Salinity values ranging from 2 to 10 g/l

Clear increase of salinity according to GW flow direction

7. Na^+/Cl^- relationship



Na/Cl = 1
Indicates dissolution
of Halite mineral

Na/Cl > 1 reflecting
Income of Na to aquifer

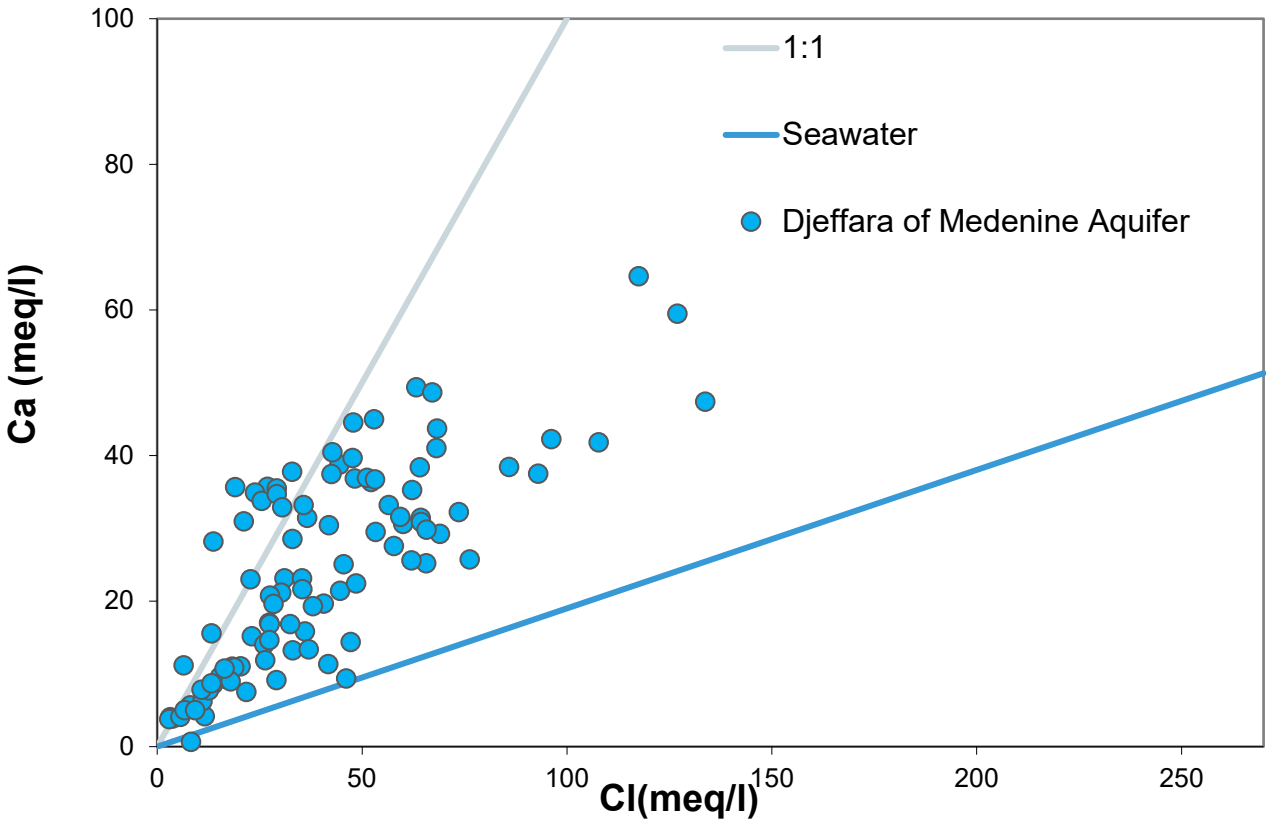
WRI

Ion exchange

Seawater intrusion:
Na/Cl <sw (0,86)

Na is retained and Ca is released

8. Ca^{2+}/Cl^{-} relationship



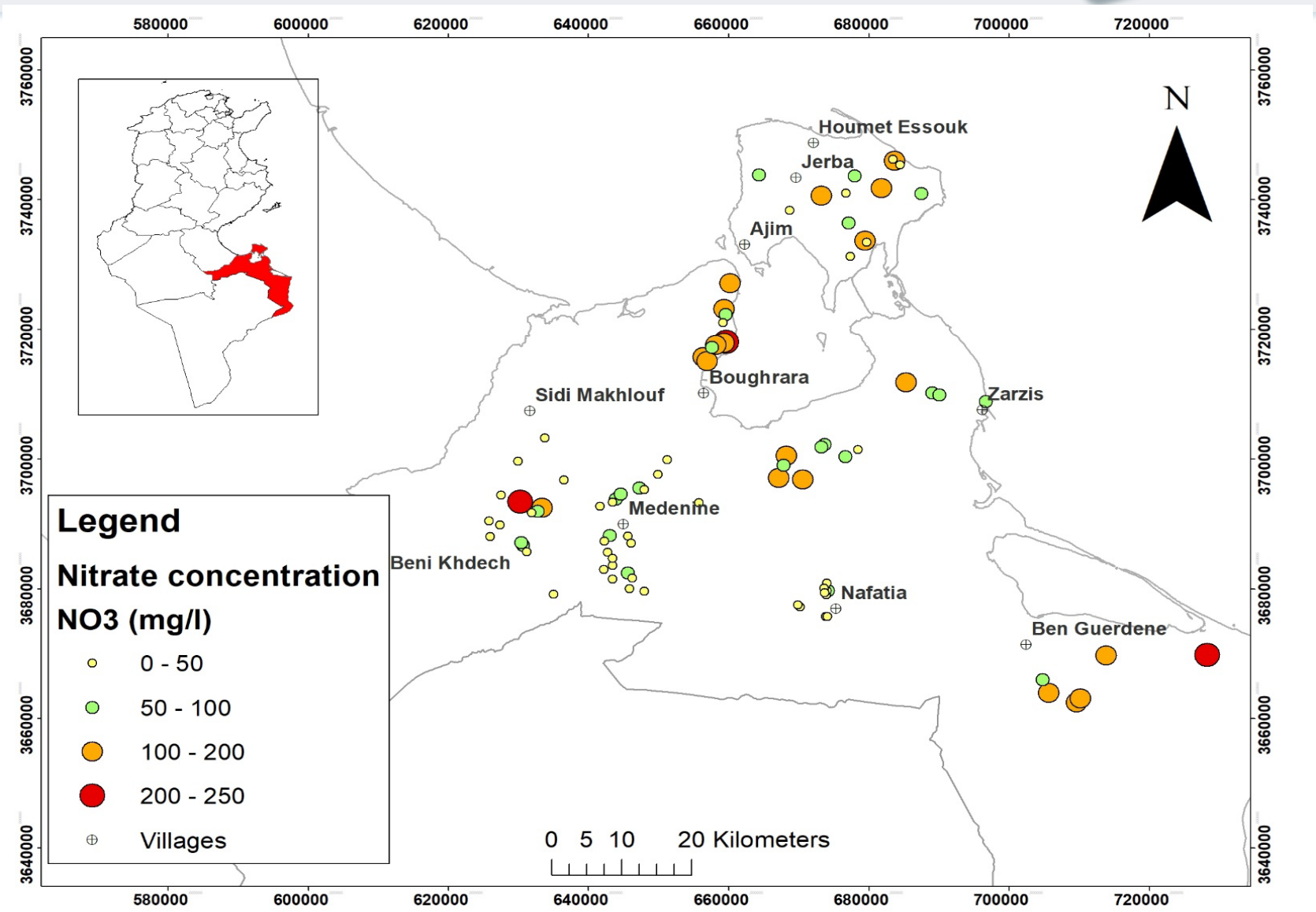
Ca/Cl >>> SW

Dissolution

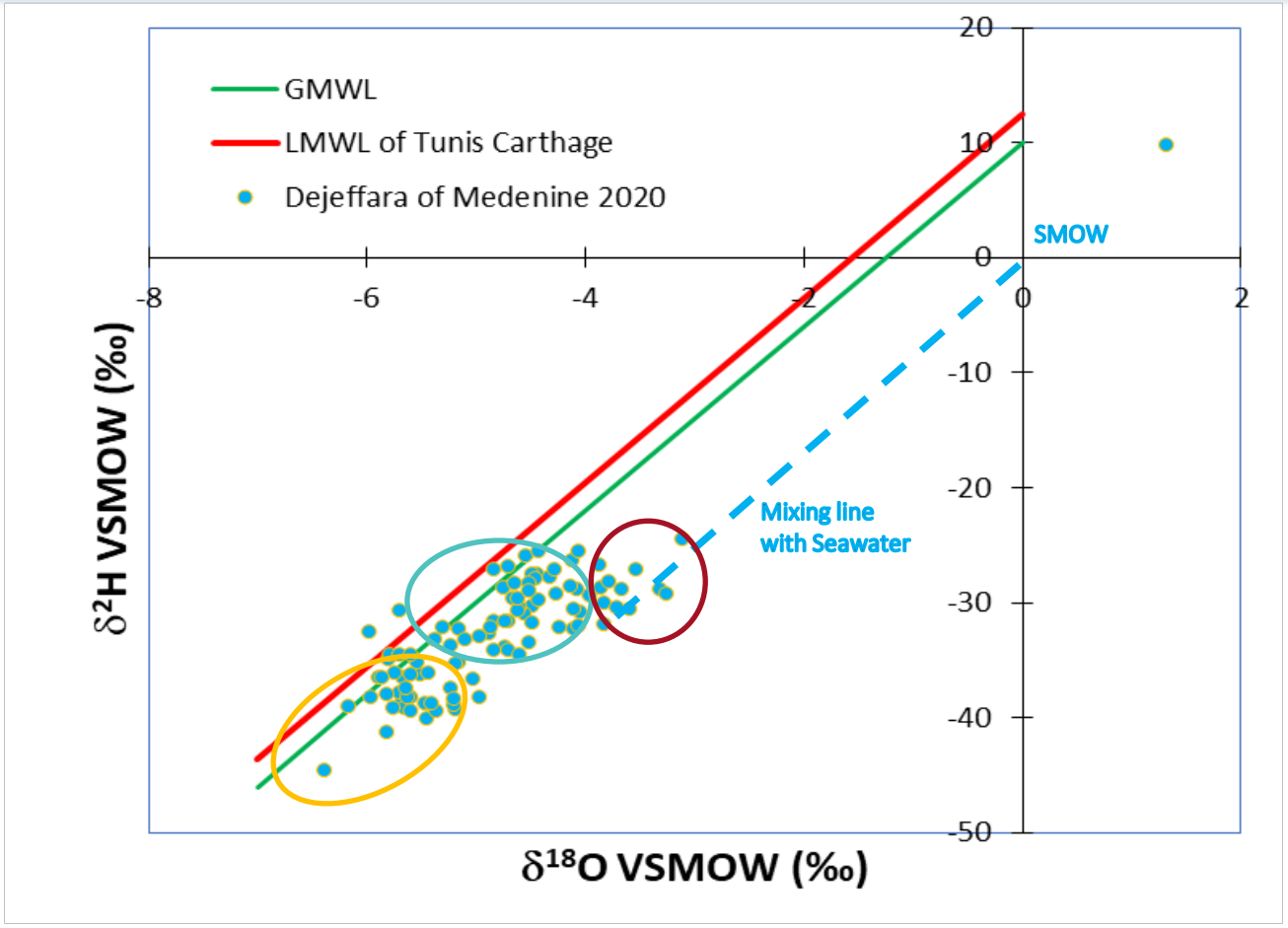
Ca/Cl > 0.19

SWI

9. Nitrates distribution map



10. Stables Isotopes (^{2}H, ^{18}O)



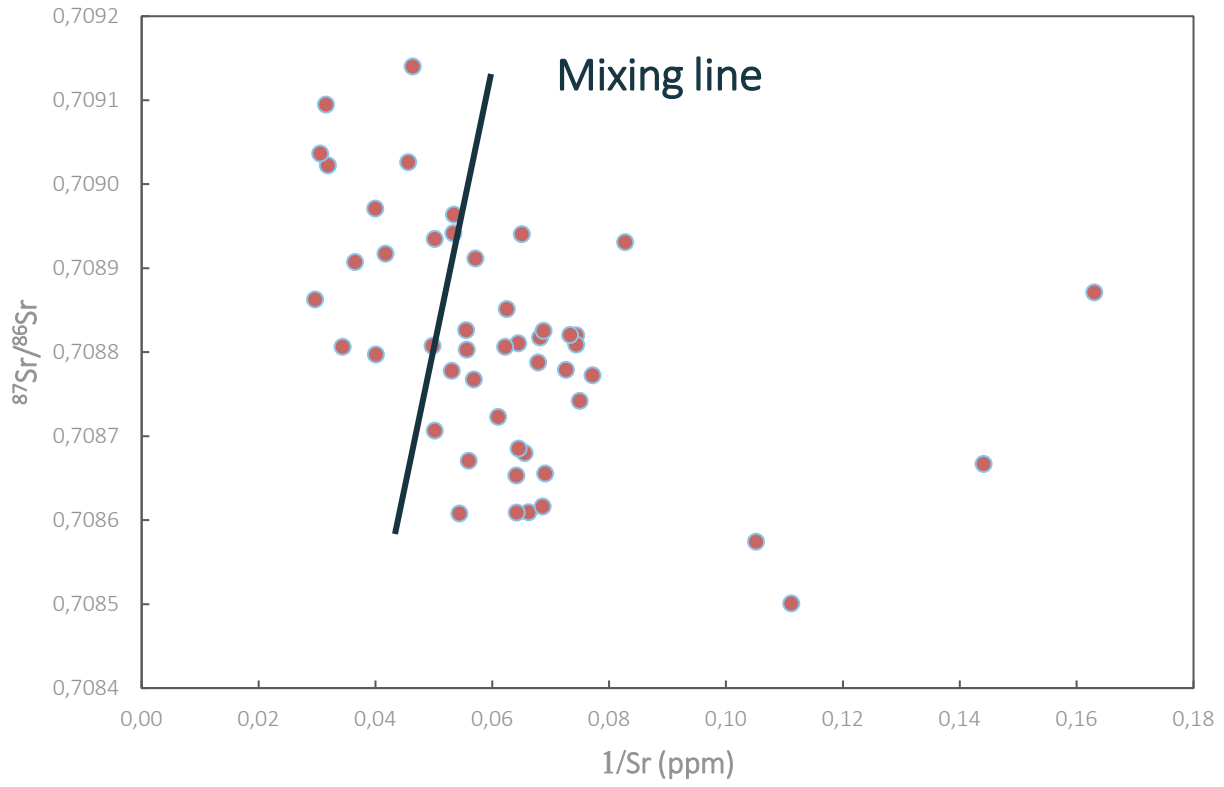
1st group:
-3 ‰ < ^{18}O < -4 ‰

Probable seawater intrusion

2nd group:
-4 ‰ < ^{18}O< -5.5 ‰
Recharge from rainwater

3rd group:
-5.5 ‰ < ^{18}O< -6.5 ‰
Oldwater

11. Strontium isotopes

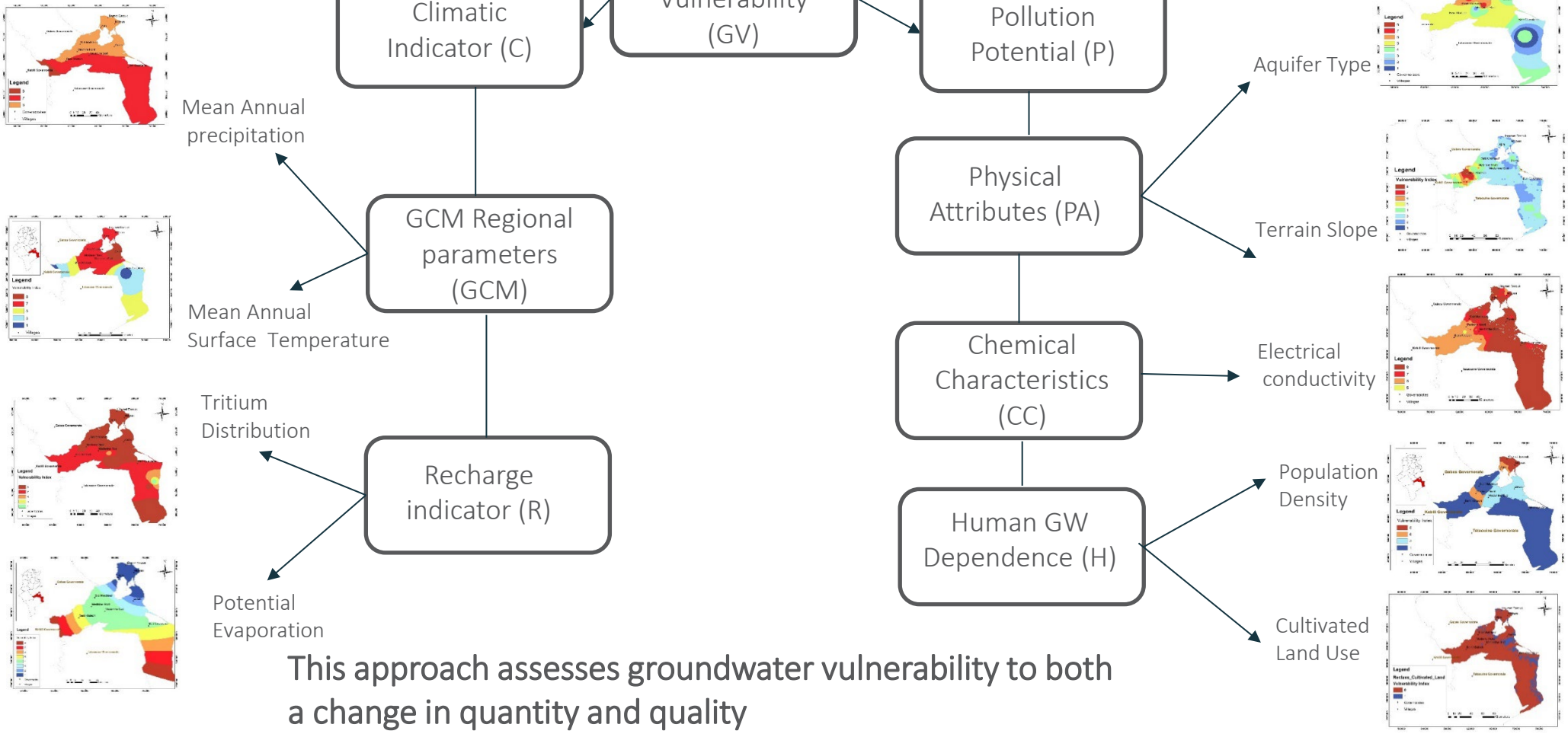


The range is fairly small (~3 in fourth decimal place)

the samples seem to follow two end-members mixing line

GW are impacted by some evaporites dissolution or seawater

12. Groundwater Vulnerability Model:

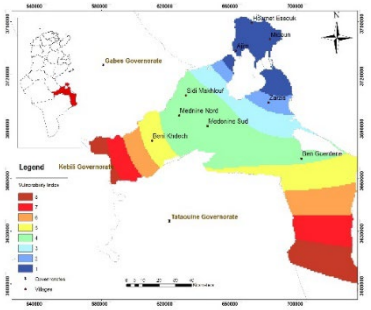


This approach assesses groundwater vulnerability to both a change in quantity and quality

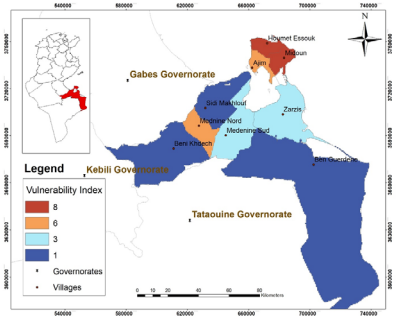
The model framework combines known spatial data in to assess how 'at risk' groundwater is to depletion and/or contamination

13. Groundwater Vulnerability maps

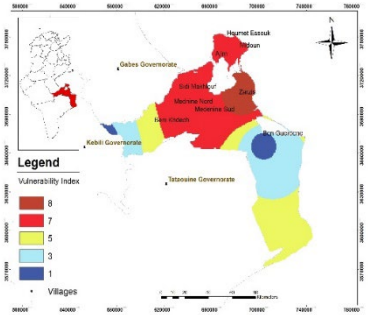
Potential Evaporation



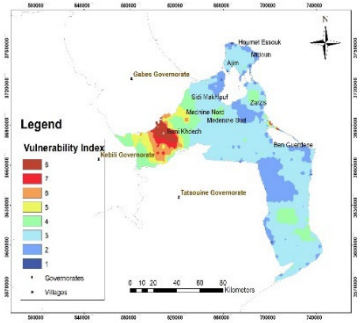
Population Density



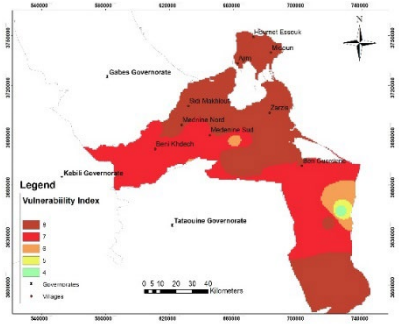
Mean Annual Temperature



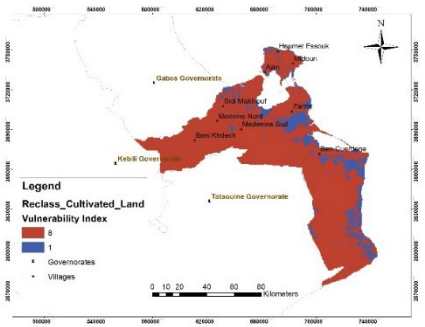
Terrain Slope



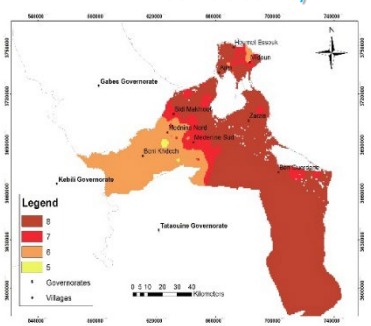
Tritium Distribution Map



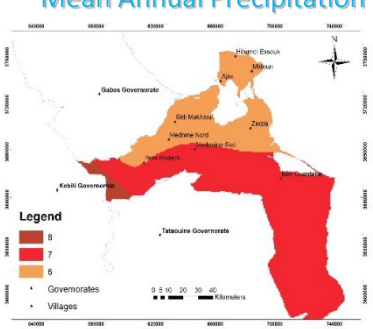
Cultivated Land



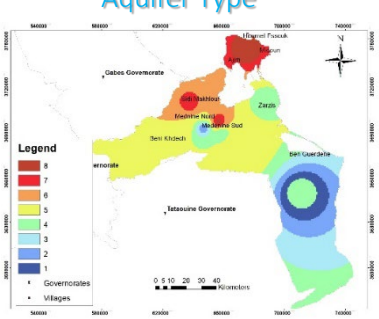
Electrical Conductivity



Mean Annual Precipitation

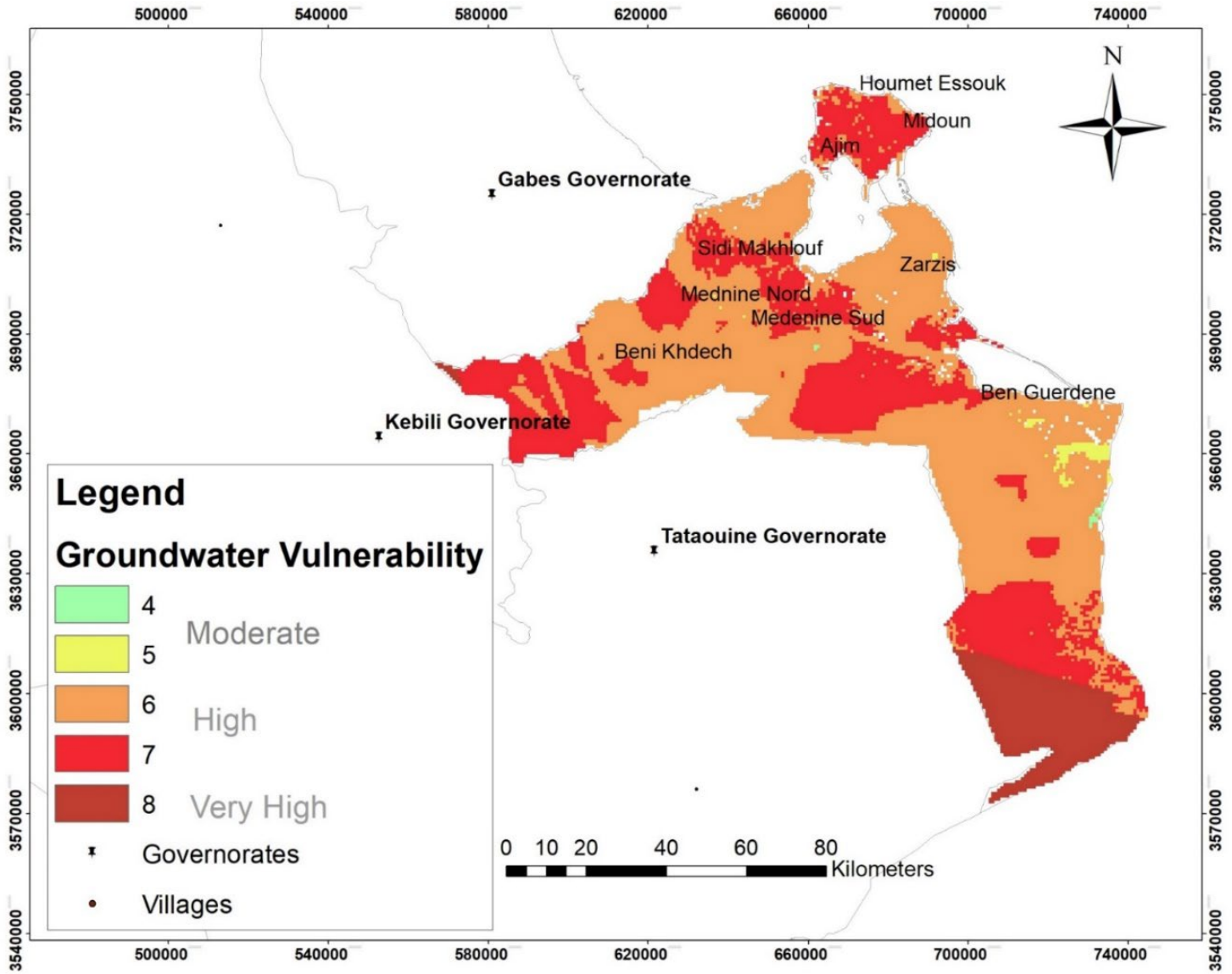


Aquifer Type



This approach has been developed in South Africa on a regional scale, in this study we downscaled to Jeffara aquifer to evaluate the vulnerability to groundwater depletion and reductions in quality as a result of future climate change impacts

14. Groundwater Vulnerability



Thank you!

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Sponsors / Partners: The study have been supported by Tunisian-South African bilateral cooperation project: « Multi Approach Investigations for Sustainable Groundwater Management »