

## ***Interactive comment on “Salinization origin of Souf Terminal Complex: Application of statistical modelling and WQI for groundwater management” by Hafidha Khebizi et al.***

### **Anonymous Referee #1**

Received and published: 8 October 2020

This is the review for the manuscript "Salinization origin of Souf Terminal Complex: Application of statistical modelling and WQI for groundwater management". The authors present an investigation on the hydro-geochemical data in Souf region of northern Algeria. They have used very trivial instruments to analyze the water quality data collected within a week in 2018. They have also presented some statistical analyses without discussing the physical significance of employing them. I have strong doubts on the data and analyses presented. Therefore, I don't find it suitable to publish in HESS. I have the following major comments:

1. The water quality samples are collected between April 30 and May 5 of 2018 from

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25 locations. The samples are collected during summer time. Salinization might be common during this time. The authors need to use additional data during different seasons and compare the estimate.

2. "Sulfates were measured by turbidimetry at 495 nm wavelength. Calcium, sodium and potassium cations were determined by flame photometry. Chlorite is measured by flame photometry. Nitrates were assayed by chlorimetry at 520 nm appropriate wavelength." [Lines 102-104] The instrumentation used for estimating the water quality parameters are very trivial with high uncertainty comparing the modern instruments. I have doubts on the water quality characterization using the data from these instruments as they are very similar (Figure 8).

3. Section 2.3: Water quality index: Details are needed here. How did the authors compute water quality index in this study?

4. "Section 3.1" Discuss the physical significance of the cluster analysis and discuss the results here. The authors have made three different groups based on cluster analysis, however, multiple overlaps are present in the data (Figure 8). How to distinguish between two different group's sample using this analysis? If the rationales are missing, cluster analysis only looks a mathematical tools nothing else.

5. "Table 2: Physico-chemical analysis results of Souf Terminal Complex groundwater". Please mention the units of each parameters. I believe the value is in decimal. If yes, remove the comma.

6. The cluster analysis based grouping has strong overlap, which is also visible in water quality index estimates (Table 5). Again, physical significance is missing here.

7. Conclusion: "The dissolution of the dominant evaporitic minerals such as halite, gypsum, and anhydrite, and other associated evaporitic minerals of halite such as sylvite, epsomite and bischofite occurrences permitted enrichment of water in sulfate and chlorate". There are no such analysis present in the manuscript to claim this. Authors are

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concluding based on qualitative data.

8. Conclusion: "The water groups distinguished are enriched in mineralization according to the groundwater host rock. The carbonate host rock showed less mineralization of sulfate and chlorate, while the evaporitic layers produced abundant elements of sulfate and chlorate. This allows the postulate in the presence of two different mineralization corridors." Authors need to provide more analyses before claiming this here.

9. Conclusion: "An osmosis phenomenon may intervene to homogenize the mineralization of Pontian and Mio-Pliocene groundwater. This mechanism allows ions circulation of the most concentrated waters in chemical elements towards waters with less enrichment through layers of Pontian clay roof, which is considered as a semi-permeable membrane. The interaction of the groundwater with Senonian evaporitic layers is regarded as subterranean preferential leaching, that was accelerated with pumping rates, and risks inducing the gradual subsidence of the overlying sandy layers, and rising static levels of the groundwater and acceleration of the dissolution-subsidence cycle." Further analyses are needed to establish these facts. Authors should not claim these using limited one season data resource.

10. Improve the quality of the figures. Either the resolution is too low or the fonts are not visible for all of the figures.

11. The title should include 'Algeria', as the readers are not familiar with the region.

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