

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

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Response to the comment (SC2) of Mr. Bouselsal Boualem His attached file: BOUSELSAL Boualem PhD thesis <https://biblio.univ-annaba.dz/wp-content/uploads/2019/07/These-Bouselsal-Boualem.pdf>

Mr BOUSELSAL Boualem, First, I should thank you for the effort you did to study the problem of the watertable static level rising in Oued Souf although the comparison you made in your comment is not objective, since this watertable is not the object of my article presented for discussion. The remarks and observations cited below have just been listed to draw the attention of the scientific community to the different analysis

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and interpretation methodology that I followed and the quality of the data that I used. My objective is to make a clear comparison between my article which constitutes a part of my current PhD thesis and your thesis which you have just presented in full for comparison! 1- I must point out that the unique common element between your entire thesis work and the part of my thesis expressed in this article is the study area which is Oued Souf particularly Souf area which occupies the center of El Oued Souf. 2- Your theme is focused on the watertable while my subject is related to the Pontian and Mio-Pliocene sandy groundwater (Terminal Complex). 3- You have mentioned the Terminal Complex only through the literature or old hydrochemical data carried out and already published in scientific articles of other researchers. For this, I would point out that you have used old analysis without specifying which groundwater in Terminal Complex it is, to determine the hydrochemical facies. Also you have not brought out the surrounding geological formations which are the origin of this mineralization by the contact rock-water. 4- Your own description “During the last 30 years, the region of El-Oued knew an upwelling in the water levels of land use” is related to the impact of the rise in the static level of the watertable. As I mentioned before this is your study object and not my objective in this paper. 5- The water sampling campaign that I carried out myself concerns the Pontian and Mio-Pliocene groundwater (Terminal Complex) and not the watertable. This campaign was done from April 30 to May 05, 2018 and I don't know in which paper did you read May 16? Regarding your remark relating to the number of samples, I draw the attention of the scientific community that this is a selective sampling limited to Souf area and not to the entire Oued Souf. Also, this is not only to bring out the hydrochemical facies that has already been treated by researchers cited in my reference. While, the novelty of my work for this recent campaign, in addition to updating the information on water quality, is the highlighting of the geological context role influencing the mineralization, based on a careful description of the host rock lateral evolution. This only appears in my work through the objective interpretation of the lithostratigraphic correlation study explaining the lateral passage of sedimentary formations. For this, I mentioned the influence of the Eocene

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host rock and the Senonian host rock. Although you have ignored this main argument that I have used. I urge you to re-read the text and try to fully understand my methodology of analysis not only hydrogeological and hydrochemical or statistical analysis, but also geological and structural interpretation. I draw the attention of the scientific community that the new concept of preferential dissolution corridors is the result of a good understanding of both geological, structural, hydrogeological and hydrochemical context. For this, I hope allowing me to mention that my experience as sedimentology engineer and structural geologist magister and my current PhD thesis allowed me to better understand the underground hydrodynamics and hydrochemistry and to present this new concept in the Lower Sahara region. 6- In your thesis work, you just used a single lithostratigraphic section exceeding 250m synthesizing the sedimentary basin. The other logs do not exceed 200m which confirms the limitation of your interpretation to this depth. While, the lithostratigraphic logs presented in my work are used to establish lithostratigraphic correlations by the Petrel geological modeling software with the collaboration of geophysical specialists and structural geologists from the National Hydrocarbon Valorization Agency (ALNAFT). The depth reached in these logs exceeds 700m. This objective is to highlight the concordance between the results of hydrochemical and statistical analysis and the geological interpretation for the determination of the Terminal Complex salinization origin in Souf. In addition, the logs used in my work aim to make lithostratigraphic correlations in order to see the lateral passage of the Terminal Complex host rock, in a regional scale, to clearly highlight the impact of the Eocene and Senonian on the mineralization of the Pantian and Mio-Pliocene groundwater. 7- The novelty of my work, which I cited above, is explained by highlighting the logical relationship between the distribution of water groups and the lithological nature of the host rock determined by the lithostratigraphic correlations. 8- This new concept of preferential dissolution corridors has never been discussed in another paper to explain the groundwater salinity and the impact of the Senonian evaporitic rocks dissolution on the overlying groundwater static level elevation in the Saharan areas and which you have completely ignored! Therefore, it is clear that my interpretation is completely different

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from yours to explain the rise in the static level of the watertable. For this, I draw the attention of the scientific community that the watertable static level rising problem has been included for the first time in my article as one of the main results of the new concept introduced. 9- In page 117 of your thesis, you wrote a paragraph under the title of Temperature: "The aquifer of the Terminal Complex (CT) is located between the depths 120 m and 700m (limestone groundwater which is located between the depths 250m and 700m, is not exploited because of the high salinity)". I do not know which carbonate groundwater you are talking about. I think you should specify this limestone layer, its age, depth and thickness. I would like to inform you that the stratigraphic logs of Sonatrach have shown that the carbonate layer is even less than 100m and I specify in this case the Eocene which changes thickness laterally because of its erosion until its complete disappearance. In this case Mio-Pliocene sandy layer is discordant on the Senonian sometimes carbonate (upper Senonian) and sometimes lagoon evaporitic (middle Senonian) according to the continuity of the members of Senonian. This obliges me to encourage you to work in collaboration with structural geologists to fully understand the geological context of the Terminal Complex. I should mention that the lithostratigraphic correlation presented in figure 03 of my article is made by Petrel software as part of my thesis in order to follow the lateral lithological variations. It is the first step in bringing to light the new concept of preferential dissolution corridors that you have completely ignored! I would like to inform the scientific community that a great work of Terminal Complex geological modeling is underway using Petrel software, with collaboration of Alnaft specialists in order to highlight the impact of this new concept at a regional scale. 10- Finally, you said that the carbonate groundwater is not exploited! Which carbonate groundwater are you talking about Eocene or Senonian since you do not make a distinction. I can confirm to you that they are exploited although they are salty and you can check the ANRH Ouargla wells inventory. It is for this reason that there are small local desalination plants. You can contact the Directorate of Hydraulics of El Oued for more information. I hope that my comment and my explanation are more than enough to get you back on track. I think the scientific community can be convinced

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by this detail. I found necessary to present even an idea on a work underway to show the importance not only of the new concept in research, but its impact on the obligation to make a new management strategy for the Terminal Complex shared by three countries. Regards.

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