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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Calibration of a semi-distributed lumped karst system model and analysis of its sensitivity to climate conditions: the example of the Qachqouch karst spring (Lebanon)" *by* Emmanuel Dubois et al.

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General evaluation and recommendation:

The paper describes the calibration of a semi-distributed model for the simulation of the discharge of a large spring in Lebanon and uses the model to assess future impacts of climate change on groundwater resources. This is a relevant and timely topic. The paper is well prepared in any respect and suitable for publication in HESS following moderate revisions.

Specific comments:

Title: The title is too long (almost three lines). Please shorten to two lines.

Abstract: Something is wrong with the first sentence, which is also too long. Please rephrase.

16, 17 and elsewhere: m3 should be m^3

Introduction: Well written in general. Short, but all relevant aspects are included.

62-65: The research objectives are relevant, but maybe you could add 1-2 additional objectives. Objective no. 2 is very general and could be complemented by a more specific research question, also including the practical relevance of your research, such as the expected climate change impacts and the implications for freshwater availability. Furthermore, objective no. 2 is not completely clear. What do you mean by "its sensitivity" – the sensitivity of the model or of the karst aquifer?

73: km2 should be km^2

80: Rearrange sentence to avoid misunderstanding. The spring is located at 64 m asl, not the aquifer.

84: quaternary should be Quaternary

84: The expression "high level of karstification" is misleading in this case. In fact, the Messinian salinity crisis created a very low topographic level of karstification. You probably mean high degree of karstification, very intense and very deep karstification.

112: Why do you put all measured parameters in brackets? This is the most important information.

124-128: three times "was used" on 5 lines. Avoid repetitions.

Section 3.3.2 describes the decomposition of spring hydrographs after Jeannin & Sauter in a very general way, but it is not clear if and how this approach was used

in the present study. Similar problem in section 3.3.3. In the “material and methods” chapter, please always say clearly what you did in your study, and how you did it, instead of describing general theory.

Heading 4.1 could be shortened.

217: “between 44 and more than 50 Mm^3” (call me pedantic, but “between 44 and > 50 Mm^3” is an improper use of language and mathematical symbols).

290: “increases the reduction” – slightly confusing. Better say “leads to stronger reduction”.

Discussion: Very good. Here, you discuss three main aspects of your research. However, you have only formulated two research objectives. Wouldn’t it be better to have at least three major research objectives, corresponding to these three main aspects? See my comment above.

320-323: Very long and extremely intricate sentence that contains a surprisingly insignificant message. Please split into several sentences, rearrange and rephrase.

Conclusions: Already in the first sentence of the conclusions, you undersell the importance of your study with respect to climate change impacts on groundwater resources, because you only mention the sensitivity of your MODEL to climatic conditions, which is a rather academic perspective. However, climate change impacts on groundwater resources is a major topic, particularly in the Mediterranean area. I would suggest to emphasize more clearly that your model allows to better predict climate change impacts on groundwater resources, and explain why this is important and how your model could help to make better management decisions. This is a general recommendation, not only concerning the conclusions, but also title, abstract and introduction.

References: Complete, relevant and up-to-date reference list.

Figure 1: The graphical quality of this map should be improved. The hatching for geological units is distracting. I would suggest to use transparent colors instead, on

top of some more intense grey shading showing the topography of the area.

The tables are very small, but I hope that their size will be increased in the final paper.

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