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Hydrology and Earth System Sciences Discussions

Interactive comment on "Spatio-temporal impact of climate change on the groundwater system" *by* J. Dams et al.

Anonymous Referee #3

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I have read the comments from the other two reviewers and basically I very much agree in most of their concerns and comments. I believe that the submitted manuscript may potentially be turned into a valuable contribution of interest to the readers of HESS, but the manuscript needs further improvements with respect to descriptions of the applied methods, justification of assumptions, and presentation and interpretation of results.

My main concerns are the following:

1. The applied downscaling methodology needs to be elaborated a bit further to increase the readability of the manuscript.

2. In line with the two other reviewers I have concerns regarding the applied modeling

approach where the results from WetSpa are fed into MODFLOW without any feedback mechanism. The combination of the WetSpa model, which, as far as the groundwater-surface water interaction is concerned, is based on empirical and conceptual type of modeling approaches, and the physically-based MODFLOW, is a modeling approach, which I have difficulties justifying. The modeling of the interaction between subsurface and surface water is of critical importance in this study and therefore I believe that a fully integrated and physically based modeling approach using e.g. a model like MIKE SHE would have been more appropriate.

3. The groundwater model seems to be overly simplified by only having two layers in the vertical. The geological settings are more complicated and I am surprised that the authors did not introduce a finer discretization such that the geological settings could be better implemented in the model. I was wondering if the simplification of the geological settings could impact the results.

4. The calibration of the models needs to be better described and substantiated as also stressed by the other reviewers.

5. The baseflow simulated by MODFLOW is not very accurate according to Fig. 5, which is disturbing as the MODFLOW results form the basis for the whole analysis of the manuscript. What is the reason that the MODFLOW simulations are less accurate than the results by WetSpa? I assume that the same recharge functions are applied in both cases. Why was baseflow not included in the calibration of MODFLOW?

6. The interpretation of the simulations results needs to be improved and expanded and framed in relation to e.g. geology and hydrological processes.

7. In line with one of the other reviewers I have difficulties understanding Fig. 8.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 10195, 2011.