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Hydrology and Earth System Sciences Discussions

Interactive comment on "Process-based karst modelling to relate hydrodynamic and hydrochemical characteristics to system properties" *by* A. Hartmann et al.

Anonymous Referee #1

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1. General comments

This paper deals with a very actual issue on identifying the dominant processes on karst systems thanks to modelling. The use of several karst systems presenting different hydrodynamic properties allow the authors to reach very interesting conclusions and the discussion section is very well detailed. Overall, it is a very good paper and I have just a few comments that may improve the quality of the manuscript.

2. Specific comments

It does not appear clear to me how the model parameters are calibrated. The authors

state that “the model is calibrated on each single signature by comparing modelled and observed signatures”. Does this mean that there are as many parameter sets as signatures for one studied site? Why not using a multi-objective algorithm? Take, e.g. the BQ signature, I guess there are plenty of parameter sets that will yield a perfect agreement for this signature, but many of these parameter sets will clearly not be informative. Table 6 presents the agreement of modelled and observed signatures, but for each study site, how many parameter sets are finally retained?

On a similar topic, it should be mentioned that Table 6 presents the results in calibration mode. It would be an interesting add-in for the paper to follow a split-sample test procedure, since one parameter set calibrated on a single flow signature might be largely influenced by the climatic characteristics of the calibration period.

The use of the BQ signature appears inappropriate to differentiate system behaviours within quite different climatic settings. To my opinion, the use of the runoff yield (Q/P) would be more appropriate. Could the authors comment this? Besides, it could be informative to describe the interrelations of system signatures since some are potentially correlated.

The authors state that the overall aim of the paper is to “regionalise system signatures and model parameters to ungauged karst areas”. This is clearly not the case and I doubt the database could allow this at this stage.

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