

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

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We thank anonymous referee #1 for the valuable review and her/his comments that will contribute to raise substantially the quality of the manuscript. According to her/his specific comments we will perform the following changes:

1. In the modified version of the manuscript, we will provide (i) a more detailed description of the calibration procedure that clarifies how many parameter sets are obtained, (ii) an explanation why each signature was considered individually and (iii) an elaboration how informative parameters were distinguished from non-informative parameters.

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2. A split sample test would certainly add more reliability to the results of the calibration. But the signatures are derived from time series with different length, different temporal resolution, and during different periods. It is therefore not straight forward to split this variable information into two equal parts. However, most of the signatures are metrics derived by transforming the hydrodynamic and hydrochemical time series. To check the stability of the transformation, the original time series may be split into half and the signatures can be calculated again. If a signature value deviates strongly from its value obtained by the complete time series, its inherent information, and the parameters derived from it, should be considered with more caution. If referee #1 agrees, such analysis will be added as supplemental material.

3. The signature BQ was considered because at least one signature had to include information about the water balance of the karst systems. This is important for determining the recharge area parameter  $A$  of the model. We agree that the runoff yield would be another useful signature, especially to describe evaporation. However, since the recharge areas of the karst systems are not known, the runoff yield cannot be calculated directly. For that reason we chose to use the streamflow elasticity (subsection 3.2 and Table 3), which includes the runoff yield, but cancels out the recharge area. We agree that a paragraph about potential correlations between the signatures will contribute to the quality of manuscript and we will add it to the discussion.

4. With the data available for our study it was clearly not possible to regionalize the system signatures (same point was also criticized by referee #2). To maintain the focus of the manuscript we will therefore remove this analysis from the manuscript. The discussion will be expanded by some more elaborations about possibilities to transfer system the system signatures and about the necessary number of karst systems for a proper regionalization. Figure 6 will be provided as supplementary material.

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