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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Reducing the ambiguity of karst aquifer models by pattern matching of flow and transport on catchment scale" *by* S. Oehlmann et al.

Anonymous Referee #1

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This manuscript presents a distributive numerical model for simulating flow and transport in a karst aquifer. In this study, the hybrid approach couples 3D matrix flow and transport with 1D conduit flow and transport. Focus is placed on model ambiguity by conducting and analyzing a parametric study.

The paper is very well written. The used modeling approach is both sophisticated and comprehensible and it is based on extensive and well documented data. The selection of analyzed scenarios is well reasoned. The study is a valuable contribution to karst groundwater simulation because it enhances our understanding of complex karst aquifer system and provides a sophisticated tool, e.g. for prediction purposes

of karst groundwater resources. Because it has large potential to contribute to better assessment of karst groundwater resources in the future, the presented study fits well into the scope of HESS. Therefore, publishing the paper in HESS is very desirable.

Some minor revisions prior to final publication are recommended:

#1 The authors say: "The geometry of the original network was mainly constructed based on qualitative evaluation from artificial tracer tests, where point-to-point connections are observed." (p. 9296, L. 23 ff.). For me it seems that morphological considerations (dry valleys) played also here a major role. Any comments?

#2 The first section in the discussion (p. 9300, L. 9-20) presents results and should be placed in section 4 (e.g., as 4.6 "Comparison of scenarios 2 and 5"). Note: Section 4.5 also includes a comparison of scenarios 2 and 5; parts of it could then also be shifted to the additional section 6.4.

#3 The discussion is very extensive (and, hence, partly tedious). It could well do with some reduction. Separating more important from less important sections is, of course, up to the authors, but I would recommend reducing some of the sections where the plausibility of calibrated model parameters is discussed.

#4 It is astonishing for me that, on the one hand, the matrix-conduit exchange may account for differences in calculated conduit volumes of up to 100 % (present simulation vs. traditional determination from tracer tests; section starting p. 9301, L. 22), but on the other hand, matrix-conduit exchange hardly impacts the tracer mass recovery in the simulations ($\sim$99 %; p. 9303, L. 13-15). Any thoughts about this apparent contradiction?

#5 Figs. 6 and 9 are very small. At least the font size in the legend should be increased.

#6 p. 9288, L. 5: "led" (not "let").

#7 p. 9299, L. 22: replace "very high" by "higher"

#8 Insert “in scenarios 2 and 5” after “as well” on p. 9301, L. 23

#9 Replace “the matrix contribution” by “conduit-matrix exchange” on p. 9301, L. 25

#10 Replace “this simulation” by “the present simulation” on p. 9302, L. 5

#11 Insert “in scenario 4” at the very end of the caption of Fig. 8.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 9281, 2014.