

# ***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.***

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Dear referee,

We are glad that you find our manuscript interesting and thank you a lot for your helpful suggestions. Here are the answers to your questions:

1) Comment:

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

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(dry valleys) played also here a major role. Any comments?

Answer:

You are correct. Since it is unlikely that the connection between the two points (tracer injection and spring) is a straight line, the conduits were aligned along major morphological features, such as dry valleys and dominant lineaments visible from air and satellite pictures. The difference to scenario 3 is, that for this scenario most of the dry valleys within the catchment area were defined as karst conduits, even when there was no evidence by tracer tests as to their high conductivity. To clarify this point in our manuscript, we will introduce the respective tracer injection points in Fig. 7 and rephrase the sentence to avoid conveying the impression that we did not consider dry valleys in the earlier scenarios.

2) Comment:

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.

Answer:

That is a really good idea. We will adopt your suggestion and add a Chapter 4.6 for scenario comparison to which we will shift the respective passages.

3) Comment:

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.

Answer:

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The extensive chapter results from the high amount of model parameters and field data that have to be considered. However, there is surely some potential for reduction, where descriptions might be too elaborate. We will check this and shorten the chapter accordingly.

4) Comment:

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 (99 %; p. 9303, L. 13-15). Any thoughts about this apparent contradiction?

Answer:

Estimates of increased conduit volumes with traditional methods result from the inflow of water from the fissured matrix to the conduit system during the time between tracer injection and tracer arrival at the spring. This leads to a high contribution of matrix water to the accumulated spring discharge during this time period. For the tracer tests, the tracer is injected directly into the conduit system. Due to the hydraulic gradients during the simulations, water flows from the fissured matrix into the conduit system and there is no advective transport of the tracer from the conduits into the matrix. The transport model also allows the simulation of tracer diffusion, which plays, however, a minor role for conduit-matrix exchange of tracer and tracer recovery in our simulations.

5-11) We thank you for your detailed comments and will of course improve the figures and correct the respective passages in our manuscript

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