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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 #2

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The manuscript presents an attempt to model tracer transport in conduit dominated aquifer on a catchment scale with a distributive model already presented in Oehlmann et al. (2013). The work focuses on parameter analysis aiming at matching some of the tracing tests results.

In general, the paper is well written, methods are up-to-date and the results plausible.

However, I have several comments & suggestions which authors might consider and use. I leave the judgement on how mandatory these comments are, to the Editor.

General comment: The paper could be reorganised. Some paragraphs could be placed earlier in the paper, before the results of Scenarios; e.g. why not presenting the "fitting" parameters and their reasonable values (Table 4) earlier. Particularly Chapter 5 is lengthy and not easy to read. Some things are told more than once.

We know that the parameter space for such system is large. The selection of the "fitting" parameters is rather empirical and should be discussed more critically.

Related to this, if I understood correctly, stationary (average, 0.5 m3/s in Gallusquelle) flow situation was used in all models. So, why not vary the spring discharge according to the situation at the tracing tests ?

Specific comments:

1) P 9288, Line 5 let -> led Also stating that "simulation led to equation" is a bit logically reversed . . . I suggest reformulating.

2) P 9289-9292 The modelling domain is rather poorly described. A 3D model or cross-section with model structure & boundary conditions, would help. As this is to some extend given in Oehlmann et al. (2013), published in the same journal, the citation is probably sufficient. However, this depends on the editorial policy.

3) P 9293, Line 10 – 15 Why is n correlated with conduit volume ? I see no physical reason for that. Same question goes for "higher conduit areas go along with higher n values and vice versa".

4) P 9294 Tracer velocities for two tests are calibrated by varying n. From Table 1 one sees that the spring discharge in TT 2 was double of that in TT1, while the discharge in the model is in between (0.5 m3/s).

5) P9295, Lines 10-25 The roughness coefficient Kc is defined in Eq 14. In hydraulics, n is defined as Manning roughness coefficient. Kc is given as 1/n (Eq.14) and here also called roughness coefficient (L15, P9295). This makes no sense. Also higher, Kc higher is the velocity s I also do not understand the reasoning behind: "While the flow cross-section gradually grows with time, the surface-volume-ratio increases as well

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leading to a higher roughness, further enhanced by exchange processes between the individual conduits. This would lead to an increase of the Manning coefficient towards the spring for a simulated single conduit." Please explain the reasons or give citations.

6) P9298 Line 25 COMMENT: In turbulent regime, the diffusion boundary layer is present and the diffusion can play role in overall dissolution. However, the faster the flow, the thinner the layer ...

7) P9299 Line 5 The work of Hückinghaus (1998) is being cited with conclusion: "This could further slow down the preferential evolution of downstream conduits ..." The consequence would be that the cross-section would decrease after intersection ? In scenario 5, however, the cross-section at intersections always increases (Eq. 15). Does this mean that the result of Hückinghaus is not considered ?

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