

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-280

Anonymous Referee #1

Referee comment on "Improving understanding of groundwater flow in an alpine karst system by reconstructing its geologic history using conduit network model ensembles" by Chloé Fandel et al., Hydrol. Earth Syst. Sci. Discuss.,
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This research article employs a probabilistic approach to test two hypotheses regarding the geological evolution of caves in an alpine karst catchment, thus in my opinion, the study fits well within the scope of the HESS journal. In general, the article is well written, and its objective is clear. The methodology consists of techniques already proposed and tested in previous studies, however, the application of such techniques in the context of geological evolution assessment is quite novel. In my opinion, the paper can be accepted for publication provided that the present comments/suggestions are correctly addressed:

- In the document the authors state that the simulation of the networks for a resolution of 50x50 meters can be performed in less than 2 minutes. In this sense, what is the limiting factor for not using a map with a higher resolution?
- In Figure 3, how is the expected network defined?
- In Figure 3, is it possible to draw the expected network with different plotting settings to enhance its visibility? As it is, the expected network can be confused with the simulated conduits.
- Could you provide an interpretation of the variability of the simulated conduits? Is it an indicator of the uncertainty of the expected conduit? Could you include a metric to measure such variability?
- In line 243 the authors mention that there is an additional scenario that is not explored in this study. Is there any justification for not analyzing it?
- In line 125 the authors wrote that in this study you are considering that conduits form preferentially in the direction of the maximum downward hydraulic gradient. Could you please add some references to studies where this assumption is also employed? Alternatively, could you please add some words explaining the reasoning behind this assumption?
- In Section 6 (Findings) you do some references to Figure 4. However, they seem to refer to elements in Figure 5.
- There is a missing closing bracket in line 112.