Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3
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Comment on hess-2021-355, Anonymous Referee

Anonymous Referee #3

Referee comment on "Tandem use of transit time distribution and fraction of young water reveals the dynamic flow paths supporting streamflow at a mountain headwater catchment" by Ravindra Dwivedi et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-355-RC3, 2021

General comments
According the reviewer the paper needs major changes for the following reasons: (1) the overall manuscript is confusing (2) the contributions of this study are not clear.
Despite some scientific contributions can be easily seen, it is necessary to make the contributions of this study clear. In general, the manuscript is difficult to read because there is no clear common thread, some sections seem to come out of the blue. Some sections are inconsistent with previous affirmation which reduces the truthfulness of the manuscript. The overall manuscript is too long, especially Methods and Results section.

General comment of each section.
The introduction section is confusing and does not show specific novelty and sound scientific value at global scale. I suggest to restructure the introduction reinforcing the state of the art of previous studies using isotopes and TT models and after explain the novelties of this paper. The term deep and shallow groundwater flow at mountain range is referred without previous explanation. Due to the complexity of this terms, I will recommend a previous definition of those. The term fractured rock system is referred in some occasion but it is not clear if this is the case of the study area. If this is the case, I would be appropriate to explain how fractures are going to be taken into account.
At some point it seems that the authors try to reproduce his previous work Dwivedi et al. (2021) but for the "deep groundwater" however, the author says that this has already been done by Ajami et al. (2011) and Dwivedi et al. (2019b). Again, a detailed reasoning about why is this paper a novelty is needed, it is confusing. The authors highlighted the contribution of using multiple year isotope data however only one year of 3H data is used, again confusing.

The Data section needs a better description of the collector type to understand the representativeness of the data. I strongly suggest to improve Fig1. In the manuscript Fig1 A and B are referred but there is no A and B in the figure. I suggest to incorporate the rivers, a standard scale (0, 0-5 and 1 km for example) and a higher resolution DEM, it looks poor.

The Methodology section seems to be a state of the art of the existing methods than something new. There are detailed descriptions of some methods that make the reader to lose the main goal of each approximation/estimation. I suggest to delete all dispensable information. The authors say at the introduction that one of the novelties is the use of multiple year data and only one year of 3H data is used. There is a repeated need to redefine the main goals and the novelty of this study.

The Results section is firstly organized by method, then change to shallow and deep groundwater and the mix between isotope type and TTD method and finally include FyW and Tyw. This section is dishful to follow.

Explaining which is the better method or the most reliable on in each case instead of only talking about the existence differences will strongly improve the Discussion section. It is not surprising to obtain different results with different methods. I will suggest to direct the discussion to explain line 577-579.

Specific comments

Line 52: Water stale isotopes: although this term has been used in other works, the term " stable water isotopes" is not correct. Water itself does not have isotopes. The correct term is stable 18O, 2H isotopes of water.

Line 61: Underestimating or overestimating transient times have other consequences than the correct understanding of the water chemistry. I will be appropriate to explain the most important ones.

Line 92: The second goal is not clear; I do not understand what are you trying to study.

Line180: â□□(ð□□□) needs to be defined here instead of line 242.

Line 296: Why only one year period?

Line 426: I would say 2-3 years.

Line 440: 10.7 “mm”