

# ***Interactive comment on “Lumped convolution integral models revisited: on the meaningfulness of inter catchment comparisons” by S. Seeger and M. Weiler***

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## **1 Specific Comments**

p. 6754, l. 2: The TTD is not only linked to water storage potential, so you should maybe add ‘amongst other things’ to the statement. It is the first sentence of the abstract after all and should therefore be a little more general.

*Reply*

As we rewrite the abstract for the revised version of the paper we will take care to be

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more general in the beginning.

p. 6754, l. 11: Reading the abstract I did not know what you mean by 'normalised'. In the paper it becomes clear, but just reading the abstract alone leaves you wondering.

*Reply*

As suggested by Anonymous Referee # 2, we will remove the normalised transfer functions altogether. Therefore this will be no issue in the revised abstract.

p. 6754, l. 15: What do you mean by '...transfer functions mainly have to agree on an intermediate time scale...'?

*Reply*

We admit that the way we included this finding (discussed in Sec. 5.4 of the manuscript) into the abstract, the statement could benefit from a more detailed rephrasing. We will seek to clarify this in the revised version of the abstract.

p. 6755, l. 12: Other important references would be Van der Velde et al. (2010) and Botter et al. (2011).

p. 6756, l. 1-17: There is a relatively new paper by Heidbüchel et al. (2013) that investigates MTTs under different meteorological conditions and assesses how these conditions alter the influence of the physical catchment characteristics on MTTs. You should definitely have a look.

*Reply*

We will consider these references in the revised introduction.

p. 6758, l. 22: Deuterium and oxygen-18 do only 'almost' convey the same information (see Lyon et al. (2009)). It is fine, however, that you make this assumption.

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### *Reply*

We are aware of the fact there is a stronger effect of evaporation on  $O^{18}$  data than on  $H^2$  data. In case of notable evaporation influences the two would not convey the same information. In our case we can rule out a notable alteration by evaporation, as all sampled isotopic compositions of precipitation and discharge plotted on the same meteoric water line.

p. 6763, l. 5: Does this method also take into account the fact that early melt water is very much enriched in the heavy isotopes?

### *Reply*

This effect is not taken into account, but is discussed in Sec. 5.3. If we considered a small area on a high temporal resolution, this certainly would play an important roll. In our case the fortnightly sampling of discharge isotopes as well as the vertical extent of most of the study catchments probably decreases the measurable influence of this effect sufficiently.

p. 6774, l. 3: Do you think that the averaging and smoothing of the input that is introduced by this method is one reason that no transfer function type could be singled out as the best one? Maybe if you had better input (i.e. more resolved in time and space) than you would find that for example the gamma function is better able to reproduce the short-term variability.

### *Reply*

Our method of precipitation isotope data estimation works with (uninterpolated) deviations from average values. This approach may introduce a bias, but it should not introduce any smoothing. The monthly averaged precipitation isotope data and the fortnightly discharge sampling certainly do introduce a smoothing and temporally higher resolved isotope data would certainly allow to decide between the TPLR and

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the gamma function.

p. 6777, l. 27 – p. 6778, l. 21: Again, this is where it would be helpful to compare and discuss your results with regard to the results of Heidbüchel et al. (2013). They found that the MTTs of catchments for three different years correlated with different physical catchment properties, depending on the specific weather conditions during that specific year. Not only was it important how much precipitation fell in one year, it was also important whether this precipitation was more distributed over time or whether it was more concentrated in certain periods. They went on to explain this observation by linking weather conditions with storage states and storage states with predominant flow paths. Depending on the specific flow paths MTTs were then controlled by different physical catchment properties. Maybe you can find something similar in your study?

*Reply*

We will try to consider this when revising the paper.

p. 6779, l. 14: What about using the median value instead? Since the long tails are not identifiable with stable isotope data anyways the median would not be affected that dramatically by the shape of the tail.

*Reply*

In comparison to the MTTs, the consideration of median transit times decreases the absolute range of uncertainty, but it hardly changes the ranking of the catchments. As previous studies focused on MTT comparisons, we would like to adhere to this practice, be it to point out its weakness.

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## 2 Figures & Tables

Figure 6: ‘...bottom left and ENTIRE right column...’

Figure 8: Why do you write ‘1/damping ratio’ on the y-axis and ‘TTP’ on the x-axis?

*Reply*

We will correct these oversights in the revised version of the paper.

## 3 Technical Corrections

We appreciate the technical corrections and will implement them in the revised paper.

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**HESD**

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