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Hydrology and Earth System Sciences
Discussions

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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We appreciate the helpful comments of the Anonymous Referee #1. The technical corrections will be implemented and the comments are answered below.

Comment #1 Steady state lumped parameter models were used to determine MTTs, although it is expected that time-variable parameters should apply especially during short-term high flow episodes. Such an approach (with their two-weekly sampling regimen) means essentially that baseflow transit times were being determined in this study

(especially if sampling during high-flow periods was avoided). This may be a satisfactory approach, although it is by no means clear that baseflow MTTs will be constant in time (e.g. that high baseflow MTT will equal low baseflow MTT). If baseflow TTDs are time-variable, the long transit time tails will be even more "underdetermined" than indicated in the paper, and the need for a longer-term tracer greater. I think that studies such as this should point out that they are talking about baseflow transit times, not streamflow transit times.

Reply We agree with that and will seek to clarify, that the data used in this study mainly represent baseflow conditions. It probably would be better to point out that the applied convolution model is based on flow time rather than on real time, i.e. even though the transfer function is static, the mass weighted way it is applied in the model allows for different MTTs during periods with low and high baseflows. So, in the time domain the model is time-variable.

Comment #2 The paper uses two variants of the three TFs, normalised and unnormalised versions. I found these difficult to understand, although a description is given in Appendix A. In particular, if it is logical for the TFs to be normalised, then why give both versions? Is there doubt about which version is correct?

Reply The presented study's program code was initially based on the program code of Weiler et al. (2003, TRANSEP). TRANSEP contained a wide range of transfer functions (TFs). Since not all of these TFs integrated to unity, normalisation of TFs was introduced into this specific implementation. During the reimplementation of the TRANSEP code into another language, we realised the consequences of TF normalisation for TFs with long tailings (see Appendix A of the manuscript). We kept the normalised variants of the TFs in order to assess the influence of normalisation. In the end it turned out, that while normalisation greatly influences the TFs' tailings, these tailings are effectively meaningless for the stable water isotope based evaluation of the simulations. On shorter time scales the differences between normalised and not

normalised TFs are negligible. Thus, we do not have any reason to insist on considering the normalised TFs. Removing them them altogether might be a good opportunity to reduce the complexity and to increase the clarity of the presented figures and tables.

Comment #3 Table 4 caption contains the sentence "Significant correlations (p-value < 0.05) are printed in boldface, correlations with p-values = 0.2 are printed in italics." I cannot see how this relates to the boldface and italic numbers in the table.

Reply In Table 4 we stated Pearson correlation coefficients and Spearman rank correlation coefficients. Instead of providing an extra table or additional columns for p-values, additional information on the significance of these correlations was encoded into the font. Some confusion might have been caused by the use of ρ (Spearman rank correlation coefficient) in the table and the mention of p-values in the table caption. These are not the same and we will try to make the table caption clearer. Furthermore, the choice to render correlation coefficients with p-values ≥ 0.2 in italics seems unnecessary and on top of that the visual distinguishability between normal text and text in italics turns out to be very low. In the revised version of the paper, we will only highlight significant ($p < 0.05$) correlation coefficients in boldface.

References

Weiler, Markus and McGlynn, Brian L. and McGuire, Kevin J. and McDonnell, Jeffrey J.: How does rainfall become runoff? A combined tracer and runoff transfer function approach, Water Resources Research, 39, 1315, doi:10.1029/2003WR002331, 2003.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 6753, 2014.