Editor

Thank you for the thorough revision of the manuscript. Both reviewers are generally satisfied with the revision and supported the publication of this manuscript. At the same time, both reviewers pointed out a few important technical issues that require further justification or discussion. I look forward to reading a revised version of this manuscript with the reviewers' additional comments in mind.

Response: We thank Lixin Wang for taking the time to handle the manuscript. We are pleased to hear that the editor and referees all appreciate our thorough revision. We agree with the points raised by the reviewers and briefly comment on each point below. We made the changes in our manuscript accordingly and hope that our study can be accepted for publication as it is.

Referee #1

Thanks for the author's careful responses. I think this manuscript should be accepted subject to some very minor revisions.

Specific comments

P5L22: The author should delete the definition of Es here.

Response: We agree, since we do not use Es at any equation in the manuscript, we can delete the definition here.

P7L16: I accept the assumption of δ30 here, but please double check the δET function. Shouldn't be δET=0.77*δsource+0.23*δ30 ? If so, the author also doesn't need actual ET data here.

Response: Thanks for this. It is correct that in both of these terms: 0.77 ET and 0.23 ET The "ET" should not be there. We deleted ET in the equation.

P19L22: The author mentioned young water fraction (Fyw) at P10L13, so an abbreviation is enough here.

Response: Changed as suggested.

Referee #2

General comments:

The authors dealt well with the reviewers' comments, improving the clarity of the text as well as the figures.

There is just one point I would like to see acknowledged in the discussion. This concerns the fact that non-classical (non-traditional) transfer function - convolution approaches also have the ability to deal with the analysis of time-variable water age dynamics. At the moment, the authors write that '…convolution transit time approaches […] contrary to SAS function applications – are not able to reflect the impact of ET isotope tracer composition and water ages on discharge tracer and ages as shown above.' This is not correct in my opinion, since new approaches have been developed in the meantime (i.e. since 2006) that can in fact reproduce and retrace hydrologic processes that are variable in time via non-static transit time distributions.

Response: See response below.

Specific comments:

Page 7, line 15: But now this equation has the wrong units. Take out the ET flux and just write: δET = 0.77 * δsource + 0.23 * δ30.

Response: Thanks for this. As suggested, we deleted ET in the equation.

Page 22, line 7-11: I disagree. You are right in pointing out that convolution transit time approaches described in the McGuire & McDonnell paper from 2006(!) cannot account for time-variable tracer and water age dynamics. Since then approaches have been developed that can at least in theory be used for reflecting the dynamic impact of ET isotope tracer composition (see, for example, Heidbüchel et al., 2012; to a certain degree also Hrachowitz et al., 2013; or McMillan et al., 2012).

Response: Thanks for pointing this out. As the provided references would have theoretically been able to account for ET age dynamics and could have made use of tracer data to describe ET ages, we deleted this sentence accordingly.

Supplements

Supp. Fig. 1: Just a suggestion. I would make both the y-axes go from 0 to 1200 days so that you have a better comparison of the range of age dynamics of Q and ET. Maybe even add a third panel where you just plot the two best simulations for both Q and ET (i.e. four lines in total).

Response: We prefer to keep it as it is to be able to see the age dynamics. With a larger y-axis scale, this would not be so easily visible.

Literature

Heidbüchel, I., Troch, P. A., Lyon, S. W., and Weiler, M.: The master transit time distribution of variable flow systems, Water Resour. Res., 48, W06520, https://doi.org/10.1029/2011WR011293, 2012.

Hrachowitz, M., Savenije, H., Bogaard, T. A., Tetzlaff, D., and Soulsby, C.: What can flux tracking teach us about water age distribution patterns and their temporal dynamics?, Hydrol. Earth Syst. Sci., 17, 533–564, https://doi.org/10.5194/hess-17-533-2013, 2013.

McMillan, H., Tetzlaff, D., Clark, M., and Soulsby, C.: Do timevariable tracers aid the evaluation of hydrological model structure? A multimodel approach, Water Resour. Res., 48, W05501, https://doi.org/10.1029/2011WR011688, 2012.