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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Examining the impacts of estimated precipitation isotope (δ^{18}O) inputs on distributed tracer-aided hydrological modelling" *by* Carly J. Delavau et al.

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The manuscript "Examining the impacts of estimated precipitation isotope (δ18O) inputs on distributed tracer-aided hydrological modelling, Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-539," by Delavau et al. currently under discussion in HESS highlights the importance of the input function and temporal resolution on tracer-aided modelling particularly in remote and data scarce catchments. The evaluation of large scale, spatially-distributed and climate model based isotope products as an alternative or complementary method to ground-based measurements could potentially become a feasible and widely used approach for tracer studies in areas with difficult access and monitoring constraints. I consider this as a novel contribution to the existing

literature. The paper is well-written and logically structured. It clearly demonstrates the impact of different isotope input functions on the coupled model and how this analysis contributes to constraining the model uncertainty particularly the internal functioning and how the model generates flows, mixing and the simulated water partitioning. Having said that, I think that the paper could be edited towards more clearly conveying the key points in terms of more generalizable results going beyond the Canadian context and the presented isoWATFLOOD model. I will detail my suggestions further below. Nevertheless, I am convinced that this paper will likely attract a lot of attention across a wide range of readers and beyond the hydrology community. Therefore, I am pleased to recommend this contribution for publication in HESS with some revisions.

All the best, Christian Birkel

Specific comments: My main point would be that the paper is in parts very much focussed on the particularities of the study site and also the presented model characteristics. However, the results and potential impact of this paper go in my opinion beyond this case study and this could be better emphasized to maximize impact particularly in the hydrological modeller community. I therefore, suggest the following:

- Title and Abstract: You could consider substituting the term "estimated" with e.g. "precipitation isotope product" throughout the manuscript to emphasize the different origins of the input functions. From Line 17 in the abstract, I suggest to revise these sentences, as they do not really reflect the key findings. For example, the statement that the model is only as good as its input function is rather trivial and could be changed to some more specific statement such as which temporal resolution is needed (hourly, daily, weekly. . .) to adequately simulate stream isotope signatures and which product is the best? I also suggest to more specifically mention that the coupled simulation of flow and isotopes actually allowed you to constrain the simulations towards a better internal representation of the dominating processes. - 2.2, Line 21:. . .is used "to" spatially distribute. . . - Page 7, Line 16: . . .based "on"? - Page 9, Line 14: Would it be feasible to test this for one model configuration and run it over let's say 100K iterations to be

able to check for differences compared to 30K runs? - Results and discussion: The results could be better linked to the wider literature. E.g. why not include the mean monthly precipitation isoscapes from Bowen and Revenaugh (2003) as a means of evaluation? I am missing a more concise attempt to generalize the results concerning model uncertainty and the value of tracer data in hydrological modelling. - Page 10, Line 1: How is the static approach with a single annual isotope value able to capture seasonal variability? - Conclusions and recommendations: I suggest to summarize the key points and present them in a numbered order. I also think it would be better to present the outlook as a separate section. - Would it be possible to include gridded maps of the different mean annual (and seasonal min/max) isotope products over the study area in relation to the observed data for comparison purposes?

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