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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical note: An improved discharge sensitivity metric for young water fractions" *by* Francesc Gallart et al.

Anonymous Referee #1

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This paper explores the application of the young water fraction and discharge sensitivity of the young water fraction as a method for catchment comparison studies and understanding streamflow generation processes, following the method presented by von Freyberg et al., 2018. The authors show using data from their catchment that this method can be improved for high discharge events by using an exponential-type instead of linear equation to fit the relation between discharge and the young water fraction.

The manuscript is well written, easy to follow and of high quality. It is a nice contribution to the field of travel time distributions and young water fractions and the methodological advances are useful for other researcher using stable isotopes and young water fractions. There is not much to criticize, and the manuscript is almost publication-ready.

Below are some minor comments that should be addressed.

L66. What is the precipitation distribution in year? Would it be possible to show small graph of the annual precipitation and discharge? This would give readers an easy way to get a feeling of the study catchments compared to other catchments.

L70 mentions that sampling was done at maximum discharge of 404 mm/day. Caption of Figure 1 mentions that maximum sampled discharge was 226 mm/day.

L72. Was sampling done for rising and falling discharges? It would be interesting to see if there is hysteresis in the ywf and the high-frequent sampling might be suitable for this analysis.

Figure 1. If I understand correctly the 'Median discharge' in Figure 1 means the median discharge on the sampling day instead of the discharge at the exact moment of sampling? So all samples are in the figure, while the actual maximum/peak discharge at the moment of sampling on these days was 226 (or 404) mm/day. The authors could consider clarifying this.

L106. Also combining with Eqs 2. Or alternatively the authors could consider writing Eqs. (3) with 'AS(Q)' instead of '(nS + mSQ)', because when combining Eqs. 1, 3 and 5 'As' is not considered a linear function of Q, as in Eqs. 2.

L117-164. I compliment the authors on this analysis: it is very interesting to see what happens when highest flows are excluded in sampling and this helps in the comparison with the results of von Freyberg et al 2018. Looking at Figure 3 I wonder if the same results would be found if the lowest flows were excluded, e.g. <0.5 mm/d? It looks like a much better linear fit would then be reached, similar to the fits of von Freyberg et al 2018. Additionally, I am curious if their catchments have higher base flows or that the lowest flows were not sampled.

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