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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Water ages in the critical zone of long-term experimental sites in northern latitudes" *by* Matthias Sprenger et al.

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We thank Referee 2 for their response to our comments, which clarified their issue raised.
We agree with Referee 2 that we are dealing with unsteady-state flow conditions and that we are using mass fluxes of E, T and R to calculate the median travel times. Since we define the median as the time half of the cumulative mass flux was passed the flow, the median travel time calculations do not need to be normalized. We will clarify that in the revised version.
However, for the calculations of the water ages in the fluxes and the storage, we need to know how much water of individual infiltration events (days of rainfall or snowmelt) is on each day of the simulation in the flux or storage of interest. Therefore, we need

to relate the concentration of the virtual tracer in the flux (or storage), O_J(t), to the total mass introduced of the virtual tracer, I_J(t$_0$). Note that we introduce for each day of rainfall or snowmelt an individual virtual tracer (with I_J, I_{J+1}, I_{J+2}, I_{J+3}, ... being the tracer on the first, second, and third day of infiltrating water, respectively). Thus, in this case, we need to do the normalization (O_J(t) / I_J(t$_0$)), which was criticized by Referee 2.
Maybe Referee 2 can provide references to show why this normalization is not valid under non-steady-state conditions.

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