Please find below our responses to the comments by Markus Hrachowitz. Our responses are given in blue, and text that will be added during the revision is underlined.

In this manuscript, the authors execute a very well-designed, straightforward experiment to isolate the individual effects of antecedent wetness and precipitation intensity on both, response and travel times. They further provide a very clear, systematic, complete description of their results and the associated implications. I really like the intriguing simplicity of the research question: in a hindsight it is such an obvious question. Yet, nobody or very few(?) have explicitly addressed it before. It was a pleasure to read the manuscript and I would be glad to see it published soon.

We are grateful to Markus Hrachowitz for taking the time to read the manuscript and for the positive evaluation of our work.

I have only a few very minor comments and suggestions:

(1) P.1, l.1: the opening sentence of the abstract may put the reader on the wrong footing. I would argue that there are quite a lot of studies that – implicitly or explicitly – analyse hydrological response and transport together: starting from early combined descriptions in models (e.g. Niemi, 1977; Christophersen and Wright, 1981; Bergström et al., 1985) to the surge of studies using coupled hydrological-tracer models over the past decade (e.g. Birkel et al., 2010,2016; Fenicia et al., 2010; McMillan et al., 2012; Hrachowitz et al., 2013, 2021; Harman, 2015, 2019; Benettin et al., 2015, 2017 and many others).

It only becomes clear after reading the paper, what the authors meant to express in this first line. I think it would be helpful for the reader if this statement was rephrased so as to more accurately reflect what has rarely been analysed together and compared with each other: response and transit times.

We agree. We will reformulate the first sentence of the abstract as follows "Hydrological response and *travel times characterise* distinct catchment behaviours that have both been intensively studied, but rarely together".

(2) P.1, l.2-3: again a bit ambiguous and not entirely clear. I recommend to rephrase to also allow readers who are not yet in detail familiar with the issue to understand the meaning and difference between "[...] how strongly, streamflow reacts to precipitation inputs [...]" and "[...] how quickly precipitation reaches the stream."

We agree. We will change this second sentence of the abstract to "The hydrologic response characterises how quickly, and how strongly, streamflow reacts to precipitation inputs, whereas transport characterises how quickly precipitation *travels through the system to reach* the stream".

(3) P.1 l.16: would be good to perhaps use a different word than "crucial" here as it has already been used four lines above.

Agree. We will change "crucial" to "*essential*" here.

(4) P.1, l.22: see also comment (2). The statement "[...] how quickly precipitation itself reaches the stream [...]" leaves quite room for ambiguity and could benefit from a more precise formulation.

Thank you. We will change this sentence to: "Catchment travel times, by contrast, characterise how quickly precipitation itself *travels through landscapes to* reach the stream"

(5) P.2, l.33-35: I think the paper by Weiler et al. (2003) as one of the earlier studies that made an *explicit* difference between response and travel time distributions needs to be cited here, too.

Thank you. We will add a reference to Weiler et al. (2003) here.

(6) P.2 l.35-37: Related to comment (1) above, I only partly agree and believe that at least some references to coupled hydrological-tracer models should be mentioned here.

Thank you for this remark. We will edit the text and include some of the references: "The starkly different timescales of streamflow response and transport of water are also neglected in most hydrological, land-surface, and earth system models, which likely leads to flawed representations of water cycling. *Some coupled analyses of hydrological response and transport estimated from tracer data exist (e.g. Hrachowitz et al., 2013; Birkel et al., 2016; Harman, 2015), however,* most work *explicitly comparing* response and transport *timescales* has been limited to laboratory column studies and plot-scale or hillslope-scale *modelling* studies, due to a lack of sufficient tracer data at the catchment scale."

(7) P.5, Fig.1: it is of course not the intention of the manuscript to compare the actual hydrological/tracer response dynamics of the two catchments. However, using the same y-axes scales would still help the reader to easier understand differences between the catchments. Although, for readability of figures, this may not be possible everywhere, here panels (a) and (c) but also panels (b) and (d) could easily have matching y-axes scales.

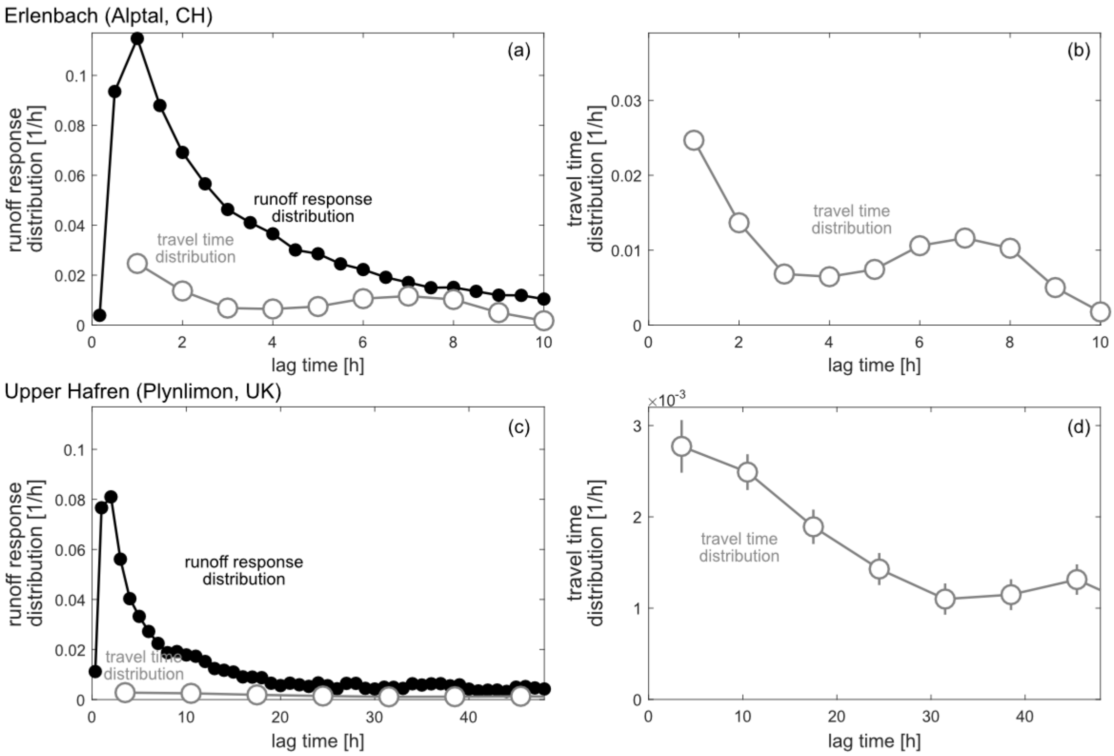
We respectfully disagree. As noted by the reviewer, it is not the intention to compare the precipitation and streamflow water fluxes and isotope signals between the two sites. On the contrary, there are several reasons to expect that the fluxes and signals differ between the two catchments (due to differences in climate, land cover, and sampling frequency).

What is of relevance for the analysis is the comparison of P and Q dynamics of water fluxes and isotope signals within the specific sites. If we matched the y-axes of the different sites, the variability within the individual catchments would become less visible, obscuring the dynamics, in particular at Plynlimon/Upper Hafren. Hence, we argue that – for this figure – keeping the y-axes scales different is important for clearly showing the variability in each catchment's data.

(8) P.6, l.146 and Fig.3: not clear where the difference in considered lag times comes from. How was this decided and why? In addition, it would be good to use the same y-axes scales for panels (a) and (c).

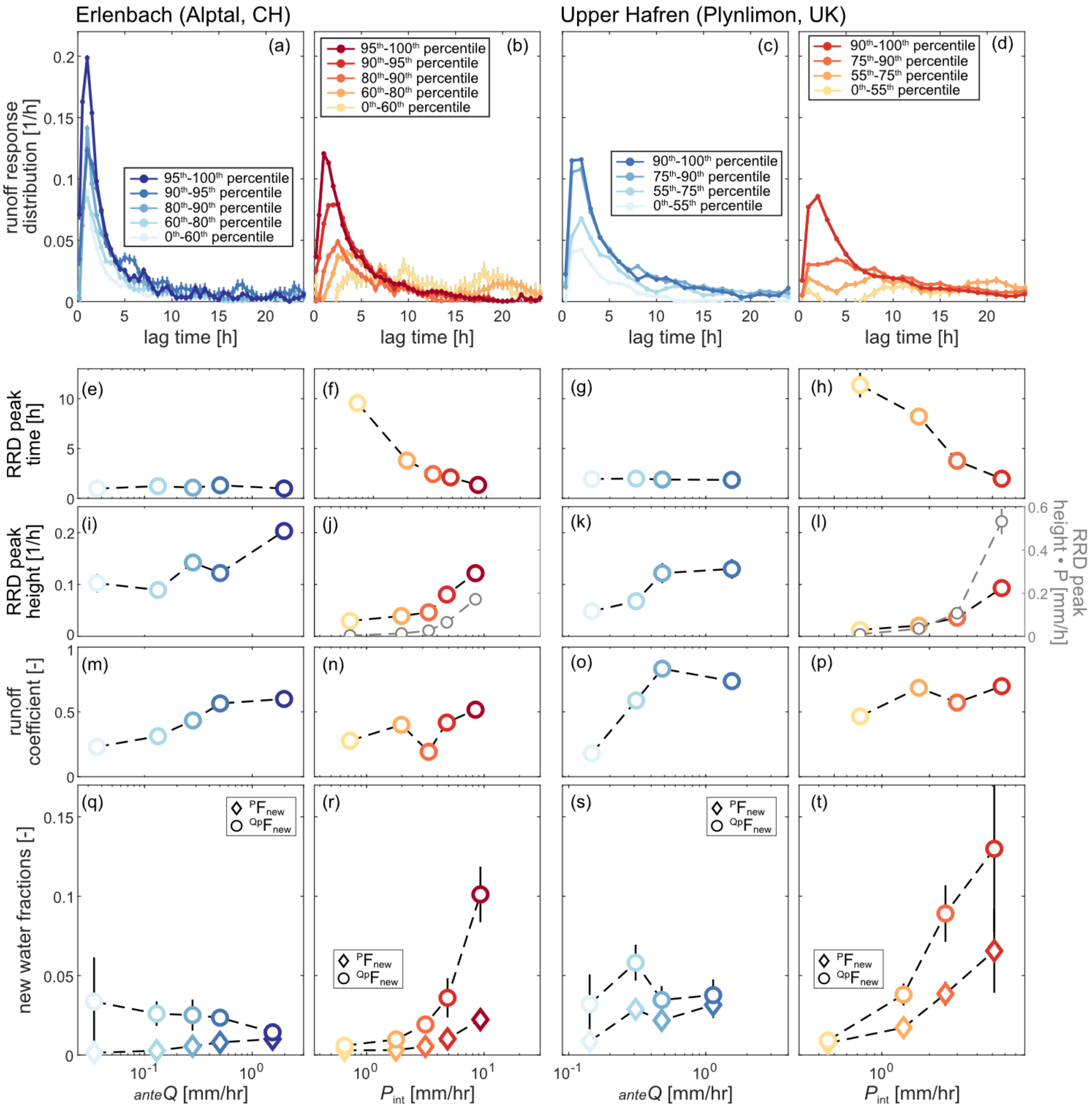
Thank you. We assume the reviewer is referring to the differences in lag times between Erlenbach (up to 10 hrs) and Upper Hafren (up to 50 hrs). This is due to the Erlenbach being much flashier than the Upper Hafren. We will update the beginning of the results section to explain this: "In both catchments the hydrologic response was quicker than transport, with higher values of the runoff response distribution (RRD) compared to the travel time distribution (TTD) during the lag times considered here (10 hrs and 48 hrs at Erlenbach and Upper Hafren, respectively, Figure 3). *The shorter lag times at Erlenbach indicate a flashier system compared to the Upper Hafren, where the hydrologic response and transport are much slower."*

We will update Fig. 3 to ensure the same y-axes scales for panels (a) and (c):



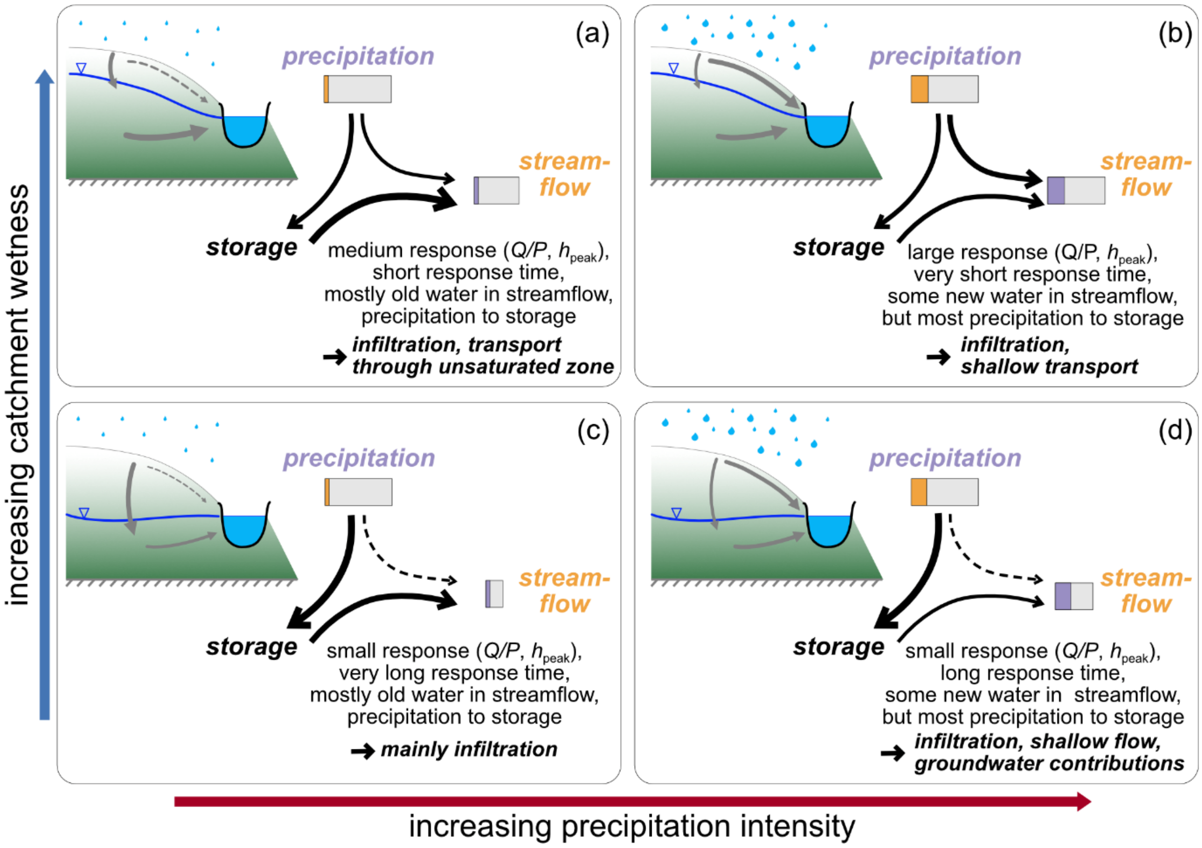
(9) P.9, Fig.4: without any loss of relevant information, the y-axes scales in each row, i.e. panels (a)-(d); (e)-(h); etc. can be matched. It would make the figure less noisy while also giving the reader a (little) bit more information.

Thank you. We will update Fig. 4 to show matching y-axes as per below:



(10) P.14, Fig.6: not clear why infiltration (red circle symbols) is lower at higher wetness? Is this meant to be a consequence of reduced infiltration capacity? If yes, then should the shallow subsurface infiltration/drainage (blue circles) not also be reduced as water also initially needs to infiltrate to reach these shallow drainage flow paths?! In addition, should infiltration then not also be reduced with increasing precipitation intensity?

We agree. We have updated the arrows in the panels to indicate that (1) with increasing antecedent wetness more old water (presumably groundwater) is mobilised – with no differences in infiltration between drier and wetter conditions; and that (2) increased precipitation intensity results in greater transport of recent precipitation to the stream (presumably through shallow flowpaths).



References to be added during the revisions:

Birkel, C., Geris, J., Molina, M. J., Mendez, C., Arce, R., Dick, J., ... & Soulsby, C. (2016). Hydroclimatic controls on non-stationary stream water ages in humid tropical catchments. Journal of Hydrology, 542, 231-240.

Harman, C. J. (2015). Time-variable transit time distributions and transport: Theory and application to storage-dependent transport of chloride in a watershed. Water Resources Research, 51(1), 1-30.

Hrachowitz, M., Savenije, H., Bogaard, T. A., Tetzlaff, D., & Soulsby, C. (2013). What can flux tracking teach us about water age distribution patterns and their temporal dynamics?. Hydrology and Earth System Sciences, 17(2), 533-564.

Weiler, M., McGlynn, B. L., McGuire, K. J., & McDonnell, J. J. (2003). How does rainfall become runoff? A combined tracer and runoff transfer function approach. Water Resources Research, 39(11).

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Harman, C. J. (2015). Time-variable transit time distributions and transport: Theory and application to storage-dependent transport of chloride in a watershed. Water Resources Research, 51(1), 1-30.

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Hrachowitz, M., Stockinger, M., Coenders-Gerrits, M., van der Ent, R., Bogena, H., Lücke, A., & Stumpp, C. (2021). Reduction of vegetation-accessible water storage capacity after deforestation affects catchment travel time distributions and increases young water fractions in a headwater catchment. Hydrology and Earth System Sciences, 25(9), 4887-4915.

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