**Responses to comments of Referee #4 to the paper "Integrated response and transit time distributions of watersheds by combining hydrograph separation and long-term transit time modeling"**

**Comment**:
Add some information on catchment characteristics (topography and soils)

**Response**:
As already pointed out in the other responses, this will be added to the MS

p.8 l.22: The input data was extended – how much uncertainty does that introduce? How well did the correlation work out? What climatic data was used for the correlation?

As already pointed out in the other responses, this will be added to the MS

p.9 l.10 "The parameter b1 maintains the water balance over the simulation period..." unclear, please rephrase

The parameter scales the total simulated runoff (a kind of runoff-coefficient). We will make this clearer in the revised MS

p.10 l.10 "the total event water fraction F can then be derived" – what is the denominator of this event water fraction? Precipitation or streamflow?

The denominator is event water runoff and the sum of it is then the total event water which can be divided by the total runoff to calculate the event water fraction.

p.10 l.14 "where tau_f and tau_s are the mean response times..." does this also refer to mean transit times?

Yes, the model is the same and hence the parameters.

p.11 eq 7 and 8 – should rc_e maybe be f? Is F equivalent to X in Weiler et al. 2003?

Yes, F is equal X in Weiler et al., 2003. But rc_e is the runoff coefficient of the event. Which includes event and pre-event water.

p.11 l.15 "the idea behind this new concept" – what exactly are you referring to here?

It is that for an open system like a catchment, part of the water molecules entering the system as precipitation will leave the catchment not through the stream but by evapotranspiration ( see also part of the discussion)

p.12 l. 10---14: what data was used for calibration and validation? Please show data.

As already pointed out in the other responses, this will be added to the MS

p.12 l.14---15 "the prediction of the isotopes variation in the streamflow with TRANSEP was also acceptable" please rephrase – explain in what way it was acceptable, show data and measures of goodness of fit.

According to the listed efficiency values for C (Table 2). We will specify this in the revised MS

p.12 l.16 the TTD is more delayed – rephrase

Will be done

p.13 l.20 should this be mean transit time instead of mean response time? The second half of the sentence seems to be describing transit time.

No, it is mean response time!

What exactly do you mean by "mean response time of baseflow"?

It is actually the mean response time of the model with a 1 day time step which was used to model the slower response of the streamflow to precipitation. We will change this and describe it to make in clearer.

p.14 l.15---19: I can't really see that in Fig. 2. Does the description maybe refer to Figure 3? the described patterns with respect to the short times in catchment BB are much clearer here.

No, it refers to Figure 2. The response of BB is slightly higher within the first hours, but as pointed out by the reviewer, difficult to see. We will change this statement in the revised MS.

Table 2: column headings unclear

As already pointed out in the other responses, we will add a description to the headings in the footnote of the table

Table 2 "event water" – how is this determined here? Measured or modeled? What is in the denominator?

Event water is the proportion of event water to total runoff, which can only be derived from the model. It cannot be measured.

Table 2: why this combination of events?

See explanation in response to reviewer #2.

Table 2: show at least exemplary plots of time series of streamflow, isotopes, hydrograph separation, model results for event 2 for all three catchments

Will be done as already pointed out in the other responses.

Table 3: explain how MRT is determined and what MRT for baseflow response is.

Will be added to the revised MS

Figures: Plots are quite small, not readable in the printout version

We will work on the appearance of the figures to make them better readable..

You should add arrows and marks to the plots to indicate the parts of the curve you are referring to in the text. Make them easier to understand for people not familiar with these types of plots. For example show where you see the losses due to evaporation, etc.

OK, we will add information about the loss due to ET to the figures, but we cannot highlight all points we are discussing in the next!

Y axis labels should probably be g(tau), h(tau) instead of g(T), h(T)

Actually, it is tau, but the selected font shows it like a T. We will change the font.

Fig. 6 – there is no red line

Sorry, the red line disappeared in the MS generated by HESSD. We will make sure in the final version in HESS that either a red line is visible or the text will be changed accordingly

Minor suggestions

p.2 l.7---10: Sentence too long, please rephrase

p.2 l.17: appear to prolong transit time

p.2 l.19: with the aim, instead of whose aim

p.3 l. 2: “the temporal variations of water contribution” rephrase

p.3 l9 “have been developed on earlier models” rephrase

p.4 l21: “This new method of hydrograph separation... sentence unclear, please rephrase. Does this refer to the method by Unnikrishna or to the method described here?

p. 4 l. 24: “are used to improve the description of hydrologic processes” p.5 l. 10: delete “and their economic activities” p.5 l.21---24: “The geological unit has a volcanic ash layer” rephrase

p.8 l.18---19: “in those time intervals for the duration of the precipitation event sampled for approximately 24 hours” unclear, please rephrase – what intervals?

p.9 l1: “ are both simple rainfall---runoff model that simulates streamflow...” do you mean “ are both simple runoff models that simulate streamflow...”?

p. 17 l.21---24: sentence not really necessary.

All Minor comments will be changed according to the reviewer suggestions in the revised MS