

Review of the manuscript by Roa-Garcia and Weiler:

“Integrated response and transit time distributions of watersheds by combining hydrograph separation and long-term transit time modeling”

General comments:

The authors extended the methodology described in Weiler et al. 2003 by combining the RTD and TTD determined for events and baseflow periods and then applying it to a data set collected in three Andean catchments. The differences in response (response times and transit times) found in the three catchments are explained by differences in land use.

The manuscript is generally well written and the dataset and its analysis are interesting and valuable. However, only model results are presented, the data itself is not shown. The manuscript could be improved by also presenting the original data. I also suggest including some information and discussion of catchment differences in topography and soils.

The manuscript should be published after improving it according to reviews 1-3 and the comments below.

Specific comments:

Add some information on catchment characteristics (topography and soils)

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?

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

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?

p.10 l.14 “where τ_f and τ_s are the mean response times...” does this also refer to mean transit times?

p.11 eq 7 and 8 – should rc_e maybe be f ?

Is F equivalent to X in Weiler et al. 2003?

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

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

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.

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

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.

What exactly do you mean by “mean response time of baseflow”?

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.

Table 2: column headings unclear

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

Table 2: why this combination of events?

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

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

Figures:

Plots are quite small, not readable in the printout version

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.

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

Fig. 6 – there is no red line

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