Hydrology and
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Discussions

Interactive comment on "Understanding mean transit times in Andean tropical montane cloud forest catchments: combining tracer data, lumped parameter models and uncertainty analysis" *by* E. Timbe et al.

Anonymous Referee #2

Received and published: 7 February 2014

General comments: Timbe et al. show, by using a set of 7 lumped parameter models to determine water mean transit times in different compartments of a tropical catchment, that the choice of an appropriate transit time distribution function (TTD) is crucial and may be ambiguous. Besides the goodness of fit also the uncertainties of the model results are analyzed and compared. One of the most valuable messages is that models that yield the best fit may provide highly uncertain results yet. The concept of the study is coherent and the results are relevant for scientists working with lumped parameter models. The paper focusses predominantly on technical aspects which is fine since

an artificially extended input data series was used, making it critical to interpret long transit times regarding processes. In this respect, the title should not imply that process analysis is a main goal of the study. It should therefore be modified to more emphasize the technical component of model testing and comparison (specific comment below). The language is clear in the first half of the manuscript. Particularly in the discussion section sentences are often long and difficult to follow. The authors may try to shorten and clarify the longest sentences (see also comments below).

Specific comments: Reorder Tables and Figures: They should appear in the same order as they are referred to in the text. (e.g. Table 2 is referred to on p. 15876, table 1 not before p. 15878)

p. 15877, l. 26: How is surface water velocity transferred into the mean velocity?

p. 15878, ll. 1-2: The Manning equation is based on the wetted perimeter and the cross-sectional area and the result is the stream velocity.

Eq. (2) on p. 15880: Now there are three time variables. If you substitute g(t-t') by g(τ) then you have also to change C(t') by C(t-τ) and the integration variable is τ, integrated from 0 to ∞.

Chapter 2.6: I understand that the input time series was too short and, therefore, had to be repeated. This proceeding is acceptable as long as the focus of the study is the comparison of different models regarding their uncertainties and applicability for different compartments. But interpreting these results and the absolute mean transit times in terms of site characterization might be risky, in particular if the MTTs are >2 yr. If this is done, the additional uncertainty arising should be taken into account. This is not an obstacle for this manuscript since, as it is said in the Conclusions, the analysis of the catchment's functioning was beyond its scope. But then you should more clearly stick to the technical aspects throughout and also modify the title: "Understanding mean residence times. . ." implies that process understanding is a central part of your work.

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p. 15884 l. 28 – p. 15885 l. 3: Is it reasonable that, at baseflow conditions, MTTs in the tributaries are larger than in the mainstem river? This question leads more to the involved processes, however, a discussion might help to understand uncertainties of model results. Could this maybe be attributed to the synthetic input data series?

Table 2: Runoff from the catchments is mostly >2500 mm/yr while precipitation was only 2000 – 2500 mm/yr in the study period. How does that fit?

Technical corrections: p. 15876 l. 15: Delete the power after 100 m

p. 15876 l. 27: total runoff volume (or delete "volume")

p. 15880 l. 8: as function of time

p. 15880 l. 16: delete "the" in . . .the Eq. (1). . .

p. 15883 l. 13: expressed as average values

p. 15883 l. 22: clearer: . . .a decreasing trend with increasing sampling depth. . .

p. 15883 l. 25: with increasing soil depth

p. 15886 l. 15: regardless of

p. 15888 ll. 7-9: Can you rearrange this sentence – it is difficult to understand

p. 15888 ll. 12-14: This sentence is also not clear – please reword.

Table 1: "m a.s.l." and "(weeks)" have to be shifted one column to the right

Table 4: Is the superscript "a" for N, σ, NSE and RMSE of relevance?

Table 5: τ is given in years, not in weeks. For a better clearness of the table it could help to separate the observed and the modelled data by a vertical line.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 15871, 2013.

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