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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Exploring the interplay between state, structure and runoff behaviour of lower mesoscale catchments" *by* S. P. Seibert et al.

Anonymous Referee #2

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This paper discusses catchment functions with particular focuses on the storage dynamics. It deals with various important aspects with a number of related references, and the scope of the paper fits to HESS.

However, current manuscript shows so many different components and unfortunately they are not well interlinked to achieve the authors' original challenge on explore the interplay between state, structure and runoff behavior.

Although one of the main focuses is on the normalized dimensionless storage predictors, as primarily described in the method, the manuscript also touches upon other things including the relationship between topography and runoff ratios, temporal sampling frequency, triple mass curves etc. As a result, it is currently very difficult to un-

derstand what the authors would like to solve or propose in this single paper and the significance of the manuscript becomes unclear.

Furthermore, the logic of the evaluation for the three storage predictors must be well defined. Obviously different predictors represent different properties, yet they are all related to the catchment storage. Therefore well understanding of the predictors' characteristics is very important in qualitative way. However, what confuses me is that the authors tend to say the predictor showing the higher correlation to the compared indices is the best. Related statements appear many times, for example on L784 in P.24. Please describe clearly your logic on the evaluation of the predictors.

Secondly, the rationale of the normalization is unclear. The values can be easily converted to be non-dimensional, but it is effective only if you can normalize them in a physically meaning manner. In the current manuscript, all of the result figures show the relationship between the predictors and the compared variables at each catchment and its evaluation basically conducted based on the rank correlation. If this is the purpose, I do not see any necessity on the normalization.

Moreover, the equation (3) normalizes the average discharge volume divided by soil porosity. What does this mean physically? Also the equation (2) sums up the difference between (P - E) whose total values vary significantly depending on the duration of the summing up. If so, how can you convince it was successfully normalized by the porosity? Why can it be better than the original values? The same concern is applied to the equation (4) also, especially Ks from a soil map can vary significantly by some orders with large uncertainty.

In addition to the major above major concerns, I have the following minor comments..

1. P1. L9: the meaning of "extensive/additive" and "intensive/non-additive" is unclear.

2. P1. L14: "the latter case" is unclear to specify the listed three items.

3. P1. L20: what is "proposed non-additive response measure"?

4. P2. L24 does the summary of the conclusion starting from L24 actually correspond to the original objective of the study?

5. P9 L294 please describe the method to separate event quick flow and base flow.

6. P12 L394 Larsim -> LARSIM to be consistent to L389

7. P15 L487 explain what is "power model exponent"

7. P16 L527 It is unclear if "CR_E and theta are often pretty linear, whereas that between CR_E and dS indicates threshold behavior" according to the figure.

8. P17 L545-550 This part is not clear.

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