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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 #3

This is an interesting paper that explores the underlying functional behavior of catchments in terms of dimensionless quantities that describe catchment processing/transmission of water. It is clear that the authors have done a lot of work – time-series analysis, modeling, etc – to complete this study. I particularly enjoyed reading it! However, I found it very difficult to follow details of the analysis throughout, and have questions related to uncertainty and how it may propagate in a study such as this.

A few questions for them: 1. While I generally enjoyed the paper, I found the organization of section 3 very difficult to follow. What data do you use to compute your statistics? Many different data are mentioned in this section including met data (relative humidity, etc) and modeled data (ET, etc). I am guessing some met data are

mentioned only because they were needed for modeling, while other products were used directly to compute statistics. It would be helpful if you directly state which data are used to compute your statistics and which are used for LARSIM. I think you were trying to be inclusive, but the generality here leaves me a little confused. For instance, what data are included in hydro-meteorological time series? 2. Along these same lines, you mention catchment characteristics data in section 3.1, but do not direct readers to Tables 1 and 2, or mention which catchment characteristics you derive or why you derive them. Brevity is good, but I found that without introducing them, when you mentioned derivatives from these datasets in results and discussion I was a little lost. 3. I guess I see the requirement of modeling (to obtain ET) as a potential source of added uncertainty in this analysis. While I see that the modeling results are published in a second paper, and I recognize you do not have to defend these results in this new paper (and as well that ET is an important part of a catchment functioning analysis), I do think it is important that you acknowledge some of the uncertainty that comes from using a derivative of a model in this type of analysis. I think our community does a good job acknowledging potential sources of uncertainty from modeling and problems related to equifinality, but I also think we run the risk of incorrect interpretation when we do not directly include this uncertainty in analyses such as the one presented in this paper. For instance, if your input data to your model was assumed to have an error of +/- 5 or 10%, and this error was propagated you're your ET signal, would this change your conclusions? It might be worth adding a short discussion of potential limitations in such an analysis. I'd be interested to see if you come to similar conclusions if one or two of the sites are located close to an Eddy-Covariance tower, and if those measured values were used in this analysis (recognizing as well that ET from Eddy-Covariance is a derivative data product with error). 4. In the introduction to the paper and in the discussion, I felt like there were two sources of literature not acknowledged. Again, brevity is important, but this work reads as very similar to the literature on runoff generation and the literature on catchment classification. I noticed the absence of some seminal/recent papers from both sources that could potentially bolster your introduc-

tion and conclusions. 5. I completely understand needing to use abbreviations in results/discussion, but I found it again very difficult to link your acronyms back to their description in Section 2 of the paper. A table linking acronyms, descriptors, and their importance in determining catchment functioning would organize the many different pieces. 6. You introduce the ideas of additive vs. non-additive in the abstract, but this does not follow throughout the paper. Consider removing, reframing. 7. What makes a dimensionless quantity better than a dimensional quantity? How is what you have framed different from other catchment classification studies? Why should we normalize measures others have used?

Minor comments: -A minor point, but consider limiting the use of the word "essentially" – there were a few sentences when it was used twice! I think it detracts from the quality of your point Line 51+: grammar Line 79+: grammar – relative? Line 674: full reference missing

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