

Interactive comment on “Learning from satellite observations: increased understanding of catchment processes through stepwise model improvement” by Petra Hulsman et al.

Anonymous Referee #2

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General comments:

The manuscript is very well written and nicely illustrated. It deals with an interesting topic of model structure and gaining information from satellite data in a data sparse basin.

It makes the paper less interesting that there are essentially no major changes to the simulated spatial patterns of ET across Model A-F (e.g. Figure 11) and that the general simulated spatial pattern does not resemble the observed in any way. It seems that you are not addressing the most important issues in your set of alternative models (B-F). The general interest of the manuscript would increase greatly if some of your

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hypothesis would at least produce a different pattern from Model A.

The simulated spatial pattern will be a reflection of both model structure and parametrizations scheme, in my experience mainly the latter. Therefore, I strongly suggest that you add a set of model setups that reflect different spatial parameterization schemes. In your discussion you address this limitation nicely, but I also feel that the manuscript would benefit greatly from an additional analysis illustrating the importance of model parameterization and parameter distribution on the simulated spatial patterns. Basically, even the most sophisticated model structure cannot be expected to reproduce a correct spatial pattern without a sound, flexible and spatially explicit parametrizations scheme.

I think you can logically add such an analysis to your manuscript in line with the idea of learning from satellite observations, by letting the observed spatial patterns guide your spatial parametrization approach. Such a parametrization scheme could also include transfer functions or simple spatial relations to known variables such as elevation, slope, soiltype, LAI etc.

In sections 3.1.2 and 3.1.3 it is unclear why the different structural changes were applied. The title suggests that you are learning from satellite data, but it is not clear to me how you learn and how you used the satellite data to make new hypothesis about model structure. It is mentioned several times that you diagnose model deficiencies, however it is unclear to me how this is done. I believe this should be elaborated in a revised manuscript.

Specific comments:

An issue with the use of the SPAEF metric for the water storage anomaly might be, that the histogram component of the metric, might not be so meaningful when applied to the coarse spatial resolution of 1 deg., with very few grids. You could look into this by examining the three components of the metric separately. I do not suggest to put this analysis in the paper, but it might be mentioned in a discussion.

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Did you perform any sensitivity analysis to explore which model parameters, structures or compartments were most important for simulating spatial patterns and temporal dynamics?

3.1.2 First model adaptation (Models B – D) : Please describe what made you chose to make exactly these structural changes? Line 522: How can you argue that you significantly improve the spatial pattern of ET? Your ESP,ET might increase slightly from 0.18 to 0.23, but looking at the maps in Figure 11, Model F has the same pattern as Model A and none of them resemble the observed pattern.

Technical comments:

Figure 11 and similar figures: I suggest that you condense the figures to make less white space and thereby allow the reader to make a better visual examination of the observed and simulated patterns. You can skip the lat long degree for instance, they can be added to figure 1 instead.

Line 59: " to spatial pattern of" change to " to the spatial pattern of" or to " to spatial patterns of" Also in line 66 + 79 "spatial pattern and temporal dynamics" I suggest writing "spatial patterns"

Line 78: "for a large river systems" change to "for a large river system"

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