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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assimilation of SMOS brightness temperature into a large-scale distributed conceptual hydrological model" *by* Renaud Hostache et al.

Renaud Hostache et al.

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We would like first to thank Referee 3 for the careful reading of the paper and the relevant remarks and comments. In the remainder, Referee 3's remarks are written in normal font while **our answers are written in bold**.

I fully agree with the author to try out the usability of a conceptual hydrological model (when compared to detailed LSMs) assimilating TB, in terms of capturing hydrological processes at large scale. Such concept of spatially calibration (or DA to enable optimal estimate) is very innovative to overcome certain calibration problems of distributed hydrological model with only one stream flow gauge.

We thank Referee 3 for this assessment.

I do have several comments for the authors to consider: 1. The manuscript focused on SFX model simulations and their coupling with CMEM as well as the whole setup in the DA framework, as well as the results comparison with the previous study using CLM. Although it is understandable that the author try to maintain the quasi similar setup to enable the consistent comparison, the current presentation of such 'similarity' is not clear. Lots of details need to dig out by readers via reading the paper of Rains. This reviewer is wondering if the author can make better presentations on this perspective, either via a diagram, via summary tables, etc.

We thank Referee 3 for highlighting this. We will put efforts on further explaining and clarifying the similarities and the differences between the two experiments. We will in particular add a better description of Rains et al (2017)'s experiment and CLM model.

2. It is very good to see the forward simulation comparisons between SFX-based and CLM-based models. On the other hand, the advantage of assimilating SMOS TB on soil moisture and ET is not presented in a satisfied manner. The manuscript only shows the performance for the in-situ sites, but not the spatial pattern changes of soil moisture and ET (before and after assimilating Tb). This point should be addressed to show straightforwardly the advantage of incorporating spatial information for distributed conceptual hydrological model simulations.

According to Referee 3's suggestion, we propose to add figures with assimilation increments in the revised version of the paper to further investigate the effect of the Tb assimilation on spatial patterns of SM and ET.

3. It is not clear if the author only run the model at the timestep of satellite observation intervals or also run the model in between observations? E.g., if the model only start to run with the satellite observation when they are available, then the author missed a lots of details in between satellite observations It is assumed with the forcing the model

can get more frequent simulation results as outputs to capture hydrological processes?

We apologize that this was not clear enough. The ensemble of models run at an hourly time step as well in-between SMOS observations. We will clarify this point in the revised version of the article

4. Last but not least, it is strongly recommended to have a native English editor to go through the manuscript. Some specific comments please find attached PDF.

According to Referee 3's suggestion, a native English speaker will carefully read and edit our paper before its resubmission. The Specific comments in the supplementary review material provided by Referee 3 will be carefully addressed in the new version of the paper.

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