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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.

Anonymous Referee #2

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The main objectives of this study is to compare a large-scale conceptual hydro-meteorological model (SUPERFLEX) and a physically-based land surface models (CLM) in their ability to simulate SMOS-like brightness temperature (Tb) and soil moisture, and (ii) to evaluate the improvement in model predictions when assimilating SMOS Tb observations. It is well written and the abstract reflects the objectives and results well. Results are supported by appropriate figures and tables, references (some could be updated). This study is very interesting and promising. However, the paper does not do it justice. I feel like it was written quickly and that the authors skimmed over some key explanations. A more in-depth explanation of the methodology and analysis of the results are necessary. They are some caveats and I am particularly concerned

about the title that does not reflect the real purpose of this study (comparison the ability of SUPERFLEX and CLM to simulate Tb and soil moisture). To me this kind of comparison is a bit unfair from the beginning as you do not necessarily want a large-scale distributed conceptual hydrological model and a large scale physically based land surface model (CLM) for the same purpose (?) Not to mention the fact that SUPERFLEX is calibrated, what about CLM? If authors wish to pursue in this way, then I am missing a proper description of the CLM set up (not only referring to a previous study and mentioning a 'quasi-identical' set up). My recommendation is major review, please find below an attempt to help.

General major comments (additionally to what is mentioned above) -From the abstract I see scores and headlines but I have no clue where the study takes place, please introduce south eastern Australia from the beginning (maybe from the title, it has to change anyway to reflect the content of the work).

-Also from the abstract it is surprising that ERA-Interim is still used rather than ERA5. The recent literature (2018, 2019) is already full of studies demonstrating the added value of ERA5 with respect to ERA-Interim. I assume that in the previous CLM study (Rains et al., 2017) ERA-Interim was used and that is the rational for keeping it. This should be stated somewhere and ERA5 mentioned, if not tested as I believe it will prove useful.

- work must be done on statistical scores to provide an indication of how significant they are, I suggest to add at least p-values to assess the significance of each datasets and a 95% confidence interval (based on boot strapping?) to assess either or not differences from the 2 configurations are significant (that can possibly hamper your conclusions?).

-Figures and tables should be self explanatory (?) please expand captions, add units when necessary (Kelvin. . .), label each panels for sake of clarity and refer to the labelling in the captions (some figure are hardly visible).

Other comments - scores from the abstract should more detailed, are you talking about

surface soil moisture? Root zone soil moisture?

- P.2, L.13, '[...] as uncertain forcing [...]' OK so justify the use of ERA-Interim over ERA5

- P.2, L.27, surface soil moisture (SSM)

- P.3, L.5, November 2019 ? Do you mean 2009 ?

- P.14, L.15, "[. . .] is impacting soil moisture variations more significantly [...]" what is the meaning of "significantly"?

- Figure 2 must be improved, ground based measurement stations are barely visible, also is the main river represented the only one in Australia (this is not a paper quality figure).

- section 2.2.1, if this work has been published elsewhere, maybe it can be put in an annexe / supplementary ?

- P.7, L.2, "[. . .] 0.25° matching the one used in ERA-Interim dataset." misleading at you put is at 0.25° while its native spatial resolution is closer to 80km

- I am missing somewhere a clear description of the 2 models set up

- Section 2.2.3, please discuss further the possible impact on the 2 models comparison.

- Figure 3, units, significance, labels

- Table 1, as it stands it is not very useful, expand the caption so readers may know what is it about, statistics between what and what? What are the units? Cal stands for calibration, Val stands for validation...(general major comment), use same number of digit..

- Figure 4, is left panel useful? Significance of the differences in figure 5?

- P.15, L.6, "[. . .] time series [...]" a figure would prove useful

- Figure 6, same min/max for axis of left and right panels

- P.17, L.9-12, please discuss the use of SMOS anomalies as it could be an explanation (?)

- Figure 8, I do not understand bottom left panel, rainfall and #obs? Also why the number of stations differs from a panel to another?

- Figure 9 is interesting!

- Figure 10, not clear enough that 5 pairs of data are represented on the Taylor Diagram, pleas improve the quality.

- Title presents 1 objective, the abstract 2 and the beginning of the conclusion 3, please be consistent.

- I am personally not a big fan of bullet points in a conclusion but I may be a personal statement.

Thanks!

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