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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Comparison of measured brightness temperatures from SMOS with modelled ones from ORCHIDEE and H-TESSEL over the Iberian Peninsula" *by* A. Barella-Ortiz et al.

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This paper described a comparison between physics-based forward modelling of brightness temperature (TB) by two models (ORCHIDEE and H-TESSEL) with SMOS derived TB. Although the temporal pattern seems to match, the absolute values and spatial pattern do not. These differences cannot be explained (i.e., are not caused) by precipitation errors, land surface temperature or model-forcing datasets.

In my view, I think the approach of comparing forward-modelled TB with actual mea-

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sured ones is very valid and a difficult hurdle to take. Therefore, I encourage the authors to continue this research. However, the conclusions reached (i.e. which factors do not cause the difference) are not mentioned. Furthermore, please include the effect of topography/slopes on the incidence angle as a possible cause for these differences in your analyses.

Textual and structural, the paper should be improved. That is why I recommend major revisions. The authors tend to dive into 'discussion mode' in several sections where they should not and where the text could be more concise. I have given some suggestions for restructuring below.

Answers to the review criteria: 1. Does the paper address relevant scientific questions within the scope of HESS? Yes.

2. Does the paper present novel concepts, ideas, tools, or data? The concept is original, but not new, as the authors themselves say that similar exercises with TB and SMOS have been performed (e.g. p. 13022, line 25). I like the set-up of comparing TB of forward models with satellite-measured; I think it is the right way to go.

3. Are substantial conclusions reached? This is hard to answer. Although the conclusions are a bit weak, these conclusion could be that we can rule out that the differences between models and SMOS data does not stem from precipitation errors, land surface temperature and model biases? But those conclusions are not given in the abstract text.

4. Are the scientific methods and assumptions valid and clearly outlined? Yes they are valid, but they are not clearly outlined, as the methods part is tucked away in a section input and methods, which I think should be separated.

5. Are the results sufficient to support the interpretations and conclusions? Yes.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Description could

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be much clearer and concise. Which again I think is just a matter of re-structuring and more concise texts.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes, although a clearer context could be given in the introduction that this work stems from earlier work and what the added value of this paper is.

8. Does the title clearly reflect the contents of the paper? Yes.

9. Does the abstract provide a concise and complete summary? No, since the conclusions (that the differences cannot be explained by P, LST and model bias etc) are not in the abstract. I have furthermore put some minor textual corrections of the abstract further below.

10. Is the overall presentation well-structured and clear? The overall presentation is too elaborate, tends to go into discussion in sections where it shouldn't (for example, data and methods and results). In my opinion, the paper should be restructured in a better separation between input data and methods, a better separation between results, and analyses of these results. The analyses themselves are also quite complex, so these could maybe be described in methods first. The text is too long and should be more concise in several parts. It seems that there are parts of a discussion in all sections. Try to be more concise please. I stopped my detailed textual comments at the EOF analyses text, since it became too unstructured for me to understand.

11. Is the language fluent and precise? No, it could be more fluent and precise. By doing that, it will also make the text more concise. Please try to put the main clause first, that will solve a lot of your textual problems. http://www.oxforddictionaries.com/words/clauses

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? They are not used, except for a textual explanation of what brightness

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temperature is. But that is ok.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes. A lot of the sections can be reduced. It seems that the authors go into 'discussion mode' in each and every section. If they can avoid that, the text could be much more concise. I have given some examples in the detailed text below, as well as some options for re-structuring. For example, separating the description of input data/models and methods used, discussion and conclusion.

14. Are the number and quality of references appropriate? No, at some locations they seem to be missing. See detailed comments for details.

15. Is the amount and quality of supplementary material appropriate? There is no supplementary material provided. The authors could consider using supplementary material to make their article more concise, but I think they would be better off putting in a lot of effort in trying to make the text more concise.

Overall general comments: The text would be somewhat clearer if input data and methodology would be separated. I now have trouble understanding what part of the input data was processed by the authors and what part of the processing was already provided with the input data set. Also, make sure you are then consistent with the past tense (e.g., we derived TB using this method). It seems like either the 2.1 and 2.2 were written by different persons, or that the authors clearly know more about the 2.2. The text does not look like a unified text. I think distinguishing between used data/models and the methodology could partly solve this. The authors are too elaborate and tend to go into 'discussion mode' in most parts of the paper where they shouldn't. For example, in the data and methods section. They should be more concise and to the point. There should be a clearer explanation of why the temporal pattern seems to match, but the spatial pattern not. There must be some areas then where the temporal pattern also does not match? Please explain clearer. Please consider the topography as one of the candidate for the difference found. Please consider separating discussion and

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conclusion. Please explain each topic per sub-section in a discussion, which makes it clearer (and hopefully more concise). Sorry, I stopped my detailed textual comments at the EOF analyses text, since it became too unstructured for me to understand.

Detailed comments P13020: abstract Just use ORCHIDEE and H-TESSEL and explain the abbrevations in the input data. I would leave out the "(CMEM)" and introduce the abbreviation in the input data section. Line 13: "However, their spatial structures. . .". Considering the sentence before, it is not clear what their points towards. P 13020: Line 23: Replace 'nowadays' by 'at present' . Line 25, use proper reference of WWDR

P13021: "Remotely sensed soil moisture products have brought about new ways to perform data retrieval, adding new observations to data assimilation chains. The optimal combination of these products with modelled ones is expected to provide best estimates of the true soil moisture state." I think that ground-observed soil moisture should play a role here and should be mentioned too. Otherwise, the statement is not correct (after all, modelled ones are a guess, and remotely sensed ones are quite noisy). Or do you have a reference that claims this statement?

P13022: Line 2. Please add 'and the relatively large radar wavelength of the L-band' at the end of the sentence.

P13023: Line 20: "Furthermore, SSM is a critical variable regarding water resources especially in the Iberian Peninsula, . . .". Why is it critical in the IP? Line 21. Use 'IP', not 'Iberian Peninsula'. P13024: Line 17: "and SMOS TBs at the antenna reference plane were derived". Did the authors derive these? If yes, this should be clear. Also, if yes, lines 17 and further should be also in past tense (e.g. line 18, "These TBs were first screened out . . .." etc) Line 23: "These TBs have been first screened out for Radio-Frequency Interferences (RFIs) (strong, ... from the Icosahedral Snyder Equal Area (ISEA) 4H9 grid to a 0.25 regular latitude–longitude grid, which is easier to manipulate." Did the authors do this? If so, put it in past tense, so it is clearer whether that has been done or not. Further, is there any study known that

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describes the effect of the topography on incidence angle (i.e. local incidence angle)?

Page 13025 Line 23 - “The reason being that Wilheit (1978) was chosen in. . .” Please correct this to correct English into something like: The methodology of Wilheit (1978) to compute. . .. was chosen, because. . ..”. This also goes for all other times Wilheit is mentioned in the journal. Line 23: - “because it is more physically based..”. More physically based than what?

Line 25: - Fresnel’s law. Do you have a reference? Also, this part, up to page 13026, line 18, looks somewhat like a discussion. I think this text should be in, but please be to the point and clearer. For example: “The methodology of Wilheit (1978) was used to calculate TBor. It considers the soil . . .... etc . Fresnel’s Law (ref) was used to calculate TBht. The differences between the Wilheit and Fresnel’s law are: . . .”

Page 13026 Line 20: ‘Several differences van be identified between. . .’ You do not start an explanation of models like this. First start with the introduction of the two models, then very concise explain some differences, but refrain from stepping into the discussion mode. For example, start with line 24. Line 24: “The hydrological scheme used by ORCHIDEE is based on the model of the Centre for Water Resources Research (CWRR)” Please cite the model of the CWRR model if possible.

Page 13027 and 13028. The whole text is based on the difference between the two models. I think this is a wrong approach, as it makes the text very confusing. First state the two models, then concisely explain their differences. For example, for three subsections of ORCHIDEE, H-TESSEL, and DIFFERENCES would be clearer.

Page 13029 Line 6-7: “Since H-TESSEL’s surface state variables consist of a value each 6 h“ This should have been mentioned in the explanation about the models and I cannot find it.

P13030 3 Results. The author step into comparison straight away. I think they could be better off and clearer if they first present the results. So the separate results of TBSM,

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TBOR and TBHT with some clear explanations. Then add a section 4. Analyses of the results. Starting with 4.1 Comparison of modelled and brightness temperatures, then 4.2 Temporal and spatial characterisation of the error and 4.3. Annual cycle of brightness temperatures. P13042. Line 5: “This study complements a previous one where modelled Surface Soil Moisture (SSM) from the ORCHIDEE Land Surface Model (LSM) was compared to retrieved SSM from SMOS (Polcher et al., 2015).“ This sentence states clearer that this work complements earlier work. Please use this clarity in a sentence in the introduction as well.

I am sorry, I stopped at the EOF analyses, since it became too unstructured for me to understand. Please restructure first.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 13019, 2015.