

Interactive comment on “Cross-evaluation of modelled and remotely sensed surface soil moisture with in situ data in Southwestern France” by C. Albergel et al.

Anonymous Referee #1

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Review

Albergel et al 2010, HESS

Cross-evaluation of modelled and remotely sensed surface soil moisture with in situ data in southwestern France

The paper evaluates ASCAT retrievals of surface soil moisture along with land model and NWP operational products against in situ observations over the SMOSMANIA and SMOSREX sites in southwestern France. The authors find that the ASCAT retrievals have useful skill (average correlation coefficient R v. in situ around 0.6). The model and

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operational products show typically higher skill (average R values 0.63–0.84). Moreover, when the ASCAT retrievals are evaluated against the model products (rather than against the in situ measurements) the skill is higher (average R value around 0.65) because of (i) the distributed nature of the model grid cells and retrieval footprints, which contrasts with the point-scale nature of the in situ observations, and (ii) the similarity in the vertical scale between the ASCAT retrievals and the model simulation, which contrasts with the deeper 5 cm depth of the in situ observations.

The paper is well-written and addresses an important topic that should be of great interest to HESS readers. The results are generally sound and well supported with figures and tables. I therefore recommend publication after the authors have addressed the comments listed below. Comments 10, 11, 13, and 14 are perhaps the most relevant scientifically. The remainder of the comments mostly addresses shortcomings in how the results are presented.

Comments (in no particular order):

- 1) It is a bit confusing which stations are omitted from the comparison. It might be helpful to include station MTM in Tables 2 and 4 and list the metrics as "n/a". Similarly, Tables 5 and 6 could list SMX with "n/a".
- 2) Tables 1, 2, and 4 should include a final row that tabulates average values across the stations (for ease of interpretation and cross-referencing with the text, where most numbers are mentioned).
- 3) Tables 2 and 4 should be merged. This would make it easier to see that ASCAT compares better to SIM than to in situ obs, and it would cut down on the number of different tables. It is a bit confusing at first to keep track of what is evaluated against what.
- 4) Are the black lines in Figure 3 identical to the lines shown in Figure 1? From the text I understand that in both cases the black lines show the 5 cm in situ time series.

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However, the lines in Figure 1 show more pronounced peaks. It is not clear whether the two figures show different things or not. If they are different, please explain clearly. If not, Figure 1 should be deleted (because it would be repetitive).

5) Figure 2 should include a marker for the SMOSREX site.

6) Figure 4 is hard to read and discussed in the text in only one sentence. It should be deleted or improved with additional discussion.

7) I am guessing that the bias and RMSE values in Tables 2-4 are in non-dimensional units obtained after rescaling the ASCAT retrieval according to equation 3 and also rescaling the in situ obs (as discussed on page 12). Please emphasize in the discussion and captions of Tables 2-4 that the units are different from the m3/m3 units that are used in the other Tables. As it stands the discussion is confusing, in particular since you convert the non-dimensional units back to m3/m3 for the ASCAT RMSE v. in situ (page 15, line 6).

8) I am surprised about the use of the word "synthetic" for soil moisture estimates from a land surface model (SIM). These "synthetic" estimates are no more synthetic than the "operational" products. In both cases, estimates of precipitation and radiation forcing (along screen-level obs for the operational products) are converted into soil moisture based on physical models. Considering this, the ASCAT retrievals can also be considered "synthetic" because they are based on converting backscatter observations into soil moisture. I would recommend to replace "synthetic soil moisture" with "soil moisture from a land model".

9) Page 16: Figure 5 is discussed in just 2.5 lines. Such a short discussion does not warrant a figure. Please expand the discussion or delete the figure. It is not clear, for example, whether the situation is similar at the other stations.

10) Page 16, section 3.2.3 first sentence: The linear transformation of the ASCAT into the downscaled ASCAT product may not affect the correlation coefficient, but it

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should affect the bias and RMSE. It is thus not clear why these metrics are not further discussed in the paper for the downscaled product. I think they should be.

11) Page 16, section 3.2.3, and Figure 6: Are the "spatial correlation" R values plotted in Figure 6 really based on just 10 data points in each case (9 SMOSMANIA stations and the SMOSREX station)?? The confidence interval associated with each of these R estimates would be huge. What are the average the R values over all 150 images (separately for ASCAT and downscaled ASCAT)? While Figure 6 motivates that the average R values (over 150 images) is greater for the downscaled ASCAT product than that of the ASCAT product, the difference might not be statistically significant. This must be investigated further.

12) Page 16, line 5 from bottom: "For each date at nine stations, ASCAT data at one km scale are spatially averaged and compared with the in situ observations." I do not understand why/how the "ASCAT data ... are spatially averaged" in this context. Please clarify.

13) Page 18, Figure 8: If the ECMWF IFS_F6ui estimates are better than the SIM estimates, why is the IFS_F6ui product not considered the "alternative truth" against which the ASCAT obs are evaluated (section 3.2.2)??? See also page 19, lines 4-5.

14) page 19, lines 3-4: "Re. ASCAT estimates, it was confirmed..." I do not see how this was in fact confirmed. You did evaluate ASCAT against in situ obs, but as far as I can tell the study does not prove that you can do so – except if you assume that the in situ validation yields results that are consistent with the validation against SIM. At some point you have to *assume* a "truth". Because that "truth" will always contain errors (measurement errors and representative errors in the case of the in situ obs; forcing and modeling errors in the case of SIM), it is really an assumption. At best you can conjecture that the errors in the "truth" that is used to validate a given dataset are much smaller than the errors in the dataset that is being validated.

15) Page 19, final sentence: "While the assimilation of ASCAT data ..." I am confused.

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Did you not just evaluate the IFS_F6ui (with assim of screen-level obs and ASCAT) versus the operational ECWMF (with assim of screen-level obs only), thereby separating the contribution of the ASCAT assimilation? I think what you are trying to say is that the operational ECMWF uses a different assim technique (OI) than IFS_F6ui (SEKF), but this is not at all clear from the sentence as it stands.

16) Caption of Figure 5: Change "Probability density function of the three datasets..." to "Probability density function of SSM for the three datasets..."

17) Table 3: There are many commas left in this Table that should be changed into decimal points.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 4291, 2010.