

## ***Interactive comment on “Assimilation of SCATSAR Soil Wetness Index in SURFEX 8.0 to improve weather forecasts” by Stefan Schneider and Bernhard Bauer-Marschallinger***

### **Anonymous Referee #2**

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This study is very interesting and promising. However, the paper does really not do it justice. I feel like it was written quickly and that the authors skimmed over some key explanations, presentation of the results and proper discussions. Additionally I disagree with several statement made by the Authors (my points are discussed below). I believe that there are too many things to do to reach the potential of this paper. I recommend the editor to reconsider the submission this paper. That is why my recommendation is reject and encourage to resubmit. Please find below an attempt to help.

#### Major issues

P.1, L.7: ‘to date [...] soil moisture data’, it is a strong statement, moreover I don’t

C1

see why and rather disagree. The T-value approach exists from nearly two decades (Wagner et al., 1999, see also Wagner’s PhD Thesis)...My understanding is that it acts as a low pass filter, smoothing the values from the surface as well as adding a small time shift (?). As you mention at latter stage you match the climatology of the estimated (rather than observed) soil moisture to the one of the model. By doing it you want to keep the short term variability of the assimilated product. This short term variability is probably lost in T-value approach when using to high T-values (but you may want to prove me wrong). P.6, L.16, I also believe you should justify more the use of the T-values themselves, giving a general rule on how to translate a given T-value to a certain soil depth is currently not possible since this depends strongly on the application and the soil composition of the area of interest. This is not discussed enough in the manuscript. I suggest that the T-values methodology needs to be developed as the reader needs more explanation to fully understand why choices were made and what are the implications of those choices. P.6, L.16, to understand the link between model and observations, could you please show the estimated Jacobian and interpret the results, I believe it is interesting. More information on the DA set up and methodology is needed, I am not sure that I understood which was the model equivalent of the observations. Data assimilation description is rather poor (what about the model and observation errors, this a key aspect of DA), a diagram showing the general flow and design of the DA will be very helpful as well. Please add an experimental set up section. P.7, first paragraph reads like one of the rational of the study if not the rational, this story about forecasting convection belongs to the introduction (?) P.10, ‘due to lack of measurements’, I disagree, as stated above the T-value approach exists for long time and your sentence implies that you have a brand new observation type which is wrong. Reference section: several references mentioned in the text are not in this section (the opposite is also true). General comment on figures: what is GMD policy for figures? I suppose you need scale and North on all of them (?)

#### Other issues

C2

P.1, L.21, 'results are not that clear', please rephrase. P.2, L.3, 'usually thin (0.01m in SURFEX' OK however many recently published paper using SURFEX land surface data assimilation do not consider this superficial layer and use the second layer of soil of SURFEX (or rather ISBA, the land surface model in SURFEX) as model equivalent of the surface soil moisture. P.2, L.9, 'years ago with Mahfouf (2010)', please rephrase P.2, L.18, You should double check as I am wondering if your approach has been tested by Barbu et al., 2011 or 2014. P.3, L.4, what is TU WIEN? P3., L.7, where does the soil porosity comes from? P.3, L.10, explain T-value better (see comment above), what is SCATSWI-SWI ? P.4, L.5, I always got confused with soil layering, better to have a diagram to clearly show the detailed layering scheme. P.4., L.11, what is ZAMG? P.4, L.12, I am confused, title says SURFEX 8.0, here it is written version 7.3 and acknowledgement section refers to 8.1, please clarify. P.4, L.13, which modifications? P.5, L.10, what are those working steps? P.5, L.11-13, you refer more to your experimental set up that to SURFEX in general (?) A section describing the experimental set up is always welcomed. P.5, L.15, what is SSF? Acronyms are required, see GMD publication policy. P.5, L.16, what is CMASK? P.5, L.17, what is 150? P.5, L.21-22, using which soil layer? P.6, L.8-14, This paragraph needs more discussions. P.6, L.21, see my comment above on soil layering. P.7, better to describe the experiments in a Table. P.8, you must explain/discuss those results. P.9, L.17, use of 'obvious' seems too strong to me in this context. P.10, L.7, what is 'met' P.10, L.10-14, you have to go further and look for example to the seasonal scale and possible decoupling between surface and deeper layers. Table 1, add information on the sampling, I personally find CC values rather low (?) could you comment on that? SURFEX soil moisture has been evaluated in many papers.

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