

Interactive comment on “Using data assimilation to optimize pedotransfer functions using large-scale in-situ soil moisture observations” by Elizabeth Cooper et al.

Anonymous Referee #1

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The author demonstrates the need to use PTFs for LSMs and propose to use DA to calibrate PTF parameters with COSMOS-UK soil moisture measurements. The calibrated PTF parameters for Cosby PTFs were used to run JULES, and a better match with in-situ SM measurements was found. Although the structure of the manuscript is clear, there are some unclear points needed clarification.

Major Concern: 1. In the conclusion, the author claimed that “Calibrating PTFs for the soils on which they are to be used and at the scales at which they are applied, rather than on small-scale field or lab soil samples, will ultimately improve the performance of land surface models.”

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First of all, I agreed with the author that the LaVenDAR DA framework was used to calibrate the Cosby PTF parameters (k1-k12). On the other hand, there is a very strong assumption the author is making here, which is that they deemed the soil texture information as from HWSO is the one very close to the in-situ conditions. This is not always true as demonstrated by the work below:

Zhao, H., Zeng, Y., Lv, S. & Su, Z. 2018, Analysis of soil hydraulic and thermal properties for land surface modeling over the Tibetan Plateau, Earth system science data. 10, 2, p. 1031

This actually means that the better match between predicted SM and the COSMOS-UK SM measurement, as demonstrated in this study, can be achieved with any other soil texture information input (e.g., SoilGrids, or FAO-UNESCO). But then, this is very dangerous then, as it will lead to a speculation that the in-situ measured soil information is not important

2. For the subsections 3.2 & 3.3, they are not independent. Furthermore, the subsection titles seem need further critical thinking (see specific comments). ‘Effect of Data Assimilation on’ does not reflect the contents and seems not justified, especially when the k1-k12 were used as the state vector, which is supposed to be updated with DA and therefore the soil physics properties via Eq. 2-11.

3. How were the COSMOS-UK SM measurements calibrated is not clear. It is understood that there were previous publications. However, some specific descriptions on how the CRNP measurements were calibrated in the table3 will help readers to understand why this or that station works. The relevant part of discussion on this is too thin.

Specific comments: see attached annotated PDF.

Please also note the supplement to this comment:
<https://hess.copernicus.org/preprints/hess-2020-359/hess-2020-359-RC1->

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