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Hydrology and Earth System Sciences Discussions

Interactive comment on "From near-surface to root-zone soil moisture using an exponential filter: an assessment of the method based on in-situ observations and model simulations" *by* C. Albergel et al.

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The authors thank the anonymous referee #4 for his in-depth review and his useful suggestions. For an easier comprehension, general comments of the referee are also reported (4.XX).

4.1 [Variable units in some cases are missing. A revision of the units of each variable used can help to make some part of the paper more comprehensible.]

Response 4.1

Yes, we agree that the different soil moisture definitions may be confusing. wg is the water content of a surface soil layer [m3/m3], 5cm for SMOSMANIA stations, 0-6cm for SMOSREX, a few mm for SIM. w2 is the root-zone soil moisture content [m3/m3], measured at 30cm (SMOSMANIA), at various depths (SMOSREX), or integrated over the root-zone profile (SIM and SMOSREX). Prior to filtering, soil moisture wg observations or simulations are scaled between [0,1] using maximum and minimum values of each time series (ms, dimensionless). The dimensionless SWIobs used in Eq.(7) to assess the quality of the results is the reference w2 (either observed in situ or simulated by SIM) scaled to [0,1] using maximum and minimum values of each time series. SWIm is the result of the exponential filter. It is dimensionless and comprised between 0 and 1.

4.2 [p. 1614, l. 2. Application of the exponential filter: "Moreover, undesired effects in the real data base due to local climate incidences are more pronounced in the afternoon, and were therefore avoided". The authors should be more explicit and a little explanation of such effects could be useful.]

Response 4.2

Measurements by the ThetaProbe impedance moisture probes used in SMOSREX and SMOSMANIA are moderately sensitive to temperature. In dry conditions, this effect may be more significant (Escorihuela et al. 2007: Escorihuela, M.J., de Rosnay, P., Kerr, Y., and Calvet, J.-C.: Influence of bound water relaxation frequency on soil moisture measurements, IEEE Trans. Geosc. Remote Sens., 45 (12), 4067-4076, doi :10.1109/TGRS.2007.906090, 2007). As this effect may vary from one soil type to another, it cannot be accounted for easily. This undesired effect is more pronounced in the afternoon (more frequent dryer and warmer conditions at the top soil layer).

4.3 [p. 1614, Statistical scores Equation 7: p is not explained.]

Response 4.3

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p is the number of values of the considered time series.

4.4 [p. 1617, l. 1. 4.1.1. SMOSMANIA: In this paragraph it is mentioned a possible dependence of the parameter T by the soil texture. Neither in this section nor in that of discussion (P 1621, line 11) there is an explanation on the possible influence of the soil texture. In section 4.3. the authors conclude that soil texture may not play a significant role in the determination of T but previously they stated that the lower N (Nash-Sutcliffe) values were found with coarse texture.]

Response 4.4

Despite the results discussed in 4.1.1., where it was shown that sandy soils tended to have the lowest N values, a detailed analysis of a correlation of particle size distribution with N did not show any conclusive results.

4.5 [p. 1619, l.22. Topt of SMOREX and the average Topt of SIM are quite different. The authors should include a statement discussing the reasons of such a remarkable difference.]

Response 4.5

The T derived from the simulated profiles are consistent with the observed ones at SMOSREX. In Figure 9, the SMOSREX Topt is plotted vs the actual sensor depth, whereas the SIM Topt is plotted vs soil thickness, ie. it represents an integrated Topt for the whole soil depth, rather than a Topt for a singular point within the soil. Plotting the SMOSREX Topt vs soil thickness gave results similar to SIM.

4.6 [Editorial remarks (figures, units, etc.)]

Response 4.6

The suggested improvements will be accounted for in a final version of this paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1603, 2008.