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Atmospheric Measurement Techniques Discussions

Interactive comment on "Assessment of the consistency among global microwave land surface emissivity products" *by* H. Norouzi et al.

Anonymous Referee #1

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General comments:

The paper assesses consistency among global land surface emissivity products. Four products are considered from respective sources - SSM/I, AMSR-E, TMI, and WindSat. Comparison is done at a monthly-average time scale. The paper illustrates that there are large inconsistencies, and shows where these are in a global, monthly-average sense. Unfortunately not much more than this can be concluded from the paper, which is a limitation. The authors cannot trace the inconsistencies to specific reasons. A long list of possible reasons is given, but this provides little real insight. The paper thus illustrates a conundrum for numerical weather prediction (NWP), which most likely needs instantaneous and not monthly-average emissivity anyway, in that microwave surface emissivity is not a well-defined or well-measurable property, and its use in

NWP is still unreliable and, as indicated by this paper, may likely remain so for the foreseeable future.

Specific comments:

It would be helpful to include a brief discussion on how the NWP models use microwave emissivity, and whether this emissivity is required at specific microwave frequencies, viewing angles, and diurnal sampling. What frequencies, angles, times are these? It seems that NWP models are needed in the emissivity retrieval to make atmospheric humidity and skin temperature corrections, and the emissivity is then used as a boundary condition for NWP models. Isn't this a circular process? Some explanation is needed.

The paper suggests that a blended land emissivity product among the existing ones might be an ultimate step. However, based on the paper, this would not be a recommended path to pursue, and this should be stated in the conclusion. There would be no way to determine how the blending would be done given the lack of knowledge of the error structures in the product.

The emissivity in low vegetation areas is affected significantly by soil moisture. The authors do not indicate what the sensitivity of emissivity to soil moisture is. Soil moisture varying from dry to wet can have a large effect on emissivity (there are many papers on this in the literature) and ignoring this fact can introduce large error into a NWP boundary condition. What is the sensitivity of NWP error to neglecting soil moisture variability effects on emissivity?

The data processing method mentions resampling the emissivity products to the same spatial resolution. This is not a simple process to do correctly. It's not clear that the spatial resolutions have indeed been normalized. Further, there seems to be an assumption in the paper that the brightness temperatures of the various sensors (SSM/I, AMSR-E, TMI, WindSat) over land have been cross-calibrated, which if not would lead to differences in derived emissivity no matter how accurately the temperature estima-

tion was done. Do the authors know if a cross-calibration was done?

The MPDI depends on both soil moisture and vegetation but in the analysis of the MPDI the soil moisture effect is hardly discussed. The soil moisture dynamics tends to be somewhat smoothed out at the monthly timescale, but it is still there. What is the effect of diurnal sampling time differences amongst sensors? Emissivity varies with time of day as the surface moisture changes diurnally. Is this impact significant?

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 9993, 2014.