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Hydrology and Earth System Sciences Discussions

Interactive comment on "The sensitivity of land emissivity estimates from AMSR-E at C and X bands to surface properties" *by* H. Norouzi et al.

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This paper presents microwave land surface emissivity estimates calculated globally from AMSR-E observations over more than 6 years. The study analyzes the sensitivity of the estimates to the vegetation, and to some extent to the soil moisture. The paper is well structured and clearly written. However it does not bring significant new information, as compared to the existing literature on the subject. Before being published, the following comments have to be taken into account.

Detailed comments:

- p. 5669. line 6. 'appropriate ... for snow cover detection'. This is to be proved.

Actually, low frequencies are likely to be insensitive to most snow cover. Even at 19 GHz, the sensitivity to snow is weak (Cordisco et a., JGR, 2006). - P. 5670. Line 6, line 26 '(19GHz >)'. This is a confusing notation. - P. 5671. Line 3, line 7. 'First is to ...'. 'Second is to...'. These expressions should be verified by a native English speaking person. - P. 5674. Lines 25-27. The use of TOVS daily resolution product is dangerous, not only because of the lack of intra-diurnal variability but mostly because to my knowledge this data set often contains climatological values, when the TOVS data are not available for a day. This can introduce significant spurious patterns in the atmospheric correction for the emissivities. - P. 5675. Line 3. '30 d' to be changed in 30 days. - P. 5675. Line 10. 'As much as 10%'. This is likely an underestimation of the uncertainty when climatological values are used in case of missing TOVS data. - P. 5676. line 5-8. The ISCCP Ts does not necessarily show systematic bias, but we observed an uncertainty that tends to increase with increasing temperature, as compared to other estimates (AIRS, MODIS, or in situ CEOP observations). - P. 5676. Line 20. 'incidence angle'. Suppress the 'on'. - P. 5676. Line 23. 'Eddington's radiative transfer'. This type of method is adapted to the radiative transfer calculation in presence of scattering. A simple radiative transfer equation would do. Suppress the mention to the Eddington method. You used a radiative transfer code to calculate the emisivities (equ. 2-3-4). Why don't you use the same one for this sensitivity analysis??? - P.5676. line 26. 'with the 2 degree difference'?? What do you mean?? - P.5677. line 6. Line 13. Which polarization? - P.5677. Line 17. For the mountainous locations, the two major differences in emissivities are likely due to spatial resolution difference, and to differences in the atmospheric correction related to the altitude. In your retrieval, is there any correction on the profiles for the altitude? - P.5677. line 27. We actually tried to use the TOVS atmospheric profiles (Prigent et al., JGR, 1997), but we abandon the idea, based on large spurious patterns in the data, especially over desert. - Figure 4. When analyzing the seasonal cycle, the two hemispheres should be separated. Although most continental surfaces are located in the North, considering the two hemispheres at the same time makes the seasonal cycle less clear. - Figure 4. Over the cold deciduous forest,

snow presence should interfere with the vegetation signal. This has to be discussed. The higher the frequency, the higher the sensitivity to the snow (Cordisco et al., JGR, 2007). - P. 5680 and figure 5. The analysis of the emissivity with respect to the soil moisture is problematic, both variables being retrieved from AMSR-E. Part of the correlation between the two variable is likely artificial. An external soil moisture variable has to be used, or you have to show that the AMSR-E soil moisture and the emissivity difference you show are independent. - Figure 5. The two different structures in the populations (for NDVI below 0.5 and above 0.5) should be interpreted. - P. 5680. Line 27. No discussion needed on the relation with the NDVI in desert regions. - P. 5681. Line 4. More information on the relationship between vegetation / soil moisture and emissivity in Prigent et al., JGR, 2005 and Aires et al., JGR, 2005. - P. 5681. NDVI in tropical forest is to be considered with caution. Its variability is often related to cloud clearing problems in these regions that are rarely cloud clear. - Figure 7. Specify the vegetation type on the figure or in the caption. - P. 5682. Line 7. 'The frequency dependence of this variability ... desert area...'. This contradicts what is said later (line 29). Be consistent. - Figure 8. The difference in the ascending and descending orbits are not clearly related to the sandy deserts. This is surprising. In our analysis (Prigent et al., JGR, 1999), it was much clearer, although the overpassing times were less favorable. To be discussed.

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