

Interactive comment on “Inverse modeling of soil characteristics from surface soil moisture observations: potential and limitations” by A. Loew and W. Mauser

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Received and published: 30 January 2008

The idea to estimate soil parameters from near-surface soil moisture should be highly appreciated, since a global cover of near-surface soil moisture can be made available with satellite data. The paper summarizes several important issues (soil texture, forcing data, and layered soil) in estimating both soil moisture and soil parameters from satellite data. In particular, the authors mention the importance of soil vertical heterogeneity (layered soils). Soil vertical heterogeneity is a common phenomenon (e.g. in Tibet and Arctic regions). According to our study, it is impossible to find a parameter set with which both near-surface and deep-layer soil moisture can be simulated well

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for layered soils. However, some researchers have been trying to derive root zone soil moisture by assimilating surface soil moisture, with soil homogeneity in mind.

I have two comments:

(1) Page 26, conclusion point 4: "The direct inversion of soil hydraulic parameters results in realistic model parameter retrievals." I think this might be a specific result rather than a general one. When you directly fit soil hydraulic parameters from near-surface soil moisture, it is possible that the fitted parameter values are not consistent in nature. For example, such an inversion may result in small values of both soil porosity and hydraulic conductivity, though one parameter should be large when the other is small. Of course, if soil moisture is affected by varying meteorological data and the data record is long enough, direct inversion of soil hydraulic parameters is possible. In most cases, however, inversion using PTF may give physically more reasonable parameters.

(2) As stated in your introduction, this paper discusses the possibility to use satellite-derived soil moisture to make a soil parameter map. However, soil parameters are input for satellite retrieval of soil moisture, and it is very likely that your derived parameter values are different from the input one for the satellite retrieval. For a robust estimation, I believe the two parameter sets should be identical, unless a satellite moisture product is not sensitive to input soil parameters. Yang et al. (2007: An Auto-calibration System to Assimilate AMSR-E data into a Land Surface Model for Estimating Soil Moisture and Surface Energy Budget, Journal of the Meteorological Society of Japan, 85A, 229-242) and following studies presented an example on how to reconcile the two processes (moisture retrieval and parameter estimation). Anyway, I think this issue is an important relevant topic worthy of mentioning in the introduction of this paper, though it should be investigated in a separate study.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 95, 2008.

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