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Hydrology and Earth System Sciences Discussions

Interactive comment on "Extension of the Hapke bidirectional reflectance model to retrieve soil water content" *by* G.-J. Yang et al.

Anonymous Referee #3

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Estimation of soil moisture is one of the Remote Sensing (RS) topics more interesting and useful for hydrological applications. In the literature there are several examples of soil moisture retrieval methods, particularly exploiting radar data. Even if there are a lot of promising examples it is still an open issue as regards the creation of operational RS products, but for passive microwave sensors, which are anyway constrained by very low spatial resolutions. Hence the proposal to use BRDF models on optical data to retrieve soil water content is interesting in this context, but I have some major concerns about the paper. In fact while the inversion of the SWAP-Hapke model is theoretically correct, the description of the experiment and the justification of results by their physical understanding, besides the operational perspective using actual RS sensors, are not sufficiently reported and considered in depth. My specific comments

are outlined below: 1. Introduction: please refer also to the literature of microwave RS for soil moisture retrieval and justify the choice to use optical data instead. line 22-25 pg 3668, please rephrase it is not clear enough (which categories?) 2.1 Experimental area and data acquisition,: please give more detailes. For instance the spectral range of the Fieldspec is not reported; in my knowledge 8° is an optics and not a probe; the common reader may have no knowledge of what the principal plane is. 2.2 Soil BRDF model and its extension: I think a sketch with the fundamental geometry of the radiation model could be of help for understanding, especially regarding quantities and angles as reported in equations. As regards equations: please check that every parameter is correctly reported and described in the text and specify that the radiometric quantities are also functions of the wavelength. The shift from ineherent to apparent optical properties could not be so usual for the common reader, please be more careful. 3.1 Model parameter inversion: please justify more in detail the choice of bands. Why did you use single wavelength as sampled by the spectrometer and not an integration on a narrow spectral band (by example 10nm) to be more consistent with hyperspectral RS sensors? Giving a code to the two experimetal programs could increase clarity in the following text 3.1 Inversion results and 4 conclusions: please give an explanation for why such relationships among parameters exist in physical terms

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