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Hydrology and Earth System Sciences Discussions

Interactive comment on "Relating surface backscatter response from TRMM Precipitation Radar to soil moisture: results over a semi-arid region" *by* H. Stephen et al.

P. Döll

p.doell@em.uni-frankfurt.de

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I disagree with the following conclusions of the authors:

"This research provides an approach to use spaceborne backscatter data for soil moisture retrieval. The model presented in the research is point-based model and provides gridded model parameters. It is a generic model with parameters that depend on surface type. The proposed model is simple yet reasonably accurate for quick retrieval of large scale soil moisture maps from backscatter data. The model inherits its spatial resolution from the input data and captures the average large scale dependence

of backscatter on soil moisture and vegetation. Thus, it is suitable for studies of large scale watersheds. The devised approach presents an alternative to the usual unavailability of in-situ soil moisture measurements."

Soil moisture estimation as done by the authors requires that there is are, at least for a period of time, independent estimates of soil moisture, to allow calibration of the backscatter model for each individual pixel for which the soil moisture is to be estimated. The approach thus only allows for the estimation of the temporal development of soil moisture. But if the output of a hydrological model has to be used for calibration (as was the case in the presented study), as there are never spatially extensive soil moisture measurements available for calibration, why would it not be better to run the model for deriving time series of soil moisture? So I personally doubt the usefulness of the described effort to retrieve soil moisture by combining information from backscatter, NDVI and a hydrological model, as it is not clear if the combination of this information is closer to reality than the result of the hydrological model. In a nutshell: what is the added value of using remotely sensed backscatter information?

In case the manuscript will finally be published in HESS:

1) The authors did not mention in their paper that the penetration depth of the radar is less (how many mm?) than the 10 cm of the uppermost cell of the hydrological model used for calibration of the backscatter model, and they should discuss the implications of this.

2) I would appreciate to see a comparison to other remote-sensing derived soil moisture estimates for the region and time of interest.

3) There are many typos, and the use of the English language requires some improvement, e.g. on p. 6437:

"The model has been also studied without incorporating and NDVI data (dropping the 5th term on the right hand side of Eq. (1). We note that adding NDVI dependence

slightly improves the model performance. The reason being that the vegetation dependence of the model is also incorporated in the other parameters (especially captured in the values of A and B)."

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