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Hydrology and Earth System Sciences Discussions

Interactive comment on "Effective roughness modelling as a tool for soil moisture retrieval from C- and L-band SAR" *by* H. Lievens et al.

Anonymous Referee #1

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General comments

An interesting study that proposes an empirical statistical model to reduce the ill-posedness in soil moisture retrieval from SAR by the integrated equation model?. The model is calibrated and tested using SAR and in-situ observations from various dedicated campaigns. For me, the study would have been even more interesting if the method had also been tested on simulated data, representing a wider range of possible scenarios. In this way you could also make a direct comparison between C-

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and L-band, without any other disturbing influences related to site or other observation characteristics.

specific comments

p4999.l21: RADARSAT does not have very low incidence angles, only ESAR does

p5000.l20-21: Explain why measuring a larger soil profile leads to better correspondence with in situ measurements: the reason is that in situ soil measurements are not performed at the surface but over a small depth interval (e.g. 0-5 cm) p5000.l27: "...may have been processed..." The author should know, and report, the way the imagery was processed.

p5003.l18: Explain in a little bit more detail what you do. I assume you invert IEM using Mv values measured in situ as input? p5003.l18: Are the different effective roughness lengths (i.e. not the real roughness lengths) really a failure of IEM? Theoretically, I would expect that effective roughness lengths would increase at larger wavelengths (i.e. for L-band).

p5005.l1-4: Is this really shortcoming of IEM or is it due do the fact that you are dealing with "effective" roughness lengths and not with "real" roughness lengths? Additionally, it would be interesting to see what happens with the RMS slope (p5001.l7) when both roughness parameters are left free. Judging from the trends found in your plots I would expect this ratio to be almost constant. This would be an indication that we are dealing rather with a model inversion problem than with a shortcoming of IEM. A better model parametrization in IEM would not necessarily lead to better retrievals.

p5005.l23-24: Explain why you use these reference angles. I suppose these should be sensor specific.

p5007.l7: Please insert both formula to avoid confusion caused by the Rmod variable.

p5008: "The validation is somewhat meager as the cross validation like performed in this paper does not really show the robustness of the model. Only using two distinctive

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training and a validation data sets would show this.

Technical corrections

p4996.l3: remove either "yet" or "at present" p4996.l8: Insert a break after "... in Europe" p4996.l16: I am not familiar with the symbol Mv being used to indicate volumetric soil moisture

p4997.l5: Please rephrase or specify "input use"

p5000.l16: "Mv-observations - add "in situ"

p5003.l4: "...one solution..." Use "... a unique solution..." instead.

p5004.l18: "... than C-band". Add "(Fig. 6)"

p5008.l18: leave-field-out validation: on p5000.l16-17 you say that you calculate Mv at field level. Therefore, what is the difference between cross validation at data point level and that performed at field level?

Table 1: in the column "sensor" you do not list the sensors (e.g. ASAR) but the platforms. It would interesting to know how many samples you take per field.

Table 3: Please add a column with relative errors.

Figure 1: Include number of data points in the plots (applies to most tables and figures, e.g. fig 11 and fig 12). Add "measured in situ" to soil moisture.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 4995, 2010.