Hydrol. Earth Syst. Sci. Discuss., 5, S2546–S2548, 2009
www.hydrol-earth-syst-sci-discuss.net/5/S2546/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Soil moisture retrieval through a merging of multi-temporal L-band SAR data and hydrologic modelling" *by* F. Mattia et al.

F. Mattia et al.

Received and published: 5 February 2009

Our replies (i.e. [AR]) to the Editor's remarks (i.e. [EC]) are listed next:

[EC] The paper fits extremely well into this special issue as it combines remote sensing and hydrological modelling in a very effective way in order to improve the estimation of soil moisture at small spatial scales. It is acceptable subject to minor revisions. In addition to the reviewer's recommendations, I have a couple of additional comments:

[AR] We would like to thank the Editor for his very positive appraisal of our work and for his remarks, which will certainly contribute to improve the paper.

[EC] 1) The statement on lines 25-26 is also true for coarse-resolution active microwave data

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

[AR] We agree with the Editor and a reference to the paper by Wagner et al. (2003) has been included on lines 25-26.

[EC] 2) In addition to Figs 3 and 4 please also show the plot of VV backscatter versus fresh biomass to corroborate your statement that VV backscatter is "clearly attenuated" by the crop canopy.

[AR] This is a very good point that evidently requires a clarification.

The plot of VV versus fresh biomass, mentioned by the Editor, does not help to highlight the wheat canopy attenuation because the VV backscatter and the fresh biomass are found almost uncorrelated throughout the observation period. In our opinion, this behaviour is not in contrast with the statement that "VV backscatter is attenuated by the wheat canopy" for two main reasons: 1) at the time of the first SAR acquisition (i.e. on April 19), the VV signal had already been significantly attenuated (indeed, at that date the wheat field #230 was at the "stem elongation" phenological stage, roughly corresponding to 30% of its full development, and, on Fig. 3, the HH and VV backscatter have almost the same value, i.e. VV was already significantly attenuated with respect to HH backscatter); 2) at L-band, both the VV and HH backscatter response of wheat fields is modulated by the soil moisture condition, which showed alternating behaviour during the AGriSAR campaign (see Fig. 2). Nevertheless, we acknowledge that under these circumstances it is probably not possible to conclude about the level of VV attenuation without a further extension of the analysis to other wheat fields (e.g. at different incidence angles and phenological stages). Since this analysis is beyond the limits of this paper and, in any events, it would not have an impact on the paper results, which are only based on the signal at HH polarization, we propose to eliminate, in the revised version of the paper, the sentence stating that "the crop canopy clearly attenuates the VV backscatter".

[EC] 3) You state that the API simulation was not calibrated over the test site, while the TOPLATS and PROMET models probably were. If calibrated may the API results not

HESSD

5, S2546–S2548, 2009

be similar to the TOPLATS and PROMET results?

[AR] Neither TOPLATS nor PROMET were specifically calibrated for the test site. Soil hydraulic characteristics were derived from standard literature, given a soil texture map of the test site. The API model is a very simple model, that does not take into account vertical water motion in the soil column as the physically based models do, neither does it account for actual loss of water due to evapotranspiration. The API model parameters basically serve in a very simple manner to parameterize the loss of water due to evapotranspiration during the seasonal cycle. Adapting the model coefficients to local evapotranspiration loss might help to improve the model predictions of soil water content. This has recently be shown by Loew and Schwank (2009).

References

Loew, A. and Schwank, M., Calibration of a soil moisture model over grassland using L-band microwave radiometry, International Journal of Remote Sensing, in press.

Wagner, W., K. Scipal, C. Pathe, D. Gerten, W. Lucht, and B. Rudolf (2003), Evaluation of the agreement between the first global remotely sensed soil moisture data with model and precipitation data, J. Geophys. Res., 108

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 3479, 2008.