

## ***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: 2 February 2009

Answers to referee #1

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

Our replies (i.e. [AR]) to the reviewer’s remarks (i.e. [RC]) are listed next:

General Comments:

[RC] This manuscript provides a new technique on soil moisture retrieval with the combined L-band SAR measurements and the Hydrological models. The results demonstrated the significant improvement on soil moisture estimation and the advantage over the either single technique (SAR retrieval and model prediction). It is a new and the

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most promised technique and concept. The manuscript is well written and should be published.

#### Specific Comments:

[RC] 1) For study site, they were the cereal fields. On SAR retrieval part, the surface backscattering model IEM was used. How significant of vegetation effects was not described. It is important to demonstrate the vegetation impact is minimal.

[AR] We partially agree with the reviewer. In fact, most of Section 2.2 was dedicated to assess the impact of wheat canopy on L-band SAR signal through a sensitivity study (see Fig. 4), which indicated that the interaction between the L-band SAR signal at HH polarization and the wheat canopy is fairly weak (i.e. less than 1dB) and therefore it has been disregarded. However, we acknowledge that this result has been obtained for one experimental site and that future theoretical and experimental studies should be dedicated to further assess the validity of the adopted approximation at L-band. Indeed, while numerous recent studies have addressed the scattering of winter wheat at C-band (e.g. Cookmartin et al., 2000; Marliani et al., 2002; Mattia et al., 2003; Picard et al., 2003; Ferrazzoli et al., 2006), at L-band relatively little work has been carried out. This point was probably not adequately underlined in the first version of the paper but it is now clearly addressed in Section 2.2 of the revised version.

[RC] 2) It is not clear in the manuscript what grid scale were the TOPLATS and PROMET performed. It is important to understand the scale issue here since the soil moisture information from the filed measurements, SAR retrieval, and model performance are great different.

[AR] The hydrologic models were applied at the point scale. It is thus not possible to assign a spatial scale to the model simulations. The point scale prior information was used for the entire test site. This is a valid assumption, because 1) the test site is relatively small, and meteorological forcings can be assumed to be homogeneous for the entire test site, and 2) the land cover properties (winter wheat) were very homoge-

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neous for the test site as well. When the methodology is extended for larger domains, however, a grid resolution in the order of 1 km can be recommended. This statement has been added before Section 4.1 of the revised paper.

## References

Cookmartin, G., et al. Modeling microwave interactions with crops and comparison with ERS-2 SAR observations, *IEEE Trans. Geosci. Remote Sensing*, vol. 38, Mar. 2000.

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

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