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Hydrology and Earth System Sciences Discussions

Interactive comment on "On the derivation of soil surface roughness from multi parametric PolSAR data and its potential for hydrological modelling" *by* P. Marzahn and R. Ludwig

P. Marzahn and R. Ludwig

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We like to thank Referee #2 for his/her helpful and constructive as well as very extensive comments on our submitted manuscript. We appreciate the suggestions for improving the paper, which will be included in the upcoming revised manuscript.

General Comments

Referee#2: In my opinion, the methods used for the retrieval of roughness information are very sound, however, the discussion of the methods and results needs to be extended. Regarding the potential of the retrieved roughness information for hydrologic modeling, the MDS is not validated or qualitatively evaluated, which is a shortcoming.

The results on the retrieval of bulk density may be discussed in more detail. Maybe it is better to focus the paper on the parts that are well established and for which you have ground truth information, i.e. the roughness retrieval and the correlation with bulk density.

AC: In the revised manuscript the methods and results will be extended as you suggest by your comments as well as the comments from Referee#1. Regarding Section 2.2, the description of the deployed roughness estimators will be revised in more depth and will provide more information about their general behaviour of theses. The results will be extended and therefore (in accordance with the suggestions of Referee#1) completely revised within the new submitted paper. With Section 4.1 it was more the intention to show the potential of this roughness retrieval approach. The validation is only possible with the modeling of the MDS out of the micro scale DSM according to Sommer (1997). However, no independent observables are available. As a consequence we will skip this section and therefore focus on the bulk density derivation in the revised paper. This is also in accordance to the suggestions with Referee#1. In the revised manuscript Section 2.2 and 2.3 will be changed for an improved and more logical outline. In addition the description of the deployed roughness estimators will be, as mentioned above, improved and their behaviour will be explained in more detail.

Specific Comments:

Section 3.2

Referee#2: Please extend the discussion and presentation of the roughness retrieval results from PolSAR versus photogrammetry. It could be interesting to really show the scatter plots of estimators or modeled RMS height versus measured RMS heights, and particularly, to show the eventual relationship that has been used to derive further roughness maps, with reflection to perhaps similar relationships found in literature. With respect to the scatter plot presented in Figure 8, you should give more information on what is presented: which dates (only April 19?), which sample points, are these

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average field values?

AC: This will be improved and revised in the newly submitted manuscript as mentioned above. Regarding to your comments on Figure 8, your suggestions will be integrated. However the Figure shows the data for the whole campaign (and not only for April 19)

Section 3.3

Referee#2: Please define in more detail how exactly you have produced the multi-temporal roughness maps. For example, did you use different relationships for bare and vegetated areas?

AC: We just used this one relationship for the retrieval of soil surface roughness for bare and vegetated areas. In the revised paper we will provide the correlation between ks and the polarimetric roughness estimators for each field separately.

Referee#2: Could it be possible that the roughness overestimation on field 101 (winter rape) of 0.8 cm, and the underestimation on field 222 of 0.2 cm may partially be due to slope effects, or is this already taken into account? In their paper of 2002, Schuler et al. suggest a correction of the real part of the coherence for large scale azimuth terrain slopes, as an extension to Eq. 5. Did you try this?

AC: For the derivation of soil surface roughness we used the already geocoded and terrain corrected SLC product (GTC) which was processed by DLR. Therefore the data is already corrected for large scale azimuth slopes.

Referee#2: In my opinion, there are really clear similarities between at one side roughness under maize and winter rape, and on the other side roughness under winter wheat, barley and sugar beet.

AC: This is obvious, but not related to the roughness conditions as more to the properties of the particular plants. While winter rape and maize show both a strong trunk, which causes a similar but still quite different scatter response as winter wheat, winter barley and sugar beet.

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Interactive Comment

Section 4.1

See response in the General Comments section.

Wording:

Your suggestions will be improved and corrected throughout the whole paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 3383, 2008.