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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 #1 for his/her helpful and constructive 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#1:[...]However, the paper is presently lacking a clear interpretation of the results and this aspect should be improved before the final publication.[...]

AC: The results will be completely revised by incorporating your suggestions as well as

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the ones made by Referee#2.

Specific Comments

Section 2

Referee#1: The description of the test site (i.e. section 2.1) should be followed by the description of in situ measurements, including sections 2.3 and 3.1.

AC: In the revised paper we will change Sections 2.2 and 2.3 to give a more clear and logical outline.

Section 2.2

Referee#1: This section would benefit from a bit more detailed description of the physical meaning of the investigated radar features.

AC: The section will be extended in the revised manuscript with a more detailed description of the behaviour and physical meaning of the deployed roughness estimators. This is in accordance with Referee#2.

Section 2.3

Referee#1: [...]However, the issue of spatial scale should be more critically addressed. Indeed, previous papers (e.g. Davidson et al., 2000) have shown that roughness parameters often change with the length of the profile over which are estimated.[...]

AC: This is a good and very crucial remark. However, those mentioned papers address only 2d roughness measurements using profiler devices (Laser, meshboards), while the role and behaviour of 3 dimensional acquisition is not sufficiently investigated yet. Several papers (e.g. Taconet and Ciarletti, 2006) tried to investigate this topic on 3d datasets. With a similar horizontal coverage of approx. 0.5 m^2 they achieved a 90% accuracy compared to roughness data with a horizontal coverage of 20 m x 10 m. With respect to your comments, this will be included in the revised paper.

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Section 3.1

Referee#1:[..] An important asset of the adopted photogrammetric method is to allow a 2-dimentional characterization of the surface roughness. This means that it must be possible to estimate the roughness parameters (at least the RMS heights) along both parallel (prl) and perpendicular (prp) directions with respect to the field tillage pattern.[...]

AC: This was originally intended to do in the future, however we will try to include this in the revised paper since it is a very interesting topic and point for roughness description due to the lack of physical interpretation of the RMS Height as well as the autocorrelation length.

Section 3.2

Referee#1: In my opinion, the comparison between polarimetric radar features (i.e. anisotropy and circular coherence) and in situ roughness measurements should be carried out per each field. In other words, Table 2 should report the statistical parameters of the comparison per each field

AC: This will be provided in the revised manuscript.

Referee#1:In addition, the procedure adopted to transform the polarimetric radar features into roughness values should be better explained. I guess that the regression was applied to the whole data set. Please elaborate this point.

AC: The regression was applied to the whole data set. In the revised paper this will be formulated more precisely.

Section 4

Referee#1: This is an informative section (especially for scientists not familiar with hydrologic modelling), however the quantitative analysis is just confined to the correlation between the bulk density and the estimated roughness parameter. Then, I would

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suggest reducing the length of subsection 4.1 and focusing on section 4.2.

AC: Since we are not able to validate the derivation of MDS parameters quantitative (due to the lack of independent observables) we will skip Section 4.1 and focus only on the derivation of bulk density parameters. This is also in accordance to the suggestions of Referee#2.

References:

Taconet, O. & Ciarletti, V.: Estimating soil roughness indices on a ridge-and-furrow surface using stereo photogrammetry. Soil and Tillage Research, 93, 64-76, 2007

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