

## ***Interactive comment on* “Brief communication “Application of mobile laser scanning in snow cover profiling”” by S. Kaasalainen et al.**

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Received and published: 7 February 2011

The authors want to thank Dr Domine and Dr Prokop for their useful comments and suggestions, which improved the clarity of the presentation. We have revised the manuscript according to their suggestions, and provide below our responses to all the comments.

F. Domine

1. Multi-scale roughness information is important for radar remote sensing and snow reflectance. We have now discussed the importance of multi-scale measurements in the text (the 2nd paragraph in the Introduction), and also the applicability of MLS methods to obtaining multi-scale roughness. We have also discussed the characteristics

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such as rms -changes and the shape and length of autocorrelation function, which are also being studied for surface roughness.

2. Vertical resolution: small-scale roughness is needed for surface optical reflectance. The mobile approach is capable of providing multi-scale data from 1mm to several meters in the vertical scale, and from cm-scale to several meters (and even kilometers) in the horizontal scale. Also, in the future the profiling measurement frequency will increase. We have added all this into the conclusion.

Style and grammar: We have also corrected the text according to the minor comments for style and grammar (the use of prepositions, hyphens, and wording).

We have added a length scale into the Figure 2.

Fig. 3 has also been improved and a legend has been added. The vertical scale has also been increased. We also made an additional correction to the elevation error, which has been explained in the text (in the 2nd paragraph of the results section). The profiles are perpendicular to the trajectory, which has now been clarified in the caption.

#### A. Prokop

Repeatability/ accuracy investigation: We agree that the repeatability of the entire instrument has to include GPS and IMU. The analysis presented in the original manuscript (Sect 3) was for the distance measurement only. According to the suggestion, we have used a control point measurement (from a road surface) to assess the repeatability of the entire instrument while it was moving. We have clarified the text and added further results on the repeatability in the beginning of Sect. 3. We have also mentioned the possibility for validation using other methods in the Conclusion.

Range: We have mentioned the scanners with greater ranges for distances, and clarified the role of the incidence angle and other problems at greater distances in the last paragraph of Sect. 3. The scanner is mounted in about 2 m height from the ground, so the received signal decreases significantly at distances further than 20-30 m because

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of large incidence angles (about  $60^\circ$ - $70^\circ$ ) to the flat surfaces.

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Interactive comment on The Cryosphere Discuss., 4, 2513, 2010.

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4, C1616–C1618, 2011

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