

Interactive comment on “Active Layer Thickness Estimation from X-Band SAR Backscatter Intensity” by Barbara Widhalm et al.

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We thank the referee for the thorough review and the many useful comments, which we will incorporate into the revised manuscript and reply to in detail during the final response phase. For the ongoing interactive discussion we would like to respond to some comments.

Response to comment 1): We thank you for pointing out the lack of information regarding vegetation characteristics that drive both X-band backscatter and ALT dynamics. We will revise the paper accordingly.

Response to comment 5): We incorporated the NDVI technique in order to compare the X-band backscatter method to an already established “traditional” method. Furthermore the NDVI was used in order to discuss the differences between the sites VD-1

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and VD-2, which show similar ALT values while backscatter values seem to differ. We appreciate your comment and will revise our manuscript in order to clarify our intentions.

Response to comment on P1,L3, Table 1; P2,L16; P2,L23-4: '...Other studies using similar techniques measured ALT > 70 cm in different areas, such as Liu et al. [2012] around Prudhoe Bay and Pastick et al. [2013] around Yukon Flats.' We thank you for pointing out these papers.

Response to comment on P6,L5; P8, Fig2: 'The authors need to explain this figure, which I did not understand. One sentence is not enough. How did the authors use this data?' The figure shows the relationship of topography and vegetation types and that certain topographic features are linked to specific vegetation covers. As is stated in the introduction, both slope and vegetation cover can be linked to ALT and as can be seen from the figure, they are also connected to each other. We will clarify this and although we did not use any topographic information in our delineation of ALT we will point out the potential of refining the backscatter approach by incorporating topographic information in the revised manuscript.

Response to comment on P6, L26-31: 'The authors should delete this paragraph. TanDEM-X data can be used for InSAR, but that is not what the authors did. The authors essentially created regressions of ALT vs backscatter, not InSAR.' The DEM was used in our study to perform the Range-Doppler Terrain Correction. The paragraph describes its origin. We suggest renaming the chapter from 'TerraSAR-X acquisitions' to 'TerraSAR-X data' in order to prevent confusions.

Response to comment on P8, L6: 'What ALT values? From the CALM sites? Later the authors use the same ALT to 'validate' the regression, which seems circular.' The CALM site data were only used for validation and the map over the entire site (not only the in situ points) produced in order to demonstrate and discuss the uncertainties. Sites VD-1, VD-2 and VD-3 were used for calibration only. We will revise the manuscript to

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emphasize this.

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