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Snow depth extraction based on polarimetric phase differences

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Polarimetric phase differences between HH and VV polarization of TanDEM-X data have been analyzed. Time series analysis shows a significant change during winter season. The measured phase differences have been compared with ground data and snow depth and show a strong correlation, which allows a determination of snow depth with an accuracy of ± 10 cm. The oblate size of snow grains are assumed to be the reason for the phase differences. A model has been developed by (Parella, 2012), which can explain these phase differences. The oblate shape of the microscopic snow structure has been confirmed by (Riche et al). For validation, ground measurements are essential and have been acquired. The test sites Sodankylä in northern Finland has been chosen as already intensive ground measurements were done there within the framework of the CoreH2O mission (Rott, 2010). Snow height, snow water equivalent, air temperature, soil moisture, wind speed and even snow profile data are available. For the test-sites exists a set of around 25 TerraSAR-X multi-pass acquisitions together with 11 single-pass TanDEM-X acquisitions during the winter 2011/2012. REFERENCES Parella, Giuseppe, 2012, "Modelling PolSAR Scattering Signatures at long Wavelengths of glacier Ice Volumes " Earth Observation and Cryosphere Meeting, 13-16. Nov 2012, Frascati. Riche, F.; Montagnat, M.; Schneebeli, M., 2013: "Evolution of crystal orientation in snow during temperature gradient metamorphism. J. Glaciol. 59, 213: 47-55. Rott, Helmut et al. 2010: "CoreH2O: Cold regions hydrology high-resolution observatory for snow and cold land processes," Proceedings of the IEEE, vol. 98, no. 5, pp. 752–765.