Inversion of Snow Depth from UAVSAR L-band PolSAR Data

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ABSTRACT

In this work, UAVSAR L-band Polarimetric Synthetic Aperture Radar (PolSAR) data along with the SnowEx 2017 field campaign data are utilized for the development and validation of a new snow depth estimation algorithm. The UAVSAR data acquired on 22 February 2017 over Grand Mesa are used. The SnowEx raw penetration force profiles measured at snow pits at Grand Mesa, Colorado using the SnowMicroPen (SMP), a digital snow penetrometer on the same date with the UAVSAR data are used for the analyzes and validation of the snow depth estimations.

Different PolSAR parameters are analyzed with the corresponding snow depth measurements. Out of those parameters, it is found that dominant scattering type phase (\(\Phi_{s1}\)) and helicity (\(T_1\)) from Touzi incoherent polarimetric decomposition method [1] are providing useful information about the snow depth. These parameters are thoroughly investigated. Finally, based on the investigations, a new generalized polarimetric parameter for the snowpack is developed. This generalized parameter is inverted as a snow depth parameter. The investigation shows that the estimated snow depth from the proposed approach is having a high correlation with the measured snow depth values. However, other snowpack parameters collected in the field along with the different snow covered ground surfaces to be analyzed and taken into the account for the better estimation of the snow depth.

REFERENCES