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Scatterometer observations of snow in a forest stand in the Hudson Bay lowlands during the CAN-CSI 2010-2011 experiment

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Significant efforts have been made to characterize and estimate snow accumulation using X- and Ku-band radar observations (9.6 and 17.2 Ghz respectively) to support ESA's COld REgions Hydrology High-resolution Observatory (CoReH2O) mission science basis. As part of this effort, observations of snow accumulation were made in a forested stand in the Hudson Bay Lowlands, near Churchill, Manitoba, Canada, during the winter of 2010-2011. The measurements were made at Ku and X band in fully polarimetric mode from instruments mounted on a scissor lift that raised the instruments to 10 m above ground level and enabled observations to be made of a combined snow and wooded terrain within a 60 degree azimuth and 60 degree elevation field of view. Observations were made from January to March in 2011 of a plot containing seasonal snow and trees with coincident snowpack measurements being made to quantify changes in bulk snow properties (snow water equivalent, snow depth and density) and in snow stratigraphy variations using traditional snowpit measurements. Tree properties were also quantified.

The paper describes the measurement approach and examines variations in calibrated backscatter in response to changes in the snowpack status. Previous experiments of snow observations in forested areas have demonstrated a reduction in SWE estimation sensitivity at forest spatial fractions of greater than 40%. We explore this threshold further with the Churchill data and examine the response of tree stand vegetation in this tundra environment.