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Dual Frequency (17.2 and 9.6 GHz) Scatterometer Observations of Terrestrial Snow in a Canadian Sub-Arctic Tundra Environment

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Ku- (17.2 Ghz) and X-band (9.6 Ghz) ground-based polarimetric scatterometer observations were collected as part of the Canadian CoReH2O Snow and Ice Experiment (Can-CSI) near Churchill, Manitoba during the winters of 2009-2010 and 2010-2011. These observations comprise a novel dataset of dual frequency backscatter signatures of Canadian sub-Arctic tundra cover types. Combined with in-situ snowpack physical properties and local meteorological observations, signatures are used to characterize physical interactions aiding in the decomposition of scattering contributions and development of property retrievals. Data relevant to this study was collected from a mobile platform allowing for characterization of spatial and temporal heterogeneity of snowpack conditions throughout two seasonal evolutions.

This presentation will describe preliminary analysis including the seasonal evolution of backscatter coefficients and their relationship to snowpack parameters including density, depth, grain size, and snow water equivalent. Results indicate that Ku-band exhibits greater sensitivity to snowpack physical structure compared to X-band, highlighting the potential for development of dual frequency SWE retrieval algorithms. Physical interactions are further explored to identify potential scattering centers at each frequency, in relation to air/snow, snow/ground, and volume interfaces. The influences and uncertainties associated with changes in soil conditions, grain size, and sensor parameters are demonstrated to provide guidance for further study. The results presented here document the inaugural field deployments of the University of Waterloo scatterometer (UW-Scat) and contribute a high-resolution dataset relevant to potential future space-borne missions such as the Cold Regions Hydrology High-resolution Observatory (CoReH2O), a candidate European Space Agency Earth Explorer mission.