

Canadian Snow Radar Satellite Mission Science Readiness Advancements

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ABSTRACT

Environment and Climate Change Canada (ECCC) and the Canadian Space Agency (CSA) continue to advance a new satellite Ku-band radar mission focused on providing moderate resolution (500 m) information on seasonal snow mass. Like many regions of the northern hemisphere, estimates of the amount of water stored as seasonal snow are highly uncertain across Canada. To address this gap, a technical concept capable of providing dual-polarization (VV/VH), moderate resolution (500 m), wide swath (~250 km), and high duty cycle (~25% SAR-on time) Ku-band radar measurements at two frequencies (13.5; 17.25 GHz) is under development. In this presentation, results from the Trail Valley Creek experiment (TVCEX) conducted in winter of 2018-19 will be presented. Data collected during the CryoSAR 2022-23 campaign in Powassan, Ontario, Canada will also be shown in the context of how the proposed snow radar mission can improve SWE retrievals in agricultural lands.

Using the UMASS airborne Ku-band radar instrument and satellite observations from RADARSAT-2 and TerraSAR-X, we show that it is possible to retrieve background soil properties allowing to separate the background from the snowpack contribution of the Ku-band signal and isolate the snow volume scattering to facilitate radar-based SWE retrievals. We also show that the ground-based snow sampling strategy deployed during the TVCEX, providing statistical distributions of snow microstructure and density, is crucial to properly estimate the radar signal from forward modelling.

Ground-based snow properties, soil and weather station information, drone LiDAR/optical data, and radar observations collected for the CryoSAR campaign will also be presented.

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