

## Using Current SAR Satellite Missions to Support Future Snow Satellite Radar Missions

BENOIT MONTPETIT<sup>1</sup>, JOSHUA KING<sup>2</sup>, CHRIS DERKSEN<sup>2</sup>, ANNA WENDLEDER<sup>3</sup>, AND  
PAUL SIQUEIRA<sup>4</sup>

### ABSTRACT

Landscape scale monitoring of snow and ice conditions is of great importance for wildlife habitat and ecosystem monitoring, species at risk and protected areas management and to support northern communities. Current Earth-observation missions do not provide the information needed to monitor snow mass evolution due to spatial and/or temporal scales or sensor properties such as wavelengths not being sensitive to snowpack properties or sensors being dependent on solar radiation. To address this issue, Environment and Climate Change Canada (ECCC) and the Canadian Space Agency (CSA) in collaboration with many international partners have designed a dual-frequency Ku-band (17.2 and 13.5 GHz) radar mission concept at a 250 m resolution to monitor terrestrial snow mass globally. To support the mission concept, an intensive airborne, satellite and *in situ* campaign was conducted at the Trail Valley Creek (TVC) research basin, Northwest Territories, Canada. Radarsat-2 and TerraSAR-X data was acquired at least twice a month between September 2018 and April 2019 over the TVC study area to monitor changes in soil and vegetation properties. Steven's Hydra Probes were deployed at 6 different sites to measure soil temperature, moisture and electric conductivity at 4 different depths continuously over the winter season. Snow properties were also measured in December 2018, January and March 2019 around the soil stations. This unique dataset enables us to link observed signal variations of the current SAR satellite sensors to measured snow/soil properties. Preliminary results show the use of the current satellite SAR missions to support a future Ku-band radar mission to monitor terrestrial snowpack properties by decoupling soil, vegetation and soil surface roughness changes from snowpack properties.

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<sup>1</sup> Environmental and Climate Change Canada, Landscape Science and Technology Division, Ottawa, ON, Canada

<sup>2</sup> Environment and Climate Change Canada, Climate Research Division, Toronto, ON, Canada

<sup>3</sup> German Remote Sensing Data Center (DFD), German Aerospace Center (DLR), Köln, Germany

<sup>4</sup> Department of Electrical and Computer Engineering, University of Massachusetts, Amherst, MA, USA