Monitoring Cryospheric Processes in Canada With Spaceborne Scatterometer and Passive Microwave Data

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Recent investigations have demonstrated the potential of scatterometer data acquired at Ku-band and C-band for monitoring the global snow cover and the freeze/thaw status forest and tundra surfaces in Alaska and Siberia. Although the scatterometer data were originally intended for determining wind speed over the oceans, these data offer a great potential for monitoring cryospheric processes from regional to hemispheric scales. Scatterometers, which have a much wider field of view than SAR sensors, can provide a global picture of the land surface every few days with ERS-1 and -2, and on a daily basis with Seawinds on Quikscat. These data can therefore provide a perspective on how land surfaces are changing at various temporal resolutions. The coarser spatial resolution data are also of particular interest for climate modelling and for understanding the fluxes between the land surface and the atmosphere. The primary objective of this study is to investigate the potential of scatterometer data for monitoring the Canadian cryosphere (*i.e.* snow depth and snow water equivalent (SWE), snowmelt and refreezing events, frozen/thawed state of various surface types,), with the Canadian Prairies as our main study area. We systematically compare backscatter measurements with the available meteorological and cryospheric data for several sampling sites well-characterizing a variety of landscapes, in order to accurately assess the way the different cryospheric components and processes are involved in the backscatter response. Furthermore, we evaluate the synergistic use of Ku-band backscatter and passive microwave sensors for monitoring the cryosphere, especially snow cover, by comparing scatterometer data with the SSM/I brightness temperature and the SWE data derived from the operational SSM/I algorithm developed by the MSC-Climate Research Branch, and commonly applied to obtain SWE estimates over the Canadian Prairies.