Operational Ice Monitoring with RADARSAT-2 – Beyond ScanSAR Wide HH

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The Canadian Ice Service (CIS) promotes safe and efficient maritime operations and protects Canada's environment by providing reliable and timely information about ice and iceberg conditions in Canadian waters. CIS operations use a variety of both airborne and satellite image datasets to operationally monitor ice conditions in Canadian coastal and inland waterways. The service relies heavily on near real-time satellite SAR imagery to provide timely, dependable, year-round ice information. On an annual basis, the CIS acquires and interprets 5000 satellite C-band SAR images -- RADARSAT ScanSAR Wide (SCW) being the primary sensor and mode.

In September 2008, the CIS transitioned its ice operations over to the daily use of RADARSAT-2 heritage mode data, i.e. SCW HH. The paper will describe this transition and will comment on the performance of RADARSAT-2 in the context of operational ice monitoring. While RADARSAT-2 offers data continuity through its heritage modes, it also promised users an improvement in image quality and system performance that should improve ice monitoring. Comparison to concurrent RADARSAT-1 data revealed that indeed, RADARSAT-2 was found to have improved image quality over RADARSAT-1. Specifically, beam transitions in ScanSAR were less noticeable, nadir ambiguities less prevalent and a lower NESZ.

Within this transition period, CIS evaluated the utility of dual channel SCW data, i.e HH+HV and VV+VH, for daily ice operations. Prelaunch evaluations using Envisat AP mode data revealed that HV data had the potential to strongly complement HH data for operational ice monitoring. Specifically, the separation of ice from open water was found to be less difficult at HV polarization due to consistently high contrast between ice and open, independent of wind speed. Also, VV data had been found to improve ice detection at shallow incidence angles.

Post-launch evaluation of RADARSAT-2 ScanSAR Wide HV to validate and expand these pre-launch findings continues at the CIS. Concurrent field-validated datasets were collected over both marginal seasonal (first-year) ice and pack (multiyear) ice regime during freeze-up and melt seasons. VV, HH and HV absolute backscatter was sampled and compared across various ice types over

the entire ScanSAR swath. Also, the HV images were examined and evaluated by expert ice analysts. Results to date have been consistent with the pre-launch evaluation. The HV channel can improve open water / ice discrimination in the near to mid-range and is providing some measure of large scale ice deformation (pressure ridges) detection. Also, since HV is more sensitive to large scale surface roughness (and less to small scale roughness), floe perimeters are more easily discerned and mapped compared to HH. This has the potential to improve floe size estimates and concentration in high concentration ice regimes.