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# EXTREME ICE FEATURE MONITORING USING C- and X-BAND DATA

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**ABSTRACT:**

Satellite synthetic aperture radar (SAR) images at C-band (RADARSAT-2 – RS2) and X-band (COSMO SkyMed - CSK and TerraSAR-X - TSX) were collected over the Beaufort Sea when ice cover was present. SAR algorithms were developed to automatically extract ice feature characteristics from ice islands and fragments, hummocks, ridges, and rubble fields.

C-and X-band satellite systems have different capabilities which make them suitable for a variety of applications:

- X-band data shows better contrast between ice and open water than C-band, however C-band over open water is less sensitive to environmental conditions;
- RS2 has more multiple polarization modes, which are useful for detecting and discriminating extreme ice features (EIFs) embedded in pack ice;
- Larger swath widths are possible at C-band and research has correlated ridge frequency with SAR backscatter response over large areas;
- Shorter revisit is available at X-band allowing a . Using TanDEM-X data a 3D surface profile of an iceberg was created. Using CSK images with one day separation small scale sea ice movement/deformation was observed;
- Both TSX and CSK are available as constellations, which provides acquisition redundancy in case of conflicts; and
- Low resolution RS2 data are used extensively for ice charting, but TSX and CSK are used less frequently. These satellites are preferred for operations when high and medium resolution data are required.

The research indicates that C- and X-band are useful in complementary ways. The recently launched C-band Sentinel-1 satellite shares many of the benefits of current X- and C-band systems: higher resolution at wide swath, conflict free operation through pre-defined acquisitions, dual polarized operation and the second satellite in the constellation will be launched in 2016. Future research will evaluate Sentinel-1 data for monitoring EIFs. This research has been supported by the Canadian Space Agency Earth Observation Application Development Program.