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Spatial and Temporal Variations in Ice Motion, Belcher Glacier and Devon Ice Cap, Nunavut, Canada

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This study presents comprehensive surface ice motion patterns of all major outlet glaciers across Devon Ice Cap, with a specific focus on seasonal changes in ice flux through the Belcher Glacier drainage basin (the largest tidewater outlet glacier of the ice cap). Synthetic aperture radar (SAR) speckle tracking of Radarsat-2 fine beam images is used to determine seasonal ice motion throughout 2008 and 2009. The results provide the first true velocity maps for Devon Ice Cap, as speckle tracking is unaffected by satellite look-direction problems associated with previous ice motion studies using SAR interferometry.

The speckle tracking results are verified against ice velocities determined between summer 2007 and summer 2009 with continuous differential GPS (dGPS) measurements along the centerline of the Belcher Glacier. In addition, annual ice motion was determined for all major tributaries of the Belcher basin by resurveying fixed marker stakes with dGPS between spring 2008 and spring 2009. Ground penetrating radar (GPR) is used to determine ice depths for each tributary and the main trunk of the Belcher Glacier. These are combined with the speckle tracking velocity results to determine ice fluxes moving through the Belcher basin.

Results are compared to the work of Burgess et al (2005), who provided ice motion maps for the Devon Ice Cap and Belcher Glacier regions from the mid-1990s. The present study increases the resolution and accuracy of the earlier results, and enables an evaluation of whether ice motion has changed over the last $\sim$15 years.