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CryoSat-2 observations of Arctic ice-cap mass trends

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The primary objective of Cryosat-2 is to measure changes in sea ice freeboard and ice sheet topography, but the satellite also provides valuable information on height changes of smaller ice caps and icefields. Compared to earlier radar altimetry missions, which where unable to retrieve elevation changes over complex terrain, Cryosat-2 has an improved capacity to locate across-track echoes and a finer spatial resolution that allows for the retrieval of elevation changes at scales of a few kilometers. We explore the utility of using Cryosat-2 interferometric SARin data to reconstruct volume changes of major ice masses in the Canadian Arctic. These measurements are compared to elevations determined from airborne (OIB ATM) and satellite (ICESat) laser altimetry. We discuss potential biases, such as slope-dependent offsets and biases depending on the orientation of the satellite track. We extrapolate the bias corrected Cryosat-2 derived elevation changes over the entire region to arrive at an estimate of the total change in glacier mass over period 2010 to 2013 and compare this to monthly glacier mass anomalies as derived from gravity measurements made by the GRACE mission.