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Fine Ice Sheet margins topography from swath processing of CryoSat SARIn mode data

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Reference and repeat-observations of Glacier and Ice Sheet Margin (GISM) topography are critical to identify changes in ice thickness, provide estimates of mass gain or loss and thus quantify the contribution of the cryosphere to sea level change. The lack of such sustained observations was identified in the Integrated Global Observing Strategy (IGOS) Cryosphere Theme Report as a major shortcoming. Conventional altimetry measurements over GISMs exist, but coverage has been sparse and characterized by coarse ground resolution. Additionally, and more importantly, they proved ineffective in the presence of steep slopes, a typical feature of GISM areas. Since the majority of Antarctic and Greenland ice sheet mass loss is estimated to lie within 100 km from the coast, but only about 10% is surveyed, there is the need for more robust and dense observations of GISMs, in both time and space.

The ESA Altimetry mission CryoSat aims at gaining better insight into the evolution of the Cryosphere. CryoSat's revolutionary design features a Synthetic Interferometric Radar Altimeter (SIRAL), with two antennas for interferometry. The corresponding SAR Interferometer (SARIn) mode of operation increases spatial resolution while resolving the angular origin of off-nadir echoes occurring over sloping terrain. The SARIn mode is activated over GISMs and the elevation for the Point Of Closest Approach (POCA) is a standard product of the CryoSat mission.

Here we present a new approach for more comprehensively exploiting the SARIn mode of CryoSat and produce an ice elevation product with enhanced spatial resolution compared to standard CryoSat-2 height products. In this so called L2-swath processing approach, the signal beyond the POCA is exploited when signal and surface characteristics are favourable. We will present the rationale, validation exercises and preliminary results from the STSE CryoTop study over selected test regions of the margins of the Greenland and Antarctic Ice Sheets.