



Surface elevation change over the Patagonia Ice Fields using CryoSat-2 swath altimetry

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Satellite altimetry has been traditionally used in the past few decades to infer elevation of land ice, quantify changes in ice topography and infer mass balance estimates over large and remote areas such as the Greenland and Antarctic ice sheets. Radar Altimetry (RA) is particularly well suited to this task due to its all-weather year-round capability of observing the ice surface. However, monitoring of ice caps (area < 104 km²) as well as mountain glaciers has proven more challenging. The large footprint of a conventional radar altimeter and relatively coarse ground track coverage are less suited to monitoring comparatively small regions with complex topography, so that mass balance estimates from RA rely on extrapolation methods to regionalize elevation change.

Since 2010, the European Space Agency's CryoSat-2 (CS-2) satellite has collected ice elevation measurements over ice caps with its novel radar altimeter. CS-2 provides higher density of observations w.r.t. previous satellite altimeters, reduces the along-track footprint using Synthetic Aperture Radar (SAR) processing and locates the across-track origin of a surface reflector in the presence of a slope with SAR Interferometry (SARIn).

Here, we exploit CS-2 as a swath altimeter [Hawley et al., 2009; Gray et al., 2013; Christie et al., 2016; Ignéczki et al., 2016, Foresta et al., 2016] over the Southern and Northern Patagonian Ice Fields (SPI and NPI, respectively). The SPI and NPI are the two largest ice masses in the southern hemisphere outside of Antarctica and are thinning very rapidly in recent decades [e.g Rignot et al., 2003; Willis et al, 2012]. However, studies of surface, volume and mass change in the literature, covering the entire SPI and NPI, are limited in number due to their remoteness, extremely complex topography and wide range of slopes. In this work, we present rates of surface elevation change for five glaciological years between 2011-2016 using swath-processed CS-2 SARIn heights and discuss the spatial and temporal coverage of elevation and its rate of change over the two regions.