



## Changes of the cryosphere observed by ICESat

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The Ice, Cloud, and land Elevation Satellite (ICESat), which carries the Geoscience Laser Altimeter System (GLAS), has provided elevation estimates of the ice sheets since the launch in 2003. Satellite laser altimetry offers a unique data set for studies of the changes of the cryosphere.

Technical problems with the lasers onboard ICESat have limited the number of repeated tracks, which introduces some difficulties when working with the data. The repeated tracks are not repeated precisely, but can be separated by up to several hundred meters. This has to be accounted for especially in areas of high surface slope. Here we present a method to derive elevation changes of the large ice sheets from ICESat repeat track altimetry data.

Our results for the Greenland Ice Sheet show rapid thinning near the ice edge in Southeast Greenland and West Greenland, which corresponds well with the observed acceleration of large outlet glaciers such as Helheim, Kangerdlussuaq and Jakobshavn. We convert the volume changes derived from ICESat into a mass change, using assumptions of snow/ice densities and a model to estimate the effect of firn compaction.