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Marginal thinning in Northwest Greenland during 2002-2011

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Many glaciers along the southeast and northwest coast of Greenland have accelerated, increasing the Greenland ice sheet's (GrIS) contribution to global sea-level rise. Here, we map elevation changes in northwest Greenland during 2003-2009 using high-resolution Ice, Cloud and land Elevation Satellite (ICESat) laser altimeter data (Zwally, 2010) supplemented with altimeter surveys from NASA's Airborne Topographic Mapper (ATM) during 2002-2011 (Krabill, 2011). We use the measurements of elevation change to estimate catchment-wide ice volume loss (convert is to mass loss) and compare with independent measurements from GPS and the Gravity Recovery and Climate Experiment (GRACE) satellite gravity mission, launched in March, 2002. The GRACE results provide a direct measure of mass loss averaged over the entire northwest sector, while the GPS data are used to monitor crustal uplift caused by ice mass loss close to the sites.
GPS data from a long term site at Thule Airbase show accelerated uplift starting in 2005 and a minor deceleration in 2009-2010. The deceleration is more dominant at GPS stations deployed in 2007 in northwest Greenland as part of the Greenland GPS Network (GNET). Independently, all three methods suggest increased ice loss in northwest Greenland starting in 2005 and a slowdown in 2009-2010.