

# Princeton geoscientists report Greenland ice sheet melting rate is increasing

20 November 2012, by Bob Yirka



Isua Supracrustal Belt Isua, south-west Greenland.  
Credit: University of Washington.

(Phys.org)—Princeton geoscientists Christopher Harig and Frederik Simons have been applying new methods to study the amount of ice melt in the Greenland ice sheet. They report in a paper published in the *Proceedings of the National Academy of Sciences* that the rate is approximately 200 billion tons annually and is rising at a rate of approximately 9 billion tons per year.

The two used data from the twin satellites used in the Gravity Recovery and [Climate Experiment](#) (GRACE) that orbit in tandem over the Earth. As they pass over the planet they measure very small differences in gravity between the two that correspond to the amount of mass below. In looking at data recorded during the period August 2002 to 2011, they were able to measure the changes in mass of the ice sheet that covers Greenland, which is second only to Antarctica in size.

The two found that by analyzing GRACE data very closely they could actually pinpoint the parts of the ice sheet that were changing and by how much. They noted for example, that for the year 2003 to 2004, the bulk of melting occurred along the

eastern coast of the island nation, whereas over the following year it was centered in the northeast. Surprisingly, they found that even as the ice sheet as a whole was losing mass, some mass was gained in central Greenland. It's not known why this has happened, but it's possibly due to higher amounts of snowfall that might have occurred.

The melting of the [polar ice sheets](#) is believed to be associated with rising [global temperatures](#), which in turn is believed by most scientists to be the result of increased amounts of carbon dioxide in the atmosphere due mainly to human pollutants. As the ice sheets melt, [global sea levels](#) rise. By studying melting rates, scientists are able to provide better estimates on how much the sea will rise and when. Current estimates put [sea level rise](#) at 0.1 inches per year. Using the numbers from their study, the researchers estimate that sea levels will rise 2.4 inches over the next century from just the melting that is occurring in Greenland. They also note that based on current numbers, it would take approximately 13,000 years for all of the ice in Greenland to melt.

**More information:** Mapping Greenland's mass loss in space and time, Published online before print November 19, 2012, [doi: 10.1073/pnas.1206785109](#) ([PDF](#))

## Abstract

The melting of polar ice sheets is a major contributor to global sea-level rise. Early estimates of the mass lost from the Greenland ice cap, based on satellite gravity data collected by the Gravity Recovery and Climate Experiment, have widely varied. Although the continentally and decadal averaged estimated trends have now more or less converged, to this date, there has been little clarity on the detailed spatial distribution of Greenland's mass loss and how the geographical pattern has varied on relatively shorter time scales. Here, we present a spatially and temporally resolved estimation of the ice mass change over Greenland

between April of 2002 and August of 2011. Although the total mass loss trend has remained linear, actively changing areas of mass loss were concentrated on the southeastern and northwestern coasts, with ice mass in the center of Greenland steadily increasing over the decade.

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