Greenland ice loss is at ‘worse-case scenario’ levels, study finds

UCI glaciologists play key roles on international assessment team
Thursday, December 19, 2019
Brian Bell
UCI News



“The more remarkable result from this study is that Greenland is melting along the lines of the highest rate of warming examined by climate models. In other words, we’re in the worst-case scenario,” says Eric Rignot, UCI professor and chair of Earth system science, shown here in Greenland with fellow researcher Isabella Velicogna, also a UCI professor of Earth system science.

Picture Credit:
Maria Stenzel / For UCI

Greenland is losing ice mass seven times faster than in the 1990s, a pace that matches the Intergovernmental Panel on Climate Change’s high-end warming scenario – in which 400 million people would be exposed to coastal flooding by 2100, 40 million more than in the mid-range prediction.

The alarming update resulted from the Ice Sheet Mass Balance Intercomparison Exercise, a project involving nearly 100 polar scientists from 50 international institutions, among them two from the University of California, Irvine.

IMBIE researchers combined 26 separate surveys to compute changes in the mass of Greenland's ice sheet between 1992 and 2018. Altogether, data from 11 different satellite missions were used, including measurements of the ice sheet's changing volume, flow and gravity.

The findings, published recently in *Nature*, show that Greenland has lost 3.8 trillion tons of ice since 1992 – enough to raise global sea levels by 10.6 millimeters (almost half an inch). The rate of ice loss has risen from an average of 33 billion tons per year in the 1990s to 254 billion tons per year in the last decade – a sevenfold increase within three decades.

"There is a rather universal agreement among the independent techniques used in this study and the international group of researchers about the mass loss in Greenland: half from surface melt, half from faster glacier flow," said IMBIE team member Eric Rignot, chair, Donald Bren Professor and Chancellor's Professor of Earth system science at UCI. "The more remarkable result from this study is that Greenland is melting along the lines of the highest rate of warming examined by climate models. In other words, we're in the worst-case scenario."

Rignot was the technical lead for the mass budget method, which compares the accumulation of snowfall in the interior with surface melt and the output of mass into the ocean from glaciers.

Isabella Velicogna, UCI professor of Earth system science, directed the part of the project that used time-variable gravity data from NASA's Gravity Recovery and Climate Experiment to measure ice sheet mass balance with great precision.

"The GRACE mission has been a leading force for looking at the mass balance of Greenland, and with the GRACE Follow-On mission, we're able to continue these critical observations," she said. "The signal from Greenland is so big right now in the GRACE observations that it's hard to miss, and it's above what was expected from climate models."

In 2013, the Intergovernmental Panel on Climate Change predicted that global sea levels would rise by 60 centimeters by 2100, putting 360 million people at risk of annual coastal flooding. But this new study shows that Greenland's ice losses are increasing faster than anticipated and are more aligned with the IPCC's high-end climate warming scenario, which forecasts an additional 7 centimeters of sea level rise.

Ice losses peaked at 335 billion tons in 2011 – 10 times the rate of the 1990s – during a period of intense surface melting, IMBIE researchers found. And although the pace has since dropped to an average of 238 billion tons per year, this remains seven times higher than in the ’90s and does not include all of 2019, which could set a new high due to widespread summer melting.

IMBIE is supported by NASA’s Cryospheric Sciences Program and the European Space Agency’s Climate Change Initiative.

Original Source
Press Releases
Earth System Science
Climate Change
View PDF