Study finds high melt rates on Antarctica's most stable ice shelf

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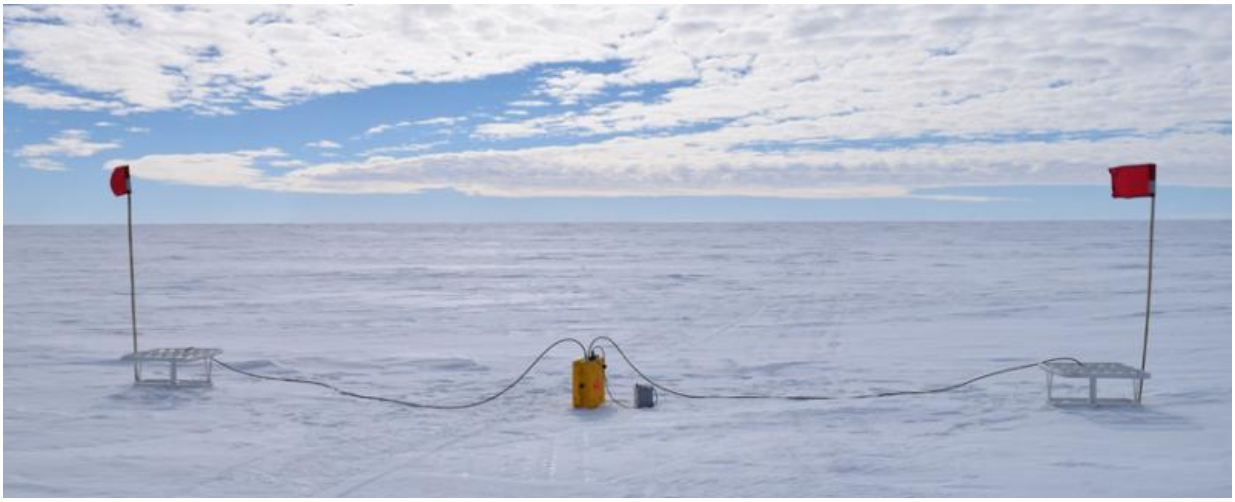

Phase sensitive radar system used by the Scripps Oceanography team to collect data. Credit: Scripps Oceanography/Oliver Marsh

A new Scripps Institution of Oceanography at UC San Diego-led study measured a melt rate that is 25 times higher than expected on one part of the Ross Ice Shelf. The study suggests that high, localized melt rates such as this one on Antarctica's largest and most stable ice shelf are normal and keep Antarctica's ice sheets in balance.

The Ross Ice Shelf, a floating body of land ice the size of France jutting out from the Antarctic mainland, continuously melts and grows in

response to changes to both the ice sheet feeding it and the warmer Southern Ocean waters beneath it.

For six weeks the researchers collected radar data to map changes in ice shelf thickness to understand the processes that contribute to melting at its base. The findings revealed dramatic changes in melt rate within less than a mile.

The highest melting rates of more than 20 meters (66 feet) per year are thought to contribute to the rapid formation of channels at the base of the ice shelf, which can result from fresh water flowing out from lakes under the West Antarctica ice sheet. Shifts in subglacial drainage patterns change the location of these basal channels, which could impact the ice shelf's stability by unevenly distributing the melting at the base.

"The highest melt rates are all clustered at the start of a developing ice shelf channel," said Scripps alumnus Oliver Marsh, a postdoctoral researcher at the University of Canterbury and lead author of the study. "The location of the melting strengthens the idea that freshwater from the local subglacial drainage system is responsible for the evolving ice shelf features."

The study, published in the American Geophysical Union's *Geophysical Research Letters*, is the first to document fine-scale changes taking place on the ice shelf that help maintain its natural balance with the surrounding ocean waters.

"It's just as important to study the places that aren't changing as the ones that are," said Scripps glaciologist Helen Amanda Fricker, a co-author of the study. "We need to understand what is causing the melting in order to predict how these places may change in the future."

Melting of ice shelves does not directly contribute to sea-level rise, but

instead they hold back water frozen in the larger ice sheet that will cause sea levels to rise. The study helps researchers understand the oceanographic processes necessary to better predict future sea-level rise from the melting of ice sheets due to climate change.

"Below the Ross Sea is one of the most remote parts of the ocean floor, and is largely unmapped," said Matt Siegfried, Scripps postdoctoral researcher and a co-author of the study. "This research is helping us better understand the interactions between the ice sheet and the ocean in this remote region on Earth."

According to the researchers, more sustained, long-term measurements are necessary to determine the exact cause of the high melt rate and how it changes over seasonal or annual timescales.

More information: *Geophysical Research Letters*, onlinelibrary.wiley.com/doi/10 … 02/2015GL066612/full

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