

Scientists Discover Another Reason for Glacial Acceleration

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File photo of an iceberg in North Bay, Rothera Point, Adelaide Island, Antarctica. Scientists unveiled Sunday the first direct evidence that massive floods deep below Antarctica's ice cover are accelerating the flow of glaciers into the sea.

(PhysOrg.com) -- Using nearly 50 years of data, University of Maine researchers have determined that subglacial floods in East Antarctica caused a rapid and short-lived acceleration of a major outlet glacier.

Leigh Stearns and Gordon Hamilton of UMaine's Climate Change Institute, along with Benjamin Smith of the University of Washington, observed that the flow rate of a large outlet glacier in East Antarctica increased by about 10 percent in response to the flooding of two subglacial lakes.

The team's findings are based on a 48-year record of ice velocities along Byrd Glacier, East Antarctica along with recent satellite observations of ice surface elevation and ice velocities from NASA's Advanced Spaceborne Thermal Emission and Reflection Radiometer instrument on NASA's Terra satellite; the Ice, Cloud and Land Elevation Satellite; and Landsat; as well as SPOT and Japan's Advanced Land Observing Satellite, and have been reported in a *Nature Geoscience* paper.

"We saw that there was this very rapid acceleration of the glacier that we didn't initially have an explanation for," Hamilton said.

It wasn't until Stearns presented these observations at a conference last year that we recognized the connection between the glacier acceleration and the subglacial drainage event.

"After my presentation," explains Stearns, "Ben [Smith, co-author] and I compared the timing of the flooding event that he measured, and the acceleration of Byrd Glacier, and were excited to find that they occurred at roughly the same time."

The increase in ice flow speed coincides with rapid changes in ice surface elevation about 200 km upstream, which the research team interprets as the filling and draining of two subglacial lakes.

"Our work shows that the speed of the glacier can change by a very large amount," Hamilton said. "It only lasted for a year, but if the same process happens again at a larger scale, sea level could rise much quicker."

For the past year, some of the team's colleagues have been mapping subglacial lakes and discovered that they are quite prevalent.

"Our understanding of why they occur is minimal," Hamilton said,

noting that it previously was thought that these lakes were stable and relatively inactive.

"The more we look, the more we see that these lakes fill up and drain," Hamilton said.

"One of the implications of this work," explains Stearns, "is that the addition of even a small amount of water to the bottom of a glacier can cause significant acceleration. While the changes taking place on Byrd Glacier are not caused by climate-driven processes, they highlight the sensitivity of glaciers to small changes."

Future investigations are expected to look at other subglacial lakes to measure their activity and determine how to include subglacial flooding in current ice sheet models for more accurate predictions of sea level changes.

"We need to include all the important processes that cause the ice sheets to grow and shrink," Hamilton said.

Provided by University of Maine

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