

Ice Sheets Can Retreat 'In a Geologic Instant,' Study of Prehistoric Glacier Shows

June 21 2009



Jason Briner's research reveals that modern glaciers in deep ocean water can undergo periods of rapid retreat, where they can shrink even more quickly than has recently been observed.

(PhysOrg.com) -- Modern glaciers, such as those making up the Greenland and Antarctic ice sheets, are capable of undergoing periods of rapid shrinkage or retreat, according to new findings by paleoclimatologists at the University at Buffalo.

The paper, published on June 21 in *Nature Geoscience*, describes fieldwork demonstrating that a prehistoric glacier in the Canadian Arctic rapidly retreated in just a few hundred years.

The proof of such rapid retreat of ice sheets provides one of the few explicit confirmations that this phenomenon occurs.

Should the same conditions recur today, which the UB scientists say is very possible, they would result in sharply rising [global sea levels](#), which would threaten coastal populations.

"A lot of glaciers in Antarctica and Greenland are characteristic of the one we studied in the Canadian Arctic," said Jason Briner, Ph.D., assistant professor of geology in the UB College of Arts and Sciences and lead author on the paper. "Based on our findings, they, too, could retreat in a geologic instant."

The new findings will allow scientists to more accurately predict how global warming will affect ice sheets and the potential for [rising sea levels](#) in the future, by developing more robust climate and ice sheet models.

Briner said the findings are especially relevant to the Jakobshavn Isbrae, Greenland's largest and fastest moving tidewater glacier, which is retreating under conditions similar to those he studied in the Canadian Arctic.

Acting like glacial conveyor belts, tidewater glaciers are the primary mechanism for draining ice sheet interiors by delivering icebergs to the ocean.

"These 'iceberg factories' exhibit rapid fluctuations in speed and position, but predicting how quickly they will retreat as a result of [global warming](#) is very challenging," said Briner.

That uncertainty prompted the UB team to study the rates of retreat of a prehistoric tidewater glacier, of similar size and geometry to contemporary ones, as way to get a longer-term view of how fast these glaciers can literally disappear.

The researchers used a special dating tool at UB to study rock samples they extracted from a large fjord that drained the ice sheet that covered the North American Arctic during the past Ice Age.

The samples provided the researchers with climate data over a period from 20,000 years ago to about 5,000 years ago, a period when significant warming occurred.

"Even though the [ice sheet](#) retreat was ongoing throughout that whole period, the lion's share of the retreat occurred in a geologic instant -- probably within as little as a few hundred years," said Briner.

The UB research reveals that the period of rapid retreat was triggered once the glacier entered deep ocean waters, nearly a kilometer deep, Briner said.

"The deeper water makes the glacier more buoyant," he explained.

"Because the rates of retreat were so much higher in the deep fjord, versus earlier when it terminated in more shallow waters or on land, the findings suggest that contemporary tidewater glaciers in Greenland and Antarctica that are retreating into deep waters may begin to experience even faster rates of retreat than are currently being observed," said Briner.

Right now, Jakobshavn Isbrae is draining into waters that are nearly a kilometer deep, he said, which means that its current rates of retreat -- as fast as 10 kilometers in the past decade -- could continue for the next hundred years.

"If modern glaciers do this for several decades, this would rapidly raise global sea level, intercepting coastal populations and requiring vast re-engineering of levees and other mitigation systems," said Briner.

Source: University at Buffalo ([news](#) : [web](#))

Citation: Ice Sheets Can Retreat 'In a Geologic Instant,' Study of Prehistoric Glacier Shows (2009, June 21) retrieved 25 April 2024 from <https://phys.org/news/2009-06-ice-sheets-retreat-geologic-instant.html>

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