

Fastest glacier in Greenland doubles speed

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The world's fastest [glacier](#), Greenland's Jakobshavn Isbrae, doubled its speed between 1997 and 2003. The rapid movement of ice from land into the sea provides key evidence of newly discovered relationships between ice sheets, sea level rise and climate warming.

The glacier's sudden speed-up also coincides with very rapid thinning, up to 49 feet of ice per year after 1997, according to research published in the Dec. 2 issue of the journal [Nature](#). Along with increased rates of ice flow and thinning, the thick ice that extends from the mouth of the glacier into the ocean, called the ice tongue, began retreating in 2000, breaking up almost completely by May 2003.

"In many climate models glaciers are treated as responding slowly to climate change," according to Ian Joughin, glaciologist at the University of Washington's Applied Physics Laboratory. "Over only a few years, this glacier has begun spewing something like an additional 30 cubic kilometers of ice into the ocean, twice what it had been producing. It appears ice sheets can respond rather dramatically to climate changes."

The NASA-funded study relies on data from satellites and airborne lasers to derive ice movements. Joughin, conducted much of this research while working at NASA's Jet Propulsion Laboratory, Pasadena, Calif. Co-authors are Waleed Abdalati, a senior scientist at NASA's Goddard Space Flight Center, Greenbelt, Md., and Mark Fahnestock, a researcher at the University of New Hampshire.

Jakobshavn Isbrae is Greenland's largest outlet glacier, draining 6.5 percent of Greenland's ice sheet area. Data from between 1985 and 2003

showed that the glacier slowed from a velocity of 4.2 miles per year in 1985 to 3.5 miles per year in 1992. This latter speed remained somewhat constant until 1997. By 2000, the glacier had sped up to 5.8 miles per year, topping out with the last measurement in spring 2003 of 7.8 miles.

"This finding suggests the potential for more substantial thinning in other glaciers in Greenland," Abdalati said. "Other glaciers have thinned by over a meter a year, which we believe is too much to be attributed to melting alone. We think there is a dynamic effect in which the glaciers are accelerating due to warming."

Airborne laser altimetry measurements of Jakobshavn's surface elevation, made previously by researchers at NASA's Wallops Flight Facility, showed a thickening, or building up of the glacier from 1991 to 1997, coinciding closely with the glacier's slow-down. Similarly, the glacier began thinning by as much as 49 feet a year just as its velocity began to increase between 1997 and 2003.

The acceleration comes at a time when the floating ice near the glacier's calving front has shown some unusual behavior. Despite its relative stability from the 1950s through the 1990s, the glacier's ice tongue began to break apart in 2000, leading to almost complete disintegration in 2003. The tongue's thinning and breaking up likely reduced any restraining effects it had on the ice behind it, as several speed increases coincided with losses of sections of the ice-tongue as it broke up.

"We still have a lot of work ahead of us to determine what the changes we are observing mean in terms of the long term stability of the ice sheet," Joughin said. "For example, we don't know if this glacier will continue to speed up and discharge more ice or if this is a short-term change that will die away within a few years."

Source: University of Washington

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