

# Speed of Glacier Movement Raises Questions and Concerns

Work by UMaine researchers Gordon Hamilton and Leigh Stearns may change the thinking about how quickly Greenland's ice sheet is disappearing.

By *Jim Frick*

University of Maine researcher Gordon Hamilton has studied the ice sheets of Greenland and Antarctica since the early 1990s. From those studies he knew that Greenland was changing quite rapidly, in ways that really couldn't be explained.

One change was the speed at which certain southern Greenland glaciers were moving—an indicator of the rate of melting. Satellite imagery studies undertaken by Hamilton and UMaine doctoral student Leigh Stearns showed increasing speeds in the movement of those glaciers.

But neither Hamilton nor Stearns was prepared for what they found when they actually visited the Greenland ice sheet and measured glacier movement on site.

At least two large glaciers had tripled their normal speed.

"We almost fell off our chairs, we were so shocked," Stearns said in a recent Associated Press interview. "The first thing you do as a scientist when you get a result like that is to recheck it and recheck it. I thought I had made a mistake."

Hamilton and Stearns had chosen glaciers with the longest historical records. All were close to the same size—about five miles wide, 30 miles long, and half a mile thick. The records indicated that there were no large changes in those glaciers' speed through 2001.

One of the glaciers, named Kangerdlugssuaq, had an average speed of about 3.5 miles per year in the late 1990s.



But when the UMaine team measured it this summer it was moving at an amazing 8.7 miles per year, or about 50 yards a day.

"The surprise was not just that the speed had increased," Hamilton notes, "but that it happened in such a short period of time. Something very dramatic has occurred in just a few years. Normally we expect such a change to take hundreds or thousands of years."

Hamilton says that such a surprising increase in glacier speed could well be an indicator that unexpectedly rapid changes are taking place in Greenland as a result of a warming climate. Those changes could eventually have dramatic consequences.

"If more of the glaciers begin to move very fast, you will get more and more ice removed from the center of the ice sheet," Hamilton explains. "Glaciers transport ice to the ocean. As a result, ocean and sea lev-

els could rise dramatically—in ways that current models don't take into account."

Those models assume that ice sheets respond slowly to climate warming and that resulting sea level changes would also be slow in coming.

"What we found this summer brings that assumption into question," Hamilton says. "This shows that a warming trend can cause glaciers to accelerate at three times their speed within a ten-year period."

Hamilton explains that having a few glaciers increase speed would not cause a big impact on sea level. But if significant portions of the ice sheet were to melt and cause other glaciers to move faster, the impact would be dramatic. If the entire Greenland ice sheet melted, the sea level would rise 21 feet. Such an occurrence would cause major dislocation and disruption.

"Since most of the world's population lives near coastlines, there's a great need to understand what is really happening to the ice sheets," Hamilton says.

Increased speed for a glacier relates directly to warmer temperatures. As ice on the surface melts, water trickles in various ways to the bottom where it acts as a lubricant between the glacier and the bedrock on which the glacier slides.

Hamilton believes that a pronounced rise in temperatures in the Greenland region in the past 10 years has increased the intensity of the ice sheet melt as well as the time period over which melting occurs.

Hamilton and Stearns got the opportunity to do on-site research of the Greenland glaciers courtesy of Greenpeace, whose ice



All photographs courtesy of Greenpeace.

breaker *Arctic Sunrise* was traveling to the region for a separate climate change-related mission. Hamilton stresses that he and Stearns operated completely as independent scientists, under no obligation to the environmental group. They both have no doubt that humans are contributing to climate change, but they don't believe in mixing science with politics.

No one had ever actually been on the glaciers which Greenpeace took Hamilton and Stearns to this summer. They were flown from the ship by helicopter to several suitable sites on each glacier (not an easy task on the jagged hills of ice and snow) where they used an auger to drill a hole in the ice surface. In the hole they placed Global Positioning System (GPS) devices to find their exact point.

"We then left the equipment there for about an hour so it could collect satellite data," Stearns explains. "Then we took the

equipment and flew back to the ship and let the glacier move for 24 to 48 hours. When we returned with the GPS equipment, we'd again find our exact position. That gave us two points, so we could figure exactly how much it moved in a specific amount of time."

The UMaine team landed four times at each site. They later matched their findings to velocities measured from satellite imagery.

"It was a great opportunity to actually get to these glaciers that we had been looking at so long from space," Hamilton says. "It was important because with the satellite imagery we couldn't get good data on the fast-moving glaciers. By being there and using GPS and traditional surveying techniques we could."

Hamilton and Stearns' findings have received a good deal of media coverage, although Hamilton is quick to point out

that most of it has come from outside the United States.

"Yes, it got a lot of foreign press coverage and was on Danish, Pakistani, and Russian television," Hamilton notes. "But as far as we know, there hasn't been any coverage on American networks."

The findings are also likely to foster other research interests, perhaps even among Hamilton's colleagues in UMaine's highly respected Climate Change Institute, where he says he regularly collaborates with other scientists.

As far as going back to Greenland, both researchers would jump at the opportunity, whether with Greenpeace or another group or agency.

"We both like working in the field and would welcome more first-hand study," Hamilton says. "But we need a small ice breaker and a helicopter, and those aren't easy to come by."