Team finds subtropical waters flushing through Greenland fjord

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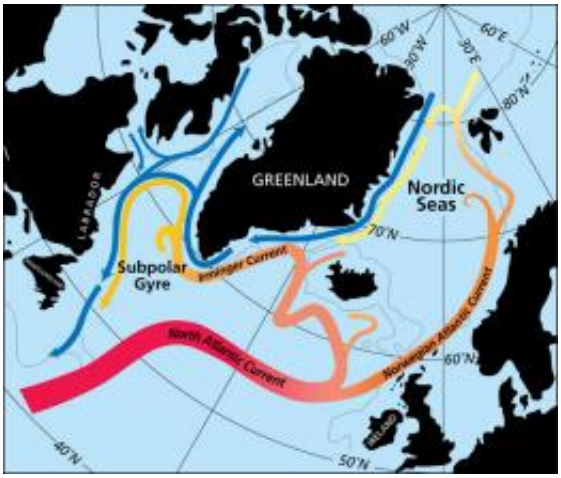

Recent changes in ocean circulation in the North Atlantic are delivering larger amounts of subtropical waters to the high latitudes. A research team led by Fiamma Straneo, a physical oceanographer at Woods Hole Oceanographic Institution, found that subtropical waters are reaching Greenland's glaciers, driving melting and likely triggering an acceleration of ice loss. Melting ice also means more fresh water in the ocean, which could flood into the North Atlantic and disrupt a global system of currents, known as the Ocean Conveyor. (Jack Cook, Woods Hole Oceanographic Institution)

Waters from warmer latitudes -- or subtropical waters -- are reaching Greenland's glaciers, driving melting and likely triggering an acceleration of ice loss, reports a team of researchers led by Fiamma Straneo, a physical oceanographer from the Woods Hole Oceanographic Institution (WHOI).

"This is the first time we've seen waters this warm in any of the fjords in Greenland," says Straneo. "The subtropical waters are flowing through the fjord very quickly, so they can transport heat and drive melting at the end of the glacier."

Greenland's ice sheet, which is two-miles thick and covers an area about the size of Mexico, has lost mass at an accelerated rate over the last decade. The ice sheet's contribution to sea level rise during that time frame doubled due to increased melting and, to a greater extent, the widespread acceleration of outlet glaciers around Greenland.

While melting due to warming air temperatures is a known event, scientists are just beginning to learn more about the ocean's impact — in particular, the influence of currents — on the ice sheet.

"Among the mechanisms that we suspected might be triggering this acceleration are recent changes in ocean circulation in the North Atlantic, which are delivering larger amounts of subtropical waters to the high latitudes," says Straneo. But a lack of observations and measurements from Greenland's glaciers prior to the acceleration made it difficult to confirm.

The research team, which included colleagues from University of Maine, conducted two extensive surveys during July and September of 2008, collecting both ship-based and moored oceanographic data from Sermilik Fjord — a large glacial fjord in East Greenland.

Sermilik Fjord, which is 100 kilometers (approximately 62 miles) long, connects Helheim Glacier with the Irminger Sea. In 2003 alone, Helheim Glacier retreated several kilometers and almost doubled its flow speed.

Deep inside the Sermilik Fjord, researchers found subtropical water as warm as 39 degrees Fahrenheit (4 degrees Celsius). The team also

reconstructed seasonal temperatures on the shelf using data collected by 19 hooded seals tagged with satellite-linked temperature depth-recorders. The data revealed that the shelf waters warm from July to December, and that subtropical waters are present on the shelf year round.

"This is the first extensive survey of one of these fjords that shows us how these warm waters circulate and how vigorous the circulation is," says Straneo. "Changes in the large-scale ocean circulation of the North Atlantic are propagating to the glaciers very quickly — not in a matter of years, but a matter of months. It's a very rapid communication."

Straneo adds that the study highlights how little is known about ocean-glacier interactions, which is a connection not currently included in climate models.

"We need more continuous observations to fully understand how they work, and to be able to better predict sea-level rise in the future," says Straneo.

Provided by Woods Hole Oceanographic Institution