

[Greenland's ice cap is melting at a frighteningly fast rate](#)

- [David Perlman, Chronicle Science Editor](#)

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The vast ice cap that covers Greenland nearly three miles thick is melting faster than ever before on record, and the pace is speeding year by year, according to global climate watchers gathering data from twin satellites that probe the effects of warming on the huge northern island.

The consequence is already evident in a small but ominous rise in sea levels around the world, a pace that is also accelerating, the scientists say.

According to the scientists' data, Greenland's ice is melting at a rate three times faster than it was only five years ago. The estimate of the melting trend that has been observed for nearly a decade comes from a University of Texas team monitoring a satellite mission that measures changes in the Earth's gravity over the entire Greenland ice cap as the ice melts and the water flows down into the Arctic ocean.

"We have only been watching the ice cap melt during a relatively short period," physicist Jianli Chen said Thursday, "but we are seeing the strongest evidence of it yet, and in the near future the pace of melting will accelerate even more."

The same satellites tracking Greenland's ice cap also are monitoring the melt rate of Antarctica's ice cover, and there too the melting is adding to the global rise in sea level, according to another team of scientists.

Next to Antarctica, Greenland, a self-governing Danish territory, is the largest reservoir of fresh water on Earth and holds about 10 percent of the world's supply. The increasing flow of fresh water -- most of it from glaciers melting on Greenland's eastern coast -- is already beginning to change the composition of the ocean's salt water currents flowing past Northwestern Europe, the scientists say.

The result could be a critical change in the composition of the main ocean current that flows past Europe's northern edge, blocking off warmer waters that normally flow there and -- ironically -- making Northern Europe's weather colder than normal, at least temporarily, while the rest of the globe continues warming.

The report on Greenland is being published today in the on-line edition of the journal *Science* by the University of Texas scientists at Austin, including Chen, aerospace engineer Byron Tapley and geologist Clark Wilson.

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According to the researchers, surface melting of Greenland's ice cap reached 57 cubic miles a year between April of 2002 and November of 2005, compared to about 19 cubic miles a year between 1997 and 2003.

"The sobering thing is to see that the whole process of glacial melting is stepping up much more rapidly than before," said Tapley in a statement.

If the Greenland ice cap ever melted completely -- a highly unlikely event, at least in the foreseeable future -- the scientists estimate it would raise world's sea level by an average of 6.5 meters, or about 21 feet, more than enough to drown all the world's low-lying islands and even some entire nations, like Holland.

The possibility of future sea level rises becomes even more evident when Antarctica's huge ice sheets are considered.

Only last March two University of Colorado physicists used the same satellite system to measure melting of ice on the Antarctic continent. Although earlier evidence using other techniques appeared to show that the East Antarctica ice sheet was actually thickening, satellite data gathered by Isabella Velicogna and John Wahr at Boulder found that melting -- primarily from the West Antarctic Ice Sheet -- had turned at least 36 cubic miles of ice to fresh water each year from 2002 to 2005.

A recent report from the Intergovernmental Panel on Climate Change -- known as the IPCC -- estimated that during all of the past century worldwide melting ice from global warming had raised sea levels by only two-tenths of a millimeter a year, or about 20 millimetres over the last century. The current rate of rise is approximately five times faster than past estimates.

But, according to Chen and his Texas team, the melting of Greenland's ice cap is already raising global sea levels by six-tenths of a millimeter each year, and the Colorado group estimates that melting of the West Antarctic Ice Sheet alone is adding up to four-tenths of a millimeter of fresh water to sea levels each year. In other words, the global sea level, due to melting of the ice in Greenland and Antarctica combined, is already rising 10 times faster than the IPCC's tentative estimates, the two analyses indicate.

Both the Texas and Colorado groups have been obtaining their data from two satellites known as GRACE, the Gravity Recovery and Climate Experiment, which fly in orbit 137 miles apart and determine with extraordinary accuracy just how the mass of even small regions of the Earth change as ice melts and flows away from the land to the sea.

The GRACE satellite mission is due to end next year, but the Texas team is awaiting NASA approval for a new and improved satellite system to continue the work, using laser beams rather than microwaves to measure ice cap melting, Chen said.

In a recent summary of the ice cap melting problem and its effect on sea levels reported by Richard Kerr in *Science*, geoscientist Michael Oppenheimer of Princeton said, "The time scale for future loss of most of an ice sheet may not be millennia," as glacier models have suggested, "but centuries."

Editor's note: Changes have been made in the above story.

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