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Warmer Water Speeds Melting of Antarctica Glaciers, Study Says

Scientists Worry a Warming Climate Will Hasten Jump in Sea Levels in Coming Centuries

By Gautam Naik

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Warmer water is washing up against large swaths of the Antarctic ice sheet, accelerating the melting of glaciers from below and hastening their slide into the sea, a new study shows.

While past research pinpointed warming in spots along the Antarctic ice shelf, the new research, published Thursday in the journal Science, concludes that the warming of the waters isn't merely local but extends for thousands of miles.

The Antarctic ice sheet, the thick layer of ice that covers the continent, contains about 70% of the world's fresh water. Glaciers slowly deposit inland ice into the sea, a normal process that forms icebergs. The worry now is that a warming climate will accelerate this process and release a vast quantity of water, triggering a big jump in global sea levels in coming centuries.

A study published in May warned that the melting of west Antarctic glaciers has now become effectively unstoppable. Estimates suggest that if the west Antarctic ice sheet were to melt completely, it would ultimately raise the global sea level by 4.8 meters (16 feet).

"A significant fraction of the world's population lives in coastal regions and are the ones most vulnerable to sea level rise," said Sarah Gille, professor at the Scripps Institution of Oceanography at the University of California, San Diego, who read the Science study but wasn't involved with the research.

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Antarctica, roughly twice the size of Australia, is covered in an ice layer averaging more than a mile in thickness. Its climate is ruled by a complex interplay of snowfall, icy ocean currents and ferocious winds. A lot of that interplay is a puzzle, especially in a warming world.

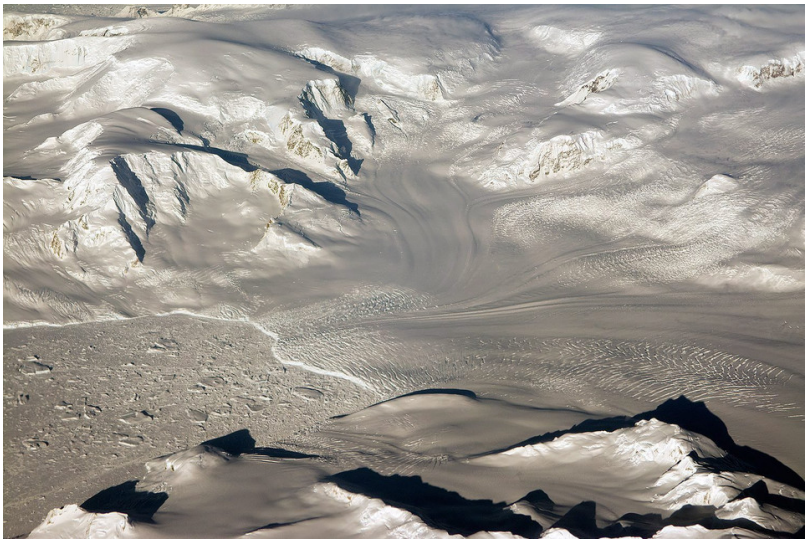
For example, unlike what has been observed in the west, parts of the eastern Antarctic ice sheet are gaining ice. The water and air temperature in some portions of

the eastern ice sheet are lower, too. And the seasonal sea ice that surrounds Antarctica every winter hit a record high this year—a striking contrast to the dramatic declines of sea ice in the Arctic.

Nonetheless, Antarctica, on the whole, is losing weight. Recent data from a European satellite called Cryosat indicates that Antarctica lost about 160 billion metric tons of ice each year between 2011 and 2014. That was enough to raise global sea levels by about 0.45 millimeters each year. A metric ton is equal to 1,000 kilograms, or about 2,200 pounds.

“In Antarctica overall, there’s an increased amount of melting,” said Karen Heywood of the University of East Anglia, U.K., a co-author of the Science study. “It means the balance is out of kilter.”

The most worrisome changes are occurring on the western ice sheet. A separate study being published Friday in the journal Geophysical Research Letters shows that the glacier melt rate in that region tripled over the past decade.



NASA’s Operation IceBridge research flights over Antarctica study changes in the continent’s ice sheet, glaciers and sea ice. This year’s campaign revisited a section of the Antarctic ice sheet that recently was found to be in irreversible decline. NASA/EUROPEAN PRESSPHOTO AGENCY

That translates to a loss of 91.5 billion U.S. tons of ice a year. In other words, the west Antarctic glaciers have lost a Mount Everest’s worth of water weight ever two years over the past two decades. The conclusion is based on 21 years of data from four independent sets of observations.

The Science study, meanwhile, tries to pinpoint the processes underlying the glacial melt. It focuses on ice shelves, extensions of the land-based ice sheet that jut out and float on the water. A shelf can be many miles long and anywhere from 200 meters (650 feet) to 1,000 meters (3,300 feet) thick.

The researchers realized that the melting was taking place because extra heat was somehow being delivered to the underside of these ice shelves. But was the source of that heat a shift in ocean currents, or warmer water temperatures?

Their analysis, based on past oceanographic records and new measurements, suggests the culprit is warmer water. The data shows, for example, that the region's Amundsen Sea has warmed by about 0.5 degrees Celsius (0.9 degrees Fahrenheit) over the past four decades, while the Bellingshausen Sea has warmed by about 0.2 degrees Celsius (0.36 degrees Fahrenheit) in the same period.

"The warming of the water column that hugs the shelf extends for several thousands of miles," said Sunke Schmidtko, a co-author of the study and oceanographer at the GEOMAR Helmholtz Centre for Ocean Research Kiel in Germany.

The precise mechanism behind the warmer water hasn't been pinned down yet. One theory is that changing wind patterns cause an upwelling, in which warmer water that lies lower in the water column rises up to wash against the underside of the ice shelf. That would trigger higher-than-normal melting.

The new findings will be used to refine existing models, so researchers can arrive at better projections of glacier melt and sea-level rise. It could also spur an increased watchfulness about east Antarctica.

"Although we're very worried about west Antarctica at the moment, if the warm water gets closer to east Antarctica that might melt next," said Dr. Heywood. "It won't happen tomorrow but it could happen in a few decades or hundreds of years."

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