

Tropical sea temperatures influence melting in Antarctica

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Accelerated melting of two fast-moving outlet glaciers that drain Antarctic ice into the Amundsen Sea Embayment is likely the result, in part, of an increase in sea-surface temperatures in the tropical Pacific Ocean, according to new University of Washington research.

Higher-than-normal sea-level pressure north of the Amundsen Sea sets up <u>westerly winds</u> that push surface water away from the glaciers and allow warmer deep water to rise to the surface under the edges of the glaciers, said Eric Steig, a UW professor of Earth and space sciences.

"This part of Antarctica is affected by what's happening on the rest of the planet, in particular the tropical Pacific," he said.

The research involves the Pine Island and Thwaites glaciers on the West <u>Antarctic Ice Sheet</u>, two of the five largest glaciers in Antarctica. Those two glaciers are important because they drain a large portion of the ice sheet. As they melt from below, they also gain speed, draining the ice sheet faster and contributing to <u>sea level rise</u>. Eventually that could lead to <u>global sea level</u> rise of as much as 6 feet, though that would take hundreds to thousands of years, Steig said.

NASA scientists recently documented that a section of the Pine Island Glacier the size of New York City had begun breaking off into a huge iceberg. Steig noted that such an event is normal and scientists were fortunate to be on hand to record it on film. Neither that event nor the new UW findings clearly link thinning Antarctic ice to human causes.



But Steig's research shows that unusual winds in this area are linked to changes far away, in the tropical Pacific Ocean. Warmer-than-usual seasurface temperatures, especially in the central tropics, lead to changes in <u>atmospheric circulation</u> that influence conditions near the Antarctic coast line. Recent decades have been exceptionally warm in the tropics, he said, and to whatever extent unusual conditions in the tropical Pacific can be attributed to human activities, unusual conditions in Antarctica also can be attributed to those causes.

He noted that sea-surface temperatures in the tropical Pacific last showed significant warming in the 1940s, and the impact in the Amundsen Sea area then was probably comparable to what has been observed recently. That suggests that the 1940s tropical warming could have started the changes in the Amundsen Sea ice shelves that are being observed now, he said.

Steig presents his findings Tuesday (Dec. 6) at the fall meeting of the American Geophysical Union in San Francisco. In another presentation Wednesday, he will discuss evidence from ice cores on the history of Antarctic climate in the last century.

He emphasized that natural variations in tropical sea-surface temperatures associated with the El Niño Southern Oscillation play a significant role. The 1990s were notably different from all other decades in the tropics, with two major El Niño events offset by only minor La Niña events.

"The point is that if you want to predict what's going to happen in the next fifty, one-hundred, one-thousand years in Antarctica, you have to pay attention to what's happening elsewhere," he said. "The tropics are where there is a large source of uncertainty."



Provided by University of Washington

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