

New Evidence Shows Antarctica Has Warmed in Last 150 Years

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Despite recent indications that Antarctica cooled considerably during the 1990s, new research suggests that the world's iciest continent has been getting gradually warmer for the last 150 years, a trend not identifiable in the short meteorological records and masked at the end of the 20th century by large temperature variations.

Numerous ice cores collected from five areas allowed scientists to reconstruct a temperature record that shows average Antarctic temperatures have risen about two-tenths of a degree Celsius, or about one-third of a degree Fahrenheit, in 150 years. That might not sound like much, but the overall increase includes a recorded temperature decline of nearly 1 degree in the 1990s, said David Schneider, a University of Washington postdoctoral researcher in Earth and space sciences.

"Even if you account for the cooling in the '90s, we still see that two-tenths of a degree increase from the middle of the 1800s to the end of the 20th century," said Schneider, the lead author of a paper detailing the work published Aug. 30 in *Geophysical Research Letters*.

The main reason that Antarctica appears to have cooled during the 1990s is that a natural phenomenon called the Antarctic Oscillation, or Southern Annular Mode, was largely in its positive phase during that time. The Antarctic Oscillation is so named because atmospheric pressure in far southern latitudes randomly oscillates between positive and negative phases. During the positive phase, a vortex of wind is tightly focused on the polar region and prevents warmer air from mixing

with the frigid polar air, which keeps Antarctica colder.

Typically the Antarctic Oscillation alternates between phases about every month. But in the 1990s the positive phase occurred much more often, Schneider said. Without the influence of the Antarctic Oscillation, he said, it is likely the Antarctic would show the same kind of warming as the rest of the Southern Hemisphere. Before 1975, Antarctica appears to have warmed at about the same rate as the rest of the hemisphere, about 0.25 degree C per century. But since 1975, while the Antarctic showed overall cooling, the Southern Hemisphere has warmed at a rate of about 1.4 degrees per century.

"The second half of the 20th century is marked by really large variability. The periods of cooling correspond with a very strong positive Antarctic Oscillation," Schneider said. "The caution is that we don't fully understand the feedbacks between overall climate warming and the Antarctic Oscillation. But having the 200-year record is what convinces us that there is a relationship between Southern Hemisphere temperature changes and Antarctic temperature changes."

He noted that other research has suggested that ozone depletion in the Southern Hemisphere is keeping the Antarctic Oscillation in its positive phase for longer periods.

Schneider began the work for his doctoral thesis and completed it as a post-doctoral researcher. Co-authors of the paper are Eric Steig, Schneider's thesis adviser, and Cecilia Bitz of the UW; Tas van Ommen of the Antarctic Climate and Ecosystems Cooperative Research Centre in Australia, Daniel Dixon and Paul Mayewski of the University of Maine and Julie Jones of the Institute for Coastal Research in Germany. The work was funded primarily by the National Science Foundation, with additional funding from the Scientific Committee on Antarctic Research and Australia's Cooperative Research Centre Program.

Reconstructing an annual temperature record for two centuries was complicated by the fact that Antarctica is the world's driest continent, so while annual snowfall for thousands of years is preserved in glacial ice there often isn't much snowfall in a given year. For this work, the scientists collected ice cores from five areas that typically receive at least 15 inches of snow per year, which provided more substance from each year for them to examine. They studied oxygen and hydrogen isotopes in the cores to develop the first reconstruction of Antarctic temperature records for the last 150 years.

"We have pretty good confidence that we're right, though some of the details might have to be refined," Schneider said.

Source: University of Washington

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