Antarctica found amplifying effects of climate change during last global warming

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SAN FRANCISCO -- A a new study indicates that the Antarctic warmed about 11 degrees Celsius between about 20,000 and 10,000 years ago while the average temperature worldwide rose about 4 degrees Celsius following Earth's last ice age.

The disparity, that the Antarctic warmed nearly three times the average temperature increase worldwide after the peak of last ice age 20,000 years ago, highlights the fact that the poles, both the Arctic in the north and the Antarctic in the south, amplify the effects of a changing climate, whether it gets warmer or cooler.

As the calculations are in line with estimates from most climate models,"the result is not a surprise, but if you look at the global climate models that have been used to analyze what the planet looked like 20,000 years ago, the same models used to predict global warming in the future, they are doing, on average, a very good job reproducing how cold it was in Antarctica," said Kurt Cuffey, a glaciologist at the University of California, Berkeley.

The models predict that as a result of current global climate change, Antarctica will warm twice as much as the rest of the planet and reach its peak in a couple of hundred years. Given business-as-usual greenhouse gas emissions, a global average increase of 3 degrees Celsius by 2100 and a rise of around 6 degrees in the Antarctic is predicted.

During the last period of global warming, the ice deep inside the Antarctic glaciers warmed more slowly than Earth's surface. By measuring the remaining difference, that the 20,000-year old ice deep in the West Antarctic ice sheet is about 1 degree Celsius cooler than the surface, the researchers were able to estimate the original temperature based on how fast pure ice warms up.

Gary Clow of the U.S. Geological Survey in Lakewood, Colorado, measured in 2011 and again in 2014 the temperature in a 3.4-kilometer-deep borehole from which the West Antarctic Sheet Divide ice core had been drilled during an eight-year project that ended in 2011. Ice at the bottom of the borehole was deposited about 70,000

years ago; ice about one-sixth of the way up about 50,000 years ago; and ice about one-third of the way to the surface 20,000 years ago.

Cuffey, first author of the study recently published in the Proceedings of the National Academy of Sciences, developed a technique to combine these temperature measurements with isotopic measurements of old ice to come up with an estimated temperature of 11.3 degrees, plus or minus 1.8 degrees Celsius, warming since the depths of the ice age.

The Antarctic temperature rose much more rapidly than did Arctic temperatures after the glacial maximum. By 15,000 years ago, Antarctica had warmed to about 75 percent of its temperature today. The Arctic took another 3,000-4,000 years to warm this much, primarily because the Northern Hemisphere had huge ice sheets to buffer warming, and changes in ocean currents and Earth's orbital configuration accelerated warming in the south.

Antarctica was also more sensitive to global carbon dioxide levels, Cuffey was quoted as saying in a news release from UC Berkeley, adding that the situation today, with global warming driven primarily by human emissions of carbon dioxide from burning fossil fuels, is different from natural cycles. The ability of the oceans to take up carbon dioxide cannot keep up with the rising levels of greenhouse gases in the atmosphere, meaning carbon dioxide and global temperatures will continue to increase unless humans cut their emissions.