

Past warming increased snowfall on Antarctica, affecting global sea level

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Credit: Newcastle University

A new study confirms that snowfall in Antarctica will increase significantly as the planet warms, offsetting future sea level rise from other sources - but the effect will not be nearly as strong as many scientists previously anticipated because of other, physical processes.

That means that many computer models may be underestimating the

amount and rate of sea level rise if they had projected more significant impact from Antarctic snow.

Results of the study, which was funded by the National Science Foundation, were reported this week in the journal *Nature Climate Change*.

Scientists have long suspected that snowfall in Antarctica increases during planetary warming and the impact of so much snow tied up on land would have a negative effect on [global sea levels](#). However, computer models on what should happen during warm periods have not matched observational data, according to Peter Clark, an Oregon State University paleoclimatologist and co-author on the study.

"Intuitively, it makes sense that as it warms and more moisture is in the atmosphere, that it will fall as snow in Antarctica," Clark said. "The problem is that we're not really seeing that through the last 50 years of observations - and documenting the relationship between changes in temperature and snow accumulation is difficult to do because of such strong natural variability."

So Clark and his colleagues looked to the past to examine ice core data to see what they could learn about the future. They found that ice cores taken from the Antarctic Ice Sheet captured [snow accumulation](#) over time - and they could match that accumulation with established temperature data. They focused on a period from 21,000 years ago to 10,000 years ago - when the Earth gradually came out of the last ice age.

What they found was that Antarctica warmed an average of 5 to 10 degrees (Celsius) during that period - and for every degree of warming, there was a 5 percent increase in snowfall.

"The additional weight of the snow would have increased the ice flow

into the ocean offsetting some of the limiting effect on sea level rise," said Katja Frieler, a climatologist at the Potsdam Institute for Climate Impact Research in Germany and the lead author of the study. "It's basic ice physics."

The scientists found that the ice core results agreed with projections from three dozen computer models used to calculate future changes in snowfall. The end result, Clark said, is that projected increasing snowfall will still have a limiting effect on [sea level rise](#), but that impact will be some 20 percent less than previously expected.

"Looking at the past gives us more confidence in anticipating what will happen in the future," Clark noted. "The validation through [ice core](#) studies helps ground truth the computer models."

Clark, a professor in Oregon State's College of Earth, Ocean, and Atmospheric Sciences, was coordinating lead author on [sea level change](#) for the fifth Intergovernmental Panel on Climate Change report.

More information: Consistent evidence of increasing Antarctic accumulation with warming , [DOI: 10.1038/nclimate2574](https://doi.org/10.1038/nclimate2574)

Related:

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Dynamics, 5, 271-293. DOI: 10.5194/esd-5-271-2014

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