

Antarctic ice loss expected to affect future climate change

September 23 2020, by Shaina Sadai



Antarctica seen from the R/V Laurence M. Gould. A team of climate scientists at UMass Amherst and Woods Hole Oceanographic Institute have published a new model that incorporates accelerated AIS melting and icebergs into simulations of Earth's future climate. Credit: Dan Lowenstein © WHOI

In a new climate modeling study that looked at the impacts of

accelerated ice melt from the Antarctic Ice Sheet (AIS) on future climate, a team of climate scientists reports that future ice-sheet melt is expected to have significant effects on global climate.

First author and graduate student Shaina Sadai at the University of Massachusetts Amherst, with Alan Condron of the Woods Hole Oceanographic Institution, Rob DeConto at UMass Amherst and David Pollard at Pennsylvania State University, present details this week in *Science Advances*.

Their study predicts how future [climate](#) conditions could change under high- and low-greenhouse gas emissions scenarios, while accounting for accelerated melting of the AIS.

Scientists have long recognized that future meltwater input from the Antarctic will affect the Southern Ocean and [global climate](#), but ice-sheet processes are not now included in most state-of-the-art climate prediction simulations, Sadai says. She and colleagues report that their modeling with the added [ice melt](#) information reveals interacting processes.

For this work, Sadai's task was to add accelerated AIS melting and icebergs into simulations of Earth's [future climate](#). One important step was to include the details of where and when the meltwater will go into the ocean.

She says, "We found that future melt water coming off Antarctica leads to huge amounts of thick sea ice around the continent. With higher greenhouse gas emissions, the ice sheet melts faster, which in turn leads to more freshwater flowing into the ocean and more sea ice production."

All this additional meltwater and sea ice production dramatically slows the pace of future warming around Antarctica, the researchers

report—seemingly welcome news. And remarkably, the climate impacts are not just restricted to the Antarctic. Condrón, previously at UMass Amherst, points out that the cooling effects are felt worldwide.

But, he adds, "All that said, it's important to note that this is not a global 'cooling' scenario—average global temperatures would still be roughly 3 degrees Celsius warmer than today due to human greenhouse gas emissions, even with the cooling effects of this melt water on climate."

That is not the end of the story. Even though atmospheric warming slows, the deep sea waters around Antarctica actually warm faster in their model. This is because, Condrón explains, the new sea ice stops heat from escaping from the deeper waters to the atmosphere. "The subsurface ocean waters warm by as much as one degree Celsius, which can increase melting below parts of the ice sheet. This could make the ice sheet more unstable and accelerate rates of sea level rise beyond current projections."

Overall, Sadai says, "Our results demonstrate a need to accurately account for meltwater input from ice sheets if we are to make confident climate predictions." She emphasizes that the delayed future warming they found in the new simulations may sound like good news, but it is important to keep in mind that serious warming and sea level rise will still occur with unabated greenhouse gas emissions, which will affect coastal communities and ecosystems worldwide.

DeConto and Pollard add that the future stability of the AIS and future sea-level rise will be governed by which process wins out—ocean warming or atmospheric cooling. Answering this question is the target of the team's ongoing research.

More information: "Future climate response to Antarctic Ice Sheet melt caused by anthropogenic warming" *Science Advances* (2020). [DOI:](#)

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