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## Warmer Air May Cause Increased Antarctic Sea Ice Cover

WASHINGTON - Predicted increases in precipitation due to warmer air temperatures from greenhouse gas emissions may actually increase sea ice volume in the Antarctic's Southern Ocean. This finding from a new study adds evidence of potential asymmetry between the two poles and may be an indication that climate change processes may have varying impacts on different areas of the globe.

"Most people have heard of climate change and how rising air temperatures are melting glaciers and sea ice in the Arctic," said Dylan C. Powell, lead author of the paper and a doctoral candidate at the University of Maryland Baltimore County. "However, findings from our simulations suggest a counterintuitive phenomenon. Some of the melt in the Arctic may be balanced by increases in sea ice volume in the Antarctic."

For the first time, the authors of the paper, published this month in the Journal of Geophysical Research (Oceans), used satellite observations from NASA's Special Sensor Microwave/Imager to assess snow depth on sea ice and assimilated the satellite observations into their model to improve prediction of precipitation rates. By incorporating satellite observations into this new method, the researchers say they achieved more stable and realistic precipitation data, to counter the great variability in precipitation data sets typically found in the polar regions.

"On any given day, sea ice cover in the oceans of the polar regions is about the size of the U.S.," said Thorsten Markus, a co-author of the paper and a research scientist at NASA's Goddard Space Flight Center. "Far-flung locations like the Arctic and Antarctic actually impact our temperature and climate where we live and work on a daily basis."

According to Markus, the deep and bottom water masses of the oceans make contact with the atmosphere only at high latitudes, near the poles. Polar processes, such as sea ice formation, are driving a huge, global, ocean heat pump, called thermohaline (or saline) circulation. To a large extent, this heat pump impacts the climate at lower latitudes.

Typically, warming of the climate leads to increased melting rates of sea ice cover and also increased precipitation rates. With increased precipitation rates and consequently deeper snow, the snow load on the Antarctic sea ice becomes heavy enough that it suppresses the ice below sea level. This results in even more and even thicker sea ice when the snow refreezes as more ice.

The paper indicates that some climate processes appear to actually be counterintuitive. "We used computer-generated simulations to get this research result. I hope that in the future we'll be able to verify this result with real data through a long-term ice thickness measurement campaign," said Powell. "Our goal as scientists is to collect hard data to verify what the model is telling us. It will be critical to know for certain whether average sea ice thickness is indeed increasing in the Antarctic as our model indicates, and to determine what environmental factors are spurring this apparent phenomenon."

Achim Stössel of Texas A&M University in College Station, Texas, the third co-author on this paper, advises that "while numerical models have improved considerably over the last two decades, seemingly minor processes like the snow-to-ice conversion still need to be better incorporated in models as they can have a significant impact on the results and therefore on climate predictions."

The study was funded by NASA.

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**Notes for Journalists**

Journalists (only) may obtain a pdf copy of this paper upon request to Jonathan Lifland: jlifland@agu.org. Please provide your name, name of publication, phone, and email address. The paper and this press release are not under embargo.

**Title:**
Effects of snow depth forcing on Southern Ocean sea ice simulations

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