Sea Ice May Be On Increase In The Antarctic: A Phenomenon Due To A Lot Of 'Hot Air'?

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A new NASA-funded study finds that 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 adds new evidence of potential asymmetry between the two poles, and may be an indication that climate change processes may have different impact 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, co-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 offset by increases in sea ice volume in the Antarctic."

The researchers used satellite observations for the first time, specifically from the Special Sensor Microwave/Imager, to assess snow depth on sea ice, and included the satellite observations in their model. As a result, they improved prediction of precipitation rates.

By incorporating satellite observations into this new method, the

researchers achieved more stable and realistic precipitation data than the typically variable data found in the polar regions. The paper was published in the June issue of the American Geophysical Union's Journal of Geophysical Research.

"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, 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 impact of the northernmost and southernmost parts on Earth on climate in other parts of the globe can be explained by thermal haline (or saline) circulation. Through this process, ocean circulation acts like a heat pump and determines our climate to a great extent.

The deep and bottom water masses of the oceans make contact with the atmosphere only at high latitudes near or at the poles.

In the polar regions, the water cools down and releases its salt upon freezing, a process that also makes the water heavier. The cooler, salty, water then sinks down and cycles back towards the equator. The water is then replaced by warmer water from low and moderate latitudes, and the process then begins again.

Typically, warming of the climate leads to increased melting rates of sea ice cover and increased precipitation rates. However, in the Southern Ocean, with increased precipitation rates and deeper snow, the additional load of snow becomes so heavy that it pushes the Antarctic sea ice below sea level.

This results in even more and even thicker sea ice when the snow

refreezes as more ice. Therefore, the paper indicates that some climate processes, like warmer air temperatures increasing the amount of sea ice, may go against what we would normally believe would occur.

"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 computer 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 Stossel of the Department of Oceanography at Texas A&M University, College Station, Tex., a 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."