

Antarctica could raise sea level faster than previously thought

August 14 2014



Image: National Science Foundation

Ice discharge from Antarctica could contribute up to 37 centimeters to the global sea level rise within this century, a new study shows. For the first time, an international team of scientists provide a comprehensive estimate on the full range of Antarctica's potential contribution to global sea level rise based on physical computer simulations. Led by the Potsdam Institute for Climate Impact Research, the study combines a whole set of state-of-the-art climate models and observational data with various ice models.

The results reproduce Antarctica's recent contribution to sea level rise as observed by satellites in the last two decades and show that the ice continent could become the largest contributor to sea level rise much

sooner than previously thought.

"If greenhouse gases continue to rise as before, ice discharge from Antarctica could raise the global ocean by an additional 1 to 37 centimeters in this century already," says lead author Anders Levermann. "Now this is a big range – which is exactly why we call it a risk: Science needs to be clear about the uncertainty, so that decision makers at the coast and in coastal megacities like Shanghai or New York can consider the potential implications in their planning processes," says Levermann.

Antarctica Currently Contributes Less Than 10 Percent to Global Sea Level Rise

The scientists analyzed how rising global mean temperatures resulted in a warming of the ocean around Antarctica, thus influencing the melting of the Antarctic ice shelves. While Antarctica currently contributes less than 10 percent to [global sea level](#) rise and is a minor contributor compared to the thermal expansion of the warming oceans and melting mountain glaciers, it is Greenland and especially the Antarctic ice sheets with their huge volume of ice that are expected to be the major contributors to future long-term sea level rise. The marine ice sheets in West Antarctica alone have the potential to elevate sea level by several meters - over several centuries.

According to the study, the computed projections for this century's sea level contribution are significantly higher than the latest IPCC projections on the upper end. Even in a scenario of strict climate policies limiting global warming in line with the 2°C target, the contribution of Antarctica to global [sea level rise](#) covers a range of 0 to 23 centimeters.

A Critical Input to Future Projections

"Rising sea level is widely regarded as a current and ongoing result of climate change that directly affects hundreds of millions of coastal dwellers around the world and indirectly affects billions more that share its financial costs," says co-author Robert Bindshadler from the NASA Goddard Space Flight Center. "This paper is a critical input to projections of possible future contributions of diminishing ice sheets to sea level by a rigorous consideration of uncertainty of not only the results of [ice sheet](#) models themselves but also the climate and ocean forcing driving the ice sheet models. Billions of Dollars, Euros, Yuan etc. are at stake and wise and cost-effective decision makers require this type of useful information from the scientific experts."

While the study signifies an important step towards a better understanding of Antarctica in a changing climate and its influence on [sea level change](#) within the 21st century, major modeling challenges still remain: Datasets of Antarctic bedrock topography, for instance, are still inadequate and some physical processes of interaction between ice and ocean cannot be sufficiently simulated yet.

Notably, the study's results are limited to this century only, while all 19 of the used comprehensive climate models indicate that the impacts of atmospheric warming on Antarctic ice shelf cavities will hit with a time delay of several decades. "Earlier research indicated that Antarctica would become important in the long term," says Levermann. "But pulling together all the evidence it seems that Antarctica could become the dominant cause of [sea level](#) rise much sooner."

More information: Levermann, A., Winkelmann, R., Nowicki, S., Fastook, J.L., Frieler, K., Greve, R., Hellmer, H.H., Martin, M.A., Meinshausen, M., Mengel, M., Payne, A.J., Pollard, D., Sato, T., Timmermann, R., Wang, W.L., Bindshadler, R.A. (2014): Projecting Antarctic ice discharge using response functions from SeaRISE ice-sheet models. *Earth System Dynamics*, 5, 271-293. [DOI](#):

[10.5194/esd-5-271-2014](https://doi.org/10.5194/esd-5-271-2014)

Provided by Potsdam Institute for Climate Impact Research

Citation: Antarctica could raise sea level faster than previously thought (2014, August 14)
retrieved 10 April 2024 from

<https://phys.org/news/2014-08-antarctica-sea-faster-previously-thought.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--