

# Achilles' heel of ice shelves is beneath the water, scientists reveal

September 15 2013

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New research has revealed that more ice leaves Antarctica by melting from the underside of submerged ice shelves than was previously thought, accounting for as much as 90 per cent of ice loss in some areas.

Iceberg production and [melting](#) causes 2,800 cubic kilometres of [ice](#) to leave the Antarctic ice sheet every year. Most of this is replaced by snowfall but any imbalance contributes to a change in [global sea level](#).

For many decades, experts have believed that the most important process responsible for this huge loss was iceberg calving - the breaking off of chunks of ice at the edge of a glacier.

New research, led by academics at the University of Bristol with colleagues at Utrecht University and the University of California, has used satellite and climate model data to prove that this sub-shelf melting has as large an impact as iceberg calving for Antarctica as a whole and for some areas is far more important.

The findings, published today [15 September] in *Nature*, are crucial for understanding how the ice sheet interacts with the rest of the [climate system](#) and particularly the ocean.

During the last decade, the Antarctic ice-sheet has been losing an increasing amount of its volume. The annual turnover of ice equates to 700 times the four cubic kilometres per year which makes up the entire domestic water supply for the UK.

Researchers found that, for some [ice shelves](#), melting on its underbelly could account for as much as 90 per cent of the mass loss, while for others it was only 10 per cent.

Ice shelves which are thinning already were identified as losing most of their mass from this melting, a finding which will be a good indicator for which ice shelves may be particularly vulnerable to changes in ocean warming in the future.

The scientists used data from a suite of satellite and airborne missions to accurately measure the flow of the ice, its elevation and its thickness. These observations were combined with the output of a climate model for snowfall over the ice sheet.

They compared how much snow was falling on the surface and accumulating against how much ice was leaving the continent, entering the ocean and calving. By comparing these estimates, they were able to determine the proportion that was lost by each process.

Professor Jonathan Bamber, from the University of Bristol's School of Geographical Sciences, said: "Understanding how the largest ice mass on the planet loses ice to the oceans is one of the most fundamental things we need to know for Antarctica. Until recently, we assumed that most of the ice was lost through icebergs.

"Now we realise that melting underneath the ice shelves by the ocean is equally important and for some places, far more important. This knowledge is crucial for understanding how the ice sheets interact now, and in the future, to changes in climate."

**More information:** *Nature*, [DOI: 10.1038/nature12567](https://doi.org/10.1038/nature12567)

Provided by University of Bristol

Citation: Achilles' heel of ice shelves is beneath the water, scientists reveal (2013, September 15)  
retrieved 24 April 2024 from

<https://phys.org/news/2013-09-achilles-heel-ice-shelves-beneath.html>

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