

# Disappearing snow increases risk of collapsing ice shelves in Antarctica

January 29 2014

---



Credit: Newcastle University

A number of floating ice shelves in Antarctica are at risk of disappearing entirely in the next 200 years, as global warming reduces their snow cover. Their collapse would enhance the discharge of ice into the oceans and increase the rate at which sea-level rises. A rapid reduction of greenhouse gas emissions could save a number of these ice shelves, researchers at Utrecht University and the British Antarctic Survey say in

a new paper published today in the *Journal of Glaciology*.

Back in 1995 and 2002, two floating ice shelves in the north of the Antarctic Peninsula (Larsen A and B) suddenly collapsed – each event occurred in a matter of weeks.

Dr Peter Kuipers Munneke, the paper's lead author, said:

"This was a spectacular event, especially when you imagine the size of these ice shelves, which are several hundreds of metres thick, and have been in place for over 10,000 years."

The team of researchers suspected that the disappearance of the snow layer on top of the ice shelves could be an important precursor for shelf collapse. Their calculations confirm this hypothesis, and show that many more ice shelves could disappear in the next 200 years.

The scientists believed the snow layer plays an important role in regulating the effect of meltwater lakes on the ice shelves.

As long as the snow layer is sufficiently thick and cold, all meltwater can sink into the snow and refreeze. But in a warmer climate, the amount of meltwater increases, and the snow layers become thinner.

As a result, meltwater can no longer refreeze and forms large lakes on the surface of the ice shelves. The water drains through cracks and faults, causing them to widen until they become so wide and deep that the entire ice shelf disintegrates.

After their collapse, ice shelves can no longer provide resistance to the flow of the glaciers previously feeding them. As a result, the glacier flow accelerates significantly, contributing to an increase in sea-level rise.

The researchers performed calculations that show how this process may evolve over the next 200 years, using two different climate scenarios.

Dr Kuipers Munneke said: "If we continue to burn fossil fuels at the current rate, almost all ice shelves in the Antarctic Peninsula will be under threat of collapse in the next 200 years. Only the two largest ones seem to be safe. Even in the much colder eastern part of Antarctica, some ice shelves could disintegrate. If we manage to keep [global warming](#) below the European Union target of 2°C, more than half of the [ice shelves](#) could be saved, compared to no action taken on emissions reductions."

The study received financial support from the European Union's four-year ice2sea project. Prof. David Vaughan said "We've been observing ice-shelf retreat around the Antarctic Peninsula since the early 1990s, but for the first time this model provides a strong basis for the prediction of future changes, which is a major step forward in understanding future sea-level changes."

**More information:** "Firn air depletion as a precursor of Antarctic ice-shelf Collapse" Peter Kuipers Munneke, Stefan R.M. Ligtenberg, Michiel van den Broeke, David G. Vaughan, *Journal of Glaciology*, 60 (220), (2014), 10.3189/2014JoG13J183

Provided by British Antarctic Survey

Citation: Disappearing snow increases risk of collapsing ice shelves in Antarctica (2014, January 29) retrieved 24 April 2024 from <https://phys.org/news/2014-01-collapsing-ice-shelves-antarctica.html>

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.