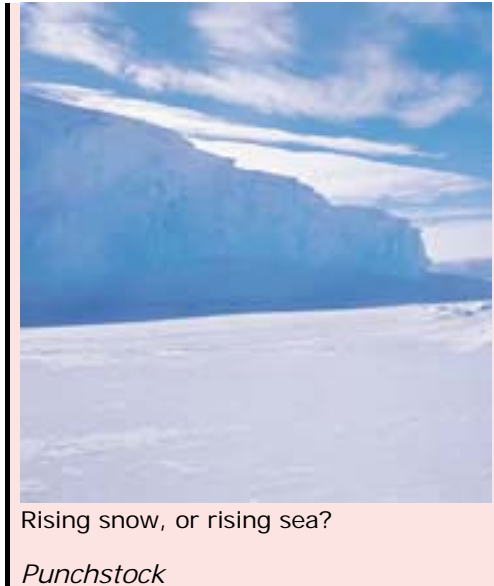


No sign of increased snowfall in Antarctica

Weather 'hindcast' could spell bad news for sea-level rise.

[Quirin Schiermeier](#)



Southern Hemisphere warming has surprisingly not led to increased snowfall over Antarctica during the past 50 years, researchers report today. If the findings are confirmed, this suggests that global sea-level rise might proceed faster than previously thought.

Average surface temperatures in the Southern Hemisphere have increased by roughly 0.5 °C since the 1950s. Climate models predict that the warming and increased evaporation should result in more snowfall over Antarctica, because the warmer air transported southwards would carry more moisture.

But a reconstruction of the Antarctic precipitation record suggests that, at least in the past, this has not been the case.

Weather observations near the poles are scarce and often unreliable, which makes it difficult to determine past precipitation. Andrew Monaghan, a meteorologist at Ohio State University's Byrd Polar Research Center, and his team used a combination of ice-core and model data to fill the large voids between the few stations. The new results double the length of the snowfall record available for Antarctica.

The 'weather hindcast' reveals that snowfall is very variable from one year or decade to the next. Within this noise, the team could not make out a statistically significant upward trend in the total amount of snowfall, they report in *Science*¹.

If warming does not result in more snowfall, this seems to suggest that the increased input of moist air is outweighed by changes in storm tracks and wind patterns, says Monaghan, resulting in less precipitation.

"Unfortunately 50 years are not enough to figure out which component will eventually win out," says Monaghan. "It could go either way."

Rising melt

Antarctica harbours 90% of the world's ice; if the 30 million cubic kilometres of ice held in its

sheets were to melt, the global sea level would rise by more than 60 metres, flooding vast stretches of densely populated coasts around the globe. At present, the global sea level rises by around 3 millimetres per year.

“ It will take at least another ten years to figure out whether or not global warming has an impact on Antarctic snowfall. ”

Andrew Monaghan
Byrd Polar Research
Center

The rate could increase if glaciers in Antarctica (and Greenland) continue to melt. However, some ice sheets in the interior of Antarctica seem to have been getting thicker rather than thinner over the past few years², and scientists have assumed that this is thanks to an accumulation of snow in the interior, which should cushion the continent's impact on sea-level rise. The Intergovernmental Panel on Climate Change in its next report, due 2007, projects Antarctic snowfall to increase by a few per cent for each degree warming.

That may now be in doubt. "If it hasn't happened in the past you might ask why it should happen in the future," says Jonathan Gregory, a climate modeller from the Centre for Global Atmospheric Modelling in Reading, UK.

Data contamination

Reconciling models and recent satellite observations with the newly available snowfall record of the past is no easy task. Rushing to the conclusion that all models got it wrong would be premature, says Gregory. "The snowfall record is not necessarily in conflict with satellite measurements of ice-mass thickness," agrees David Vaughan, a glaciologist at the British Antarctic Survey in Cambridge, UK.

Satellite measurements have only been taken for a few years, and a trend on this timescale would be very hard to pick out of the snowfall data. So the satellites could reflect a true trend of increasing ice. On the other hand, says Monaghan, it is possible that satellite altimetry measurements haven't been seeing a real trend but rather are 'contaminated' by random variations in snowfall from year to year.

Gravity measurements, which measure the weight rather than the height of the ice sheets, are less likely to be skewed by random variations in snowfall. But adjusting this data to account for other gravity changes on the planet is tricky. The method was previously tried in Antarctica, and has now been used to confirm ice-mass losses over Greenland³.

"We always knew that the rather short record of satellite observations might be spoiled by inter-annual variability," says Vaughan. "The problem is we don't even know all the variables. What we do know is that we need more data and more time."

"It will take at least another 10 years to figure out whether or not global warming has an impact on Antarctic snowfall," says Monaghan.

References

1. Monaghan A., *et al.* *Science*, **312**. 827 - 831 (2006).
2. Davis C., Li H., McConnell J. R., Frey M. M., Hanna E. *Science*, published online.

- doi: 10.1126/science.1129007 (2006).
3. Chen J., Wilson C., Tapley B., *Science*, published online. doi:10.1126/science.1129007 (2006).