



Science for Environment Policy

Largest Antarctic ice sheet more sensitive to ocean warming than previously thought

The largest ice sheet in the world, the east Antarctic ice sheet, may succumb to climate change faster than thought, according to recent research. Warming ocean currents, triggered by shifting wind patterns, could accelerate melting of the ice sheet, leading to a rise in sea levels, say the researchers.

The east Antarctic ice sheet has an average thickness of over 2 km and can reach more than 4 km in places. If it melts entirely, it could raise global sea levels by over 50 m.

Until recently, this ice sheet was thought to be more stable than the west Antarctic ice sheet, which now appears to be heading for an inevitable collapse, according to other recent research. The western sheet sits on bedrock which is mostly below sea level. In contrast, however, much of the base of the eastern ice sheet is above sea level. This was thought to make it less vulnerable to ocean warming caused by [climate change](#).

The study explored the east Antarctic ice sheet's response to climatic changes in the past to better understand how global warming could affect it in the future. The researchers focused on the last interglacial period, which was 116 000 - 132 000 years ago. This was a time of relative warming when the ice sheets retreated and global sea levels rose to between 6 and 9 m above present levels. Global air temperatures were approximately 2°C warmer than today - similar to those projected for the next century.

Using atmosphere-ocean models, the researchers investigated how circulation changes in the Southern Ocean, driven by changes in the Southern Hemisphere westerly winds, affected the ice sheet.

The modelling results revealed that during the interglacial period, the southerly migration of the westerly winds significantly affected large ocean currents in the Southern Ocean. This resulted in regional warming across the Southern Ocean that lasted thousands of years. Temperature rises varied from 0.2°C in the Weddell Sea, to 0.6°C in Prydz Bay and 0.9°C in the Ross Sea.

Ocean warming was concentrated around areas of the eastern ice sheet where glaciers flow into the sea, draining ice into the ocean. Results suggest that significant melting of the sheet potentially contributed three to five metres of the global sea level rise during the interglacial period.

This past history of warming has implications for the future stability of the east Antarctic ice sheet. Other studies suggest that ozone depletion in the upper atmosphere and climate change are shifting the westerly winds southwards, and affecting the large circular ocean currents in the Southern Ocean surrounding Antarctica. Furthermore, warming comparable to that of the last interglacial period has been recorded in the Southern Ocean in recent decades.

Warming, combined with the southerly shift of westerly winds, is likely to cause glacier flows to quicken, and lead to major losses of ice from the sheet. This could result in a substantial rise in sea levels, the researchers warn.



15 May 2014
Issue 372

**Subscribe to free
weekly News Alert**

Source: Fogwill, C.J.,
Turney, C.S.M.,
Meissner, K.J. *et al.*
(2014). Testing the
sensitivity of the East
Antarctic Ice Sheet to
Southern Ocean
dynamics: past changes
and future implications.
*Journal of Quaternary
Science*. 29(1): 91-98.
DOI: 10.1002/jqs.2683

Contact:
c.fogwill@unsw.edu.au

Read more about:
[Climate change and
energy](#), [Marine
ecosystems](#)

The contents and views
included in *Science for
Environment Policy* are
based on independent,
peer-reviewed research
and do not necessarily
reflect the position of the
European Commission.

To cite this
article/service: "[Science
for Environment Policy](#)":
European Commission DG
Environment News Alert
Service, edited by
SCU, The University of the
West of England, Bristol.