

Sustained levels of moderate warming could melt the East Antarctic Ice Sheet

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The Antarctic ice sheet. Credit: Stephen Hudson / Wikipedia

New research on marine sediment layers from Antarctica indicates that the East Antarctic Ice Sheet (EAIS) retreated during extended warm periods in the past, when temperatures were like those predicted for this century.

The international research team, led by Dr. David Wilson of Imperial College London, used evidence from a previous time in Earth's history, the late Pleistocene, to inform how the EIAS might react to a [warming](#) climate.

Scientists had previously focused much attention on the West Antarctic Ice Sheet, which predominantly sits on land below sea level, and contributes most of Antarctica's ice melt today.

The EAIS, in contrast, mostly lies on land above sea level. It is the largest [ice sheet](#) on Earth, at around 60 times the area of the UK. It contains around half of Earth's freshwater but is assumed to be less sensitive to a warming climate.

However, the new data, published today in *Nature*, suggest that 2°C warming in Antarctica, if sustained over a couple of millennia, would lead to melting in an area of the EAIS that lies below sea level. This has implications for rising global sea levels and global warming's threat to human civilisation.

Dr. Wilson, from Imperial's Department of Earth Science and Engineering, said: "Studying ice sheet behaviour in the geological past can inform us about future changes. By building a picture of how the ice sheet has grown and shrunk as temperatures have fluctuated, we can understand the response of the EAIS to future warming."

The researchers studied the Wilkes Subglacial Basin, one of three major areas where the EAIS sits on land that lies below sea level. If all the ice in this basin were to melt, global [sea level](#) would rise by up to four metres.

Glaciers, which come from ice sheets, grind up rocks on the continent, and then transport this sediment to the nearby Southern Ocean, leaving

behind a record of past erosion by the ice sheet.

To understand how warming affected the ice sheet in the past, the team chemically analysed layers of sediment from the ocean floor that originated from the Wilkes Subglacial Basin. They were collected during an expedition of the Integrated Ocean Drilling Program.

The researchers studied sediment layers that had settled on the seafloor during four previous warm intervals that occurred between ice ages (interglacials) over the past 450,000 years. They found chemical 'fingerprints' in the sediment that revealed the changing patterns of erosion as the ice sheet advanced and retreated.

The findings show that:

- The ice sheet had retreated from its current size during some of the interglacials, when temperatures were as little as two degrees warmer than pre-industrial times.
- The most extreme changes in the ice sheet occurred during two interglacial periods 125,000 and 400,000 years ago, when global sea levels were between six and 13 metres higher than they are today.
- Ice loss from the EAIS likely made a significant contribution to those higher sea levels in the past.

Dr. Wilson said: "What we have learned is that even modest warming of just two degrees, if sustained for a couple of thousand years, is enough to cause the ice [sheet](#) in East Antarctica to retreat in some of its low-lying areas.

"With current global temperatures already one degree higher than during pre-industrial times, future ice loss seems inevitable if we fail to reduce carbon emissions."

More information: Ice loss from the East Antarctic Ice Sheet during late Pleistocene interglacials, *Nature* (2018). [DOI: 10.1038/s41586-018-0501-8](https://doi.org/10.1038/s41586-018-0501-8) ,
www.nature.com/articles/s41586-018-0501-8

Provided by Imperial College London

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