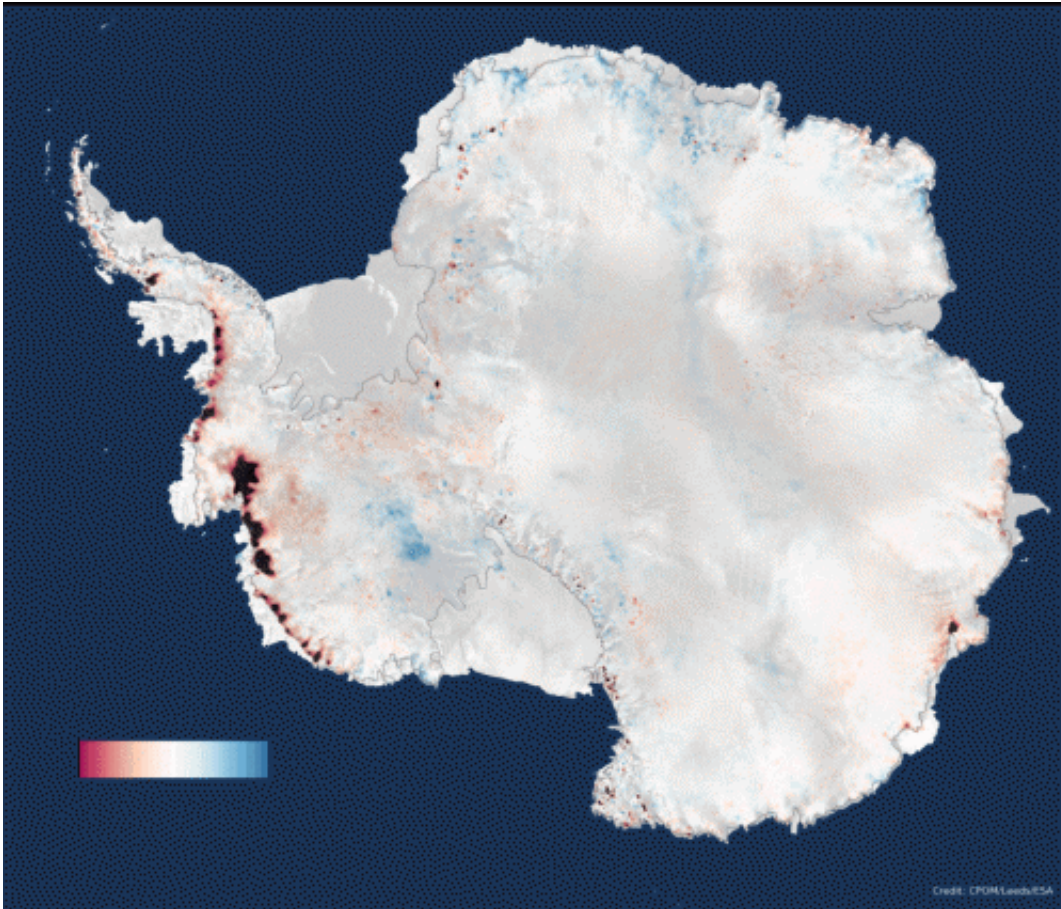


Antarctica's ice losses on the rise

May 19 2014



Three years of measurements from CryoSat-2 show that the Antarctic Ice Sheet is now losing 159 Gigatons of ice each year, enough to raise global sea levels by 0.45 millimetres per year. Colour scale ranges from -1 to +1 metres per year. Credit: University of Leeds

Three years of observations show that the Antarctic ice sheet is now

losing 159 billion tonnes of ice each year – twice as much as when it was last surveyed.

A team of scientists from the UK Centre for Polar Observation and Modelling, led by researchers at the University of Leeds, have produced the first complete assessment of Antarctic ice sheet elevation change.

They used measurements collected by the European Space Agency's CryoSat-2 satellite mission, which carries an altimeter specially designed for this task.

In sharp contrast to past altimeter missions, CryoSat-2 surveys virtually all the Antarctic continent, reaching to within 215 kilometres of the South Pole and leading to a fivefold increase in the sampling of coastal regions where today's ice losses are concentrated.

Overall, the pattern of imbalance continues to be dominated by glaciers thinning in the Amundsen Sea sector of West Antarctica.

However, thanks to the improved capabilities of CryoSat-2, problem areas such as the rugged terrain of the Antarctic Peninsula can now also be surveyed.

On average West Antarctica lost 134 gigatonnes of ice, East Antarctica three gigatonnes, and the Antarctic Peninsula 23 gigatonnes in each year between 2010 and 2013 – a total loss of 159 gigatonnes each year.

The polar ice sheets are a major contributor to global [sea level rise](#) and, when combined, the Antarctic losses detected by CryoSat-2 are enough to raise [global sea levels](#) by 0.45 millimetres each year alone.



Sastrugi and mackerel sky over Pine Island Glacier. The iSTAR camp is barely visible in the distance. Credit: Anna Hogg.

In West Antarctica, ice thinning has been detected in areas that were poorly surveyed by past satellite altimeter missions.

These newly-mapped areas contribute additional losses that bring altimeter observations closer to estimates based on other approaches.

But the average rate of ice thinning in West Antarctica has also increased, and this sector is now losing almost one third (31%) as much ice each year than it did during the five year period (2005-2010) prior to CryoSat-2's launch.

Lead author Dr Malcolm McMillan from the University of Leeds said:

"We find that ice losses continue to be most pronounced along the fast-flowing ice streams of the Amundsen Sea sector, with thinning rates of between 4 and 8 metres per year near to the grounding lines of the Pine Island, Thwaites and Smith Glaciers."

This sector of Antarctica has long been identified as the most vulnerable to changes in climate and, according to recent assessments, its glaciers may have passed a point of irreversible retreat.

Launched in 2010, CryoSat carries a radar altimeter that can 'see' through clouds and in the dark, providing continuous measurements over areas like Antarctica that are prone to bad weather and long periods of darkness.

The radar can measure the surface height variation of ice in fine detail, allowing scientists to record changes in its volume with unprecedented accuracy.

Professor Andrew Shepherd, also of the University of Leeds, who led the study, said: "Thanks to its novel instrument design and to its near-polar orbit, CryoSat allows us to survey coastal and high-latitude regions of Antarctica that were beyond the capability of past altimeter missions, and it seems that these regions are crucial for determining the overall imbalance."

"Although we are fortunate to now have, in CryoSat-2, a routine capability to monitor the [polar ice sheets](#), the increased thinning we have detected in West Antarctica is a worrying development. It adds concrete evidence that dramatic changes are underway in this part of our planet, which has enough ice to raise global sea levels by more than a metre. The challenge is to use this evidence to test and improve the predictive skill of climate models."

Professor David Vaughan of the British Antarctic Survey said: "The increasing contribution of Antarctica to sea-level rise is a global issue, and we need to use every technique available to understand where and how much ice is being lost. Through some very clever technical improvements, McMillan and his colleagues have produced the best maps of Antarctic ice-loss we have ever had. Prediction of the rate of future global sea-level rise must be begin with a thorough understanding of current changes in the ice sheets – this study puts us exactly where we need to be."

Dr Ian Joughin at the University of Washington, author of a recent study simulating future Antarctic [ice](#) sheet losses added: "This study does a nice job of revealing the strong thinning along the Amundsen Coast, which is consistent with theory and models indicating this region is in the early stages of collapse."

The findings from a team of UK researchers at the NERC Centre for Polar Observation and Modelling, are published in the journal *Geophysical Research Letters*.

More information: Malcolm McMillan, Andrew Shepherd et al. 'Increased ice losses from Antarctica detected by CryoSat-2', *Geophysical Research Letters* (2014), is online [DOI: 10.1002/2014GL060111](#) ; URL [onlinelibrary.wiley.com/doi/10 ... 014GL060111/abstract](http://onlinelibrary.wiley.com/doi/10.1002/2014GL060111/abstract)

Provided by University of Leeds

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