

22 November 2009

East Antarctic ice sheet may be losing mass

By Richard Black
Environment correspondent, BBC News website



The mass loss is probably driven by processes occurring on the coast

The East Antarctic ice sheet has been losing mass for the last three years, according to an analysis of data from a gravity-measuring satellite mission.

The scientists involved say they are "surprised" by the finding, because the giant East Antarctic sheet, unlike the west, has been thought to be stable.

Other scientists say ice loss could not yet be pinned on climate change, and uncertainties in the data are large.

The US-based team reports its findings in the journal Nature Geoscience.

The data comes from Nasa's Gravity Recovery and Climate Experiment (Grace) mission.

“ It energises me as a scientist, but I'm not convinced that as yet it should energise anyone else ”

Professor Richard Alley

Grace has previously shown that the smaller West Antarctic and Greenland ice sheets are losing mass.

These two bodies of ice contain enough water to raise sea levels by about six to seven metres (20ft) each if they melted completely.

Melting the East Antarctic sheet would raise sea levels by much more - about 50-60m.

But scientists have generally discounted the possibility of it happening because the region is so cold.

The Grace measurements suggest there was no net ice loss between 2002 and 2006.



But since then, East Antarctica has been losing 57 billion tonnes (Gt) per year.

"We felt surprised to see this change in East Antarctica," study leader Jianli Chen from the Centre for Space Research at the University of Texas in Austin told BBC News.

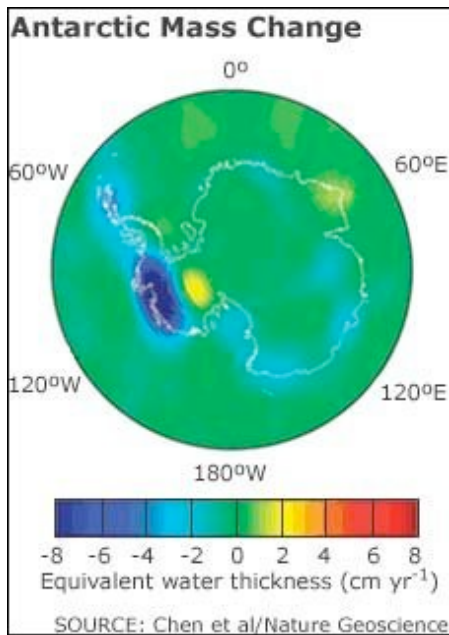
The loss still looks small by contrast with West Antarctica, which is losing 132Gt per year, and with Greenland, where a recent analysis combining Grace data with other measurements indicated an annual figure of 273Gt.

Previous Grace analyses - and those from other satellites - had given an inconclusive picture for the giant ice body.

The twin Grace satellites fly in close formation, detecting minute changes in the Earth's gravity through the marginal changes this causes in their relative positions.

Eastern energy

Measuring Antarctic ice loss is a tricky issue because the continent itself is rising and deforming.



Its ice cover was significantly thicker during the last Ice Age; as the ice melted, the weight pressing down on the rock abated, and the rock is "isostatically rebounding".

Readings from satellite missions have to be adjusted to allow for this rebound - and that is one source of uncertainty when trying to assess the significance of the new research, according to Richard Alley, one of the world's leading glaciologists.

"The first thing is that lots of this is dependent on the isostatic [rebound] model, and (recent work has) cast some doubt on the isostatic models that people are using," commented the Penn State University researcher (who was not involved in the paper).

"And then you get into the age-old question of 'is it climate or is it weather?'

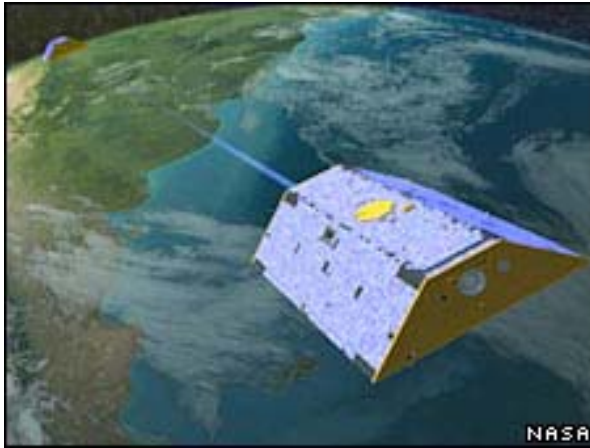
"So it energises me as a scientist, but I'm not convinced that as yet it should energise anyone else."

Rising potential

The Grace data gives a picture of where ice is being lost across the continent; and these areas are mainly on the coast.

It is not clear what physical processes could be driving any loss of mass here, although it is not simply melting due to high air temperatures, because temperatures are well below zero.

One clue could lie in research published last year by Leigh Stearns and colleagues, showing that lakes under the ice sheet can periodically overflow, with the liquid water then acting as a lubricant to speed glaciers on their way towards the sea.



The Grace satellites provide a twin eye on gravity at the Earth's surface

Commenting on the new research, Dr Stearns told BBC News: "In these coastal regions the ice loss could be driven by some interaction with the oceans or some weather patterns, or it could be a sub-glacial lake that drained and caused some thinning - so it might not be climate-related.

"It's easy to jump to the conclusion that it's exceptional because it's the first time we've recorded it, but we do need a baseline of how things have been in the past so we do need to be cautious," said the University of Kansas researcher.

"Nevertheless, it awakens us to the fact that the East Antarctic sheet is more dynamic than we thought, and we do need to pay attention to it because its potential for sea level rise is so much greater than in West Antarctica or Greenland."

Dr Chen said that one of his team was currently conducting airborne surveys of one of the regions where mass loss had been detected, hoping to shed some light on the mechanisms involved.

Richard.Black-INTERNET@bbc.co.uk