greenhouse gas ozone — ends up in the upper troposphere, where it has a strong influence on climate.

A team led by Lesley Ott of NASA's Goddard Earth Sciences and Technology Center in Greenbelt, Maryland, used data collected during lightning storms in Germany and the United States between 1985 and 2002, along with a cloud simulation model, to estimate the amount of $NO_x$ produced by an average flash of lightning. They found that a single lightning strike produces about 7 kilograms of chemically reactive $NO_x$. Worldwide, this amounts to an annual production of 8.6 million metric tonnes. As none of the data were collected in the tropics — where lightning may yield less $NO_x$ per flash — the global estimate may be on the high end, say the researchers.

They speculate, however, that if lightning storms become more frequent in the future, as predicted by some theoretical models, increased $NO_x$ in the upper atmosphere could affect global climate change.

**Stephanie Baudains**

## CRYOSPHERE

# In the balance

STEVE MORGAN

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Greenland, home to one-tenth of the world's land ice, is rapidly losing mass, pushing up global sea levels. Approximations of how fast this is happening vary widely, but a study now offers one estimate verified using two independent methods.

An international team led by Michiel van den Broeke at Utrecht University in the Netherlands gauged the rate at which the Greenland ice sheet is shrinking based firstly on observations of ice movement, melting and snowfall. They then compared these results with remote gravity measurements made by a pair of US–German satellites known as GRACE (the Gravity Recovery and Climate Experiment). They found that, on average, the ice sheet lost a total of about 1500 gigatons of mass between 2000 and 2008, equivalent to about 0.46 millimetres of global sea level rise per year. The loss of mass during this time was split equally between surface processes, such as melting, and the physical discharge of large chunks of ice into the ocean.

From 2006 to 2008, the rate of ice loss accelerated, mostly due to high rates of summer surface melting, reaching 273 gigatons of mass per year, or 0.75 millimetres of annual sea level rise.

**Olive Heffernan**

## OCEAN SCIENCE

# New shores for sinks

SEAWIFS, NASA & ORBIMAGE

*Glob. Change Biol.* doi:10.1111/j.1365-2486.2009.02071.x (2009)

In areas of water newly exposed by the melting and retreat of glaciers around the Antarctica Peninsula, large blooms of phytoplankton are beginning to flourish. By sucking up carbon and transporting it to the deep sea, the blooms can act as a buffer against climate change.

A research team from the British Antarctic Survey in Cambridge, led by biologist Lloyd Peck, compared historical records of glacial retreat along the Antarctic Peninsula coastline with measurements of chlorophyll — a green photosynthetic pigment contained in the phytoplankton — from the surrounding ocean. They found that a new carbon sink has developed in the region over the past 50 years and is now taking up 3.5 million tonnes of carbon from the ocean and atmosphere each year. Of the 3.5 million tonnes of carbon absorbed annually, 0.7 million tonnes is transported to the seabed, where it can stay locked away from the atmosphere for thousands of years.

The researchers anticipate that the blooms — which now soak up as much carbon as 6000-17000 hectares of tropical rainforest — will grow as the ice continues to melt. The amount sequestered will still only be minor, however, compared to the billions of tonnes of $CO_2$ produced by humans each year.

**Olive Heffernan**