Cryosphere

Southern snowmelt

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Geophys. Res. Lett. **34,** L18504 (2007)

Antarctic snowmelt is occurring farther inland and at higher altitude than previously observed, according to a new analysis of satellite observations.

A team led by Marco Tedesco at the University of Maryland, US, and NASA mapped the extent and duration of Antarctic melting continent-wide over 20 years using microwave satellite imagery. Unlike other satellite instruments that use visible or infrared data, the sensors can measure the microwave radiation naturally emitted by snow and ice, can see through clouds, and can even detect subsurface melting, day and night.

The data show that from 1987 to 2006, Antarctica, as a whole, cooled, but in some years, coastal areas became warmer. The greatest extent and duration of melting was observed at the Ross Ice Shelf — the continent's largest ice shelf — where the researchers detected episodes of persistent melting lasting three or more days, starting in 1991–1992. In early 2005, the persistent melt reached nearly 900 kilometres from the coast and an altitude of 2 kilometres in the Transantarctic Mountains — farther inland and higher than ever before recorded. Ice shelves slow the flow of glaciers, and a weakened Ross Ice Shelf could allow much greater quantities of inland ice to reach the ocean, potentially resulting in a significant rise in sea level.

Harvey Leifert

Atmospheric science

Wetter world

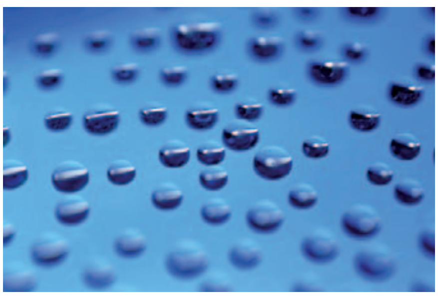
Nature **449,** 710–713 (2007)

The amount of water vapour in the atmosphere has increased significantly in recent decades as a result of human activity, according to new research. Because water vapour is a greenhouse gas that traps heat in the atmosphere, increased humidity is likely to heighten the affect of human-induced climate change.

A study led by Katherine Willett of the Climatic Research Unit at the University of the East Anglia, UK, used a new gridded observational data set of surface-specific humidity with a coupled climate model to investigate whether changes in humidity between 1973 and 1999 were due to human or natural influences on climate. The researchers found a significant global increase of 0.07 g kg^{-1} per decade in surface-specific humidity over this period that was primarily due to human activity.

Although an upward trend in atmospheric water vapour in the late twentieth century has been previously reported, this study is the first to link the increase directly to anthropogenic warming. The findings have important implications for understanding future increases in atmospheric humidity, which would be likely to influence the intensity of precipitation and tropical cyclones, as well as effecting human heat stress and water availability.

Olive Heffernan



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Ocean science

Cloud control

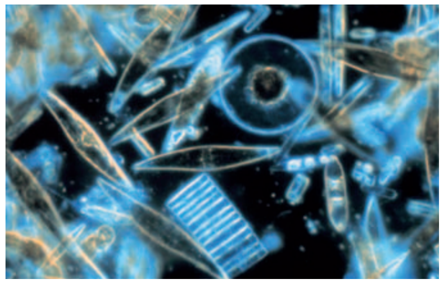
Proc. Natl Acad. Sci. USA **104,** 16004–16009 (2007)

The production of a sulphur-containing compound by oceanic plankton will not slow global warming as once thought, new research shows. Dimethyl sulphide (DMS) is produced by phytoplankton roughly in proportion to the amount of sunlight they receive. But by acting as a seed for cloud formation, DMS can slow its own formation and can also cool the climate.

Sergio Vallina from the Institut de Ciencies del Mar de Barcelona in Spain and colleagues used two different models of DMS production incorporating ocean circulation to study future global emissions of the sulphide gas. They found that a 50% increase in atmospheric CO_2 resulted in a 1.2% annual increase in DMS production, but that the cooling effect of the DMS was minimal relative to the warming caused by CO_2. However, the models predicted large seasonal changes in DMS emissions — 10–20 times more in summer compared with winter — indicating that DMS regulates summertime sunlight over the ocean.

These findings suggest that although DMS production may have a considerable effect on seasonal cloud production, it does not show a significant trend over longer timescales, such as would be needed to counterbalance the warming effect of increasing atmospheric CO_2.

Alex Thompson



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Palaeoclimate

Stormy seas

Science doi:10.1126/science.1146138 (2007)

The well-mixed upper layer of the North Atlantic Ocean — an area of intense biological activity directly involved in climate change — thickened during cool periods in the past, according to a new study. Over the past 65,000 years, there have been eight periods of significant cooling, known as Heinrich events, which were characterized by a massive iceberg release into the North Atlantic Ocean. Until now, it was thought that freshwater discharged from the ice created an isolated layer of low salinity surface water in the region, which disrupted ocean circulation, further affecting the climate.

But a study by Harunur Rashid at the University of South Florida and Ed Boyle of Massachusetts Institute of Technology challenges this concept by reconstructing past ocean surface conditions using the oxygen isotope ratios recorded in single-celled foraminifera fossils taken from a sediment core in the North Atlantic. They discovered that throughout three of five Heinrich events studied, foraminifera living at a wide range of depths experienced similar conditions.

The researchers propose that the upper ocean was mixed during these events owing to changes in atmospheric circulation, which led to stronger winds and increased storminess. This suggests that increased freshwater input, such as from the modern melting of the Greenland Ice Sheet, may not disrupt ocean circulation as much as previously predicted.

Alicia Newton

Atmospheric science

Tibetan dust bowl

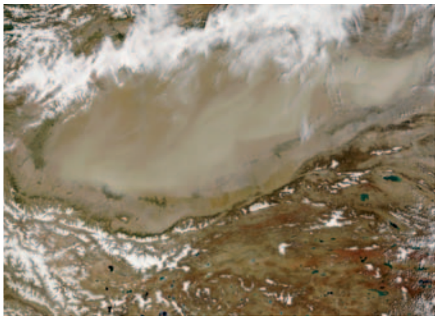
Geophys. Res. Lett. **34,** GL029938 (2007)

Large dust storms in Tibet could be heating the region and influencing the development of the Indian monsoon, finds a new study. Although occasional dust plumes have been previously observed near the edge of the Tibetan Plateau, new satellite observations show that large summer dust storms from the Taklamakan desert are relatively common over the Plateau.

Using the CALIPSO satellite, Jianping Huang from the College of Atmospheric Sciences at Lanzhou University, China and colleagues recorded almost 50 dust plumes from June to September 2006 — an almost fivefold increase over events recorded by traditional ground-based methods. The dust plumes recorded reached up to 10 km, with typical thicknesses of 3 to 7 km. By combining modelling with an analysis of the shape of the dust particles, the researchers inferred that the aerosols came primarily from the nearby Taklamakan desert, rather than from human sources

The dust particles tend to absorb heat from sunlight, creating an unusually warm area over the Tibetan Plateau. This heating enhances atmospheric circulation from relatively cold to warm areas, thus strengthening the Indian summer (rainy) monsoon. If desertification progresses in the Taklamakan desert as the climate warms, Tibet will probably become more dusty in summer, with important implications for central Asian climate.

Alicia Newton



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Biodiversity and Ecology

Carbon balance

Global Biogeochem. Cy. **21,** GB3018 (2007)

The growing season in the Northern Hemisphere has lengthened over the past few decades, but the atmospheric carbon dioxide mopped up by plant growth has been offset by a parallel rise in soil carbon decomposition, finds a new study.

Shilong Piao and colleagues from the Laboratoire des Sciences du Climat et de l'Environnement in Gif-sur-Yvette, France investigated changes in the onset and termination of the growing season and their impacts on air-land carbon exchange in the Northern Hemisphere between 1980 and 2002. Using a vegetation ecosystem model and observed data, they found that the growing season has lengthened by about three days per decade since 1980, mainly owing to earlier springs in Eurasia and later autumns in North America.

Total plant growth increased with longer summers, in agreement with satellite and ground station observations, and although the plants absorbed carbon dioxide from the atmosphere as expected, the warming climate activated soil microbes that decompose litter, returning a comparable amount of CO_2 to the atmosphere. The study suggests that the amount of carbon sequestered on land is not directly linked to the lengthened growing season and increased plant growth associated with global warming.

Alex Thompson

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