

CRYOSPHERE

Arctic arch decline



EUROPEAN SPACE AGENCY

Geophys. Res. Lett. **37**, L03502 (2010)

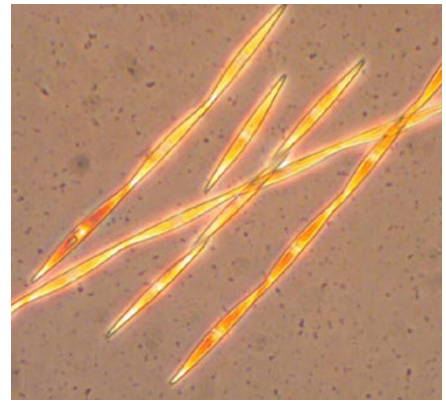
Each winter and spring, large ice blockages known as arches form along the straits leading out of the Arctic Ocean, preventing sea ice from drifting further afield. Scientists now report that in 2007 ice arches did not form along one of these passages, known as the Nares Strait, and that this

contributed to record low sea ice cover in the Arctic that year.

Ron Kwok of the Jet Propulsion Laboratory in Pasadena, California, and colleagues used satellite imagery to track the movement of sea ice through the Nares Strait, the passageway that separates Greenland from Ellesmere Island, from 1997 to 2009. The Nares Strait carries only ten per cent of the ice lost to the Atlantic each year, but it drains the oldest and thickest ice. They found that during typical winters and springs, ice arches develop at two key locations along the strait. Failure of these arches to form in 2007, however, meant that transport through the strait that year was more than twice the average over the 13-year study period.

The team warns that future warming in the Arctic could inhibit arch formation, allowing more sea ice to escape and enhancing the decline of summer sea ice cover.

Alicia Newton



NOAA

Charles Trick of the University of Western Ontario in London, Ontario, and colleagues studied the ability of *Pseudo-nitzschia* species in the sub-Arctic North Pacific Ocean to produce domoic acid under normal and iron-enriched conditions. They found that *Pseudo-nitzschia* species produce domoic acid even as part of their normal physiology during spring and that adding iron to the ocean favours the growth of these species. Once domoic acid is present in the water column, it too enhances *Pseudo-nitzschia* growth, found the researchers.

The authors suggest that large-scale ocean fertilization could result in toxin levels as high as one to two micrograms of domoic acid per litre, enough to cause widespread amnesic shellfish poisoning in humans and acute toxicity in seabirds and marine mammals.

Olive Heffernan

EXTREME EVENTS

Methane megapool



GORISBILLETOV, UNIVERSITY OF ALASKA, FAIRBANKS

Science **327**, 1246–1250 (2010)

The amount of methane being released from permafrost in the Siberian Arctic could rival that being vented from the entire world ocean, suggests new research. The study confirms what scientists have suspected for some time — that substantial quantities of the potent greenhouse gas are being released from sub-sea sites as the Arctic warms.

Between 2003 and 2008, Natalia Shakhova of the University of North Carolina and colleagues measured methane levels at 1,080 locations in the sea above the East Siberian Arctic Shelf, a vast area of shallow sea floor off Russia's northeast coast. From

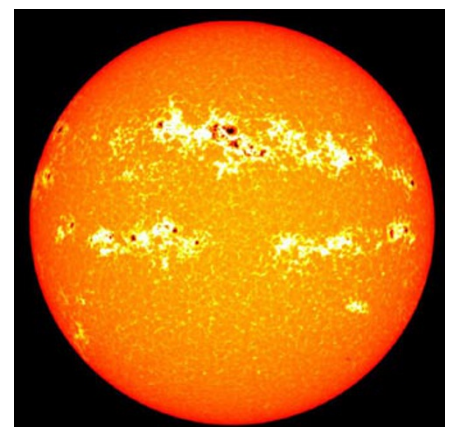
more than 5,000 at-sea observations, they found that than 80 per cent of the bottom waters, and over 50 per cent of the surface waters, are supersaturated with methane. The researchers detected methane in rising bubble clouds and trapped within the annual sea ice, suggesting that the gas escaped from sub-sea sediments. Combining these measurements, they estimate the annual release of methane from the East Siberian Arctic Shelf at just below 8 million tonnes per year.

The authors note that atmospheric methane levels have risen in recent years, providing further evidence of methane escape.

Anna Armstrong

CLIMATE VARIABILITY

Solar low scenario



NASA

Geophys. Res. Lett. **37**, L05707 (2010)

A weakening of the sun's activity, such as happened in the late seventeenth century, would only moderately offset global warming, finds a new study. The sun is

OCEAN SCIENCE

Poisonous cure

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0910579107 (2010)

Plans to counteract climate change by boosting the growth of oceanic algae could contaminate the ocean with deadly levels of a neurotoxin, say scientists. Although previous studies have shown that oceanic species of the genus *Pseudo-nitzschia* are harmless, new research finds that these species can, in fact, produce the neurotoxin domoic acid and that their toxicity is enhanced in iron-enriched waters.

currently in a phase of low activity, leading some to suggest that its warming influence will wane further in the coming decades to the extent that Earth could experience a 'grand solar minimum'.

Georg Feulner and Stefan Rahmstorf of the Potsdam Institute for Climate Impact Research in Potsdam, Germany, used a coupled climate model to explore how a lull in solar activity could influence future temperatures. They assumed that during a grand solar minimum, the amount of radiation reaching Earth would be similar to that during the Maunder Minimum, a period of low solar activity linked to the noticeably low temperatures of the Little Ice Age that began in about 1645. They found that by 2100 temperatures would be no more than 0.3 °C lower than in a scenario with solar activity similar to recent decades.

The authors conclude that a grand solar minimum would reduce human-induced global warming only slightly. They also note that any offset in warming would be temporary, lasting at most several decades or a century.

Oliver Heffernan

BIODIVERSITY AND ECOLOGY

Early emergence



PAUL SAINNAOKS

Biol. Lett. doi:10.1098/rsbl.2010.0053 (2010)
Over recent decades, the timing of many spring events has occurred progressively earlier year on year. Though these seasonal shifts are linked to rising temperatures, attributing them to climate change has proven difficult. Now scientists have shown that the common brown butterfly has begun to emerge from its chrysalis 1.6 days earlier per decade over a 65-year period. The shift tallies with a rise in air temperatures of 0.14 °C per decade over the same era.

A team led by Michael Kearney of the University of Melbourne, Australia, compiled information on the emergence date of *Heteronympha merope* in Melbourne over the period 1941 to 2005. In the laboratory, they raised eggs, larvae and pupae from ten field-collected females and calculated the rate of development

at various temperatures. Combining the data on sensitivity to temperature with historical monthly climate data, they used a microclimate model to predict that the emergence date would shift 1.3 days earlier per decade over the same period, close to the observed rate.

Results from four global climate models show that the temperature trend over the 65-year period is very unlikely to result from natural climate variability alone. The authors deduce that the seasonal shift is directly linked to human-induced warming.

Oliver Heffernan

BIODIVERSITY AND ECOLOGY

Little birdie



ROBERT S. MAJUHILL / POWDERMILL NATURE RESERVE

Oikos doi:10.1111/j.1600-0706.2009.18349.x (2010)

Birds migrating throughout the United States are shrinking in size as temperatures rise, say scientists.

Between 1961 and 2006, Josh van Buskirk of the University of Zurich in Switzerland and colleagues collected data on body mass, body fat and wing chord — the distance from a bird's wrist to the tip of its longest primary feather — from almost half a million birds of over 100 species captured at a field station in western Pennsylvania. Over the 46-year study period, birds arriving at the banding station steadily became lighter in weight and had shorter wings. Buskirk and colleagues found widespread declines in the body mass of birds during all four seasons and in wing length during spring and autumn. Sixty of 83 spring migrant species shrunk in size, having smaller wings and weighing less. Of 75 autumn migrant species, 66 became leaner over time and 52 developed shorter wings.

Although the changes in body size were statistically significant, they were relatively small: on average, mass declined 3.6 per cent over 46 years. The birds are therefore unlikely to be harmed by the drop in their body sizes, say the authors.

Oliver Heffernan

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