CLIMATE IMPACTS

More potent poppies

ALAMY

Climatic Change
doi:10.1007/s10584-008-9418-9 (2008)
Poppies will grow larger and produce more opiates as atmospheric carbon dioxide levels rise, say scientists. Cultivated for their use in legitimate pharmaceuticals, the delicate flowers are perhaps best known as the primary source of illegal drugs such as heroin.

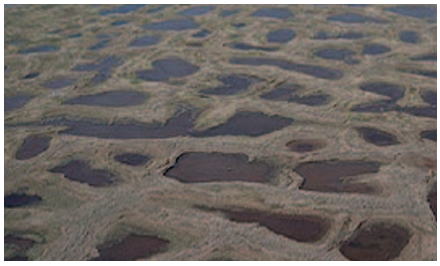
Lewis Ziska at the US Department of Agriculture in Maryland and colleagues grew wild poppies, which are closely related to opium poppies, under atmospheric carbon dioxide concentrations equivalent to those in 1960, at present levels and at higher levels that could be reached by 2050 and 2090 if current emissions trends continue. The biomass and leaf area of the plants increased significantly at higher concentrations of the greenhouse gas, and far more raw opiates were produced, with morphine showing the greatest rise.

Earlier studies have suggested that higher temperatures could also boost opium production. The amount of opiates per plant will continue to rise for at least 50 years — though not as considerably as in the last half-century — before levelling off, say the researchers. The study adds to existing evidence that plants are already showing physiological responses to the anthropogenic rise in atmospheric carbon dioxide.

Alicia Newton

CRYOSPHERE

Shaky ground



USGS

Geophys. Res. Lett. **35,** L10703 (2008)
Warming may eventually destabilize massive frozen carbon reserves trapped in the east Siberian permafrost, but not for centuries, finds a new study. Frozen reserves constitute over 60 per cent of the carbon stored in soils globally, and their escape to the atmosphere could have a considerable effect on future climate.

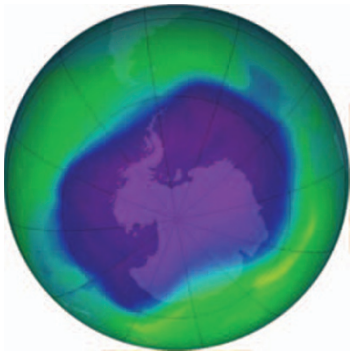
Dmitry Khvorostyanov at the Laboratoire des Sciences du Climat et de l'Environment, France, and colleagues used model simulations of permafrost to assess the potential future release of the frozen carbon in east Siberia. They found that the rate of warming is a key factor affecting the destabilization of the carbon stores. If the temperature rises 3 °C per century in northeastern Siberia, the stores there will be mobilized by AD 2300.

Faster warming could lead to an earlier release, however. Once the process has begun, it is irreversible. The authors estimate that up to 75 per cent of the initial carbon store could enter the atmosphere within 50 to 100 years of the deposits being destabilized.

Alicia Newton

ATMOSPHERIC SCIENCE

Waning winds



NASA

Science **320,** 1486–1489 (2008)
Recovery of the Earth's ozone layer could weaken climate change in the Southern Hemisphere, scientists have discovered. As the hole in the atmosphere heals, they predict that a westerly wind, or 'jet stream', will slow near the South Pole, countering this wind pattern's acceleration in recent decades as a result of rising greenhouse gas levels.

A multinational research team, led by Seok-woo Son of Columbia University, New York, used chemistry–climate models to investigate how wind and pressure patterns in the Southern Hemisphere are likely to be affected by the recovery of ozone up until 2050. They found that ozone restoration, by warming the portion of the lower atmosphere at a height of around 20 kilometres, slows the jet stream as it nears the pole. Such a shift would influence surface temperatures, the extent of sea ice, the location of storm tracks and arid regions, ocean circulation and the exchange of carbon dioxide between the atmosphere and ocean.

The study challenges the most recent findings of the Intergovernmental Panel on Climate Change, which predicts the wind will continue to accelerate near the pole over the century. The effect of ozone recovery should be more carefully accounted for in climate predictions, say the authors.

Olive Heffernan

OCEAN SCIENCE

A coastal escape

NOAA

Glob. Biogeochem. Cycles **22,** GB2013 (2008)
Over half of the carbon dioxide taken up by mangrove forests has been unaccounted for until now. Scientists show in a new study that this 'lost carbon' is probably washed away with the tide.

Steven Bouillon of the University of Brussels and colleagues scoured the available literature and came up with a global estimate for the amount and fate of carbon fixed during photosynthesis by mangrove vegetation. Although nearly half of the carbon appeared to be siphoned off into soils or released back into the atmosphere, the rest — averaging 112 million tonnes per year — could not be

found. Because previous studies used the amount of carbon dioxide released from mangrove soils as a measure of soil carbon breakdown, they severely underestimated the rate at which carbon passes through mangrove ecosystems. Bouillon and colleagues conclude that the missing carbon may be leaving the mangroves for coastal waters.

Mangrove forests are disappearing fast, with the UN Food and Agriculture Organisation estimating global losses around one per cent of the total area per year. Their decline will shrink a vital land carbon sink and could also affect the amount of carbon being transported from coastal waters to the deep sea, where it is sequestered from the atmosphere.

Anna Armstrong

BIODIVERSITY AND ECOLOGY

Toxic meltdown

HEIDI GEISZ

Environ. Sci. Technol. doi:10.1021/es702919n (2008)

Adélie penguins are taking in decades-old stores of the toxic pesticide DDT being released by melting Antarctic ice. Post-1970 bans on the pesticide reduced levels in other seabirds, which store the toxin in their tissues — but melting of DDT-laced glaciers along the western Antarctic Peninsula, hastened by rising temperatures, has meant continued exposure for the penguins.

Heidi Geisz of the College of William and Mary in Virginia and co-workers tested for the chemical in Adélie carcasses and eggs collected from Palmer Archipelago on the Peninsula and Ross Island in east Antarctica. Although worldwide use of DDT has dropped over 90 per cent since its 1970s peak, the amount concentrated in Palmer Island Adélie penguins has changed little in that time, they found.

Whereas eastern Antarctic birds contained only DDE, a metabolic product of DDT that lingers in the food chain over time, those from Palmer Island also had a fresh source of DDT — most likely pesticide that hitched onto pole-bound particles and was buried in the growing glaciers of the mid-twentieth century. The one to four kilograms of DDT per year now leaking into the ocean is unlikely to harm the penguins, say the authors, but it could be accompanied by more dangerous chemicals.

Anna Barnett

EARTH SCIENCE

Complex connections

GETTY

Phil. Trans. R. Soc. B **363,** 1753–1759 (2008)

Changes in sea surface temperature could play a major role in loss of the Amazon rainforest in the latter half of this century, a new study has found.

The research, led by Phil Harris of the Centre for Ecology and Hydrology, United Kingdom, used the atmospheric component of a well-established climate model developed by the UK's Hadley Centre to determine whether changes in sea surface temperature could trigger the disappearance of the Amazon rainforest by 2100. If sea surface temperatures of both the Atlantic and Pacific oceans changed simultaneously up until 2059, annual rainfall in the Amazon basin would be reduced by of more than 20 per cent on average, the authors found. Rainfall could decrease by as much as 48 per cent in the period outside of the South American monsoon season, between May and October.

The authors say that the projected reductions in rainfall are influenced by a suite of factors, but that sea surface temperature across the Pacific and Atlantic oceans is the main driver under certain warming scenarios. Such shortages of rain would cut the Amazon's carbon uptake by nearly a third, rendering this socially, economically and biologically critical ecosystem unsustainable.

Anna Armstrong