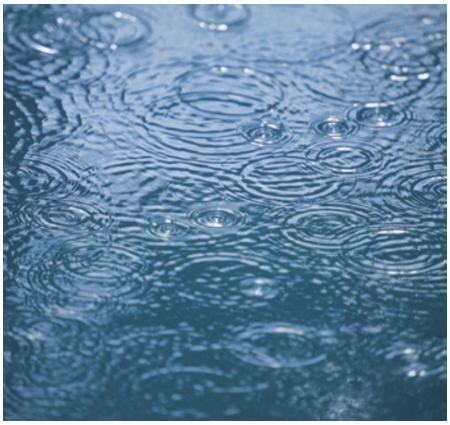
Suboxic Pacific Ocean waters were found to become more oxygenated under a warming scenario, because of changes in convection and vertical mixing.

The study highlights the effect of global warming in producing circulation changes that alter the mix of old, low oxygen waters and younger high oxygen waters that feed suboxic zones. The global ocean is a complicated system and further work is required to fully understand the effects of climate change on deoxygenation. *BW*

MODELLING

Predicting rain

J. Clim. http://doi.org/hs2 (2012)



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Climate models allow us to predict future weather events, with rainfall expected to increase in many parts of the world. Regional climate models, which look at small areas to predict local climate effects, are limited in their accuracy of rainfall events. They tend to underestimate dry days and poorly represent the diurnal cycle and hourly precipitation extremes. Better modelling of past rainfall will increase confidence in future predictions.

Elizabeth Kendon and colleagues from the Met Office UK compared rainfall in regional climate models at a very high resolution (1.5 km) and a coarser resolution (12 km). The model was run for a 20-year period (1989–2008), covering southern England and Wales. Running the model at higher resolution meant convection could be represented without a convective parameterization scheme.

Using finer resolution of the regional climate model allowed more realistic representation of past rainfall. Results showed better representation of the duration and spatial extent of heavy rain, resolution of diurnal cycle of rainfall, with convection peaking later in the day, and decreased overestimation of persistent light rain. *BW*

CLIMATE SCIENCE

Exactly what don't we know?

Nature Geosci. **5,** 256–260 (2012)

Estimating the future evolution of global mean temperature is subject to significant uncertainty, which stems from incomplete understanding of three aspects of the climate system. These are: equilibrium climate sensitivity (temperature sensitivity to a doubling of carbon dioxide), the rate of ocean heat uptake and the role of historical aerosol forcing (scattering, absorption and reflectance of radiation, and enhancement of cloud formation by fine aerosol particles).

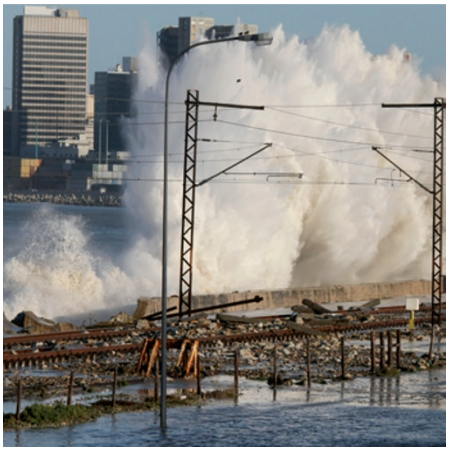
Daniel Rowlands, from Atmospheric, Ocean and Planetary Physics, Department of Physics, University of Oxford, UK, and co-workers used a climate model ensemble composed of thousands of model versions to explore the range of uncertainty resulting from these three aspects of the climate.

The model versions that reproduce observed warming over the past 50 years suggest that a mid-range greenhouse-gas emissions scenario without mitigation could lead to a warming of between 1.4 and 3 °C by the middle of the twenty-first century, relative to 1961–1990 baseline. This range of warming is broadly consistent with the expert assessment provided in the fourth assessment report of the Intergovernmental Panel on Climate Change. *AB*

IMPACTS

US coastal flooding

Environ. Res. Lett. **7,** 014032 (2012)



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An understanding of changing flood vulnerability is required to design policies that safeguard coastal communities and their infrastructure into the future. A key uncertainty for coastal flood risk is the effect of sea-level rise on storm-surge-driven water levels and their frequencies.

Claudia Tebaldi, from Climate Central, Princeton, USA, and co-workers investigate this question for the contiguous United States. Based on a model of sea-level rise and long-term records from 55 nationally distributed tidal gauges combined with historic patterns of high-water events, they project changing local water extremes until 2050.

They estimate that, by mid-century, some locations may experience high-water levels every year that would qualify today as 100-year events. Today's 100-year levels become 10-year (having a chance of 10% annually), or more frequent, events at about one-third of the study gauges. The majority of locations see substantially higher frequency of previously rare storm-driven water heights in the future. The authors note that their findings support the need for policy approaches that consider the nonstationarity of extreme events (that is, do not simply depend on past variability) when evaluating the risks of adverse weather. *AB*

ECOLOGY

Release from the cold

Glob. Change Biol. http://doi.org/hs3 (2012)

Plant production in northern peatlands is generally nitrogen limited. A key ecological question is whether thawing of permafrost will lead to the release of nitrogen in a form that can be used by plants.

Frida Keuper, from the Department of Ecological Science, VU University Amsterdam, The Netherlands, and co-workers compared plant-available nitrogen pools and fluxes in near-surface permafrost (0–10 cm below the thawfront) with those taken from the current-rooting-zone layer (5–15 cm depth) across five representative peatlands in subarctic Sweden.

Results consistently showed up to seven times more plant-available nitrogen in near-surface permafrost soil compared with the current-rooting-zone layer. Furthermore, a supplementary experiment showed an eightfold larger plant nitrogen uptake from permafrost soil than from other nitrogen sources, such as current-rooting-zone soil or fresh litter substrates. These results demonstrate that near-surface permafrost soil of subarctic peatlands can release a biologically relevant amount of plant-available nitrogen, which may have impacts on plant productivity and species composition. *AB*

Written by Alastair Brown, Monica Contestabile and Bronwyn Wake.

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