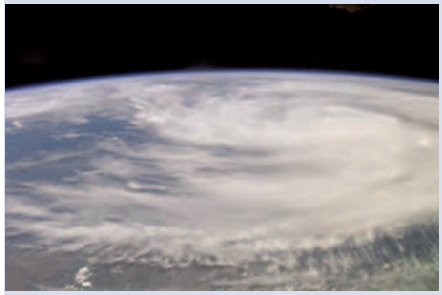
ATMOSPHERIC SCIENCE

Indian cyclones soar



NASA

Geophys. Res. Lett. **35,** L15710 (2008)

The frequency and intensity of summer tropical cyclones forming in the north Indian Ocean could increase in the coming century, according to scientists. Tropical storms such as the recent Cyclone Nargis, which made landfall in May and caused thousands of fatalities, are common in spring and late fall. But the onset of the summer monsoon system has usually prevented summertime tropical storm activity.

V. Brahmananda Rao at the Center for Weather Forecast and Climate Studies, São Paulo, Brazil, and colleagues assessed the causes of increased summer tropical-storm activity over the north Indian Ocean, which saw its first-ever category 5 hurricane in June 2007. They found a strong statistical link between increasing numbers of storms and the weakening of the Tropical Easterly Jet associated with the summer monsoon. The decline of the jet resulted in decreased wind shear in the atmosphere above the ocean, creating a prime breeding ground for violent storms, say the scientists.

Greater summer storm activity poses a hazard to millions of people living in low-lying deltas and coastal plains surrounding the Indian Ocean, especially those already inundated with monsoonal rains and floods.

Alicia Newton

OCEAN SCIENCE

Doubling dead zones

NASA

Glob. Biogeochem. Cycles
doi:10.1029/2007GB003147 (in the press)

Anthropogenic carbon dioxide emissions could strip tropical oceans of oxygen and drastically expand the region's 'dead zones' by the end of this century. Large portions of the tropical oceans are oxygen-depleted and hostile to marine life. Although these poorly ventilated zones are known to be highly sensitive to climate change, it's not clear how they will fare over the next century.

Andreas Oschlies at the University of Kiel, Germany, and colleagues used a global biogeochemical model to examine the effect of rising atmospheric carbon dioxide concentrations on the oxygen content of the world's oceans. They found that emissions-stimulated increases in the carbon content of marine biological matter might deplete oxygen in tropical oceans, with the greatest oxygen losses — of up to 70 per cent by 2100 — occurring on the margins of existing dead zones. Overall, the model predicts a 50 per cent increase in the volume of oxygen-depleted water in the tropical oceans by the end of the century.

The researchers attribute the spreading tropical dead zones to greater bacterial activity, which consumes oxygen, in a high-carbon world where organic carbon — the fodder of marine life — is in plentiful supply.

Anna Armstrong

EXTREME EVENTS

Revised sea rise

ISTOCKPHOTO.COM/SERDAR YAGCI

Science **321,** 1340–1343 (2008)

An increase in sea level of more than two metres by 2100 is implausible, conclude scientists, who say that sea level could rise 0.8 metres to two metres at most by then.

The new study factors in the dynamic effects of glaciers and ice sheets on sea level, aspects that have been excluded from earlier model estimates owing to poor understanding of the processes.

W. Tad Pfeffer of the University of Colorado at Boulder and colleagues estimated the volume of ice that all glaciers and ice sheets worldwide could lose through ice melt and the release of icebergs into the ocean. The authors analyse sea-level rise under four model scenarios that variously assume a present-day rate of ice melt or a tenfold increase in ice melt from land throughout the century, in combination with steady or severe ice loss through the calving of glaciers to form icebergs. For sea level to rise more than two metres by 2100, the discharge of icebergs into the ocean would need to occur more rapidly than ever before observed, at rates that may not even be feasible.

Accurate forecasts of sea-level rise are needed, say the scientists, so that resources for adapting to climate change can be directed appropriately.

Olive Heffernan

CLIMATE VARIABILITY

Hot times

TOM COHILL

Proc. Natl Acad. Sci. USA **105,** 13252–13257 (2008)

A new global temperature reconstruction, undertaken as a follow-up to the infamous 1998 'hockey stick' curve, confirms that the past two decades are the warmest in recent history. The original graph was a focal point of the 2001 Intergovernmental Panel on Climate Change assessment report and became a symbol of fierce debates over the evidence for global warming.

Michael Mann at Pennsylvania State University and colleagues used seasonally to decadally resolved climate records from corals, cave deposits, sediments

and tree rings from around the world to reconstruct global climate variability over the past 2,000 years. The team created two curves, with and without tree-ring records — data whose validity had previously been questioned — to place recent temperature observations in a historical context. Without inclusion of the tree-ring measurements, the data showed that recent warming is greater than at any point in at least the past 1,300 years; inclusion of tree-ring data extended this period to at least 1700 years.

Both curves show that global surface temperature increased during the Medieval Warm Period, an episode that lasted from around AD 800 to AD 1300, but indicate that average temperatures during this period were below those of the early twenty-first century.

Alicia Newton

CRYOSPHERE

Future feedbacks

ISTOCKPHOTO.COM / MISHA ZELKOVICH

Geophys. Res. Lett. **35,** L17705 (2008)

Melting of the Antarctic ice-sheet could moderate warming in the Southern Hemisphere, by as much as 10 °C locally, shows a new study.

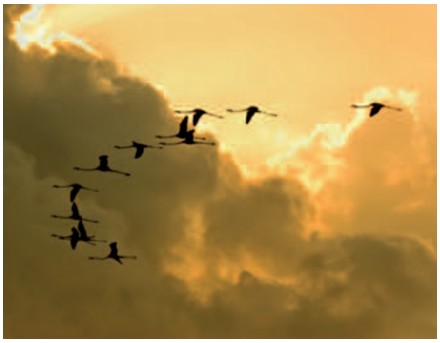
The study led by Didier Swingedouw of the Université Catholique de Louvain, Belgium uses a three-dimensional Earth system model with well-characterised polar ice sheets to look at the effect of Antarctic ice-sheet melting over coming centuries and millennia. The authors use a scenario whereby atmospheric carbon dioxide concentrations increase by one per cent a year until they reach four times their initial value and then remain unchanged for 3,000 years. Under such conditions, the model shows that a shallow halocline forms in the Southern Ocean, where colder, lower-salinity surface water would limit the retreat of sea-ice cover. The white reflective surface of the sea ice is important in reducing local warming. In addition, the simulations show that ice-sheet melt water can limit the formation of Antarctic bottom water, with implications for global ocean circulation and consequently climate and sea level.

The authors stress that the results are not intended as a forecast, but to provide insights on how climate would be affected by Antarctic ice-sheet melting for a given warming scenario.

Olive Heffernan

CLIMATE PREDICTION

One for the birds



ISTOCKPHOTO.COM / ALBERTO POMARES

Proc. Natl Acad. Sci. USA
doi:10.1073/pnas.0803506105 (2008)

A method frequently used to predict how wildlife will respond to a changing climate has been called into question. 'Climate envelope' models use current species distributions to determine how climate influences their range, and hence where they could potentially live in a warmer world. But despite their widespread application, these models have been controversial as they may overlook other potentially important drivers of distribution.

Now, Colin Beale and colleagues at the UK's Macaulay Institute of Land Use Research, Aberdeen, show that the apparent association between species distribution and climate found by these models is no better than chance association for 68 out of 100 bird species across Europe. Although the envelope models show a good fit to real distributions, Beale and colleagues found the models also fit artificial species distributions constructed with no reference to climate. In many cases models fitted the false data better than the real data.

The result raises doubts about earlier predictions made using climate envelopes, especially for species outside of extreme environments. The team urges the use of a more measured approach to assessing climate impacts on populations, accounting for factors such as species interactions, land-use change and habitat degradation.

Alicia Newton