



NOAA

Observations task force announced

SCIENTISTS studying the Earth system pull together data from many sources. Developing and testing Earth-system concepts and models often requires merging of data sets from observing systems in ways that frequently result in a lack of precision. This means that only the largest and most obvious consequences of global change can be studied and understood.

Moreover, *in situ* monitoring and measuring stations are often not linked to satellite

instruments, but satellites usually require ground-based calibration and verification.

These problems have led to a call for coordinated measurements and networks of measurement sites. At its Scientific Committee meeting in Grenoble, 2010, IGBP announced it would create a task force on observations. This task force – led by Dave Schimel, chair of IGBP's Analysis, Integration and Modelling of the Earth System (AIMES) project – will identify a set of integrative science issues and questions, and the required measurements to support them. It will work to devise an integrative observation strategy.

The task force has already identified the flow of energy and matter between land and oceans, for example, nitrogen and dust flows, as being particularly important.

All IGBP projects, partner programmes as well as the

Group on Earth Observations (GEO), NASA and the European Space Agency (ESA) will be invited to participate.

New home for SOLAS International Project Office

THE International Project Office of SOLAS (Surface Ocean – Lower Atmosphere Study) moved to Kiel, Germany, in April 2010 to be co-located with the project's Chair, Doug Wallace. The office will be hosted by the Kiel Leibniz-Institut für Meereswissenschaften (IFM-GEOMAR) and supported by IFM-GEOMAR and the German Ministry of Education and Research, BMBF. The UK Natural Environment Research Council (NERC) will continue to support the UK node of the project office (one position) at the University of East Anglia until 2012.

AN EYE ON THE SINK

Ane Körzinger

BY ABSORBING substantial quantities of carbon dioxide, the Earth's oceans help in slowing down the increases in atmospheric concentrations of this greenhouse gas. But how the uptake of carbon dioxide varies with location and time remains poorly understood. Recent measurements in the North Atlantic Ocean, reported in *Science*, suggest that the capacity of this carbon-dioxide sink varies considerably on a decadal timescale.

Researchers led by Andrew Watson of the University of East Anglia, United

Kingdom, used ship-based measurements to quantify the exchange of carbon dioxide between the atmosphere and the surface of the North Atlantic Ocean. They found that, over a substantial region, the yearly flux between 2002 and 2007 – the longest period for which measurements were available – differed by more than a factor of two. This could be due to natural climate variability, but the exact explanation awaits additional research.

This work also demonstrates that sensors fitted on

commercial ships can define the uptake by the North Atlantic with a precision of about 10 percent; an observation system constituted by such ships in various oceans has the potential to provide quantitative constraints on the oceanic sink of carbon dioxide, according to the researchers.

Watson A J *et al.* (2009), *Science* 326: 1391-1393.

The research was conducted under the auspices of the CARBOOCEAN project, endorsed by IGBP's Surface Ocean – Lower Atmosphere Study (SOLAS) project.

IGBP DIARY

2010

June

7-8. PAGES Scientific Steering Committee meeting. Nagoya, Japan. This will be preceded by a workshop on 5-6 June.

8-12. International Polar Year Oslo Science Conference. Oslo, Norway.

13-18. Goldschmidt 2010: Earth, Energy, and the Environment. Knoxville, Tennessee, USA.

22. ICSU Open Forum on Institutional Support for the Grand Challenges. Paris, France.

July

11-16. 11th IGAC conference with CACGP. Halifax, Canada.

September

13-17. LOICZ Storm Surges Congress 2010. Hamburg, Germany.

13-15. PAGES Symposium. Global Monsoon and Low-Latitude Processes: Evolution and Variability. Shanghai, China.

14-16. SCOR General Meeting. Toulouse, France.

October

10-14. IMBER Imbizo II. Integrating Biogeochemistry and Ecosystems in a Changing Ocean: Regional Comparisons. Crete, Greece.

12-14. International Workshop on ENSO, Decadal variability and climate change in South America. Guayaquil, Ecuador.

17-19. GLP Open Science Meeting. Land Systems, Global Change and Sustainability. Tempe, Arizona, USA.

November

3-9. Earth Observation for Land-Ocean Interaction Science. Frascati (Rome), Italy. Co-sponsored by iLEAPS.

Major global change conference in 2012

THE UK will host a major international science conference in 2012. The London conference, Planet Under Pressure: New knowledge towards solutions, aims to attract 2500 of the world's leading thinkers on global-change research.

The four-day conference is sponsored by the International Council for Science's (ICSU) global-environmental-change research programmes. It will bring together a diverse set of individuals interested in global-change issues, including natural and social scientists, economists, engineers, national and international policymakers, industry representatives and NGOs.

The event, provisionally booked for 7-10 May 2012, will take place prior to the next UN Earth Summit in Rio de Janeiro, also scheduled for that year. Presenting the latest research findings, the London conference is anticipated to provide a solid scientific foundation for the summit.

IGBP Executive Director Professor Sybil Seitzinger says, "We need to communicate a comprehensive picture of the state of the planet and its future to the institutions charged with global environmental stewardship."

"We will work with these institutions to help develop a planetary management approach that tackles all the challenges in a truly integrated way," she added.

The conference will be hosted by the UK's Royal Society, the Living With Environmental Change programme (LWEC, which represents all the UK's main agencies and government departments tackling environmental change) and the Natural Environment Research Council (NERC), the UK's largest funder of environmental science.



ONGOING acidification of the Earth's oceans may impair the ability of some marine organisms to make their calcium carbonate skeletons. According to a recent study in *Nature Geoscience*, the impacts of the current phase of acidification are likely to be more severe than those associated with a similar event that occurred some 55 million years ago, at the Palaeocene-Eocene boundary.

Andy Ridgwell and Daniela Schmidt of the University of Bristol, United Kingdom simulated and compared the response of the ocean to increased acidification in the

future and at the Palaeocene-Eocene boundary. Assuming that atmospheric carbon dioxide concentrations will peak around the year 2150, they found that conditions favourable for the formation of calcium carbonate (calcite) skeletons become on average restricted to the uppermost 600 m of the ocean – as opposed to 4 km for the modern ocean. This change in ocean conditions occurs far more rapidly than estimated for the Palaeocene-Eocene boundary.

Marine organisms residing in the deep-sea sediment – also called benthic organisms

– were particularly affected at the Palaeocene-Eocene boundary, leading to extinction. This has the potential to recur if the modern phase of acidification continues. Not only that, but the capacity of surface-dwelling micro-organisms to adapt to such changes will also be severely tested, say the researchers.

Ridgwell A, Schmidt D (2010), *Nature Geoscience* DOI: 10.1038/NNGEO755.

This work arose out of the IGBP-SCOR (Scientific Committee on Oceanic Research) Fast-Track Initiative on Past Ocean Acidification.

Stockholm to house new international office

IN HUMAN history, some societies collapsed catastrophically, while others blossomed and grew. A complex web connects societies with their environments in every dimension – economic, social, political, spiritual and philosophical – and is critical to building long-term social-ecological resilience. A new project, Integrated History and future Of People on Earth (IHOPE), fosters a global network of researchers and research projects that share knowledge about the past to enable a sustainable future for humanity and our planet. IHOPE facilitates interaction among the social sciences, humanities, modelling and biophysical communities to identify key variables and

conditions of these historic complex systems to address future changes.

IHOPE was initiated and has operated for the past several years under the auspices of the Analysis, Integration and Modelling of the Earth System (AIMES) core project of IGBP. It is co-sponsored by AIMES, the Past Global Changes (PAGES) core project of IGBP, and the International Human Dimensions Programme on Global Environmental Change (IHDP).

IHOPE's International Project Office is hosted at the Stockholm Resilience Centre (SRC), Stockholm University (Sweden). The centre provides central coordination, communication and integration for the IHOPE community and infrastructure. It will also support the implementation of the recently published science plan. Carole Crumley and

Stephen Barthel manage the International Project Office at the centre and Kathy Hibbard and Jennie Rice contribute on behalf of AIMES.

See: <http://stockholmresilience.org/ihope>

IGBP statement in support of IPCC

ON 3 May, IGBP released a statement emphasising that the IPCC process for assessing climate change, its causes, impacts and responses, is reliable and unbiased. The statement was in response to criticism thrown at the IPCC in the wake of its admission of a small number of errors in its Fourth Assessment Report. Research conducted by IGBP's network of scientists in 74 countries has been assessed by all four IPCC reports. The full statement is available on the IGBP website.

New vision for Earth-system science coming soon

THE International Council for Science (ICSU) is set to announce its new vision for Earth-system science in June. The team tasked with developing the vision has produced a draft document outlining the five challenges in global sustainability research

for the next decade. The outcome could have a large bearing on the future of IGBP and its projects.

In a high-level meeting scheduled for 23-24 June 2010, ICSU will discuss which types of institutional arrangements will be needed to support the research strategy. Representatives from the four global-environmental-change

programmes as well as their co-sponsors, funding agencies and other organisations will participate. An Open Consultative Forum in Paris will be held on 22 June 2010, in conjunction with the co-sponsors' meeting, to consider institutional support for the research priorities.

<http://www.icsu-visioning.org/the-visioning-process/>

IMMIGRANT OZONE?

OZONE from Asia may be finding its way to western North America and raising springtime tropospheric ozone levels in this region, according to measurements reported in *Nature*. High concentrations of ozone in the troposphere – the lowermost layer of Earth's atmosphere – are considered to be harmful to human health and vegetation.

Stringent regulations have helped improve air quality in Europe and North America during the past few decades. The emissions of nitrogen oxides, which go on to form ozone, have decreased as a result. This is not the case for Asia, however, where emissions have increased considerably in recent years: prevailing winds are expected to transport ozone produced in Asia to North America. But previous work had not recorded clear increases in

tropospheric ozone over western North America.

Springtime ozone concentrations measured by Owen Cooper from the University of Colorado and colleagues now show distinct increases for the 1995-2008 period in the region 3-8 km above the surface of western North America. The trend is even more pronounced when data for only the air masses from Asia are considered, implicating Asian ozone. However, further research is required to determine how much of this ozone reaches the surface of North America. In a related article in the same journal, Kathy Law of the Université Pierre et Marie Curie in Paris, France, points out that the clarification of the role of Asian ozone was possible in this case due to the large dataset that was used in the study.

Law calls for measurements

in seasons other than spring and additional work to uncover the mechanisms underlying the trends observed by Cooper and colleagues. But she highlights the utility of programmes that make long-term measurements, both for testing climate models and monitoring changes in the concentrations of atmospheric gases.

These results reveal the limitations of purely national approaches to pollution control, and point to the necessity of an effective international regulatory framework.

Cooper O R *et al.* (2010) *Nature* 463: 344-348; Law K (2010) *Nature* 463: 307-308.

Kathy Law is a former chair of IGBP's International Global Atmospheric Chemistry (IGAC) project. Some of the paper's authors are associated with IGAC.

Events

2010

June

29 June-1 July. 2010 International Climate Change Adaptation Conference. Climate Adaptation Futures: Preparing for the Unavoidable Impacts of Climate Change. Gold Coast, Queensland, Australia.

July

5-7. NCAR Atmospheric Science Conference 2010. Manchester, United Kingdom.

September

13-16. 3rd Bi-Annual Symposium: The Future Ocean. Kiel, Germany.

29 September-1 October. Deltas in Times of Climate Change. Rotterdam, the Netherlands.

October

4-13. 2010 Marie Curie training course on Architectures for Earth System Governance. Berlin, Germany.

11-14. International River Symposium. Perth, Australia.

26-30. Urban Futures and Human and Ecosystem Wellbeing. Shanghai, China.

November

15-17. Ester Boserup Conference 2010. Long-term Trajectories in Population, Gender Relations, Land Use, and the Environment. Vienna, Austria.

22-26. International Conference on Environment and Resources of the South Pacific. Viña del Mar, Chile.

December

3-7. International Nitrogen Conference 2010. New Delhi, India.

6-8. The Global Dimensions of Change in River Basins: Threats, Linkages and Adaptation. Bonn, Germany.

Major science funders call for focus on regional environmental change

IN June 2009, the chief executives of the world's major global-change funding agencies and the International Council for Science (ICSU) met at a high-level forum in Belmont, near Washington DC. The aim of the meeting was to identify strategic priorities for international cooperation. The UK's Natural Environment Research Council (NERC) hosted the second meeting of this 'Belmont Forum' in January 2010, at the UK Royal Society. The meeting identified regional environmental change, in particular human action and adaptation, as a major issue requiring regional and decadal prediction, advanced observing systems and inclusion of the social sciences. Related priority topics include the coastal zone, water cycle and resources, ecosystem services/food security, most vulnerable societies (geographic areas) and the carbon cycle.



Jacques Deschênes/NASA

Climate change and tropical cyclones

AS the climate warms, the globally averaged frequency of tropical cyclones is likely to decrease, suggests a survey of recent work published in the journal *Nature Geoscience*. Rainfall resulting from such cyclones is expected to increase in the future, and an increase in the intensity of the strongest storms is also possible.

Knutson T R *et al.* (2010) *Nature Geoscience* 3: 157-163.

DRYLANDS' DELICATE BALANCE



Weizmann Institute of Science, Israel

DESPITE the fairly inhospitable conditions, forests in semi-arid regions can lock up as much carbon as forests in wetter settings, suggests a study recently published in the journal *Science*. The results emerged from a decade-long measurement programme in the Yatir pine forest in Israel. Dryland forests cover almost half of the Earth's land surface.

The study's authors, Eyal Rotenberg and Dan Yakir of the Weizmann Institute of Science, Israel, measured the flux of carbon dioxide, water vapour and energy to determine the productivity of the Yatir Forest. They found that during the past decade, the forest's net carbon uptake is comparable to that of pine forests in Europe. Dryland forests apparently manage this feat by reducing respiration rates and growing rapidly in early spring to take advantage of temperatures most favourable for growth. Forests such as those in Belgium and Finland, in contrast, achieve maximum growth in the summer.

The drawdown of atmospheric carbon dioxide by

dryland forests would be expected to contribute to a net cooling of Earth's climate. But two processes lead to warming and serve to counter the cooling effect of carbon sequestration.

First, being darker than their surroundings, dryland forests enhance the absorption of incoming shortwave solar radiation, leading to warming. Second, dryland forests – by virtue of low tree density and open canopy – are particularly conducive to aerodynamic coupling with the atmosphere. This coupling promotes efficient heat convection and causes localised cooling over the forest canopy. The cooling suppresses the flux of outgoing thermal radiation from the forest surface, also causing net warming.

The authors estimate that after afforestation, it would take about 80 years for the CO₂-absorption-induced climate cooling to balance out the radiative warming effect. Yatir, though, represents an extreme case, and this period can be shorter on average. Elaborating on the significance of the results

in a related opinion article in the same journal, David Schimel at the National Ecological Observatory, Colorado, suggests that the benefits of afforestation programmes in drylands – albeit long term – are worth investing in.

The past few decades have witnessed increased desertification globally in semi-arid regions. Rotenberg and Yakir report that this led to lower absorption of incoming solar radiation and enhanced emission of outgoing thermal radiation. As a result, there was some amelioration of the warming induced by increased carbon-dioxide emissions during the same period. Clearly, the role that forests in arid and semi-arid regions play in controlling global climate is a complex one, and deserves closer scrutiny.

Rotenberg E and Yakir D (2010) *Science* 327: 451-454; Schimel D S (2010) *Science* 327: 418-419.

DAN YAKIR is a member of IGBP's Scientific Committee. David Schimel is Co-chair of IGBP's Analysis, Integration and Modelling of the Earth System (AIMES) project.