

Workshop discusses ecosystem impacts of geoengineering

ALTHOUGH several geoengineering schemes have been discussed with respect to their capacity to combat harmful climate change, their potential unintended consequences have received less attention. Against this backdrop, a diverse group met in La Jolla, California, for an IGBP synthesis workshop to explore the impacts of proposed geoengineering schemes on ecosystems.

The participants agreed that the key question is whether impacts of geoengineering methods would be less or more acceptable than the ecosystem impacts of the climate change expected for doubled CO₂. Research on the possible ecological impacts of geoengineering will be important, say the group, because geoengineering may produce new environments that differ from those existing in the present or produced in a non-geoengineered future. This research could be complementary to that needed and already under way on the ecosystem-impacts of climate change.

<http://aerosol.ucsd.edu/IGBPworkshop>

Ocean fertilisation summary published

Geoengineering schemes involving ocean fertilisation to affect climate have a low chance of success, according to the first summary for policymakers on the issue. The summary commissioned by the Intergovernmental Oceanographic Commission (IOC) was produced by the Surface Ocean Lower Atmosphere Study (SOLAS). <http://unesdoc.unesco.org/images/0019/001906/190674e.pdf>



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LINK BETWEEN NITROGEN AND CLIMATE PROBED

Human perturbations of the nitrogen cycle cause adverse health and environmental effects but might have a positive impact on Earth's climate (small net cooling) suggests a synthesis of recent work initiated by IGBP. There are many complicating factors, however, and the report resulting from this activity points out that current knowledge is insufficient to fully quantify the complex links between nitrogen and climate.

During pre-industrial times, the nitrogen and carbon cycles were in a state of equilibrium. But since humans began converting atmospheric nitrogen into reactive forms to make fertilisers, the nitrogen

cycle has been profoundly altered. An effect on the carbon cycle, and thus climate, was to be expected. The direct effects include warming due to the release of nitrous oxide, a potent greenhouse gas, whereas indirect effects include stimulating the growth of terrestrial vegetation that sequesters carbon, thereby causing cooling. A key challenge is to quantitatively evaluate whether the overall effect is one of warming or cooling, says the report.

The findings of the IGBP synthesis will be discussed further at a workshop to be held later this year involving the Intergovernmental Panel on Climate Change (IPCC) and the Task Force on Reactive Nitrogen.

Planet Under Pressure: the Great Debate on five continents

IGBP's Director of Communications, Owen Gaffney, is working with the global network of science and technology centres to organise debates on all continents around the time of the Planet Under Pressure 2012 open science conference

in London, March 2012. The debates will engage the public in discussions about the Earth system and global sustainability with a particular focus on the United Nations Rio+20 Summit, in June 2012. More information: owen.gaffney@igbp.kva.se

IGBP DIARY

2011

July

29-30. PAGES Scientific Steering Committee meeting. Bern, Switzerland.

September

5-10. Land-Ocean-Atmosphere Interactions in the Changing World, an IGBP-sponsored international young scientists' conference, Kaliningrad Oblast, Russia.

8-10. LOICZ Scientific Steering Committee meeting. Yantai, China.

12-15. LOICZ Open Science Conference. Yantai, China.

18-23. iLEAPS Open Science Conference. Garmisch-Partenkirchen, Germany.

27-30. 30th ICSU General Assembly. Rome, Italy.

October

10-13. IGBP Officers Meeting and IGBP workshop, Manaus, Brazil.

24-28. WCRP Open Science Conference - Climate Research in Service to Society. Denver, Colorado, USA.

2012

March

26-29. Planet Under Pressure: New knowledge towards solutions, London, UK.

May

7-10. SOLAS Open Science Conference. Washington State, USA.

10-12. IMBER Scientific Steering Committee meeting. Location to be decided.

September

17-21. IGAC Open Science Conference. Beijing, China.

24-27. SCOR-IGBP-IOC Third Symposium on the Ocean in a High CO₂ World. Monterey, California, USA.

New IGBP website

IGBP has updated and relaunched its website. The site now contains more information on global change, the Anthropocene and the Great Acceleration. It will run more news, more features and more multimedia content. It links directly to IGBP's Facebook page. Use the new site to download presentations, link to other networks and keep up to date with the latest global-change news. www.igbp.net

Nine policy briefs announced for Rio+20

THE global-change programmes and ICSU are producing nine policy briefs to provide scientific input and leadership to the United Nations Rio+20 Summit, June 2012. The topics for the briefs and white papers are: green economy, international governance, water security, energy security, food security, health, well-being, ecosystem services and biodiversity, interconnected challenges.

The policy briefs will be published in September 2011 to coincide with UN regional preparatory meetings for Rio+20.

The more detailed white papers will be published early 2012, and available at the Planet Under Pressure conference. More information: owen.gaffney@igbp.kva.se

Bringing planetary stewardship to Rio+20

TWENTY years after the iconic 1992 United Nations Earth Summit, the UN will hold the Rio+20 Summit in June 2012.

The UN is preparing for the Summit through a series of preparatory meetings in 2010 and 2011. IGBP and the global-change programmes organised a side event,



A recent report entitled *State of the Arctic Coast 2010: Scientific Review and Outlook* provides a comprehensive picture of the status and current and anticipated changes in the most sensitive Arctic coastal areas. The assessment leading up to the report was initiated after a 2007 workshop organised by the LOICZ project in conjunction with the International Permafrost Organisation (IPA) and the International Arctic Science Committee (IASC).

The assessment takes

a socio-ecological approach that explores the implications of change for the interaction of humans with nature. The report is a first step towards a continuously updated coastal assessment and aims to identify key issues for scientific enquiry in an international Earth-system research agenda. The document was prepared by an international writing team, including 15 lead authors and 27 contributing authors.

The report is organised in three parts: the first provides

an assessment of the state of Arctic coastal systems under three broad disciplinary themes – physical systems, ecological systems and human dimensions; the second examines progress in integrative approaches to monitoring, understanding and managing change in Arctic coastal systems; the third identifies data gaps and research priorities over the coming decade.

State of the Arctic Coast 2010 – Scientific Review and Outlook. Edited by Forbes D L (2011). 178 pp. <http://arcticcoasts.org>

moderated by *New York Times* writer Andrew Revkin, at the second preparatory meeting held in New York in March 2011.

IGBP Executive Director Sybil Seitzinger discussed planetary and societal risks and the urgent need for planetary stewardship with a packed room of delegates.

Seitzinger's talk was followed by Deborah Rogers from the International Human Dimensions Programme on Global Environmental Change, who discussed the links between equality and sustainability.

The International Council for Science's Senior Policy Advisor, Gisbert Glaser, spoke about the need to improve links between science and international policy.

Global sustainability initiative dominates IGBP scientific committee meeting

THE International Council for Science's new vision for Earth-system research was the focus of IGBP's 26th meeting of its scientific committee, Washington DC, March 2011.

The visioning process for a new ten-year initiative, Earth-system research for global sustainability, culminated in February with an agreement of the five grand challenges. ICSU says: "The initiative will be a joint integrated research strategy that is expected to unify most of the existing global-environmental-change research structures (including

DIVERSITAS, IGBP, IHDP, ESSP and possibly some components of WCRP), and fully engage START."

ICSU is creating a "transition team" to build the new international framework for the initiative. Details of the new initiative will be announced at the Planet Under Pressure conference and the Rio+20 Summit, both in 2012.

The IGBP scientific committee meeting was followed by a one-day symposium jointly sponsored by NASA, Global Change: Mounting Pressure on the Earth System.

More information on the ICSU Earth-system vision: www.icsu-visioning.org

New review addresses global bioenergy potential

Recent work assessing the world's capacity to produce bioenergy has led to widely varying estimates. Whereas some studies calculate this capacity to be equivalent to current bioenergy use, others come up with a capacity almost 20 times higher. A new review finds the global bioenergy potential for the middle of this century to be at the lower end

of previous estimates, around 200 exajoules (EJ) or more than thrice the current use.

The review, led by Helmut Haberl of the Global Land Project, considered a range of factors for estimating bioenergy potential for the year 2050. These include the area available for bioenergy crops and their expected yields, but also the potential for organic residues to contribute to the generation of bioenergy. The results suggest that over half of the

future bioenergy could come from material that is currently underutilised, such as crop residues, animal and municipal waste, and forestry residues.

Uncertainties remain, among other things, regarding the amount and quality of land that could be used to grow crops for bioenergy, the effects of future climate change and the trajectory that future diets would follow.

Haberl H *et al.* (2011) *Current Opinion in Environmental Sustainability* 2: 392-403.

FOREST AND GRASSLAND RESPONSE TO EUROPEAN HEAT WAVES

Europe experienced major heat waves in 2003 and 2006, and such waves are expected to become more frequent in the future. Depletion of soil moisture played a part, but how did the type and distribution of vegetation influence the temperature extremes? A team of researchers associated with IGBP's iLEAPS project reports that forests and grasslands responded in fundamentally different ways during the course of these prolonged heat waves.

The team analysed measurements provided by a network of observation towers in Europe to understand the evolution of surface heating over forests and grasslands. The analyses show that the surface over grasslands is cooler than that over forests during the early stages of a heat wave. This

is because of higher evaporation over grass. But eventually this causes soil-moisture depletion in the grasslands, and there is a shift in behaviour as the heat wave advances: the surface over grasslands begins heating up and might cause a shift in the regional climate to even higher temperatures.

Prolonged dry and warm conditions during the summer of 2003 in Europe meant that grassland became the main source of heating during the later stages of the heat wave. This likely explains the extreme temperatures measured in this region in August 2003.

The researchers contend that forests could serve to ameliorate the effects of prolonged and severe heat waves, and also contribute to preserving water by virtue of generally lower evapotranspiration.

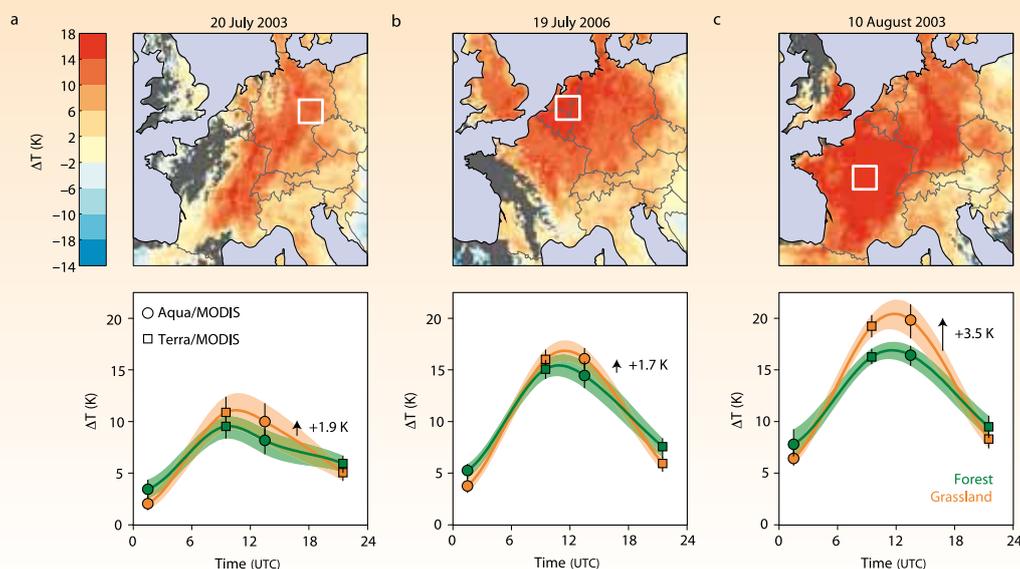


Figure 3 from Teuling A J *et al.*, *Nature Geoscience* 3: 722-727 (2010). Reprinted with permission from Macmillan Publishers Ltd.

EVENTS

2011

July

20-27. 18th INQUA Congress. Bern, Switzerland.

August

14-19. Goldschmidt 2011. Prague, Czech Republic.

September

26-30. World Conference on Marine Biodiversity. Aberdeen, Scotland, UK.

October

24-26. Ocean deoxygenation and implications for marine biogeochemical cycles and ecosystems. Toulouse, France.

November

2-4. Sixth International Symposium on Non-CO₂ Greenhouse Gases (NCGG-6): Science, Policy and Integration. Amsterdam, the Netherlands.

29 November - 2 December. ESA-SOLAS-EGU Conference on Earth Observation for Ocean-Atmosphere Interactions Science. Frascati, Italy.

December

5-9. AGU Fall Meeting. San Francisco, USA.

2012

February

19-24. Ocean Sciences Meeting 2012. Salt Lake City, USA.

April

22-27. European Geosciences Union (EGU) General Assembly. Vienna, Austria.

May

14-18. ICES-PICES Effects of Climate Change on World's Oceans. Yeosu, Korea.

June

4-6. The United Nations Conference on Sustainable Development. Rio de Janeiro, Brazil.



ECONOMIC IMPACT OF OCEAN ACIDIFICATION

A recent workshop in Monaco was the first of its kind to analyse the economics of ocean acidification. IGBP Deputy Director Wendy Broadgate attended the three-day workshop: "Research on the economics of this issue is still in its infancy. We know ocean acidification will have economic impacts, but have little handle on

the true costs – we need research in this area."

The workshop highlighted why natural and social scientists need to work together to assess the costs. The report says: "We need economists to advise biologists and biogeochemists on the exact data required for economic assessments." The objective is to reduce uncertainties biologically

and economically.

The report states that some regions are more vulnerable than others. The research community must "identify and prioritise these regions and countries", and alert these nations to the risks.

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Planet Under Pressure attracts over 350 session proposals

The global-change programmes received over 350 session proposals for the Planet Under Pressure conference.

Proposals came in from scientists across the globe and from organisations such as the World Trade Organization, the World Health Organization, the United Nations Environment Programme, NASA, European Space Agency and the British Antarctic Survey. The conference will have around 100 sessions. More information: www.planetunderpressure2012.net



James Syvitski to chair IGBP beginning January 2012

Professor James P M Syvitski was appointed recently as the new chairperson of IGBP. He will assume his responsibilities on 1 January 2012, and will succeed Professor Carlos Nobre. The IGBP Chair leads the Scientific Committee, IGBP's main decision-making body.

The US academic is Executive Director of the Community Surface Dynamics Modeling System and brings extensive experience directing large national and international research institutes and programmes. Syvitski specialises in research on rivers, deltas, polar environments, sediment transport and continental margins.

"This is an important time to join IGBP," says Professor Syvitski who is based at the University of Colorado, Boulder. "The defining research question of our age is how do we manage the Earth system – the planet's physical, chemical, biological and social components – responsibly, whilst feeding, clothing and protecting a population predicted to grow to nine billion people? IGBP and its partners are at the centre of this research," he adds.

Mark Stafford Smith addresses Global Sustainability meeting

Planet Under Pressure Co-chair Mark Stafford Smith spoke at a key meeting of Ban Ki-moon's Global Sustainability Panel in April in Madrid, Spain. The high-level panel has been set up to find new solutions to the many interconnected international challenges: climate change, sustainable development, poverty alleviation and others. The panel report, due for publication in January 2012, will feed into the United Nations Rio+20 Summit.

Stafford Smith, former IGBP Vice Chair, discussed ideas for a new paradigm for global sustainability and the need to inject urgency into the international process.

The concept of planetary boundaries was discussed

at length, but policymakers expressed concern about equity issues. Dr Stafford Smith says, "It is being interpreted by developing nations as setting another set of thresholds, like two degrees for greenhouse-gas emissions, which the North has already transgressed and the South is now going to be prevented from doing as part of their development." The panel argues the equity issue needs to be addressed for the boundaries idea to gain momentum in international processes.

The panel's report will likely form the foundation for the follow on to the Millennium Development Goals, due to end in 2015. These goals could become the "Sustainable Development Goals". Several members of the Secretary General's panel are invited to participate in the Planet Under Pressure conference.