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7.1 International Council for Science (ICSU)

7.1.1 International Geosphere-Biosphere Programme (IGBP) Broadgate, Burkill

International Geosphere-Biosphere Programme

*Wendy Broadgate and IGBP Secretariat Communications Team
June 2014*

SCOR and IGBP have a fruitful cooperation co-sponsoring the international projects IMBER and SOLAS, organising the symposium series on the ocean in a high-CO₂ world and on various fast-track initiatives and working groups. Below are recent updates from IGBP, including ocean acidification activities conducted jointly with SCOR. The IGBP networks are undergoing a transition to a new international initiative on global sustainability, Future Earth, www.futureearth.info. The transition should be completed by December 2015.

IGBP organises IPCC public dialogue in Stockholm

IGBP and partners hosted a public dialogue on 28 September 2013 for the launch of the report from the IPCC Working Group I. Co-chair Thomas Stocker and IGBP director Sybil Seitzinger joined a panel to discuss the new report with a packed auditorium of public, journalists, policymakers and business representatives. The public forum, which began with a Hans Rosling talk on 200 years of global change, attracted 500 people and more than 30,000 people have viewed the [webcasts](#). The event was first time IPCC has held a public dialogue on the launch of one of its reports and came at the end of a week of grueling negotiations.

IPCC data visualization

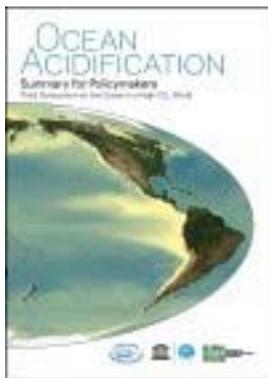
IGBP's climate change [data visualization](#) based on the IPCC Working Group I report went viral during UNFCCC climate talks in Warsaw with 100,000+ views in 48 hours.

The data visualization summarises and visualizes several of the most significant statements in the Intergovernmental Panel on Climate Change's (IPCC) recent Fifth Assessment Report, (Working Group I summary for policymakers, the Physical Science Basis). The statements and facts presented are derived from the IPCC Working Group I summary for policymakers.

The visualization was produced and directed by Owen Gaffney (IGBP) and Félix Pharand-Deschênes (Globaia) and funded by the UN Foundation. The visualization has received over 600, 000 views online.

The visualisation projects are part of IGBP's public outreach website: www.anthropocene.info

Ocean Acidification report launched



IGBP and partners' [summary for policymakers](#) on ocean acidification made [headlines](#) during UNFCCC climate talks in Poland.

Over the past two decades, researchers have shown that ocean acidification is increasing as humans have added more carbon dioxide (CO₂) to the atmosphere. A panel of scientists reports a summary of outcomes, in which they connect the impacts on ecosystems and socio-economic consequences with levels of confidence that have implications for policy.

This new publication is based on the research presented at the Third Symposium on the Ocean in a High-CO₂ World, where 540 experts from 37 countries gathered in Monterey, California, in September 2012. The outcomes described here are informed by that discussion and the latest peer-reviewed research. They illustrate for policymakers what the implications could be of ocean acidification in the future – both with and without any action taken today.

Download the summary [here](#)  (pdf, 4.9 MB), as well as the infographics that illustrate the problems that ecosystems -- and humans -- face as ocean acidification increases over the next century. The summary addresses outcomes based on whether humans continue to emit carbon dioxide at current rates to the atmosphere, or what could happen if policymakers take action to mitigate these emissions. This publication is co-sponsored by IGBP, SCOR and IOC-UNESCO.

Ocean Acidification website launched, ocean-acidification.net



A new [Ocean Acidification website](#) has been launched that brings together new ocean acidification infographics, publications, background information, presentations and news for researchers, policymakers and the public. The website has received more than 25, 000 views.

The new website provides information on Ocean Acidification based on the recently published [Summary for Policymakers](#).

The website ocean-acidification.net has been developed by the International Geosphere-Biosphere Programme (IGBP), the

Intergovernmental Oceanographic Commission (IOC-UNESCO), the Scientific Committee on Oceanic Research (SCOR) and the Ocean Acidification International Coordination Centre (OA-ICC) of the International Atomic Energy Agency (IAEA).

IGBP Landmark Synthesis Event at AGU 2015

IGBP was the first major international research initiative charged with expanding knowledge of Earth as a system, and thus helping to develop what is now known as Earth System Science. In three decades, the global-change research community supported by IGBP has shown how Earth functions as a system and, importantly, how humanity is altering this functioning. This is crystallised in the concept of the Anthropocene, the proposal that humanity has pushed Earth into a new geological epoch.

The Landmark Synthesis event will take place as part of the 2015 AGU Fall meeting in San Francisco and will bring together IGBP committees, projects, staff, partners and stakeholders for a range of sessions within AGU and an evening reception, plus other activities.

IGBP Synthesis

In 2013, IGBP initiated three synthesis activities with a focus on:

1. The Anthropocene (led by James Syvitski and Eduardo Brondizio)
2. Earth System Science (led by Jan Willem Erisman and Guy Brasseur)
3. Core Project achievements (led by Paul Monks)

Each is due to produce a paper or series of papers for a scientific journal in the 2014-15 timescale.

Recent IGBP publications:

Broadgate W, Gaffney O, Isensee K, Riebesell U, Urban E and Valdés L, eds (2013) Ocean Acidification Summary for Policymakers – Third Symposium on the Ocean in a High-CO₂ World. IOC, SCOR, International Geosphere-Biosphere Programme, Stockholm, Sweden.

Gaffney O (2014) Quiet green revolution starts to make some noise. *Nature* 505, 587 doi: 10.1038/505587a.

Griggs D, Stafford-Smith M, Gaffney O, Rockström J, Öhman M, Shyamsundar P, Steffen W, Glaser G, Kanie N, Noble N (2013) Sustainable development goals for people and planet. *Nature* 495, 305–307, doi: 10.1038/495305a.

The World Climate Research Programme (WCRP): a Short Update to SCOR-2014***General background***

The World Climate Research Programme (WCRP) was established in 1980 by the World Meteorological Organization (WMO) and International Council for Science (ICSU) to address two objectives: determine the predictability of climate and determine the effects of human activities on climate. Since 1993, WCRP has also been cosponsored by the IOC of UNESCO. During the last decade, the WCRP activities were aligned to the strategic framework “Coordinated Observation and Prediction of the Earth System 2005-2015” that facilitated development of practical applications of direct relevance to the needs of society.

This report provides a brief summary of WCRP activities. More information on ocean-related WCRP activities is available from the WCRP, CliC, CLIVAR, and GEWEX websites (see <http://www.wcrp-climate.org>, <http://www.climate-cryosphere.org/>, <http://www.clivar.org>, and <http://www.gewex.org>, respectively).

Major events for the recent past

A number of large-scale community events were organized by WCRP in 2013 and 2014. They include:

- (a) The WCRP/ACPC Conference on the African Climate System - Addressing Priority Research Gaps to Inform Adaptation Decision-Making in Africa, that took place from 15-18 October 2013 in Arusha, Tanzania;
- (b) The joint WCRP-IPCC-EU “International Conference on Regional Climate – CORDEX 2013” held 4-7 November 2013 in Brussels, Belgium;
- (c) The sixth General Assembly of the WCRP Project “Stratosphere-troposphere Processes And their Role in Climate (SPARC) organized on 12-17 January 2014 in Queenstown, New Zealand; and
- (d) The Conference on Climate and Society for Latin America and the Caribbean held on 17-21 March in Montevideo, Uruguay.

WCRP also organized a wide range of regional scientific workshops, capacity development and training activities. A 2014 summer school on attribution and prediction of extreme events will be held on 21 July-1 August 2014 in Trieste, Italy.

WCRP and IPCC AR5

Once again, WCRP and its affiliated scientists made a major contribution to the Fifth Assessment Report of the IPCC, especially to the WG I Report "Climate Change 2013: The Physical Science Basis". The WCRP intercomparison experiment CMIP Phase 5 (CMIP5) provided an unprecedented dataset of model projections, which were widely used around the world to study climate variability and change and the impacts of climate change. The CMIP5 output constituted the basis for more than 350 scientific publications. WCRP is now working on the CMIP6

experimental design, which is expected to make climate predictions and projections even more robust and comprehensive.

Recent sessions of WCRP working bodies and main new directions of WCRP research

The 34th Session of the WCRP Joint Scientific Committee (JSC) was held on 27-31 May 2013 in Brasilia, Brazil. Following the JSC session, WCRP embarked on the preparation of implementation plans for the six Grand Science Challenges, as follows:

- (a) Provision of skilful future climate information on regional scales;
- (b) Regional sea-level rise;
- (c) Cryosphere in a changing climate;
- (d) Clouds and climate sensitivity;
- (e) Changes in water availability; and
- (f) Prediction and attribution of extreme events.

As reported previously to SCOR, these research topics had been identified by WCRP as scientific challenges of particularly high societal importance and as areas of research in which it is possible to expect significant progress within next five to ten years. They also serve as unifying themes across the four WCRP core projects and the various working groups.

Climate research in support of global sustainability

The WCRP Sponsors emphasize the importance of climate research for providing a strong contribution to, and motivation for, research on global sustainability. WCRP is in an excellent strategic position to contribute to the objectives of the Future Earth, a new 10-year multidisciplinary research initiative in support of global sustainability. Optimal modalities of cooperation between WCRP and Future Earth are still being developed, and communication on these issues between WCRP and Future Earth is active.

Development of climate services

WCRP led the development of the Research, Modelling, and Prediction Annex to the GFCS Implementation Plan, which was endorsed by the first session of the Intergovernmental Board on Climate Services in July 2013. The research activities for the GFCS aim at establishing partnerships to conduct effective research in areas of initial priority for the GFCS and making the wealth of experimental climate information available to users. Also, they will create a scientific basis to account for climate information uncertainty in decision-making and will address a number of pressing science issues such as improved understanding of predictability and prediction skill of climate models.

Progress in various aspects of climate research

Significant progress has been recently achieved on a number of research priorities pursued by WCRP including, but not limited to, predictability of the North Atlantic Oscillation and Madden-Julian Oscillation on seasonal time scale, and of global surface temperatures on decadal time scale. Continuing improvements are taking place in coupled climate models and representation of atmospheric chemistry in them. Major achievements have been made in the research at the

weather/climate interface and in advancing understanding of regional climate, especially through the successful implementation of the Coordinated Regional Downscaling Experiment (CORDEX) in many regions of the world.

Strengthening benefits of integration in research on modeling and observations

WCRP JSC-34 endorsed the Earth System Grid Federation (ESGF) as a WCRP-recommended data and information dissemination mechanism. Through ESGF, WCRP is enabling access to the climate model outputs and observational products for all scientists in the world, with data being available on the same grid, uniformly formatted and documented through the WCRP-led Observations for Model Intercomparison Projects (obs4MIPs). The first WCRP initiatives that use this mechanism are the Coupled Model Intercomparison Project (CMIP), seasonal predictability experiments under the Climate system Historical Forecast Project (CHFP), and the Coordinated Regional Downscaling Experiment (CORDEX).

Capacity development and support to early career scientists

WCRP is committed to capacity development in the domain of climate research and strives to provide strong support to Early Career Scientists (ECS), as well as students and scientists from developing countries. The Programme is strengthening cooperation with the Asia-Pacific Network (APN) and the Inter-American Institute for Global Change Research, and is joining efforts with networks of early career professionals, such as the Young Earth System Scientists (YESS) and the Association of Polar ECS (APECS). WCRP CLIVAR and SPARC projects are in process of establishing associations of affiliated ECSs.

Highlights for immediate future

The 35th session of the WCRP Joint Scientific Committee (JSC) will take place on 30 June–4 July 2014 in Heidelberg, Germany. On 2 July 2014 WCRP and WMO Commission for Climatology (CCI) will hold a joint 1-day session of the CCI-16 Technical Conference to focus on research and operational support to climate services. A major joint meeting of CLIVAR and GEWEX and the 7th International Scientific Conference on the Global Water and Energy Cycle will be held in The Hague, The Netherlands, in July 2014. Working groups and Councils of WCRP are also planning several major activities associated with the WCRP Grand Science Challenges. The Workshop “IPCC AR5: lessons learnt for climate change research and WCRP” will take place in Bern, Switzerland on 8-10 September 2014. The WCRP Conference “Climate Research and Earth Observations from Space” will be held in Darmstadt from 13-17 October 2014. It is being hosted and prepared by Eumetsat and supported by European Commission and several other partners. WCRP-affiliated scientists will also contribute to the Third IOC/ICES/PICES International Symposium “Effects of Climate Change on the World’s Oceans” that will take place in Santos, Brazil, on 23-27 March 2015.

7.1.3 Scientific Committee on Antarctic Research (SCAR)



SCAR activities of relevance to SCOR



SCAR and SCOR have a strong overlap of interest in the Southern Ocean region. In many cases the two organisations work together (e.g., with the SOOS) and in other cases there are SCAR activities which may be of interest to SCOR (as well as vice versa). The below 'top ten' is a non-exhaustive summary of such activities. Please see www.scar.org for further details.

(i) The Southern Ocean Observing System

Louise Newman <newman@soos.aq>

SCOR and SCAR jointly sponsor the Southern Ocean Observing System and provide funds for the meeting of the Steering Committee (see separate report to SCOR for details).

(ii) Ocean Acidification

Richard Bellerby <richard.bellerby@niva.no>

SCAR appointed an international ocean acidification Action Group to document the scientific understanding of ocean acidification. The Action Group consists of an international cross-disciplinary team of ocean acidification experts representing the fields of marine carbonate chemistry, global and regional modelling, marine ecology, ecotoxicology/physiology and paleoceanography. The Ocean Acidification Action Group is finalizing a report to:

- define our present understanding of the contemporary rates and future scenarios of Southern Ocean acidification;
- document ecosystem and organism responses from experimental perturbations and geological records;
- identify present and planned observational and experimental strategies;
- identify gaps in our understanding of the rates and regionality of ocean acidification; and
- define strategies for future Southern ocean acidification research.

The report will be completed in early 2015.

(iii) The International Bathymetric Chart of the Southern Ocean

Jan Erik Arndt <Jan.Erik.Arndt@awi.de>

The International Bathymetric Chart of the Southern Ocean (IBCSO) project was initiated in 2006 with the objective to design and implement an enhanced digital database that contains bathymetric data available south of 60°S latitude. IBCSO is endorsed by international organizations such as the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the International Hydrographic Organization (IHO), and the Scientific Committee on Antarctic Research (SCAR).

In April 2013, IBCSO Version 1.0 was released by the Alfred-Wegener-Institute (AWI), in Germany. The map and data are now available: <http://www.ibcso.org>.

(iv) Antarctic Biodiversity Informatics

Bruno Danis <bdanis@ulb.ac.be>

Biodiversity Informatics is the application of informatics techniques to biodiversity information for improved management, presentation, discovery, exploration and analysis. The application of modern computer techniques can yield new ways to view and analyse existing information, as well as predictive models for information that does not yet exist. More specifically, the Expert Group and Antarctic Biodiversity Informatics plans to optimize ongoing developments in biodiversity informatics for the community. A series of relevant initiatives are ongoing, all aiming at offering free and open access to biodiversity information, but also at carrying out open source technical developments, and promoting international standards.

(v) Continuous Plankton Recorder

Graham Hosie <graham.hosie@iinet.net.au>

The sensitivity of plankton to changes in the environment makes them useful early warning indicators of the health of ocean systems. The Southern Ocean Continuous Plankton Recorder Survey maintains a database on plankton abundance and distribution, See separate report to SCOR for details.

(vi) Birds and Marine Mammals

Mark Hindell <Mark.Hindell@utas.edu.au>

The SCAR Expert Group on Birds and Marine Mammals (EG-BAMM) is tasked with providing expert knowledge and research leadership within SCAR in all matters related to birds and mammals in the Antarctic, in order to support research that will quantify the role of birds and marine mammals in the Antarctic marine and terrestrial ecosystems.

(vii) Antarctic Climate in the 21st Century

Nancy Bertler <Nancy.Bertler@vuw.ac.nz>

The goals of the SCAR Scientific Research Programme Antarctic Climate in the 21st Century (AntClim21) are to deliver improved regional predictions of key elements of the Antarctic atmosphere, ocean and cryosphere for the next 20 to 200 years and to understand the responses of the physical and biological systems to natural and anthropogenic forcing factors. A primary form of data that we see being used by AntClim21 are the global coupled atmosphere-ocean model runs that form the basis of the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Palaeo-reconstructions of selected time periods, recognised as past analogues for future climate predictions, will be used to validate model performances for the Antarctic region.

(viii) State of the Antarctic Ecosystem

Aleks Terauds <Aleks.Terauds@aad.gov.au>

Biological diversity is the sum of all those organisms that are present in an ecosystem, that dictate how ecosystems function, and that underpin the life-support system of our planet. The State of the Antarctic Ecosystem (AntEco) Scientific Research Programme has been designed to focus on patterns of biodiversity across terrestrial, limnological, glacial and marine environments within the Antarctic, sub-Antarctic and Southern Ocean regions, and to provide the scientific knowledge on biodiversity that can be also used for conservation and management. In essence, we propose to explain what biodiversity is there, how it got there, what it does there, and what threatens it. A primary product of this programme would be recommendations for its management and conservation.

(ix) Antarctic Thresholds - Ecosystem Resilience and Adaptation

Julian Gutt <Julian.Gutt@awi.de>

Stresses on Antarctic ecosystems result from global climate change, including extreme events, and from other human impacts. Consequently, Antarctic ecosystems are changing, some at a rapid pace while others are relatively stable. A cascade of responses from molecular through organismic to the community level are expected. The differences in biological complexity and evolutionary histories between the polar regions and the rest of the planet suggest that stresses on polar ecosystem function may have fundamentally different outcomes from those at lower latitudes. Polar ecosystem processes are therefore key to informing wider ecological debate about the nature of stability and potential changes across the biosphere.

The main goal of the Scientific Research Programme Antarctic Thresholds - Ecosystem Resilience and Adaptation (AnT-ERA) is to facilitate the science required to examine changes in biological processes, from the molecular to the ecosystem level, in Antarctic and Sub- Antarctic marine, freshwater and terrestrial ecosystems. Tolerance limits as well as thresholds, resistance and resilience to environmental change, will be determined.

(x) The Biogeographic Atlas of the Southern Ocean

Claude deBroyer <claude.debroyer@naturalsciences.be>

Biogeographic information is of fundamental importance for discovering marine biodiversity hotspots, detecting and understanding impacts of environmental changes, predicting future distributions, monitoring biodiversity, or supporting conservation and sustainable management strategies. The recent extensive exploration and assessment of biodiversity by the Census of Antarctic Marine Life (CAML), and the intense compilation and validation efforts of Southern Ocean biogeographic data by the SCAR Marine Biodiversity Information Network (SCAR-MarBIN / OBIS) provided a unique opportunity to assess and synthesise the current knowledge on Southern Ocean biogeography.

The scope of the Biogeographic Atlas of the Southern Ocean is to present a concise synopsis of the present state of knowledge of the distributional patterns of the major benthic and pelagic taxa

and of the key communities, in light of biotic and abiotic factors operating within an evolutionary framework. Each chapter has been written by the most pertinent experts in their field, relying on vastly improved occurrence datasets from recent decades, as well as on new insights provided by molecular and phylogeographic approaches, and new methods of analysis, visualisation, modelling and prediction of biogeographic distributions.

The atlas will be officially launched at the SCAR Open Science Conference (www.scar2014.com) this August. A dynamic online version of the Biogeographic Atlas will be hosted on www.biodiversity.aq.

7.1.4 Future Earth Initiative

Burkill



The Future Earth Initiative continues its development. Three aspects most relevant to SCOR are the following: (1) an international consortium to host the Future Earth Secretariat has been selected, (2) two SCOR-sponsored projects (SOLAS and IMBER) have continued to engage with Future Earth in preparation for potential co-sponsorship, and (3) Future Earth has announced its first set of Fast-Track Initiatives/Clusters.

(1) Future Earth Secretariat

The implementation and initial stages of the Future Earth Initiative have been co-ordinated by an interim Secretariat, hosted at the main ICSU Secretariat offices in Paris and in place from July 2013 to December 2014. A call for Expressions of Interest to host the Future Earth Executive Secretariat was issued in July 2013 by the Science and Technology Alliance for Global Sustainability and over 20 expressions of interest were received. Following a two-day bidders' conference hosted in Paris, consolidated final bids were reviewed on the basis of their vision, capability, organisational model and management plan and funding.

The successful bid comes from an international consortium of several lead organisations: Montreal International (Montreal, Canada), the Ministry of Higher Education and Research (Paris, France), the Science Council of Japan (Tokyo, Japan), Royal Swedish Academy of Sciences (Stockholm, Sweden), and in Colorado, USA, the University of Colorado (Boulder) and Colorado State University (Fort Collins). These five global hubs will contribute to a distributed Secretariat headquarters functioning as a single entity. The Secretariat will support five core functions: coordination, communication and outreach, research enabling, capacity building, synthesis and foresight.

These global hubs are complemented by regional hubs coordinated by: the Inter-American Institute for Global Change Research (for Latin America) and other regional South American partners, the Research Institute for Humanity and Nature (for Asia), the Tyndall Centre for Climate Change Research (for Europe) and The Cyprus Institute (for the Middle East and North Africa). Discussions to develop a sub-Saharan African hub are underway, with plans in other regions also under consideration.

The new Secretariat is expected to be in place and operational in early 2015.

(2) Co-sponsorship of SCOR projects by Future Earth

All 23 Core and Joint Projects of IGBP, IHDP and DIVERSITAS have been invited to join Future Earth, this includes two SCOR projects: the Surface Ocean – Lower Atmosphere Study

(SOLAS) and Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project. The process of transitioning to Future Earth involves the submission to Future Earth of a transition statement from the Core Project's Scientific Steering Committee. This is then reviewed by the Future Earth Science Committee and once agreed upon, a Memorandum of Understanding (MoU) between the Core Project and Future Earth is signed. The MoU outlines the general governance arrangements within Future Earth and specifies that where co-sponsorship with another entity (e.g. SCOR) exists, issues relating to the structure and management of the project will be approved by all co-sponsors, and negotiated where necessary.

A Letter of Agreement outlining joint governance responsibilities between Future Earth and SCOR has been drafted and provided to SCOR for comment.

To date, 8 Projects have submitted transition statements to Future Earth.

(3) Fast-Track Initiatives/Clusters

Future Earth recently obtained funding from the U.S. National Science Foundation for a series of Fast Track Initiatives and Cluster Activities. In response to a call issued in early 2014, fifty-two proposals were submitted. After review by the Future Earth Science and Engagement Committees, eight proposals were selected to be fully funded and two groups of proposals were provided asked to submit combined proposal. The total amount of financial support for these activities is around US\$850,000.

Fast Track Initiatives and Cluster Activities build on areas of research strength in the existing Global Environmental Change (GEC) projects and programmes, and are intended to kick-start integrated activities and strengthen collaboration around multidisciplinary research challenges. The new initiatives will produce specific outputs, such as publications, within a relatively short timeframe, or will develop a basis for agenda-setting research over the longer term. They will also allow for existing projects to develop collaborations and will support joint planning between projects. The awards are for a period of 2 years, and will typically support co-ordination activities, meetings, and the creation of outputs such as publications.

The list of funded activities is as follows:

Exploring nitrogen in Future Earth

Establishing a cross-disciplinary, multi-stakeholder network to co-design an integrated nitrogen approach for Future Earth.

Scientific support for IPBES knowledge generation

Building and coordinating a community of practice that can support the activities of the newly created Intergovernmental Platform for Biodiversity and Ecosystem services (IPBES). IPBES is mandated to mobilize international experts to assess the trends, status and future trajectories of biodiversity and ecosystem services.

What is Urban? Global Urbanization as viewed from multiple scientific domains

Developing the foundations for a fresh new interdisciplinary approach to global urbanization as a dominant driver of global environmental change, and the implications for policy and governance

at multiple scales. The initiative will focus on providing a representation of the different intellectual traditions of how ‘the urban question’ is conceived and researched across science. This will also incorporate elements of the proposal: **Urban Futures within Future Earth**

Bright spots: seeds of a good anthropocene

Seeking, exploring and developing a suite of alternative, plausible visions of “Good Anthropocenes” – positive visions of futures that are socially and ecologically desirable, just, and sustainable. This initiative will also identify and analyse ‘bright spots’ – places that demonstrate one or more elements of a positive future that might serve as seeds of a Good Anthropocene.

Global biodiversity monitoring, prediction and reporting

Bringing together observational, remote sensing and modelling communities that are collecting and using spatio-temporally explicit biodiversity or environmental data to capture, report and predict ongoing changes, and to develop integrated knowledge products (e.g. map layers, biodiversity trends) to support global monitoring initiatives, assessment mechanisms, and Future Earth projects.

Extreme events and environments from climate to society

Identifying, bringing together and mobilizing the different Global Environmental Change (GEC) scientific communities which together address a wide perspective on climate extremes, as well as the stakeholder organizations exposed to changes related to extreme events. The initiative will address the need for better predictions of the occurrences and impacts of extreme events, constraints on associated risks, improved adaptation techniques, and governance strategies.

Linking earth system and socio-economic models to predict and manage changes in land use and biodiversity

Bringing together the modelling communities in the Earth system-, biodiversity-, and socio-economic sciences in order to significantly advance the capabilities and approaches used to model human-environment systems, and to develop an integrated framework for socio-environmental modelling.

Sustainability for Water, Food and Energy through Integrated Water Information and Improved Governance

Developing a plan for research and application activities to improve the sustainability of water resources and the essential productivity of energy and food systems, and to advance integrated application of sustainable development principles in the Water-Energy-Food (WEF) Nexus at all scales.

The total funding includes support to two groups of complementary proposals, one on polar issues, and one on climate research and services for Africa. Each of these was identified as addressing key challenges, but requiring more co-ordination and integration. These groups have been awarded seed funding to support the development of collaborative and integrated proposals.

IMBER and SOLAS are directly involved as lead or co-applicants in three of the successful proposals: Scientific support for IPBES knowledge generation; Global biodiversity monitoring, prediction and reporting; and the group of polar-related proposals

(4) Other significant activities

Future Earth is close to finalising two major documents that will frame the vision and scientific priorities for Future Earth. The first of these is 'Future Earth in 2025'. This is a short 2 page document outlining what Future Earth aims to have contributed towards its vision for an equitable and sustainable world by 2025.

Secondly, a Strategic Research Agenda is being developed, providing a set of research questions that are seen as priorities for the medium term (3-5 years). The research agenda has been co-designed through bringing three strands of consultation together: (1) priorities from the Future Earth scientific community, i.e. the Core Projects, (2) engagement with external stakeholders and new communities, and (3) an assessment of other recent and ongoing priority-setting processes related to global change and sustainability.

The Future Earth Science and Engagement Committees are currently finalising these two documents and they will be published and launched towards the end of 2014.

7.2 Affiliated Organizations

7.2.1 International Association for Biological Oceanography (IABO)

Song

Annual Report of the International Association for Biological Oceanography (IABO)

IABO General Assembly

The IABO General Assembly will be held in conjunction with the 3rd World Conference in Marine Biodiversity in Qingdao, China 13-16 October 2014

<http://wcmb2014.csp.escience.cn/dct/page/1>

IABO thanks SCOR for grants for delegates from Developing Countries to its GA (WCMB III).

These grants, and some others, have now been offered to applicants.



SCOR WG and programmes are invited to have special sessions (symposia) and side meetings and workshops at WCMB III.

IABO Executive Committee

- Mark Costello (New Zealand) (President)
- Annelies Pierrot (The Netherlands) (Past President)
- Patricia Miloslavich (Venezuela)
- Mike Thorndyke (Sweden)
- Sun Song (China) (Convenor WCMB III)
- David Patterson (UK) (convenor WCMB II)
- Charles Griffiths (South Africa)

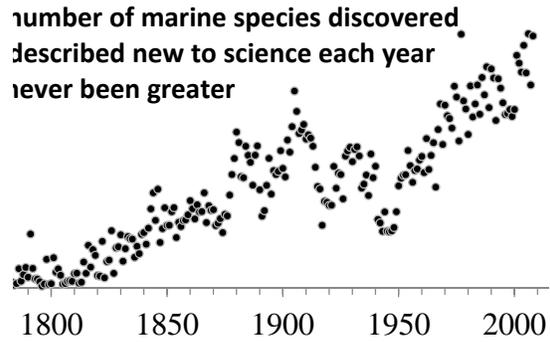
IABO Email list

IABO has an email list with ca. 1,000 subscribers. It welcomes SCOR Working Groups and associated organisations to subscribe and send out news of new positions available, meetings, publications and questions to subscribers.

- MARINE-B, the MARine Research Information NETwork on Biodiversity
- official email network of the International Association for Biological Oceanography
www.iabo.org
- for communication related to marine biodiversity research
- Archived at <https://listserv.heanet.ie/marine-b.html>
- to join send message "SUBSCRIBE MARINE-B firstname surname" to
listserv@listserv.heanet.ie

Marine taxonomy

IABO endorses the World Register of Marine Species (WoRMS) www.marinespecies.org as the premier resource for quality control in marine (and some freshwater and terrestrial) species nomenclature. It asks SCOR WG and associated activities to use this to keep species nomenclature updated and notify the database of new species and omissions.



**7.2.2 International Association for Meteorology and Atmospheric Sciences
(IAMAS)**

Coustenis

7.2.3 International Association for the Physical Sciences of the Ocean (IAPSO) *Morozov* IAPSO Report to SCOR in 2014

Introduction

IAPSO has the prime goal of "promoting the study of scientific problems relating to the oceans and the interactions taking places at the sea floor, coastal, and atmospheric boundaries insofar as such research is conducted by the use of mathematics, physics, and chemistry." IAPSO works mainly through 1) biennial scientific assemblies; 2) working groups; 3) commissions; 4) services and 5) website information. Of special importance to IAPSO is to involve scientists and students from developing countries in the oceanographic activities.

IAPSO maintains formal liaison with other scientific commissions and committees. These include the ICSU's Scientific Committee on Oceanic Research (SCOR), and UNESCO's Intergovernmental Oceanographic Commission (IOC). For more information see <http://iapso.iugg.org/>.

Administration

The IAPSO office has been situated at Gothenburg University, Sweden since July 2007, and the day-to-day business has been managed by the Secretary General (SG) Johan Rodhe, Sweden. The Bureau of IAPSO comprises of the President, Eugene Morozov, Russia, the Past President, Lawrence Mysak, Canada, the SG, Johan Rodhe, and the Treasurer, Fred Camfield, USA. The SG has been responsible for the IAPSO website.

In 2013, there were three IAPSO business meetings and meeting of the EC during the Assembly in Gothenburg. The other IAPSO discussions were maintained by means of e-mail communication. On important decision was to hold the Assembly 2017 in Cape Town, jointly with the two IUGG associations IAMAS and IAGA.

Activities

Three of IUGG's constituent Associations, IAHS, IAPSO and IASPEI, met for a Joint Scientific Assembly in Gothenburg, Sweden, during the week 22 – 26 July 2013. The title of the Assembly, "Knowledge for the Future", was chosen in order to highlight the importance of improved knowledge in hydrology, oceanography and seismology in addressing the challenges posed by climate change and the risks of natural disaster events. The Assembly attracted 1321 participants from 66 different countries. 320 registered as IAPSO scientists. 49 scientists got grants to make their participation possible.

Each Association offered a broad programme of lectures and posters, with up to 11 parallel sessions at any one time. The lecture programme was organized into 48 Association symposia (11 IAPSO), together with 9 joint symposia focusing on areas such as land-ocean interactions, advanced applied statistics, and tsunamis. 2 of the joint symposia were organized by IAPSO and the rest were co-sponsored by IAPSO. This programme was complemented by two afternoon poster sessions.

The next Scientific meeting will be the IUGG General Assembly June 22 – July 2, 2015 in Prague. The detailed planning started at a meeting with the Scientific Program Committee in

Prague in September 2013. Information about the conference at <http://www.iugg2015prague.com/>.

Vice President Denise Smythe-Wright also participated in the SCOR EC Meeting 25-28 November in New Zealand.

Working groups

The following SCOR/IAPSO working groups (WGs), which have received funding from IAPSO, have been active during the last years and have published important books and/or special journal issues:

SCOR/IAPSO WG 127 “The Thermodynamics and Equation of State of Seawater” (Chaired by T.J. McDougall) was reorganized into a special IACS-IAPSO Commission on Seawater. SCOR/WCRP/IAPSO WG 136 (Co-chaired by L. Beal and A. Biastock): “The Climatic Implications of the Greater Agulhas System” continued their activity. IAPSO also participates in the IUGG WG on History, formed in 2013.

IAPSO Commissions and Services:

A Joint Committee on the Properties of Seawater, JCS (with SCOR and IAPWS) was formed during 2013. This was a result of the work within WG 127. Chair: Prof. Rich Pawlowicz, Vice Chair: Prof. Trevor McDougall and Vice Chair: Dr. Rainer Feistel.

Commission on Mean Sea Level and Tides (CMSLT), President: Gary T. Mitchum. Website: www.psmsl.org/

Tsunami Commission (Joint with IASPEI and IVACEI). Chair: Dr. Vasily V. Titov. Website: www.iaspei.org/commissions/JCT.html GeoRisk Commission (Joint with IAMAS, IAHS, IASPEI and IAVCEI). Website: www.iugg-georisk.org/

Permanent Service for Mean Sea Level, hosted by Proudman Oceanographic Laboratory, UK. Contact: Dr. Lesley Richard. Website: www.psmsl.org/

IAPSO Standard Seawater Service, hosted by OSIL, Havant, Hampshire, UK. Director: Paul, Ridout; Website www.osil.co.uk

The working groups commissions and services report to IAPSO. These reports are posted on the IAPSO website <http://iapso.iugg.org/working-groups>.

Prince Albert I Medal

IAPSO and Monaco Royal Family established the Prince Albert I Medal for excellence in physical and/or chemical oceanography. The winner is selected every two years and the ceremony is held during the Assemblies. Professor Arnold L. Gordon from Lamont-Doherty Earth Observatory, USA was selected in as the winner of the Prize 2013.

Eugene LaFond Medal

This Medal, created in honour of Eugene LaFond who was a former SG of IAPSO, is awarded to a scientist from a developing world country for an oral or poster presented at an IAPSO Assembly. IAPSO forms a special commission to select the winner. In 2013, the medal was awarded to Issufo Halo, a student of the Cape Town University, originally from Mozambique.

Members of IAPSO Executive Committee (EC) for 2011-2015:

President: Dr. Eugene Morozov (Russia) Secretary General: Prof. Johan Rodhe (Sweden) Past President: Prof. Lawrence Mysak (Canada) Treasurer: Dr. Fred Camfield (USA) Vice President: Dr. Isabelle Ansoorge (South Africa) Dr. Denise Smythe-Wright (UK) EC Members: M.Sc. Silvia Blanc (Argentina) Prof. Toshiyuki Hibiya (Japan) Dr. Chris Meinen (USA) M.App.Sc. Ken Ridgway (Australia) Dr. Satheesh Shenoi (India) Dr. Stefania Sparnocchia (Italy).



Eugene Morozov, IAPSO President
July 2014



Johan Rodhe, IAPSO Secretary General

7.3 Affiliated Programs

SCOR-Affiliated Projects and Programs

SCOR sponsors many, but not all, of the major international ocean research projects and programs. Some projects not co-sponsored by SCOR can gain benefits from association with SCOR, such as (1) increased visibility; (2) participation in SCOR activities, such as project coordination meetings and annual SCOR meetings; (3) opportunities to provide comments on working group proposals and membership; (4) access to national SCOR contacts; and (5) opportunities to apply for SCOR funding for travel of scientists from developing countries and countries with economies in transition to their workshops and symposia. In 1995, SCOR developed the option of formal affiliation of relevant projects/programs with SCOR. Unlike projects sponsored by SCOR, affiliated projects and programs receive funding from organizations besides SCOR and do not need staff support from SCOR.

SCOR's role in relation to affiliated projects and programs is one of advice and regular review. SCOR gives advice about appropriate balances on the projects' steering committees and adequate rotations of these committees to renew the committees' memberships regularly. SCOR's national contacts can be used to find new members in regions where there is a need, or to entrain new countries into projects. SCOR can also provide an independent mechanism for the review of planning documents such as science or implementation plans.

Application for SCOR Affiliation

Application to SCOR for program affiliation should be initiated with a proposal of 2 to 5 pages, sent to SCOR at least three months before an annual SCOR meeting. The proposal should include an outline of the program's science plan, the terms of reference, current membership of the steering committee, and rotation procedures and schedule. The proposal for SCOR affiliation should also address the following criteria, accepted at the 1995 SCOR Executive Committee meeting (see *1995 SCOR Proceedings*). The Executive Committee agreed that in order to become a SCOR-affiliated project/program, an activity must

- be truly international, with a committee membership that rotates on a regular basis;
- show evidence of existing financial and/or organizational support;
- demonstrate a benefit from SCOR affiliation;
- have a scientifically well-integrated theme;
- show that it is in SCOR's interests to establish this affiliation;
- be of broad scale and global importance;
- show, as appropriate, that any scheme of membership dues includes some nominal level so as to encourage the widest possible international participation by all countries; and
- be willing to adhere to the SCOR Publication Policy.

After a program is affiliated with SCOR, annual reports are required, and scientific presentations may be requested at any annual SCOR meeting, as a basis for the decision on continuing the relationship between SCOR and each project/program. The Chair of each affiliated

project/program serves as an ex-officio member of SCOR as a Scientific Rapporteur (see SCOR Constitution, paragraph 4). Continued affiliation with SCOR depends on the project meeting the guidelines specified above, and maintaining high scientific quality and adequate rotations of committee members and chairs.

Reports to SCOR

Annual reports to SCOR should answer the following questions and present any additional information that the project/program would like to transmit to SCOR:

- What scientific accomplishments have been achieved by the project/program in the past year?
- How has the project's steering committee membership changed in the past year?
- What is the financial status of the project?
- What is the status of the project's secretariat?
- What are the plans for the scientific development and implementation of the project over the next two to three years?
- How is the project interacting with and contributing to other SCOR activities?

In addition, projects/programs should communicate regularly with their SCOR Executive Committee Reporter regarding their activities and progress.

7.3.1 InterRidge - International Ridge Studies (affiliated in 1996)

Feeley

Terms of reference:

- To build and maintain an interactive international ridge-research community
- To identify, through InterRidge working groups and the workshops and conferences they organize, the most compelling questions in ridge research and develop program plans to address these questions
- To continue to develop scientific, technical and logistical co-operation among nations and to strengthen international foundations for innovative research.
- To provide current information about research activities through the InterRidge website and *IR News*.
- To encourage participation of smaller oceanographic countries and individual scientists from non-seagoing countries.
- Through education and outreach, to communicate the importance and excitement of ridge research to the general public and decision makers worldwide.
- To act as a representative body for international ridge scientists in policy discussions.

Chair: Bramley Murton

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Co-chair: Jon Copley

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Members:

Fernando Barriga	PORTUGAL	Françoise Gaill	FRANCE
Donna Blackman	USA	Timothy Henstock	UK
John Chen	CHINA-Beijing	Sung-Hyun Park	KOREA
Paul R. Dando	UK	Rosario Lunar	SPAIN
Colin Devey	GERMANY	Rolf Pedersen	NORWAY
Nicole Dubilier	FRANCE	K.A. Kamesh Raju	INDIA
Jérôme Dymont	USA	Nobukazu Seama	JAPAN
		Steve Scott	CANADA

Coordinator:

Executive Committee Reporter: Missy Feeley

7.3.2 International Ocean Colour Coordinating Group (IOCCG) (Affiliated in 1997)

Volkman

IOCCG Report to SCOR
June 2013 – June 2014

The International Ocean-Colour Co-ordinating Group (IOCCG) is an Affiliated Program of SCOR, and was established in 1996 to promote communication and co-operation between the space agencies and the ocean-colour user community. The IOCCG has a wide-ranging mandate addressing technological and scientific issues through its scientific working groups and task forces, conducting training courses in both developing and developed countries, and helping to ensure continuity of the ocean-colour data stream through the CEOS Ocean Colour Radiometry-Virtual Constellation (OCR-VC). The group is currently chaired by Stewart Bernard (CSIR, South Africa) and the IOCCG Project Office is located at the Bedford Institute of Oceanography, Canada, staffed by Project Scientist, Venetia Stuart.

1. IOCCG Scientific Working Groups

These relatively short-lived IOCCG scientific working groups investigate various aspects of ocean-colour radiometry and its applications and publish reports on the topic. IOCCG Report 14 was published by the IOCCG this past year, and two new working groups were formed (see details below).

Published Reports from IOCCG Working Groups

- IOCCG Report 14 (2013): *In-flight Calibration of Satellite Ocean-Colour Sensors*, edited by Robert Frouin (Scripps, USA). This report reviews techniques for radiometric calibration of ocean-colour sensors in orbit, and provides recommendations on how to meet calibration requirements for science applications during mission lifetime.

New and On-going IOCCG Working Groups

Seven active IOCCG scientific working groups are currently in various stages of deliberation, as outlined below.

- 1.1 Phytoplankton Functional Types from Space (Chair: Shubha Sathyendranath, PML, UK). PFTs are of interest to the biogeochemical community because they are relevant proxies of ecosystem functioning, and may play a role in climate change, with potential impacts on the efficiency of ocean carbon sequestration. This WG provides an overview of progress to date, examines the advantages and limitations of various methods used to detect PFTs from marine reflectances, and provides suggestions for further development. The final report has been edited and formatted and is expected to be published later this year.
- 1.2 Joint GEOHAB/IOCCG WG on Harmful Algal Blooms (Chair: Stewart Bernard, CSIR, South Africa). This is a joint working group between the IOCCG and GEOHAB program of IOC-SCOR, the main goal of which is to provide a resource to improve communication between the satellite ocean colour community and the *in situ* HAB scientific community. Regional approaches will be used for effective ocean-colour utilisation in optically

complex coastal and inland waters. The two primary deliverables of the WG are an IOCCG report, followed by a special issue in a peer-reviewed journal. A complete draft monograph is expected by the end of the year.

- 1.3 Ocean Colour Remote sensing in Polar Seas (Chairs: Marcel Babin, Univ. Laval, Canada; Kevin Arrigo, Stanford University, USA; Simon Bélanger, Univ. Québec, Canada). This WG is examining ocean colour remote sensing in polar seas, highlighting some of the difficulties encountered in such areas. An advanced draft report was presented to the IOCCG Committee for review at the recent IOCCG-19 meeting, and contains a lot of new material. Furthermore, a database has been assembled from different sources (Arctic and Antarctic) to test the different algorithms. It is anticipated that the final draft report of this working group will be ready by mid- to late 2014.
- 1.4 Uncertainties in Ocean Colour Remote Sensing (Chair: Roland Doerffer, GKSS, Germany). Due to the demand for improving the information about uncertainties in ocean-colour remote sensing data, an IOCCG working group was established to outline procedures on how best to determine uncertainties, and to develop methods to routinely distribute the information. This working group will address the various sources of uncertainty in ocean-colour applications and the results and recommendations will be summarized in the form of an IOCCG report.
- 1.5 Coastal Water Algorithm Comparison (Chair: Kevin Ruddick, RBINS, Belgium). The main objective of this WG is to understand how algorithm performance relates to algorithm design and calibration of specific IOPs. There have been some obstacles with regard to the assembly of an *in situ* dataset to test the algorithms, which is a key action needed to progress. Furthermore the Chair is under pressure from new projects, so proposes to keep the WG active, but under different leadership (still to be determined).
- 1.6 Intercomparison of Atmospheric Correction Algorithms Over Optically Complex Waters (Cédric Jamet, Wimereux, France). This newly established IOCCG working group will inter-compare and evaluate atmospheric correction algorithms over optically complex waters to understand retrieval differences and to provide recommendations for improving and selecting the optimal atmospheric correction scheme for a given water type. Results of these inter-comparisons will be documented in an IOCCG report, providing recommendations on the range of validity and limitation of each algorithm.
- 1.7 Earth Observations in Support of Global Water Quality Monitoring (Chairs: Arnold Dekker, CSIRO, Australia, Paul DiGiacomo, NOAA/NESDIS and Steven Greb, Wisconsin Department of Natural Resources, USA). This WG was established to help develop a strategic plan for incorporation of current and future Earth observation information into coastal and inland water quality monitoring efforts. To date, management agencies have been slow to embrace satellite-derived measurements, even though important parameters such as chlorophyll, suspended solids, light attenuation, and coloured dissolved organic matter have been quantified with required accuracies. This working group seeks to build stronger linkages between water resources management end-users and data providers to fully realize current and future Earth observation products.

2.0 IOCCG CONTRIBUTION TO CEOS

The role of the Committee on Earth Observation Satellites (CEOS) is to coordinate EO satellites and to act as the main implementation body for the space segment of GEOSS (Global Earth Observation System of Systems). The IOCCG contributes to CEOS primarily through the Ocean Colour Radiometry-Virtual Constellation (OCR-VC), which is aimed at producing sustained time series of well-calibrated and validated satellite ocean-colour data to assess the impact of climatic changes on the global ocean. Each of the agencies serving on the IOCCG Committee support some aspect of this virtual constellation, and are taking a leadership role in the activities. One of the main issues is to ensure free, open and timely sharing of all current and future OCR data. Near-future plans include implementation of the INSITU-OCR (International Network for Sensor Inter-comparison and Uncertainty assessment for Ocean Color Radiometry), including establishment of a multi-agency Project Office (still under deliberation). IOCCG agencies have been encouraged to define commitments for implementation of INSITU-OCR based on an itemized list of recommendations from the INSITU-OCR White paper:

http://www.ioccg.org/groups/INSITU-OCR_White-Paper.pdf. The feedback from this exercise will help to apply a modular approach to OCR-VC and INSITU-OCR implementation. Other plans include establishment of an OCR Calibration Task Force (see below).

3. IOCCG Task Forces

These task forces are established to address matters that require an ongoing capability and/or expertise and are expected to continue until that need no longer exists.

- 3.1 Task Force on ECV Assessment (Chairs: James Yoder, Woods Hole, USA; Nicolas Hoepffner, JRC, Italy): The IOCCG formed this task force to carry out a critical comparison of essential climate variables (ECVs) produced by different space agencies, and to provide guidance on the generation of better long-term OCR climate data records. The task force has reviewed a number of international efforts to produce time series and the different groups should hopefully converge on a cooperative approach for implementation and evaluation. The task force will also establish criteria to be satisfied by ocean-colour ECV products and recommend actions needed to ensure the quality and consistency required by GCOS (Global Climate Observing System).
- 3.2 Task Force on Satellite Sensor Calibration. The IOCCG aims to establish a permanent inter-Agency Task Force to facilitate collaboration among experts from various space agencies to maximize the accuracy and stability of ocean-colour radiometry records from individual missions. Gerhard Meister (NASA GSFC) has been proposed as the chair of this Task Force.

4. Capacity Building Initiatives

IOCCG sponsored a student from Cameroon, and one IOCCG lecturer to participate in a training course on *Remote Sensing Data Analysis* in Qingdao, China. The IOCCG is also preparing for the second Summer Lecture Series, which will take place at the Laboratoire d'Océanographie de

Villefranche (France) from 21 July to 2 August 2014. This training course is dedicated to high-level training in ocean optics, bio-optics and ocean colour, and will focus specifically on current critical issues of concern. A total of 23 students from 16 different countries were selected to attend the course, out of an overwhelming 140 applications, all of an extremely high standard. SCOR sponsorship of three students (two from Brazil and one from Vietnam) is greatly appreciated. Twelve prominent scientists will deliver a comprehensive program including lectures, discussion sessions and hand-on tutorials. Because of the high demand for the course, all lectures will once again be video recorded and made available on the IOCCG website. The 36 lectures from the previous Summer Lecture Series have already been downloaded more than 23,000 times in total (with over 13,000 views online), emphasizing the demand for this type of teaching resource.

5. Project Management and Coordination

The IOCCG Committee and Executive Committee meet once each year to coordinate the activities of the group as a whole, review the progress of the various working groups, discuss plans for the year ahead, and approve a budget for the coming year. The IOCCG-19 Committee meeting took place from 28-30 January 2014 in Cape Town, South Africa (for minutes of the meeting see <http://www.ioccg.org/reports/Minutes-19-FINAL.pdf>), and the 20th IOCCG Committee meeting is planned for February 2015 (Paris, France).

6. IOCCG Membership (2014)

The IOCCG Committee consists of members drawn from space agencies as well as the scientific ocean-colour community. Rotation of members is being implemented according to a roster: three members marked with an asterisk (*) were appointed after the last Committee meeting.

Antoine, David (Past-Chair)	-	Laboratoire de Physique et Chimie Marines, France
Bernard, Stewart (Chairman)	-	University of Cape Town, South Africa
Bélangier, Simon*	-	Université du Québec à Rimouski, Canada
Bontempi, Paula	-	NASA HQ, USA
Chauhan, Prakash	-	ISRO, India
Crevier, Yves	-	Canadian Space Agency, Canada
Dierssen, Heidi	-	University of Connecticut Avery Point, USA
DiGiacomo, Paul	-	NOAA, USA
Dowell, Mark	-	JRC, Italy
Dutkiewicz, Stephanie	-	Massachusetts Institute of Technology, USA
Feldman, Gene	-	NASA GSFC, USA
Hardman-Mountford, Nick	-	CSIRO, Perth, Australia
Hirata, Taka	-	Hokkaido University, Japan
Kampel, Milton	-	INPE, Brazil
Kwiatkowska, Ewa	-	EUMETSAT, EU, Germany
Lambin, Juliette	-	CNES, France
Mao, Zhihua	-	Second Institute of Oceanography, China
Murakami, Hiroshi	-	JAXA EORC, Japan
Park, Youngje	-	KIOST, Korea
Regner, Peter	-	ESA/ESRIN, Italy

Ryu, Joo-Hyung	-	KIOST, Korea
Tyler, Andrew	-	University of Stirling, UK
Wiafe, George*	-	University of Ghana, Ghana
Wilson, Cara*	-	NOAA / NMFS, USA
Yoder, James	-	Woods Hole Oceanographic Institution, USA
Zibordi, Giuseppe	-	Joint Research Centre, EU, Italy

7. IOCCG Sponsors

Activities of the IOCCG are supported by contributions from various national space agencies and other organisations (see <http://www.ioccg.org/about/sponsor.html>) and upon infrastructure support from SCOR. This year, CSIRO (Australia) became a new IOCCG sponsor. Representatives from funding agencies form the Executive Committee. The Bedford Institute of Oceanography (DFO, Canada) provides in-kind support (office space, informatics) while SCOR provides logistic support and manages the NASA funds.

Global Alliance of CPR Surveys (GACS) – report of activities.

Graham Hosie
Chair of the Board of Governance
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This is a somewhat brief report of activities. The GACS annual Board of Governance is not until the last week of September, after the SCOR 2014 meeting, when all reports from board members and GACS working groups will be collated and discussed.

The last year has been a period of ups and downs for GACS. One of our aims is to develop a global network of CPR Surveys, especially in regions where there is little or no monitoring or plankton. While we have been assisting Brazil, Cyprus and India with the development of their surveys, we have lost a valued member of the GACS community.

Government cutbacks has resulted in the U.S. National Oceanic and Atmospheric Administration's (NOAA) Northeast Fisheries Science Center (NEFSC) to end their support for the U.S. east coast CPR runs. NEFSC conducted two monthly CPR transects: one across the Gulf of Maine and the other across Mid Atlantic Bight. This survey was the second longest running CPR program after that led by SAHFOS in the North Atlantic and North Sea. It's also one of the longest running plankton time-series in the Northwest Atlantic. At a time when there is a growing demand for knowledge about how climate change is affecting marine ecosystems we cannot afford to lose existing long-term monitoring programmes. There are already too few.

Monitoring plankton is particularly important as the foundation of marine food webs, and not surprisingly plankton monitoring is an important component of programmes such as GOOS, SOOS and other programmes supported by SCOR, SCAR, POGO, as well as the various national agencies and government departments that support and sponsor CPR surveys.

Fortunately for the moment, SAHFOS is attempting to maintain the former NEFSC transects, while a longer term solution is found to maintain this valuable data stream. Dr Chris Melrose was the NEFSC representative on GACS. His enthusiasm and active contribution to the development of GACS and his direct input into the board meetings will be missed.

In the meantime, GACS continues to help new and existing surveys to develop, and we are grateful to our various sponsors and stakeholders for their much valued support, as well as the various GACS partners themselves who have provided advice, training and assistance to new surveys. After considerable effort and discussions with the Brazilian government, Prof. Eric Muxagata has secured funding to purchase a new CPR from SAHFOS. This will be used for both monitoring around Brazil, and also across Drake Passage, in support of the SCAR SO-CPR Survey. Cyprus and India continuing to develop surveys in their regional waters.

Changes in GACS membership

We hope that the absence of the US CPR programme from GACS will be temporary. In the meantime, we will be welcoming Ms Rana Abu Alhaija (Cyprus) and Dr Ramaiah Nagappa (India) as full members of GACS. There will be other board changes at the September 2014 GACS meeting. I will be stepping down as Chair of the Board of Governance in September after completing my term as the inaugural Chair. The Chair of GACS is a three year term. A new Chair will be elected at the September meeting. I and my colleague Prof. Mitsuo Fukuchi (Japan) have also retired from our respective institutes, the Australian Antarctic Division and National Institute of Polar Research, both after more than 30 years each in Antarctic research. I started the survey in 1991 and Prof. Fukuchi helped me establish the Southern Ocean CPR Survey as an international programme under SCAR. We were also co-leaders of that survey, as well as Co-Chairs of the SCAR Expert Group on CPR Research. Dr Kunio Takahashi, NIPR, has taken over as Director of the SO-CPR Survey, and as Chair of SCAR EG-CPR. I will continue as Deputy-Director and advisor. I'll also will act as an ambassador for the SO-CPR Survey to help further develop the Survey.

Interfacing with other programmes

In addition to attending the SCOR meeting in Wellington, November 2013, GACS has actively participated in a number of major meetings including:

- Global Ocean Observing System (GOOS) meeting in Townsville Australia, November 2013, to discuss “Sustained and systematic monitoring of the biological and biogeochemical ocean: defining Essential Ocean Variables”,
- POGO annual meeting in Hobart Australia, January 2014,
- SOOS meeting at Rutgers University USA, March 2014, to discuss “ecosystem Essential Ocean Variables” (eEOVs) in the Southern Ocean,
- IMBER Open Science Conference in Bergen Norway, June 2014, where a number of GACS members led workshops and conference sessions,
- CPR work will be presented at the SCAR Business Meetings and Open Science Conference in Auckland New Zealand, August 2014.

Data usage and publications

GACS has just completed a major paper for the Global Environment Facility (GEF) - Transboundary Water Assessment Programme (TWAP). GACS provided information on long term and spatial changes in zooplankton abundances and copepod composition for a number of regions. Most of the data came from the North Atlantic, North Sea, North Pacific and Southern Ocean. Result of this work has shown zooplankton composition and abundance changes in response to ocean climate variability are not always as expected, such as a shift towards larger copepod species under warmer conditions in parts of the North Atlantic and the Southern Ocean. The TWAP exercise further highlighted that most of the world's oceans are not routinely surveyed, i.e. most of the Indian Ocean, southern Atlantic, and nearly all of the Pacific Ocean. The Arctic and tropical regions are a particular concern in relation to the lack of monitoring.

CPR data from the Southern Ocean have contributed to a number of plankton chapters in the SCAR Biogeographic Atlas of the Southern Ocean currently in press. In addition, there is a

dedicated CPR chapter showing predictive zooplankton biogeographic pattern synthesising data at a community level.

A major report was recently published by the New Zealand Ministry of Primary Industries showing the similarities and differences in zooplankton distribution, abundance and trends between the Ross Sea region south of New Zealand and the eastern Antarctic region, south and south-west of Australia. The two regions had substantially different trends in annual abundances and composition of copepods species despite the two regions being connected by the Antarctic Circumpolar Current. There was a shift towards larger species of copepods were seen in the eastern Antarctic region accompanied by a general increase in zooplankton abundance, whereas no similar patterns were observed in the Ross Sea. Instead the Ross Sea recorded much higher abundances overall, with higher chlorophyll a concentrations. There was also greater variability in zooplankton abundance in the Ross Sea region. The report was published by MPI New Zealand in May 2014 and is available from <http://www.mpi.govt.nz/news-resources/publications.aspx>. Following the report, the New Zealand government provided the NZ CPR programme with further five year funding to continue the CPR work between the South Island of New Zealand and the Ross Sea.

The next GACS global status report on plankton will be published later in 2014.

Future activities

GACS' initial funding contract ended in June 2014, and this marks the end of the establishment period of GACS. An initial assessment has concluded that GACS has been successful in addressing its initial objectives, these being:

- the global database of CPR data has been established,
- a website has been established,
- assistance has been provided to developing surveys (France, Brazil, Korea, Cyprus, India) which has including training workshops at SAHFOS and the Australian Antarctic Division; FAQs have been developed to provide advice for new surveys,
- the first Global Marine Ecological Status Report has been published; the second report is imminent,
- providing an interface for plankton biodiversity with other global ocean observing systems,
- documenting and promoting a common set of standards and methods.

Many of these objectives will continue, such as assisting new surveys, regular publication of the Global Marine Ecological Status Report, as well as maintaining the database, website and engaging with other agencies/programmes. At the September 2014 GACS meeting, the specific objectives will be reviewed and if require revised and/or new objectives will be developed. We will be seeking the involvement of SCOR and other stakeholders in the review/development of the objectives in order that we address stakeholder requirements.

Future training workshops at SAHFOS are scheduled on phytoplankton taxonomy in 2014 and zooplankton in 2015. I am still planning to visit the South African CPR team in Cape Town to provide training on Southern Ocean plankton methods and taxonomy. This is now scheduled in

early 2015 when refurbishment of the laboratories of South African Department of Environmental Affairs are completed.

Appendix

Current members of the GACS Board of Governance

Name	Survey	Country	Affiliation
Dr Graham Hosie (Chair, end Sept 2014)	SCAR Southern Ocean CPR Survey	Antarctica, Australia	SCAR, AAD
Dr Sonia Batten (Vice Chair)	North East Pacific	Canada	SAHFOS
Prof. Nicholas Owens	North Atlantic Arctic	UK	SAHFOS (Director)
Dr Sanae Chiba	North West Pacific	Japan	JAMSTEC
Prof. Martin Edwards	North Atlantic Arctic	UK	SAHFOS (Chief Scientist)
Prof. Mitsuo Fukuchi (End Sept. 2014)	Japanese Antarctic Program	Japan	NIPR
Dr Julie Hall	New Zealand	New Zealand	NIWA
Prof. Erik Muxagata	Developing	Brazil	FURG
Dr Anthony Richardson	IMOS Australia CPR	Australia	CSIRO
Dr Hans Verheye	Benguela LME	South Africa	DEA, BCC
Dr Sun Song	China	China	IO-CAS
Prof. Philippe Koubbi	Marion Dufresne CPR	France	UPMC, IPEV
Ms Rana Abu Alhaja (from Sept. 2014)	Cyprus, eastern Mediterranean	Cyprus	The Cyprus Institute
Dr Ramaiah Nagappa (from Sept 2014)	India	India	NIO
Dr Kunio Takahashi (from Sept. 2014)	SCAR Southern Ocean CPR Survey	Antarctic, Japan	SCAR, NIPR
Dr Chris Melrose (end Dec. 2013)	US East Coast	USA	NOAA
Prof. Peter Burkill	<i>Ex Officio</i>	UK	GACS Ambassador

Observers
Dr Chris Melrose

AAAD: Australian Antarctic Division
BCC: Benguela Current Commission
CSIRO: Commonwealth Scientific and Industrial Research Organization
DEA: Department of Environmental Affairs
FURG: Federal University of Rio Grande
IMOS: Integrated Marine Observing System
IO-CAS: Institute of Oceanology, Chinese Academy of Science
IPEV: Institut polaire français Paul Emile Victor
JAMSTEC: Japan Agency for Marine-Earth Science and Technology
NIO: National Institute of Oceanography, Goa.
NIPR: National Institute of Polar Research
NIWA: National Institute of Water and Atmospheric Research
NOAA: National Oceanic and Atmospheric Administration
SAHFOS: Sir Alister Hardy Foundation for Ocean Science
SCAR: Scientific Committee on Antarctic Research
UPMC: Université Pierre et Marie Curie

7.4 Other Organizations

7.4.1 Partnership for Observation of the Global Oceans (POGO)

Feeley

Partnership for Observation of the Global Oceans (POGO) Report to SCOR Annual General Meeting 2014

Introduction

POGO was established in 1999 by a group of directors of marine research institutions who met to discuss ways in which they could work together more effectively in support of global oceanography. As stated at the founding of POGO, the objective of POGO is to make a major contribution to the attainment of sustained in situ observations of the global ocean that meet the requirements of international research and operational programmes.

In the last fifteen years, POGO has established itself as a respected and credible voice for the marine science community. Members value POGO as a forum in which they can meet their peer-directors at least annually, in well-attended meetings, to discuss matters of common interest.

The POGO programme in capacity-building is universally admired; it receives substantial support from the Nippon Foundation. The pool of former scholars trained under Nippon Foundation-POGO initiatives have been integrated into a global network (NANO), which now has a biannual newsletter and four regional, collaborative research projects and one outreach project. Since 2011, POGO has taken a leadership role with GEO in the formulation of an oceans Task, "Oceans and Society: Blue Planet". On a broader scale, POGO has created an informal grouping, Oceans United, to allow many organisations to speak with a common voice on issues of relevance to oceans and society. POGO enjoys excellent working relations with all relevant partner organisations.

Collaboration with SCOR

SCOR is the leading international organisation in the marine science arena, and it is essential that POGO maintain good relations with it. We enjoy the highest level of cooperation with SCOR, especially with its Executive Director, Dr Ed Urban. For example:

- POGO funds jointly with SCOR a fellowship programme that enables young scientists from developing countries to study for up to three months in a major oceanographic institution chosen by the candidate. The programme is managed by POGO. Candidates are selected by a committee in which both POGO and SCOR are represented.
- SCOR also runs a Visiting Professorship modelled on the POGO one, and on several occasions the two programmes have complemented one another (for example, in Southern Africa).
- POGO and SCOR also collaborate in assessing capacity building at the world level in marine science and coordinate their respective capacity-building programmes. Together with partner organisations IOC/IODE, SCOR and POGO have created a website advertising summer schools and other training opportunities in ocean sciences (www.oceansummerschools.org).
- SCOR has established jointly with POGO a new research initiative, the International Quiet Ocean Experiment (IQOE). This is a programme aimed at the acoustic background in the ocean, including its anthropogenic and natural components. A science plan has been written

and reviewed, and the response to review is due to be completed by 1st September 2014. An article has also been published in Oceanography magazine. The Sloan Foundation was instrumental in starting up this initiative, by providing funding for workshops and an open science meeting, held at IOC (Paris) in 2011.

- POGO contributed to the establishment, and continues to support the development of the SCOR-SCAR Southern Ocean Observing System (SOOS).
- Both POGO and SCOR support the Global Alliance of Continuous Plankton Recorder Surveys (GACS).
- POGO has an interest in contributing to the activities planned under the International Indian Ocean Expedition 50th anniversary (IIOE-2), an initiative of SCOR and IOC.

Priorities for 2014

At the last POGO Annual Meeting (POGO-15) held in Hobart, Australia, in January 2014, four workshops were held on the following themes that were identified as priority areas for POGO.

1. Autonomous Devices for Deep Sea Observations

Background: Ocean observing capabilities are being developed for the coastal and blue-water ocean. Over the last decade, tools such as Argo profiling floats, surface drifters, moorings, gliders, AUVs, and wind/wave-driven surface platforms have expanded our collection of data at the surface and in the upper ocean. More recently, there has been a growing awareness of the need for observing capability over the full water column and access to the deep ocean. The goals of this workshop are to discuss the needs for autonomous devices for deep-sea observations. Objectives of the discussion would be to identify what variables should be observed and how they should be observed (specifics of the sampling methodology), to outline the challenges faced in making the sought after observations, to summarize the present state of the art, and to point to the need for further development work. The session will be organized around the following objectives.

Objectives:

- a. To discuss the need for deep ocean observations by autonomous devices, identifying what variables should be observed and with what sampling.
- b. To identify the challenges to be faced (e.g., calibration, stability, power consumption).
- c. To summarize the present state of the art (what exists, what is needed).
- d. To call out the need for further development.

2. Southern Ocean Observing System (SOOS)

Background: Over the last decade, the scientific community identified a need for an internationally-coordinated approach to observing the Southern Ocean, and worked together to produce a strategy for the Southern Ocean Observing System (SOOS). POGO was integral in the development of SOOS, and a key stakeholder community in both the provision of logistics and support for SOOS objectives, and users of SOOS data and data products.

Objectives:

- a. To inform delegates of SOOS activities and identify priority observation gaps
- b. To discuss the challenges and issues facing SOOS implementation, and develop mechanisms to tackle these.
- c. To encourage and identify those institutes with the capability and interest to fill the identified priority observation gaps
- d. To develop further the POGO commitment to SOOS, by implementing the existing relevant POGO Action Items and developing new ones.

3. Long-term data from observing systems

At the AWI we are currently working on a timeseries station GIS visualization for global timeseries stations. We will include all POGO stations (those reported on the website) in the general set-up and station list. Since we are using a general WEB GIS interface developed at the AWI we can include a range of layers and sub-layers to visualize and sort stations by, e.g., geography, parameters measured, length of the timeseries, or even governance structures and any other information that POGO might find useful and that can be provided for all stations (location of NANO members, ship tracks etc.). This would be a way of:

- a. Summarizing data,
- b. Revealing gaps in distribution of information and,
- c. Providing exposure to individual timeseries and their operators as well as to POGO.

Importantly, with this tool no data would have to be submitted to a repository, with each institution continuing to host their own data (or archive them in their chosen repository). The data would just have to be described properly and their metadata reported in the GIS resource. POGO already has a non-dynamic online list of sites with timeseries and this can be expanded easily with additional timeseries information from the AWI, and other affiliates who have surely collated this information to publish on their own web resource. Collections of metadata often already exist but the professional visualization is usually lacking.

This resource could therefore provide enormous added value and be very useful particularly in the early stages of setting up new ocean studies requiring timeseries information. Collaborations could be set up with already existing resources to maximize visibility of the timeseries (harvesting protocols, sharing technical analysis tools etc.).

4. Autonomous Observing System for Tropical Air-Sea Interaction –Tropical Moored Arrays

Background: Climate variations such as El Niño, the Indian Ocean Dipole and Atlantic Niño phenomena in the tropics are caused naturally by large scale air-sea interactions in the Earth's ocean and atmosphere. To understand and monitor these recurring phenomena, tropical mooring systems as well as other observing systems have been deployed. Recent scientific reports suggest that global warming affects these oscillations and vice versa; however, the current existing systems are facing serious challenges for sustainable atmosphere and ocean record. The tropical moored

arrays are currently implemented at ~50% of requirement. Continued funding to sustain and enhance the arrays remains problematic. At the same time, there are persistent threats to existing arrays from vandalism in all oceans; and piracy is a major hindrance to implementation and maintenance in the western Indian Ocean. It is therefore important to communicate aspects of science needs and engineering challenges for sustainable air-sea interaction observation, to facilitate use and exploitation of the data for societal benefits. In this context, it is proposed that the session will be organized around three major objectives.

Objectives:

- a. To share information on the challenges that the existing observing systems are facing to sustain the air-sea interaction data.
- b. To identify the scientific needs and technological challenges, which foster development of air-sea interaction research and predictable research associated with societal benefits.
- c. To explore possible partnership for fostering air-sea interaction study.

7.4.2 Marine Working Group of the International Arctic Science Committee *Fennel*

SCOR has been communicating with the Marine Working Group (MWG) of the International Arctic Science Committee (IASCO) about whether it would be timely to create an MOU between the two organizations. Michiel van der Loeff, who is a member of the MWG and has been a member of SCOR working groups and projects, made a presentation to the MWG in early April 2014. The MWG did not show any interest at this time in developing a partnership with SCOR, possibly do to a full slate of other partnerships and activities.