

7.0 RELATIONS WITH NON-GOVERNMENTAL ORGANIZATIONS

- 7.1 International Council for Science** *Burkill*
- 7.1.1 World Climate Research Programme (WCRP), **p. 7-1** *Caltabiano, Fennel*
- 7.1.2 Scientific Committee on Antarctic Research (SCAR), **p. 7-7** *Brussaard*
- 7.1.3 Future Earth Initiative, **p. 7-16** *Burkill*
- 7.1.4 Belmont Forum, **p. 7-16** *Burkill*
- 7.2 Affiliated Organizations**
- 7.2.1 International Association for Biological Oceanography (IABO),
p. 7-17 *Miloslavich*
- 7.2.2 International Association for Meteorology and Atmospheric Sciences
(IAMAS), **p. 7-19** *Turner*
- 7.2.3 International Association for the Physical Sciences of the Oceans
(IAPSO), **p. 7-21** *Smythe-Wright*
- 7.3 Affiliated Programs, p. 7-25**
- 7.3.1 InterRidge - International, Interdisciplinary Ridge Studies, **p. 7-27** *Urban*
- 7.3.2 International Ocean Colour Coordinating Group (IOCCG), **p. 7-31** *Sun Song*
- 7.3.3 Global Alliance of CPR Surveys (GACS), **p. 7-36** *Burkill*
- 7.4 Other Organizations**
- 7.4.1 Partnership for Observation of the Global Oceans (POGO), **p. 7-37** *Shapovalov*

7.1 International Council for Science (ICSU)*Burkill*

ICSU plans to allow SCOR to check the draft report of the SCOR-SCAR review committee for factual errors before finalizing it.

7.1.1 World Climate Research Programme (WCRP)*Caltabiano, Fennel****The World Climate Research Programme (WCRP): a Short Update to SCOR-2016******General background***

The mission of the World Climate Research Programme (WCRP) is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society. The two overarching objectives of the WCRP are: (1) to determine the predictability of climate; and (2) to determine the effect of human activities on climate.

WCRP is organized as a network of core and co-sponsored projects, working groups, modelling activities and cross-cutting initiatives (see www.wcrp-climate.org). Those activities of most relevance to the work of SCOR are highlighted below.

WCRP is sponsored by the World Meteorological Organization (WMO), the International Council for Science (ICSU) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

The WCRP Grand Challenges

<http://wcrp-climate.org/grand-challenges>

The overarching WCRP Grand Science Challenges (GCs) represent major foci of scientific research, modelling, analysis and observations over the next decade or so. The WCRP intends to promote these GCs through community-organized workshops, conferences and strategic planning meetings to identify high-priority and exciting research that require international partnership and coordination, and that yield “actionable information” for decision makers. Currently, WCRP has seven GCs, including two new ones approved in April 2016 focussed on decadal climate prediction and climate and carbon:

- 1 Clouds, Circulation & Climate Sensitivity
- 2 Melting Ice & Global Consequences
- 3 Climate Extremes
- 4 Regional Sea-level Change & Coastal Impacts
- 5 Water Availability
- 6 Near-term Climate Prediction
- 7 Climate and Carbon

Of these, the GC on *Regional Sea-Level Change and Coastal Impacts* is of most relevant to SCOR.

7-2

This Grand Challenge represents an integrated interdisciplinary program on sea level research reaching from the global to the regional and local scales to

- Establish a quantitative understanding of the natural and anthropogenic mechanisms of regional to local sea level variability;
- Promote advances in observing systems required for an integrated sea level monitoring; and
- Foster the development of sea level predictions and projections that are of increasing benefit for coastal zone management.

The effort will focus on all components of global to local sea level changes and will consider the necessary analyses on global and regional climate change data and simulations, extreme events and potential impacts, including the evaluation of sea level rise impacts for coastal zones. The program also aims to have close interaction with coastal communities to assure that results of the proposed scientific research are incorporated into practices of coastal zone management, and impacts and adaptation efforts. A WCRP-IOC Joint Sea Level Conference is being planned in commemoration of the ten years' anniversary of the WCRP Sea Level workshop held at IOC in Paris in 2006. The conference is scheduled for 10-15 July 2017 at New York University in New York City.

The WCRP Core Projects

WCRP carries out a major part of its activities through its four core projects, CLIVAR (oceans and climate - www.clivar.org), CliC (cryosphere and climate - www.climate-cryosphere.org), GEWEX (water and climate www.gewex.org) and SPARC (upper atmosphere and climate - <http://www.sparc-climate.org>). Both CLIVAR and CliC are official endorsers of the SCAR/SCOR Southern Ocean Observing System (SOOS). Of these core projects, the work of CLIVAR is of particular relevance to SCOR.

The CLIVAR Project

The year 2016 marks the celebration of 20 years of CLIVAR, culminating with the CLIVAR Open Science Conference in Qingdao, China, and the launch of a new Science and Implementation Plan. The overarching goals of the project continue - to improve understanding and prediction of the ocean-atmosphere system and its influence on climate variability and change, to the benefit of society and the environment.

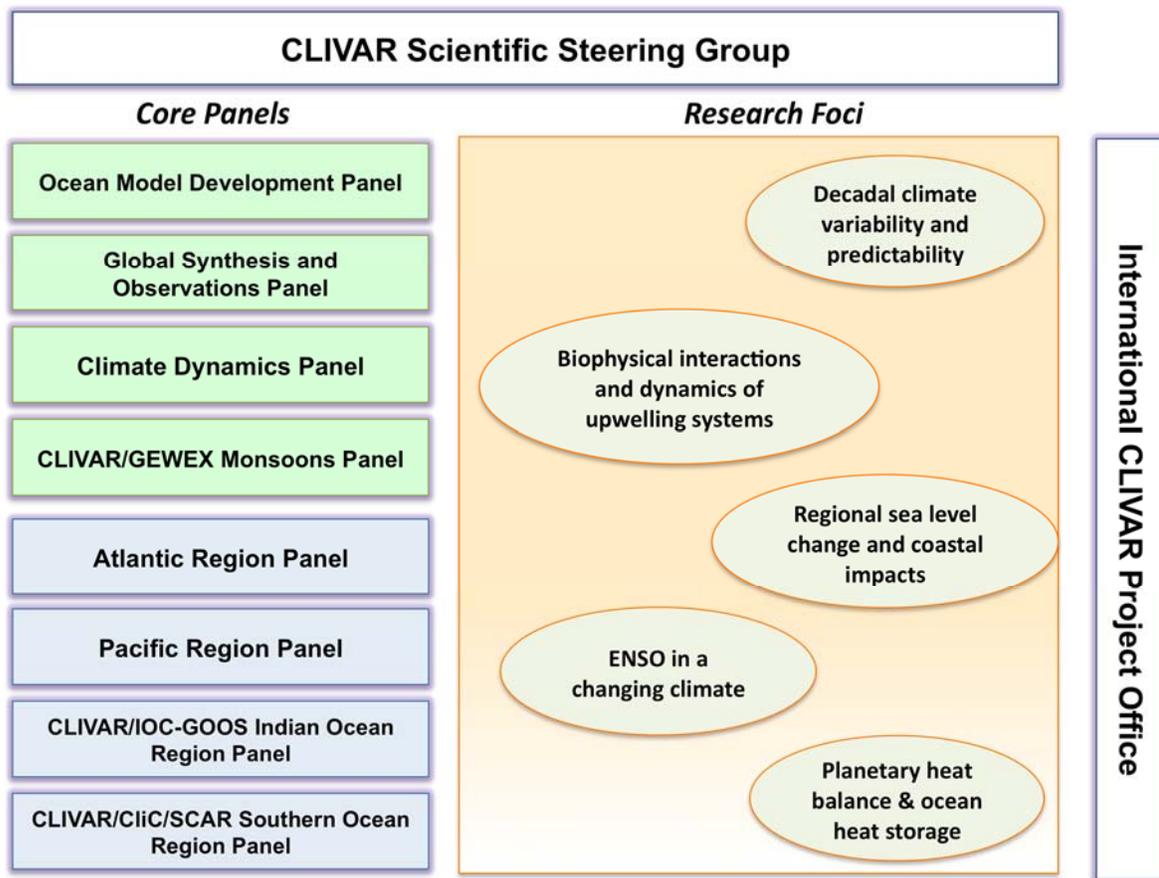
CLIVAR's main activity in 2016 has been the organisation of its Open Science Conference "Charting the course for future climate and ocean research" (www.clivar2016.org), to be held in Qingdao, China on 19-23 September 2016. An exciting programme was prepared, based on the review of 936 abstracts submitted by 750 authors from 66 countries. Daily plenary sessions and 12 parallel sessions with community leaders and promising young scientists speaking will cover diverse aspects of CLIVAR science. The associated Early Career Scientist Symposium (ECSS) 18, 24-25 September also has a programme developed by and for ECS, focusing on discussions

of science frontiers and engagement of the young generation of researchers in CLIVAR science topics. CLIVAR is grateful to SCOR for providing travel support that will enable a couple of young scientists from developing countries to attend the ECSS and OSC.

The CLIVAR organisational structure is comprised of four global panels (Ocean Model Development Panel, the Global Synthesis and Observations Panel, the Climate Dynamics Panel, and the joint CLIVAR-GEWEX Monsoons Panel), and four regional ocean basin Panels (Atlantic, Pacific, Indian and Southern Ocean). All Panels report to the CLIVAR Scientific Steering Group.

The regional ocean basin panels have developed through the years strong partnerships with groups that also work on the implementation of the ocean observing system, like the CLIVAR/IOC-GOOS Indian Ocean Region Panel links with IIOE-2 activities and the CLIVAR/CliC/SCAR Southern Ocean Region Panel's links with SOOS. More recently, the Atlantic Region Panel and the Pacific Region Panel are involved with AtlantOS and TPOS2020, respectively.

Recognizing the need for the CLIVAR project to be flexible and responsive to new ideas and challenges, the CLIVAR SSG has initiated the concept of *Research Foci* (RF, <http://www.clivar.org/about/research-foci>). These are focused research topics identified by members of the CLIVAR community as being ripe for progress in the next 5-10 years and that would significantly benefit from enhanced international coordination. The RF have already demonstrated to be an effective means for CLIVAR to initiate activities and invigorate progress in areas that go beyond the traditional areas addressed by the Panels, fostering cross-panel, cross-community collaboration, and an opportunity to bring young scientists into CLIVAR. Five RF (ENSO in a Changing Climate, Decadal Climate Variability and Predictability - DCVP, Sea Level Rise and Regional Impacts (also a WCRP Grand Challenge), Planetary Heat Balance and Ocean Heat Storage - CONCEPT-HEAT, and Eastern Boundary Upwelling Systems - EBUS) have presented their science and implementation plans to the SSG and have been endorsed. All of them have organised kick-off meetings and are planning further meetings around the CLIVAR OSC.



Panels and RF activities:

GSOP: The production of ocean reanalyses, or ocean state estimates, is now an established activity in several research and operational centres. A new generation of products has recently been produced and a coordinated community effort on the Intercomparison of those ocean reanalyses has been undertaken addressing a variety of aspects. These include: i) quantifying uncertainty; ii) measuring progress in the quality of the reanalyses; and iii) defining indices for ocean monitoring. These are the motivations for the current Ocean Reanalyses Intercomparison Project (ORA-IP), which was jointly developed by GSOP and GODAE Ocean View (CLIVAR Exchanges, 2014; Balmaseda et al., 2015). A special issue of *Climate Dynamics* with results of the intercomparison has been completed.

SORP: The CLIVAR/CliC/SCAR Southern Ocean Region Panel (SORP) works closely with the Southern Ocean Observing System (SOOS) program, providing scientific and technical input to the observation system design and implementation, particularly on air-sea fluxes in the Southern Ocean, which is also an important topic identified in the contribution from SORP to the Year of Polar Prediction (YOPP) plans. SORP members have also had critical involvement in the proposal that led the Southern Ocean Carbon and Climate Observations and Modeling

(SOCCOM) project to be funded. SOCCOM will contribute further to the scientific and public understanding of the role of the vast Southern Ocean in climate change and biogeochemistry.

ARP: The CLIVAR Atlantic Region Panel has been involved with the newly funded European project AtlantOS, that brings together scientists, stakeholders and industry from around the Atlantic to provide a multinational framework for more and better-coordinated efforts in observing, understanding and predicting the Atlantic Ocean. It will also continue to recognize the importance and urgency of resolving the tropical Atlantic bias issue, and will interact with the CLIVAR EBUS Research Focus in a concerted effort within the CLIVAR Atlantic community to understand causes of the bias. In the Southeastern Atlantic region, the Atlantic Region Panel has helped in the setup of the Enhancing Prediction of Tropical Atlantic Climate and its Impacts (PREFACE) project that is now making good scientific progress with all observations made in that region.

PRP: In the Pacific region, the CLIVAR Pacific Region Panel has been discussing recently, among other things, how to better observe the Indonesian Throughflow (ITF) ocean current, which is of great importance to countries in that region. The panel, together with the IOC Sub-Commission for the Western Pacific (WESTPAC), will continue to engage regional partners with strong interest in monitoring the ITF. The panel has also been heavily involved in the planning of the Tropical Pacific Observing System (TPOS 2020) project that is being led in collaboration with the Ocean Observations Panel for Climate (OOPC). Observation activities in the upwelling regions of the Pacific off Peru and Chile are currently being planned by the panel. Significant interactions between the Panel and the CLIVAR ENSO Research Focus have taken place.

IORP: The CLIVAR/IOC-GOOS Indian Ocean Region Panel (IORP) has played an important role in the design of the International Indian Ocean Expedition-2 (IIOE-2), and implementation of the various associated activities will be a major focus for the panel in the coming years. In order to address multidisciplinary issues in the Indian Ocean (IO) region, a physical-biological interaction project named Eastern Indian Ocean Upwelling Research Initiative (EIOURI) has been jointly initiated by IORP and the Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) project, focusing on the upwelling system in the eastern IO and the climate impacts on the ecosystem and fisheries in that region.

OMDP: Fosters the development of ocean models for research in climate and related fields through the development of models and improved representation of ocean processes (parameterizations, resolution, numerics, addressing model biases) and the design and implementation of coordinated ocean-ice modelling studies and their analysis. The 2nd Session of the CLIVAR Ocean Model Development Panel (OMDP) was held on 14-16 January 2016 at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in Yokohama, Japan. The focus of the meeting was primarily on a detailed evaluation of the new Japanese Reanalysis (JRA-55) atmospheric product for forcing ocean – sea-ice climate models produced by the Japan Meteorological Agency (JMA). Presentations and discussions included technical aspects of the JRA-55 reanalysis, the JRA-55/OMDP collaborative evaluation that has been on-going since early 2015, reviews of applied and/or additional corrections; creation of a repeat-annual-cycle

7-6

forcing data set; and preliminary simulations forced with the JRA-55 data sets. An important goal of the meeting was to receive input from the wider ocean and climate modelling communities participating in the CORE-II and OMIP efforts. OMDP, jointly with two other CLIVAR panels (Pacific Region Panel and Climate Dynamics Panel) and the WESTPAC project on Air-Sea Interaction in the Kuroshio Extension and its Climate Impact (AIKEC), organised the “CLIVAR/JAMSTEC Workshop on the Kuroshio Current and Extension System: Theory, Observations, and Ocean Climate Modelling”, held in Yokohama, Japan, on January 12-13, 2016 (<http://www.clivar.org/omdp/kuroshio>). The workshop was hosted by JAMSTEC. The main objective of the workshop was to assess the state-of-science of the theory, observations, and ocean climate modelling of the Kuroshio Current and Extension systems in the North Pacific Ocean. A special issue of *CLIVAR Exchanges* is in preparation and should be available from July 2016.

Climate Dynamics Panel: The newly established panel is in the process of finalising a science and implementation plan of its activities for the coming years. The panel will foster and coordinate international research efforts to increase understanding of the dynamical processes that control circulation variability and change in the atmosphere and ocean on synoptic to centennial time scales. The focus is on large-scale phenomena, processes, and mechanisms of coupled climate variability/modes, teleconnections and change on seasonal to centennial time-scales, in particular i) storm tracks, jet streams and weather systems, ii) tropical-extratropical interactions, and iii) long-term coupled atmosphere-ocean circulation.

ENSO: The 4th CLIVAR workshop on the evaluation of El Niño/Southern Oscillation (ENSO) processes in climate models was held at Sorbonne-Universités in Paris in July 2015, in conjunction with the UNESCO “Our Common Future Under Climate Change” conference. The workshop hosted by IPSL and attended by 50 experts (including 12 early-career scientists) was organized by the CLIVAR Research Focus on “ENSO in a changing climate.” The workshop built upon a February 2015 workshop in Sydney, Australia, which focused on ENSO diversity and extremes. It also entrained members of the U.S. CLIVAR working group on ENSO diversity, which has focused attention on understanding the substantial inter-event differences in ENSO mechanisms and impacts. Presentations highlighted ENSO mechanisms, the role of intraseasonal variability, climate change and decadal variability, modeling and prediction, and historical and paleo observations. Discussion sessions focused on model evaluation and metrics, and on envisioning future observations as part of the Tropical Pacific Observing System 2020 (TPOS 2020) initiative.

EBUS: The Eastern Boundary Upwelling Systems Research Focus had a planning meeting in Ankara, Turkey on 2-3 October 2015 to discuss and finalise their science and implementation plan. The focus of the RF activities will be to re-visit the physical and biological science of EBUS, to develop research recommendations for synergistic activities between the modelling and observational communities, and to improve the quantification of potential impacts of climate change on the marine ecosystem and the consequences on their dependent societies. Members of the RF also contributed as lecturers in the ICTP - CLIVAR School on Ocean Climate Modelling: Physical and Biogeochemical Dynamics of Semi-Enclosed Seas, which was organised just before the RF planning meeting in Turkey. IMBER and SOLAS will also have a strong collaboration to

the RF.

DCVP: The CLIVAR Decadal Climate Variability and Predictability RF organised the CLIVAR-ICTP International Workshop on Decadal Climate Variability and Predictability: Challenge and Opportunity, in Trieste, Italy, on 16-20 November 2016, and it is in the process of publishing the meeting summary, together with a special issue of *CLIVAR Exchanges*. In association with the workshop, DCVP hosted its kick-off meeting in order to address the “obstacles to progress”, and identify cross-CLIVAR linkages and implementation, and relationship and interaction with the WCRP GC on Near Term Prediction, relevant CMIP 6 MIPS, and partner projects e.g., CliC, SPARC, GEWEX, and PAGES. The RF Science and Implementation plan has been approved by the CLIVAR SSG.

CONCEPT-HEAT: The overall goal of the "Consistency between planetary energy balance and ocean heat storage" Research Focus is to bring together several climate research communities all concerned with the energy flows in the Earth's System to advance on the understanding of the uncertainties through budget constraints. The RF organised its first workshop at the UK MetOffice on 29 September to 1 October 2015. During the workshop, there were presentations and discussions of new scientific results under four different main CONCEPT-HEAT topics: the Earth's energy budget, energy flows as estimated from reanalyses and climate models, air-sea fluxes, and ocean heat content and atmospheric radiation. A *Nature Climate Change* article has been published by members of the RF, setting out the main science topics to be pursued.

WCRP and CLIVAR look forward to exploring possible collaborations in ocean-related activities in the future. Please contact Mike Sparrow (WCRP - msparrow@wmo.int) or Nico Caltabiano (CLIVAR - nico.caltabiano@clivar.org) to discuss this further.

7.1.2 Scientific Committee on Antarctic Research (SCAR)

Brussaard

30 June 2016



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). Below are a few of those activities. Please see www.scar.org for further details.

1. 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 SOOS report to SCOR for details).

7-8

2. Southern Ocean Acidification Report

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 launched at the SCAR Open Science Conference in Kuala Lumpur, Malaysia on 23 August.

3. 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>.

A new version is in the works that would include data south of 50°S latitude, however funding needs to be secured for this to progress to a full new version.

4. 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.

5. 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.

6. Birds and Marine Mammals

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

The Retrospective Analysis of Antarctic Tracking Data (RAATD) has also progressed significantly through the publication of a paper on multi species tracking data over the last two decades. This study developed global and regional habitat usage maps for key species based on physical and biological attributes of their "hot-spots" and overlaid species-specific maps to identify multi-species areas of ecological significance. This new approach identified regions that are important to multiple species, and therefore provides a much better understanding of the regions and processes that require monitoring and management in the future.

The RAATD project has taken a big step forward recently. A team of data crunchers and modellers met at a joint meeting of several SCAR Expert Groups in Brussels to compile and standardise the datasets on the one hand, and to start processing them and choose modelling options on the other. The meeting was hosted by the Belgian Science Policy Office in Brussels and was extremely successful: the project now has more than two million lines of data points from more than 2000 individuals from 14 species of top predators covering almost all the Southern Ocean. The detailed report can be found here:

http://www.scar.org/scar_media/documents/science/egbamm/RAATD_Brussels_workshop_v2.docx

7. Antarctic Climate in the 21st Century

Nancy Bertler <Nancy.Bertler@vuw.ac.nz> and Thomas Bracegridle <<mailto:tjbra@bas.ac.uk>>

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.

AntClim21 now has strong links with a major NSF-sponsored project called SOCCOM (Southern

7-10

Ocean Carbon and Climate Observations and Modeling) through one of the Steering Committee members Joellen Russell. This has helped solidify plans for providing an AntClim21 contribution to community climate model evaluation diagnostics (www.esmvaltool.org) for the next major climate model inter-comparison dataset (cmip6). This model dataset will feed into the next round of IPCC reports, therefore this is potentially a high-impact contribution to the global climate modelling community.

An update on activities over the past 4 years, as well as future plans can be found here:

https://www.dropbox.com/s/b912q5g0rcl55s/2016_AntClim21_External_Review_Report_FINAL.pdf?dl=0

8. State of the Antarctic Ecosystem

Jan Strugnell <J.Strugnell@latrobe.edu.au> and Huw Griffiths <hjg@bas.ac.uk>

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.

An update on activities over the past 4 years, as well as future plans can be found here:

https://www.dropbox.com/s/gm80c935fbhg34d/2016_AntEco_External_Review_Report_FINAL.pdf?dl=0

9. 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.

An update on activities over the past 4 years, as well as future plans can be found here:
https://www.dropbox.com/s/iln95crk848uysx/2016_AnTERA_External_Review_Report_FINAL.pdf?dl=0

10. 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 was launched at the last SCAR Meeting and Open Science Conference (Auckland, New Zealand August 25-28th 2014) and is available online via <http://atlas.biodiversity.aq>, or to purchase at: <http://www.amazon.co.uk/gp/product/0948277289>. Plans are underway to create an interactive and updated web application with these data.

11. The SCAR Antarctic Science Horizon Scan and Antarctic Roadmap Challenges

Chuck Kennicutt <mckennicutt@gmail.com>

The 1st SCAR Antarctic and Southern Ocean Science Horizon Scan assembled some of the world's leading Antarctic scientists, policy makers, leaders, and visionaries to identify the most important scientific questions that will or should be addressed by research in and from the southern polar region over the next two decades. The Scan outcomes will assist in aligning international programmes, projects and resources to effectively facilitate Antarctic and Southern Ocean science in the coming years. The outcomes have so far been published in the journals [Nature](#) and [Antarctic Science](#).

Many national Antarctic programmes are now developing their own strategies on how they will deliver their science programmes in the future. Delivery of such a "roadmap" is not without its challenges. Therefore, with SCAR's assistance, the Council of Managers of Antarctic National Programs (COMNAP) lead a second stage in the process with the Antarctic Roadmap Challenges

7-12

(ARC) Project (<https://www.comnap.aq/Projects/SitePages/ARC.aspx>) in order to assist national Antarctic programmes to understand, and develop ways to address the challenges, and share any innovation or access to such technology. The ARC project focused on answering the question: "How will national Antarctic programmes meet the challenges of delivery of their Antarctic science in the next 20 years and beyond?"

The ARC report and summary can be found here:

<https://www.comnap.aq/Projects/SitePages/ARC.aspx>

12. Antarctic Nearshore Terrestrial Observing System (ANTOS)

Craig Cary <<mailto:caryc@waikato.ac.nz>>

[Antarctic Near-Shore and Terrestrial Observation System \(ANTOS\)](#) is a SCAR Action Group, established in August 2014. It is a biologically focussed initiative to coordinate a cross continent- and cross national programme-scale assessment of environmental variability and change. A major aim is to foster and facilitate collection and sharing of long-term automated climate and associated environmental observations across Antarctica and national programmes. In August 2015, a workshop was held to develop an implementation plan for ANTOS. The workshop was attended by 25 researchers from 12 countries (Australia, Belgium, Chile, France, Germany, Italy, Japan, Korea, NZ, Sweden, UK, USA). [The report from this workshop is now available.](#)

At this workshop key characteristics of locations, parameters to measure, frequencies, scales and gradients of measurement, and the technical requirements of the system were discussed (i.e., what do we need to measure and monitor in order to detect change, where do we need to do this, and how?). The strong consensus was for locations that share basic characteristics of (a) representative biodiversity for the region concerned, (b) environmental features likely to be informative in a context of change studies, and (c) the practicality of access and working conditions. A 3-tiered approach both to platform complexity and cost was recommended, to enable wide national programme involvement and achievement of the scientific goals. At all tiers, biologically relevant attributes of change need to be assessed within six broad criteria (physical environment, colonisation, diversity, distribution, functional and genetic). ANTOS installations will use a suite of agreed methodologies to enable robust cross-programme and continent-wide comparisons of information. An ANTOS database will be designed and established to allow easy access to the real-time data that is intimately linked with existing databases and follows internationally accepted protocols.

The strength of ANTOS is its (i) unification of researchers over the necessity for, and the extreme value of, a long-term vision for observation systems to understand biological systems in a changing environment, and (ii) the comprehensive continent-wide approach. The value of this information in informing policy and management of the region at national and international levels cannot be understated.

13. The Monaco Assessment

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In June 2015, SCAR, in partnership with the government of the Principality of Monaco, and several other supporters, held a meeting of biodiversity, legal and policy experts to assess Antarctic and Southern Ocean biodiversity and its conservation status in the context of the Strategic Plan on Biodiversity 2011 to 2020. To date, Antarctica and the Southern Ocean have not been adequately represented in associated global biodiversity assessments. The meeting considered the current status of biodiversity conservation in Antarctica and the Southern Ocean, available evidence for this status, and both their trajectory and evidence for this trajectory, in the context of each of the 20 Aichi Targets of the Strategic Plan on Biodiversity 2011 to 2020. The meeting recognized that for some areas of conservation, in the context of these Aichi Targets, Antarctica and the Southern Ocean are in a leading position globally. The meeting also recognized that some of the Aichi Targets provide no applicable context for conservation in the Antarctic region. The meeting concluded that it is essential to ensure that Antarctica and the Southern Ocean are fully represented when a report on the state of global biodiversity is presented at the end of the decade.

For more information on the assessment visit: <http://www.scar.org/monaco-assessment> or [download the paper](#) submitted to the Antarctic Treaty summarizing the outcomes.

14. CLIVAR/CLiC/SCAR Southern Ocean Region Panel

Inga Smith <<mailto:inga.smith@otago.ac.nz>> and John Fyfe <<mailto:john.fyfe@canada.ca>>

The SORP has been very active since its last panel meeting in September 2015 (<http://www.clivar.org/sites/default/files/documents/Report%2010th%20SORP%20meeting.pdf>); with extensive participation in international research coordination and collaboration with several relevant programs, including the Southern Ocean Observing System (SOOS), the Ocean Observations Panel for Climate (OOCPI), the Polar Prediction Project (PPP) and the Polar Climate Predictability Initiative. The panel has a new co-chair (Inga Smith) and one new member (Riccardo Farneti).

The SORP has organized sessions at several international conferences including the upcoming SCAR 2016 Open Science Conference (Kuala Lumpur, Malaysia; August 2016) and the CLIVAR Open Science Conference (Qingdao, China; September 2016); and is also co-sponsoring a Townhall meeting on “Ocean-Cryosphere Interactions” at the CLIVAR Open Science Conference. The panel is presently helping to organize a Polar Prediction Workshop in Bremerhaven, Germany (March 2017) co-sponsored by the Polar Climate Predictability Initiative (WCRP-PCPI), the Polar Prediction Project (WWRP-PPP), and the Sea Ice Prediction Network (ARCUS-SIPN). Over the past six months the panel was represented at several international workshops, including the US Polar Research Board Antarctic Sea-Ice workshop in Boulder Colorado (John Fyfe and Lynne Talley; January, 2016), the Ozone and Climate Project (OCP) workshop in Boston Massachusetts (John Fyfe; June 2016) and the International Workshop on Coupled Modeling of Polar Environments in Columbus, Ohio (François Massonnet and Ben Galton-Fenzi; June 2016). The SORP has developed a template to maximize input from national

7-14

reports, and has strengthened coordination of national representatives between SOOS and SORP (Inga Smith). The SORP has been actively promoting and strengthening ties with SOOS (Lynne Tally).

The SORP has reported out to several sponsoring and related organizations such as SOOS (Lynne Tally; San Diego, May 2016), the Ocean Observations Panel for Climate (OOCIP; Katsuro Katsumata; Esporles, Majorca, April 2016); May 2016), the Polar Prediction Project (PPP) Steering Group (François Massonnet) and the CliC Scientific Steering Group (Kenny Matsuoka, February 2016, Copenhagen).

15. Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED)

<http://www.iced.ac.uk/> or contact Rachel Cavanagh <<mailto:iced@bas.ac.uk>>

ICED is an international multidisciplinary programme launched in response to the increasing need to develop integrated circumpolar analyses of Southern Ocean climate and ecosystem dynamics. ICED has been developed in conjunction with SCAR, the Scientific Committee on Oceanic Research (SCOR) and the International Geosphere-Biosphere Programme (IGBP), through joint support from the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) and Global Ocean Ecosystem Dynamics (GLOBEC) programmes. The ICED vision is to develop a coordinated circumpolar approach to better understand climate interactions in the Southern Ocean, the implications for ecosystem dynamics, the impacts on biogeochemical cycles, and the development of sustainable management procedures.

16. Antarctic Sea Ice Underway Observation Platform v2

<http://aspect.antarctica.gov.au/> or contact Petra Heil <<mailto:petra.heil@utas.edu.au>>

The Antarctic Sea Ice Process and Climate (ASPeCt) digital underway ice observation method, v.2, has been launched. Voyages from October 2015 - March 2016 have uploaded near-real time data, pending networking from vessel to central server, and automatic cameras were implemented on some research cruises to take images that currently supplement ASPeCt visual observations. Ships going to the Antarctic are encouraged to participate in data collection.

17. Celebrating Women in Antarctic Research Wikibomb

Jan Strugnell <<mailto:J.Strugnell@latrobe.edu.au>>

From the viewpoint of the present day it is difficult to imagine how Antarctic science and gender was viewed even only a generation ago. Many countries explicitly prohibited women working in Antarctica until relatively recently. The first dedicated male scientists to work in Antarctica were aboard the Belgica during the Gerlache expedition in 1898. It would be over half a century before the first woman scientist arrived in Antarctica, the Soviet marine geologist Maria Klenova, in 1956. Female scientists from other nations followed in the decade after. Despite their late arrival, the rise and impact of Antarctic women scientists has been rapid. For example, the director of both the British Antarctic Survey and the Alfred Wegener Institute are both women.

A key point for the future of science is that demographics are changing dramatically. Around 55% of polar early career researchers are women. It is essential that we celebrate our influential female Antarctic researchers in order to provide early-career female scientists with visible role models and for their male colleagues to better understand the contributions of these scientists to a once-biased field.

In order to achieve this we have organised a 'Wikibomb', where Wikipedia pages of influential Antarctic women scientist are being created. We called on the Antarctic scientific community for nominations and received 170 nominations from 30 countries. A team of volunteers, primarily female early career researchers, have been developing Wikipedia pages with over 60 on-line and counting (prepared 63 new Wikipedia pages to date). These profiles will be highlighted and celebrated at an event at the Scientific Committee on Antarctic Conference in Malaysia on 23 August, 2016. For more information, see <http://www.scar.org/outreach/women>.

18. Upcoming Conferences

- ***XXXIV SCAR Meetings and Open Science Conference***. 19-31 August 2016, Kuala Lumpur, Malaysia. The SCAR Open Science Conference will be held on 25-29 August. See: <http://scar2016.com>
- ***2017 SCAR Biology Symposium***. 10-14 July 2017, Leuven, Belgium.
- ***POLAR2018, including the XXXV SCAR Delegates Meetings***. 15-27 June 2018, Davos, Switzerland. The conference will cover both Polar Regions, being organized jointly by SCAR and the International Arctic Science Committee (IASC). <http://www.polar2018.org/>

19. SCAR Fellowships and Prizes

In order to expand capacity within all its Members, SCAR runs several Fellowship and Prize Schemes (<http://www.scar.org/awards>):

- ***SCAR/COMNAP Fellowships*** focus on early career researchers and aim to build new connections and further strengthen international capacity and cooperation in Antarctic research. The fellowships are advertised in tandem with the [CCAMLR Scholarships](#). In 2015 four SCAR fellowships, including the new Prince Albert II of Monaco Biodiversity Fellowship and one SCAR/COMNAP fellowship were awarded. A mini-symposium to highlight the SCAR/COMNAP fellowships will be held during the 2016 SCAR Open Science Conference. <http://www.scar.org/awards/fellowships>
- ***SCAR Visiting Professor Scheme*** provides mid- to late-career scientists the opportunity to undertake short-term visits to a facility in, or operated by, SCAR member countries, to provide training and mentoring. Two Visiting Professorships were awarded in 2015. <http://www.scar.org/awards/visitingprofs>

7-16

- *Tinker-Muse Prize for Science and Policy in Antarctica*, facilitated by SCAR, is a USD \$100,000 unrestricted award presented to an individual in the fields of Antarctic science or policy. Dr. Valérie Masson-Delmotte was awarded the 2015 Tinker-Muse Prize for her work on the characterization, quantification and understanding of past changes in climate and water cycle, translating the isotopic data to paleo-temperature records.
www.museprize.org

SCAR would welcome SCOR's interest in a joint fellowship to support Southern Ocean activities.

20. Staff Changes

In May 2015, Mike Sparrow also left SCAR to take on a position with the Joint Planning Staff of the World Climate Research Programme. Dr. Jenny Baeseman replaced Mike in July 2016. She is the first non-UK resident and first female to hold the position since the creation of SCAR in 1958.

21. Future SCAR/SCOR Collaborations

SCAR looks forward to continuing our mutual activities and welcomes suggestions from SCOR on new joint ventures.

7.1.3 Future Earth Initiative

Burkill

7.1.4 Belmont Forum

The Belmont Forum has awardees and stakeholders participating in 48 multi-national projects, from more than 30 countries. Applicants to the Belmont Forum represent a broad swath of organizations invested in global environmental change sciences, including academia, industry, government laboratories and institutes, military, NGOs, non-profits, and hybrid organizations. Awards to date account for more than 100 million euros and promote networking activities for capacity building, synthesis efforts, and research projects. Projects are encouraged to leverage available data, infrastructure, and expertise.

The Belmont Forum currently has 21 members from 6 continents. The Belmont Forum also has four partners providing further reach into international science funding and governance. The Belmont Forum has made awards in seven thematic areas: Freshwater Security, Coastal Vulnerability, Food Security, Biodiversity, Arctic Observing and Science for Sustainability, Mountains as Sentinels of Change, and Climate Predictability. On the governance front, the Belmont Forum is on the governing council for Future Earth and a member of the S&T Alliance.

7.2 Affiliated Organizations

7.2.1 International Association for Biological Oceanography (IABO)

Miloslavich

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

IABO General Assembly

The next IABO General Assembly will be held in conjunction with the 4th World Conference in Marine Biodiversity (WCMB) in Montreal in May 2018 (Table 1).

Table 1. Statistics on the WCMB.

	Location	Dates	Delegates	Talks	Posters
1 st	Valencia, Spain	11-15 November 2008	600	200	160
2 nd	Aberdeen, Scotland	26-30 September 2011	800	500	400
3 rd	Qingdao, China	12-16 October 2014	480	154	89
4 th	Montreal, Canada	May 2018			

The Canadian Healthy Oceans Network (CHONe), in collaboration the Department of Fisheries and Oceans Canada, Ocean Network Canada and other networks of Canadian marine scientists will host the 4th World Conference on Marine Biodiversity in Montréal, Canada from May 19-23, 2018. The theme for this conference will be “*Connecting with the living ocean*”, emphasizing the connection between all segments of society and the ocean’s biodiversity. In addition, the participation of the secretariats of the Convention on Biodiversity and the Convention on Migratory Species in the planning of the conference program will ensure a strong connection with the marine policy sector, and bring policy makers in direct contact with the latest developments in marine biodiversity research in interdisciplinary sessions and workshops.

Furthermore, during the next few months a call for nominations will be issued for the Carlo Heip Memorial Medal. Carlo Heip was an inspiring leader for marine biodiversity science and was responsible for very important initiatives that brought together the European scientists in this field. He also had a key role in initiatives at the global level. In his memory, IABO in collaboration with the 4th WCMB will establish a Carlo Heip Memorial Medal. This Award will honor the leadership of a researcher in the field of marine biodiversity. An international jury will be made to evaluate the candidacies. The Award will be delivered during the 4th WCMB that will be held in May 20-23, 2018, in Montréal’s spacious Palais des congrès (<http://wcmb2018.org/>).

Philippe Archambault
Chair of the 4th WCMB

7-18

The present committee (with country and affiliations) of

- David Paterson (Scotland, convener WCMB II)
- Patricia Miloslavich (Venezuela)
- Annelies Pierrot (Past-President, Netherlands)
- Michael Thorndyke (Sweden)
- Sun Song (China, convener WCMB III, SCOR Vice-chair)
- Mark Costello (President, New Zealand, WoRMS, GEO BON)
- Eulogio Soto (Chile)
- Tina Molodtsova (Russia)
- Isabel Sousa Pinto (Portugal) (IPBES, GEO BON)
- Suchana Apple Chavanich (Thailand, IOC/WESTPAC)
- Prof Siew Phang Moi (Malaysia)
- Philippe Archambault (Canada, 4th WCMB convener)

Other activities

IABO published a short note in the newsletter *Deep-Sea Life* Issue 4, November 2014:

The International Association for Biological Oceanography (IABO) Executive Committee met on 15 October 2014 at the World Conference of Marine Biodiversity in Qingdao, China. Ten delegates from developing countries (Sanna Durgappa (India); Girish Beedessee, Nadeem Nazurally (Mauritius); Mhairi Alexander, Tammy (Tamara) Robinson (South Africa); Fernando A. Zapata (Colombia); Joel Kareithi Gatagwu (Kenya); Olesia Vishchuk (Russia); Hoang Dinh Chieu (Vietnam); Junior Vitor (Peru)) received travel grants from SCOR to attend WCMB 2014 as this was the IABO General Assembly. A call for new committee members resulted in six new members. Thus, the present committee of David Paterson (Scotland, convener WCMB II), Patricia Miloslavich (Venezuela), Annelies Pierrot (Past-President, Netherlands); Michael Thorndyke (Sweden), Sun Song (China, convener WCMB III, SCOR Vice-chair), Mark Costello (President, New Zealand, WoRMS, GEO BON) is joined by Eulogio Soto (Chile), Tina Molodtsova (Russia), Isabel Sousa Pinto (Portugal) (IPBES, GEO BON), Suchana Apple Chavanich (Thailand, IOC/WESTPAC), Siew Phang Moi (Malaysia), Philippe Archambault (Canada, the next WCMB convener). The International Association for Biological Oceanography is a constituent Section of the International Union of Biological Sciences. The objects of the Association are to promote the advancement of knowledge of the biology of the sea, by providing opportunities for communication between marine biologists and co-operating with organizations and individuals with similar aims and interests. Further information about IABO and reports of the IABO Executive Committee can be found at <http://www.iabo.org/>

ICSU

IABO's nominee, Dr Annelies Pierrot, was selected to the ICSU ad hoc panel for the review of SCAR and SCOR.

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 is the official email network of the International Association for Biological Oceanography www.iabo.org and for communication related to marine biodiversity research. Emails are archived at <https://listserv.heanet.ie/marine-b.html>. To join send message "SUBSCRIBE MARINE-B firstname surname" to listserv@listserv.heanet.ie.

7.2.2 International Association for Meteorology and Atmospheric Sciences (IAMAS)

Turner



The International Association of Meteorology and Atmospheric Sciences 2016 Report to SCOR (www.IAMAS.org)

IAMAS is one of the eight associations dealing with the Earth system and its environs that make up the International Union of Geodesy and Geophysics (IUGG). The scope of IAMAS includes the atmospheres of the Earth and other planets. IAMAS is made up of ten international commissions and one committee that play a major role in implementing IAMAS's activities. The ten commissions cover *Atmospheric Chemistry and Global Pollution* (ICACGP), *Atmospheric Electricity* (ICAE), *Climate* (ICCL), *Clouds and Precipitation* (ICCP), *Dynamical Meteorology* (ICDM), the *Middle Atmosphere* (ICMA), *stratospheric Ozone* (IOC), *Planetary Atmospheres and their Evolution* (ICPAE), *Polar Meteorology* (ICPM), and *atmospheric Radiation* (IRC). The *Committee on Nucleation and Atmospheric Aerosols* (CNAA) brings together scientists covering the areas of Nucleation Theory and Experiment, Tropospheric and stratospheric aerosols, Cloud Drop and Ice Nucleation and Aerosol-Climate Interactions.

Many of these commissions play international leadership roles in their specialist areas [see www.iamas.org/Commissions.html]. The commissions provide an important supplement and extension to the leadership and research role of the *World Meteorological Organization* (WMO), which is the governmental body with a comparable scientific scope to IAMAS.

The current Bureau of IAMAS elected in Prague in 2015 consists of:

- President - John Turner (UK)
- Secretary General – Teruyuki Nakajima (Japan)
- Vice President – Joyce Penner (USA)

7-20

- Vice President – Laura Gallardo Klenner (Chile)
- Deputy Secretary General – Peter Pilewski (USA)
- Assistant Secretary General – Yoshi Sasaki (Japan)
- Assistant Secretary General - Nozomi Tomizawa (Japan)

The organization also has five Members at Large who promote IAMAS activities:

- Prof. Daren Lu (China) 2015-2019
- Prof. Colin Price (Israel) 2015-2019
- Dr. Lisa Alexander (Australia) 2015-2023
- Dr. Keith Alverson (USA/Kenya) 2015-2023
- Dr. Iracema Cavalcanti (Brazil) 2015-2023

a) The IAMAS Bureau met in Kyoto, Japan on 13-14 April 2016. The meeting focused on reviewing the financial status of the organization, considering the future direction in terms of award medals, engaging early career scientists and planning activities for the next couple of years.

b) The IAMAS Bureau and Executive have been heavily involved in the planning of the joint IAPSO-IAMAS-IAGA assembly, which will be held in Cape Town, South Africa on 27 August–1 September 2017. A conference web site is now available at <http://www.iapso-iamas-iaga2017.com> In May 2016, the IAMAS President, Secretary General and Assistant Secretary General attended a planning meeting for next year's assembly in Cape Town.

c) IAMAS has recently signed a Memorandum of Understanding with the journal *Advances in Atmospheric Sciences*, which is published by Springer. It is hoped that the arrangement will be beneficial to both parties, with IAMAS having a means to publish regular accounts of its meeting and conferences, and the journal benefitting through higher visibility via the IAMAS web site and assemblies. The arrangement is for an initial period of 4 years and will be reviewed at the IUGG assembly in Montreal, Canada in 2019.

d) The IAMAS web site was given a refresh in early 2016 and is now hosted in Japan. It can be accessed via www.iamas.org.

e) The IAMAS Information E-mail, which is published several times each year, was also re-designed in 2016. The current and past issues can be seen at <http://www.iamas.org/NewsLetters/>.

f) Each year the IAMAS commissions hold a number of high-profile conferences either alone or in conjunction with other organizations. Some recent and planned meetings are:

- IRS-2016, International Radiation Symposium, 17-22 April 2016, Auckland, NZ
- Workshop “Atmospheric Blocking” (ICDM), 6-8 April 2016, Reading, UK
- DLR Conference on Climate Change (ICCL, WMO, etc.), 5-7 April 2016, Cologne, Germany
- SPARC workshop “SHARP2016” (ICMA and IOC), 16-19 Feb. 2016, Berlin,

Germany

- The 6th HEPPA workshop (ICMA), 13-17 June 2016, Helsinki, Finland
- 17th ICCP conference (clouds and precipitation), 25-29 July 2016, Manchester, UK
- 41th COSPAR (ICMA) scientific assembly, 30 July – 7 August 2016, Istanbul, Turkey
- International Ozone Commission Quadrennial Ozone Symposium 2016, 4 – 9 September 2016, Edinburgh, United Kingdom

Further details on IAMAS meetings can be found at <http://www.iamas.org/meetings/>.

For more information on IAMAS please contact :

John Turner, President (jtu@bas.ac.uk)

Teruyuki Nakajima, Secretary General (terry-nkj@nifty.com)

*Submitted by John Turner, IUGG/IAMAS representative to SCOR
[14 June 2016]*

7.2.3 International Association for the Physical Sciences of the Ocean (IAPSO)

Smythe-Wright



International Association for the Physical Sciences of the Oceans (IAPSO)

<http://iapso.iugg.org>

INTRODUCTION

The primary goal of IAPSO is to ‘promote the study of scientific problems relating to the oceans and the interactions taking place at the sea floor, coastal, and atmospheric boundaries insofar as such research is conducted by the use of mathematics, physics, and chemistry’. It works mainly through 1) biennial scientific assemblies; 2) working groups; 3) commissions; 4) services and 5) website information. It particularly works to involve scientists and students from developing countries in 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/>.

7-22

ADMINISTRATION

The 2015-2019 Bureau of IAPSO comprises:

President:

Denise Smythe-Wright, (UK)

Past President:

Eugene Morozov, (Russia)

Secretary General:

Stefania Sparnocchia (Italy)

Treasurer:

Ken Ridgway (Australia)

The Executive Committee comprises the Bureau members and

Vice-Presidents:

Dr Isabelle Ansorge (South Africa)

Trevor McDougall (Australia)

Members:

Dr Agatha de Boer (Sweden)

Dr Hans van Haren (The Netherlands)

Prof Toshiyuki Hibiya (Japan)

Dr Christa von Hildebrandt-Andrade (USA and Puerto Rico)

Dr Chris Meinen (USA)

Dr Satheesh Chandra Shenoi (India)

The IAPSO office is located at the Institute of Marine Science of the National Research Council of Italy, Trieste and day-to-day business is managed by Secretary General (SG), Stefania Sparnocchia. The SG is responsible for the IAPSO website and in July, 2015 a new IAPSO page was created in the Facebook social network, with the aim of facilitating the spreading of information in the community (see <https://www.facebook.com/iapso.iugg.org>). Together with the President, the SG also prepares and distributes a 4-monthly Newsletter to IAPSO delegates and interested parties.

Financial management is presently split between Australia and Sweden. The previous Secretary General, Johan Rodhe, was co-opted to the IAPSO executive to assist the Treasurer, Ken Ridgway with day to day banking and facilitate a smooth transfer of funds from the IAPSO bank account in Sweden to a new account in Australia. The IAPSO Executive took the decision to operate in US dollars in the future; a new US dollar account has been opened in Australia and IAPSO finances will be consolidated there in the near future.

To date, there have been no formal IAPSO Executive business meetings in 2016 and none are planned for the remainder of the year. Business has been conducted by email and video conference where appropriate.

ACTIVITIES

2017 Assembly

The principal activity during 2016 was a planning meeting for the joint IAPSO-IAMAS- IAGA assembly in Cape Town 27 August - 1 September, 2017. The Presidents and SGs of the 3 organizations met in Cape Town in May and were introduced to the conference organisers and shown around the venue and attractions. A preliminary list of sessions was put together and this has been finalised during two video conferences. Details of the assembly can be found at <http://www.iapso-iamas-iaga2017.com>.

SCOR Administration

IAPSO has maintained its formal relations with SCOR during the year. It has been involved in the evaluation of the 2016 Working Group proposal to be funded by SCOR in the next years. President, Denise Smythe-Wright participated in the SCOR General Meeting in Goa India, 6-9 December 2015 where decisions about the 2015 Working Group proposals were made.

Co-funding SCOR proposals

In the past IAPSO has co-funded a number of SCOR working groups and in 2015 there was an offer on the table to fund WG145, but this had not been taken up. Following the General Meeting in Goa, the IAPSO executive made the decision to withdraw this offer as WG145 was already more than half way through its term and did not appear to require the funding at this stage. An offer of a one off payment was made to assist in the setting up of the website detailed in the WG 145 proposal, but to date there has been no request from the WG chair to do this and it would appear that the development of the website is still pending.

It had been the IAPSO expectation that members of any WG co-funded by them would arrange a session at one of the IUGG assemblies, but this has not been the case recently. Since SCOR policy prevents any offer of funding being bound by conditions, the IAPSO Executive are now rethinking how they will co-fund SCOR WGs in the future. It is unlikely that there will be an offer of co-funding for the 2016 round of proposals as those aligned to IAPSO objectives are not of sufficient quality.

G7 initiative

In November 2015, the Secretary General of IUGG, Alik Ismail-Zadeh, requested the President of IAPSO, Dr Denise Smythe-Wright to instigate an initiative in response to the marine science issues raised by the G7 Science Ministers in the communiqué arising from their meeting in October 2015. The G7 countries have outstanding oceanographic capabilities and are well-placed not only to continue to provide world leadership in marine environmental research, but also to use the research outcomes for their wider socio-economic benefit. Realising that this was not just an IAPSO initiative, she approached Professor Peter Burkill, President of SCOR and together they mustered fourteen international experts to address the following issues:

- Marine Litter
- Ocean Acidification
- Biodiversity Loss

7-24

- Deoxygenation
- Ocean Warming
- Ecosystem degradation
- Deepsea mining

The resulting report - *Future of the Ocean and its Seas: a non-governmental scientific perspective on seven marine research issues of G7 interest*, was completed in April 2016 and submitted to the Science Ministers prior to their meeting in Japan, May 2016. A copy of the report can be found at <http://www.icsu.org/news-centre/news/pdf/Report%20to%20G7%20SMins%20on%20FOSs.pdf>

At their meeting in Tsukuba the Science Ministers proposed a way forward and the lead for this has been taken by the UK Department of Business Innovation and Skills (UK BIS) working with the UK National Oceanography Centre. The focus of future work will be on observations and while IAPSO-SCOR are not formally part of this initiative the President of IAPSO has been working with UK BIS to ensure that IAPSO-SCOR input continues. For further details see the G7 Tsukuba communiqué which can be found at http://www8.cao.go.jp/cstp/english/others/communique_en.html

IAPSO sponsored activities:

- Commission on Mean Sea Level and Tides (CMSLT), President: Gary T. Mitchum. Vice-President: Simon Holgate. Website: www.psmsl.org/
- Permanent Service for Mean Sea Level, hosted by Proudman Oceanographic Laboratory, UK. Director: Dr. Lesley Rickards. IAPSO Liaison: Philip L. Woodworth. Website: www.psmsl.org/
- IAPSO Standard Seawater Service, hosted by OSIL, Havant, Hampshire, UK. Director: Paul, Ridout; Website www.osil.co.uk
- Joint Committee on the Properties of Seawater, JCS (with SCOR and IAPWS). Chair: Rich Pawlowicz. Vice-Chairs: Trevor McDougall, Rainer Feistel. Website: <http://www.teos-10.org/>
- IAPSO/IASPEI/IAVCEI Joint Tsunami Commission. Chair: Dr. Vasily V. Titov. IAPSO Representative: Efim Pelinovsky. Website: www.iaspei.org/commissions/JCT.html
- The working groups, commissions and services report to IAPSO. These reports are published on the IAPSO website <http://iapso.iugg.org/working-groups>

IAPSO Liaison Officers and IUGG Commission Correspondents:

The Liaison Officers and Correspondents to Commissions and Committees for 2015-2019 are as follows:

- UNESCO Intergovernmental Oceanographic Commission (IOC): Stefania Sparnocchia (Italy) and Eugene Morozov (Russia)
- ICSU Scientific Committee on Oceanic Research (SCOR): Denise Smythe-Wright (UK)
- ICSU Regional Office for Africa (ROA): Isabelle Ansong (South Africa)
- Climatic and Environmental Changes (CCEC): Harry Bryden (UK)

- Mathematical Geophysics (CMG): Adam Monaham (Canada)
- Geophysical Risk and Sustainability (GRC): Christa von Hillebrandt-Andrade (USA)
- Data and Information (UCDI): Ira Didenkulova (Estonia)
- Working Group on History (WGH): John Gould (UK)

Submitted by
Denise Smythe-Wright, IAPSO President
Stefania Sparnocchia, 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;

7-26

- 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)

Urban

2016 InterRidge Update for SCOR

Since its creation in the early nineties, InterRidge has been an international forum for mid-ocean ridge (MOR) scientists, expanded to other oceanic spreading centres and related processes. InterRidge promotes interdisciplinary studies by creating a global research community, planning and coordinating new science programmes that no single nation can achieve alone, exchanging scientific information, and sharing new technologies and facilities. InterRidge plays a dual role. Its primary aim is to favor the emergence of new concepts and makes possible ambitious experiments at international level. InterRidge also support the definition and dissemination of codes of conduct for scientific studies in relation to chemosynthetic hotspot ecosystems and their vulnerable environments. More recently, with the growing interest of countries and industries for deep-sea mineral resources, including seafloor massive sulfide (SMS) deposits at MOR, InterRidge has become the voice of expert scientists in different fora. Through its observer status at the International Seabed Authority, InterRidge particularly has formal links with the United Nations Environment Programme.

InterRidge scientific activities are currently led under the frame of the 3rd decadal plan 'From Ridge Crest to Deep-Ocean Trench: Formation and Evolution of the Oceanic Crust and Its Interaction with the Ocean, Biosphere, Climate and Human Society' launched in 2012. Beside its affiliation with SCOR, InterRidge program has links with international research programs such as the International Ocean Discovery Program and the International Lithosphere Project. InterRidge activity includes meetings and workshops where the advancement of scientific knowledge, new issues, methodological improvements and standardized protocols are discussed. InterRidge also dedicates itself to interact with the public, scientists and governments, and to provide a unified voice for ocean ridge researchers worldwide. An increasing role for InterRidge is our involvement in compiling information and advice for policy makers. The multidisciplinary coverage of InterRidge working groups give the organization a key role in future discussions concerning the exploration and exploitation of mineral resources associated with Ridges, volcanic arcs and back-arcs and associated hydrothermal systems.

InterRidge has a Steering Committee comprising representatives of the member countries and of working group chairs that are scientists nominated for their expertise in a particular field. The Steering Committee meets at least once a year (the last meeting was held in Hangzhou, China, on Sept. 25-27, 2015). The Steering committee considers updates to its Science Plan, endorses InterRidge membership, approves the InterRidge budget, decides on membership fees, oversees the operation of the InterRidge Office, reviews bids for the InterRidge Office and nominates the Program's chair. It also evaluates working group progress, assesses and admits/rejects working group proposals, and nominates the working group chairs.

The InterRidge contribution is 25 kUS\$ for a Principal Member country and 5 kUS\$ for a Regular Member country. Considering the present membership (China, France, Germany, UK and USA as Principal members and Japan, Canada, India, South Korea, Norway, Portugal, as

7-28

Regular members) and the double contribution for the host country, the resulting annual budget is c.a. 200 kUS\$. The recent reforms adopted by InterRidge Steering Committee in 2014 state that, on Principal Member contributions, 5 000 US\$ are used to operate the office and 20 000 US\$ for InterRidge activities.

Achievements and changes during the last year

Office rotation

The rotation of the office after the completion of the 4-year office coordination by China was discussed during the last Steering Committee in Hangzhou (China) on 28 September 2015. The proposal submitted by France, for the coordination of Jérôme Dymont (IPG Paris, CNRS, marine geophysics, chair) and Nadine Le Bris (Université Pierre et Marie Curie, Sorbonne Universités-CNRS, Marine ecology and marine environmental sciences, co-chair) was accepted unanimously of the present Steering committee members.

The InterRidge (IR) programme office has been hosted at Peking University, China until the end of 2015, under the responsibility of John Chen (IR Chair, marine geophysics) and Jiabiao Li (IR Co-Chair, marine geology). The office has been transitioning to France, since January 2016 but is still facing administrative issues delaying the establishment of an operational office. The budget and administration of the programme is placed under the responsibility of CNRS, and will be hosted at IPGP (Institut de Physique du Globe, Paris). The InterRidge web site, which had been running until June 30th, 2016 on the server at Peking University, is also in the process of being transferred at IPGP.

Scientific activities

In 2015, the main scientific networking activities of InterRidge have been organized around the Third Theoretical Institute on "Magmatic and Tectonic Processes and Seabed Resources at Mid-Ocean Ridges" that was organized by InterRidge in Hangzhou, China in September, 2015 and the 2nd InterRidge International Workshop on Circum-Antarctic Ridges (CARs), in Incheon, Republic of Korea, Oct 2015. Other activities in liaison with InterRidge have included the publication of an update of the IR Hydrothermal Vent Database [Beaulieu et al., 2015], the presentation of the Working Group Ecological Connectivity and Resilience to the Deep-sea Biology Symposium, Aveiro, Portugal in Sept. 2015 (see details below).

- *Third InterRidge Theoretical Institute September 2015.*

A Third Theoretical Institute on "Magmatic and Tectonic Processes and Seabed Resources at Mid-Ocean Ridges" was organized by the InterRidge office in Hangzhou, China on September 25-27, 2015. 30 oral talks and 38 posters have been presented in sessions defined according to the theoretical Third Decadal Plan : Theme I - Magmatic and Tectonic Processes and Theme 2 - Seabed Resources. (Conveners Dr. Jian Lin (WHOI, USA), Dr. Marcia Maia (CNRS, France), Dr. Nobukazu Seama (Kobe University, Japan), Dr. Jiabiao Li (China), Dr. Sergei Silantyev (Russia), Dr. Jerome Dymont (France)).

- *Update of the IR Hydrothermal Vent Database*

The InterRidge Vents Database (<http://vents-data.interridge.org/>) has been upgraded and revised with the addition of 94 new listings by Stace Beaulieu (stace@whoi.edu) in relation with the InterRidge Office. Most of these new listings were discovered in the past five years. There is now a total of 632 confirmed or inferred active vent fields in the database and the corresponding kml file for visualization in Google Earth (download at: <http://vents-data.interridge.org/maps>). New in Version 3.3 is a database record field to link to the Smithsonian Institution Global Volcanism Program volcano profile for those vent fields that are sub-features of these identified volcanic features.

- *2nd InterRidge International Workshop organized by the Circum-Antarctic Ridges (CARs) working group*, hosted by Korea Polar Research Institute, Incheon, Republic of Korea, Oct 12-15, 2015 (<https://ircar.kopri.re.kr/>)

The Working group is dedicated to Circum-Antarctic Ridges (CARs), defined as the mid-ocean ridges encircling the Antarctic Plate. CARs constitute one third of the global mid-ocean ridge system, and include the Pacific-Antarctic Ridge, Chile Ridge, Australian-Antarctic Ridge, Southeast Indian Ridge, Southwest Indian Ridge, and American-Antarctic Ridge. CARs are unique in that they exhibit shallow water depths, ultra-slow or intermediate spreading rates, and complex series of transform offsets compared to low-latitude ridges. Furthermore, since these ridges cover all major oceans with no continental barriers, we may be able to trace mantle flow between different oceanic domains, as well as the migration routes of hydrothermal vent animals between major oceans.

This workshop was the second event organized by the dedicated InterRidge WG, after a first workshop in Toulouse (France) in 2011. It was covered by Sung-Hyun Park (Korea Polar Research Institute), Seung-Sep Kim (Chungnam National University, Korea), Anne Briaies (University of Toulouse, France), Jian Lin (Woods Hole Oceanographic Institution, USA), Charles Langmuir (Harvard University, USA), Nobukazu Seama (Kobe University, Japan), Chunhui Tao (Second Institute of Oceanography, China). 30 talks and 12 posters were presented in 3 sessions I: Tectonics and Geochemistry, II: Hydrothermal Systems and III: Life in Extreme Environments.

- *1st meeting of the Working Group Ecological Connectivity and Resilience at the 14th Deep-Sea Biology Symposium, Aveiro, Sept. 2015.*

Working group chairs Anna Metaxas (Dalhousie University, Canada) and Lauren Mullineaux (Woods Hole Oceanographic Institution, USA) have presented the WG at a dedicated meeting during the Deep-Sea Biology symposium (<http://dsbsoc.org/conferences-meetings/interridge-working-group-at-14th-dsb-symposium/>). The objectives of the open meeting were to refine the goals and the content of the papers to be produced, to identify task leaders, interested participants, their roles, and a timeline.

The ecological connectivity of vent communities, and their resilience in the face of disturbance, has been a hot topic of research ever since their discovery. This topic has become particularly

7-30

timely and societally relevant as plans for deep-sea mining progress toward implementation. It is also directly relevant to management decisions under consideration for recently designated deep Marine Protected Areas (MPAs), such as those on the Endeavour Segment, in the Marianas region, on the mid-Atlantic Ridge off the Azores, and in the Guaymas Basin and Eastern Pacific Rise. These topics were also identified in InterRidge's third decadal plan.

The objectives of the WG are to generate a synthesis of scientific data on vent community connectivity. The intent is to assemble a group of objective scientists with broad expertise in this field (including physical oceanography, larval biology, environmental geochemistry, microbial ecology, population genetics, metacommunity dynamics and biogeography) to assemble existing data, interpret it in the context of human disturbance, and disseminate it to the scientific community, the public, and policy makers. Part of this effort will be to identify and evaluate potential ecosystem services from vent communities. Use the data synthesis to identify gaps in our knowledge and facilitate international cooperation in future research in fields relevant to this topic. (for more information see our website: [www.interridge.org/Ecological Connectivity and Resilience](http://www.interridge.org/Ecological_Connectivity_and_Resilience))

Plans for future development of IR approved by the Steering committee

1) Build on experience to maintain and reinforce InterRidge as an efficient scientific forum

- build small task forces, the ***InterRidge Working Groups*** (or WGs)) that meet, brainstorm, and come with reports and plans. WGs usually interact with the interested community by organizing an ***InterRidge Workshop***. WGs should complete their task on a two or three year basis. The WG structure should be dynamic, with inactive WGs being stopped and new ones created. To do so, we will initiate reflections and discussions within the steering committee and a call to the community.
- promote the involvement of young scientists in ridge research through the ***InterRidge Fellowships*** (as well as the ISA fellowships offered through InterRidge) and the ***InterRidge Cruise Bursaries***. In addition, young scientists should be offered travel grants to attend InterRidge Workshops, workshop budget permitting. Despite its limited financial resources, InterRidge should do its best to develop and facilitate these actions.
- pursue development and advertisement of the ***InterRidge Vent Database***, include portals toward other external databases of interest for ridge scientists (including, for instance, regional oceanography).
- disseminate MOR and Arc-Back Arc (ABA)-related information through regular e-mail (***InterRidge newsletters***), the annual ***InterRidge News***, and workshop reports within the InterRidge community and beyond its own field (e.g., physical and biogeochemical oceanography, paleoceanography, geobiology, deep-sea ecology).

2) Develop bridges between the scientific community and the society

- **A scientific voice to international/national agencies, policy makers, etc.**

InterRidge has built a privileged relationship with the International Seabed Authority (ISA). It is affiliated to the Scientific Committee for Ocean Research (SCOR) and has developed specific

interactions through joint working groups and conferences. Through these specific relationships and new partnerships to be developed, InterRidge should be recognized as the voice of the scientific community, providing authoritative advices on societal topics such as environmental impacts of Seafloor Massive Sulfides exploration or exploitation.

The peculiar ecosystems found at MOR hydrothermal systems are important with respect to biodiversity, and several of such systems have been recognized as EBSA (Ecologically and Biologically Significant Areas) and are or may be later proposed as Marine Protected Areas (MPAs). InterRidge may provide decision-makers with the most accurate and recent knowledge and identify knowledge gaps to help considering the need for conservation and/or management with the necessary scientific exploration and provide relevant scientific information in the design and regulations of such MPAs.

- **Outreach**

Although InterRidge does not have the resource to produce its own outreach material - a task that would be hampered by the diversity of languages in which this material should be produced - the office can play a role in facilitating attempts by member countries or any third party to produce media material related to MOR and ABA (e.g., papers for the general press, movies, Web sites...).

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

Sun Song

IOCCG Annual Report to SCOR
Venetia Stuart (IOCCG Project Coordinator)

Reporting Period: June 2016 –July 2016

The International Ocean-Colour Co-ordinating Group (IOCCG) was established in 1996 to promote communication and co-operation between the space agencies and the ocean-colour user community. IOCCG is an Affiliated Program of SCOR, and an Associate member of CEOS (Committee on Earth Observation Satellites). The IOCCG has a wide-ranging mandate addressing technological and scientific issues through its scientific working groups and task forces, conducting intensive training courses in 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 IOCCG also hosts biennial International Ocean Colour Science (IOCS) meetings open to the entire ocean colour community. SCOR has been instrumental in helping the IOCCG secure funding from NASA for general IOCCG activities, as well as funding to host the IOCS meetings. Further information about ongoing IOCCG activities is given below. 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 Coordinator, Venetia Stuart.

1. IOCCG Scientific Working Groups

IOCCG scientific working groups are relatively short-lived (2-4 years) and investigate various aspects of ocean-colour radiometry and its applications, generally publishing an IOCCG report upon completion. There are currently five active IOCCG working groups in various stages of deliberation (see below). No new working groups were accepted this year, but several proposals will be reconsidered within a year or two, to allow time for the ocean colour community to advance their understanding of the various science and applications issues, and also for a body of literature on the subject to be amassed.

- 1) [Joint GEOHAB/IOCCG WG on Harmful Algal Blooms](#) (Chair: Stewart Bernard, CSIR, South Africa). This is a joint working group between the IOCCG and the 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 HAB scientific community. Case studies compare retrieval of the same organism in different locations, as well as ecologically disruptive blooms and various types of toxic blooms. The critical element in terms of retrieving phytoplankton functionality is atmospheric correction, especially at low biomass. The real value of ocean colour remote sensing lies in detecting high-biomass blooms. Sophisticated regional algorithms can only be used in high-biomass, Case-1 systems. The final report on the topic is currently about half complete. SCOR (GEOHAB) has offered to provide funding for a small workshop to prepare material for the outstanding chapters (including Sentinel-2 applications), which is gratefully acknowledged. A final draft report ready for review should be available by the end of this year. The writing meeting will likely take place in South Africa in August this year.
- 2) [Uncertainties in Ocean Colour Remote Sensing](#) (Chair: Frédéric Mélin, JRC, Italy). This working group is reviewing the methods for quantifying uncertainties for remote sensing reflectance and derived products, and is developing a set of recommendations for the various sources of uncertainty in ocean-colour applications. They will also outline procedures on how best to determine the uncertainties, and develop methods to routinely distribute the information.
- 3) [Intercomparison of Atmospheric Correction Algorithms Over Optically-Complex Waters](#) (Cédric Jamet, Wimereux, France). This working group aims to inter-compare and evaluate existing atmospheric correction algorithms over turbid waters to understand retrieval differences. The challenge is to understand the advantages and limitations of each algorithm and their performance under certain atmospheric and oceanic conditions. The group is examining 12 algorithms in 5 different categories to understand advantages and limitations of each, using three different databases (classic match-up, simulated dataset for sensitivity studies, and satellite images). They will provide recommendations for improving and selecting the optimal atmospheric correction scheme for various water types, along with the range of validity and limitations of each algorithm. The redaction of the report is scheduled for the end of the year.

- 4) **Earth Observations in Support of Global Water Quality Monitoring** (Chairs: Steven Greb, Wisconsin Dept. Natural Resources, USA, Arnold Dekker, CSIRO, Australia; Paul DiGiacomo, NOAA/NESDIS). This WG was established to help develop a strategic plan for incorporation of 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. The group has already produced a draft report, with most chapters nearly complete – the goal is to submit the final draft report to the IOCCG in time for the IOCCG Executive meeting in October. The report framework centers on three audiences with three different time scales. For the short time frame (0-1 year) the focus is on societal infrastructure and end users/managers (stewardship, how to get water quality products, real time monitoring etc.). For the mid-range (1-5 years) the focus is more on science and the sensors/satellite signal. For the long range the focus is on technical infrastructure assets and user support programs.
- 5) **Role of Ocean Colour in Biogeochemical, Ecosystem and Climate Modelling** (Chaired by Stephanie Dutkiewicz, MIT, USA). The goal of this WG is to facilitate a better dialogue between numerical modellers and ocean colour specialists. The group aims to synthesize current uses of ocean colour products by modellers and will address common questions and provide recommendations for continued and better use of ocean colour products by modellers in the future. The group held its first meeting in New Orleans (February 2016) to review the Terms of Reference and discuss the outline of the report. The report will address regional (coastal) and global (climate change) models, as well as data assimilation. The group plans to hold several meetings of opportunity, as well as a breakout session at IOCS-2017 before finalising the report in November 2017.

2.0 International Ocean Colour Science (IOCS) Meetings

Plans are underway for the third International Ocean Colour Science (IOCS) meeting, which will be convened by the IOCCG in partnership with, and thanks to sponsorship from, EUMETSAT, ESA, the European Commission and likely NASA. The meeting is scheduled to take place from 15-19 May 2017, in Lisbon, Portugal. Feedback from the first two IOCS meetings has been excellent, so the IOCCG has resolved to hold these meetings every two years, funding permitting. The synergy achieved between the ocean colour community and the various international space agencies has helped to collectively address common issues, and the breakout sessions have provided an excellent forum for discussion of new concepts and techniques.

3.0 Capacity Building

The IOCCG will be conducting the third Summer Lecture Series at the Laboratoire d'Océanographie de Villefranche (LOV, France) on 18–30 July 2016. This training course is dedicated to high-level training in bio-optics and ocean colour, and focusses specifically on current critical issues in ocean colour science. Once again, we received an overwhelming number of excellent and deserving applications (145 in total), making the selections process

7-34

extremely difficult, but 22 students hailing from 18 different countries were eventually nominated. SCOR has agreed to sponsor two of these students (from Brazil and Kenya), which is greatly appreciated. Sixteen prominent scientists will deliver a comprehensive program including lectures, discussions and hands-on tutorials. Because of the high demand for the course, all lectures will be video recorded once again and will be available for download from the IOCCG website after the training course, along with the PowerPoint presentations. The material from previous training courses has proven to be extremely useful as a teaching resource, and the files have been downloaded thousands of times by researchers from around the world.

4.0 Ocean-Colour Radiometry-Virtual Constellation

All IOCCG agencies contribute to the CEOS Ocean-Colour Radiometry-Virtual Constellation, a set of space and ground segment capabilities operating together in a coordinated manner, to meet a combined and common set of Earth Observation requirements. The individual satellites and ground segments belong to single agencies, but the Constellations effort provides a unique forum to increase mutual benefit among space and other environmental agencies in support of common interests. The Ocean Colour Radiometry-Virtual Constellation (OCR-VC) provides long time series of calibrated ocean colour radiances at key wavelength bands from measurements obtained from multiple satellites. OCR-VC activities include the establishment of an IOCCG Task Force for the Assessment of Ocean Colour Essential Climate Variables (ECVs) and another Task Force on Ocean Colour Satellite Sensor Calibration. All IOCCG agencies support some aspect of this virtual constellation, and are taking a leadership role in the activities.

5.0 Project Management and Coordination

The IOCCG Committee meets once each year to coordinate the activities of the group as a whole, discuss plans for the year ahead and review the progress of the various working groups. The Executive Committee also approves the budget for the coming year. The annual IOCCG-21 Committee meeting was hosted by NASA and NOAA, and took place in Santa Monica, USA (1-3 March 2016), the minutes of which are available on the IOCCG website at: <http://www.ioccg.org/reports/Minutes-21-FINAL.pdf>. The 22nd IOCCG Committee meeting is scheduled to take place from 7-9 February 2017 in Perth, Australia, hosted by CSIRO.

6.0 IOCCG Membership (2016)

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: the three members marked with an asterisk (*) are new members for 2016. The IOCCG Executive Committee consists of representatives from the sponsoring agencies.

Agyekum, Kwame*	-	University of Ghana, Ghana
Antoine, David (Past-Chair)	-	Curtin University, Australia
Bélanger, Simon	-	Université du Québec à Rimouski, Canada
Bergeron, Martin	-	Canadian Space Agency, Canada
Bernard, Stewart (Chairman)	-	University of Cape Town, South Africa
Bontempi, Paula	-	NASA HQ, USA

Boss, Emmanuel	-	University of Maine, USA
Chauhan, Prakash	-	ISRO, India
Dierssen, Heidi	-	University of Connecticut Avery Point, USA
DiGiacomo, Paul	-	NOAA, USA
Donlon, Craig*	-	ESA/ESRIN, Italy
Dowell, Mark	-	JRC, Italy
Dutkiewicz, Stephanie	-	Massachusetts Institute of Technology, USA
Escudier, Philippe	-	CNES, France
Franz, Bryan	-	NASA GSFC, USA
Hardman-Mountford, Nick	-	CSIRO, Perth, Australia
He, Xianqiang	-	Second Institute of Oceanography, China
Hirata, Taka	-	Hokkaido University, Japan
Kampel, Milton	-	INPE, Brazil
Kwiatkowska, Ewa	-	EUMETSAT, EU, Germany
Loisel, Hubert	-	Université du Littoral, France
Murakami, Hiroshi	-	JAXA EORC, Japan
Park, Youngje	-	KIOST, Korea
Ryu, Joo-Hyung	-	KIOST, Korea
Santoleri, Rosalia*	-	ISAC-CNR, Italy
Tyler, Andrew	-	University of Stirling, UK
Wilson, Cara	-	NOAA / NMFS, USA
Yoder, James	-	Woods Hole Oceanographic Institution, USA
Zibordi, Giuseppe	-	Joint Research Centre, EU, Italy

7.0 IOCCG Sponsors

The IOCCG is sponsored and supported by contributions from various national space agencies and other organisations listed below:

- Canadian Space Agency (CSA)
- Centre National d'Etudes Spatiales (CNES, France)
- Commonwealth Scientific and Industrial Research Organisation (CSIRO, Australia)
- Department of Fisheries and Oceans (Bedford Institute of Oceanography, Canada)
- European Space Agency (ESA)
- European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)
- National Institute for Space Research (INPE, Brazil)
- Indian Space Research Organisation (ISRO)
- Japan Aerospace Exploration Agency (JAXA), Joint Research Centre (JRC, EC)
- Korea Institute of Ocean Science and Technology (KIOST)
- National Aeronautics and Space Administration (NASA, USA)
- National Oceanic and Atmospheric Administration (NOAA, USA)
- Scientific Committee on Oceanic Research (SCOR)

7-36

The Bedford Institute of Oceanography (Canada) provides in-kind support, providing office space and informatics support, while SCOR provides infrastructure support and manages the NASA funds, as well as sponsors students from developing countries or countries with economies in transition to attend training courses or the IOCS meetings.

7.3.3 Global Alliance of CPR Surveys (GACS)

Burkill

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

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There has been no meeting of GACS since our last report to SCOR (GACS meetings are held in September of each year); however, there has still been a significant amount of activity which will be summarised here:

- Discussions have taken place to develop and produce a framework for the enhancement of GACS, for example, by developing an international molecular archive, enhancing the use of new sensing technologies, and developing protocols for the development of Essential Ocean Variables for the monitoring and assessment of marine biodiversity and ecosystem health. Funding is being sought for this initiative.
- Early in 2016, a workshop was held at the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) to provide CPR training for technicians from the National Institute of Oceanography in Kochi, India. Subsequently, in May 2016, an 80-mile test deployment of a CPR was carried out in the Bay of Bengal from the ORV *Sindhu Sankalp*.
- June 2016 saw the release of the latest Global Status report, available electronically at <https://www.sahfos.ac.uk/publications/scientific-reports/ecostatus-reports/>.
- While routine sampling continues in the established surveys of the North Atlantic, North Pacific, Australian and Southern Ocean regions, successes from more recently established regional surveys are as follows:
 - The Brazilian CPR survey undertook 720 miles of towing across Drake's Passage and into the Southern Ocean in February 2016.
 - In October 2016, the MedCPR will complete two years of successful monthly tows in the Eastern Mediterranean Sea. Up till now, only one route has been sampled (Cyprus-Israel), while discussions have taken place to consider a second route (Cyprus- Greece). Although in its infancy, the survey has demonstrated great potential in capturing the spatial variation in plankton distribution. The major trend to date appears to indicate two distinct systems: a highly oligotrophic system close to the Cypriot coast and open sea, and a more productive system close to the Israeli port. Reinforcement and expansion of the survey is being attempted through regional research proposals.

- Regular tows in the Benguela Current LME have been suspended for 4 years, owing to the decommissioning of the CV *Horizon*; however, negotiations have hopefully achieved the re-establishment of quarterly tows from August 2016. In the meantime, opportunistic tows have occurred in the Indian Ocean, on the Agulhas Bank and between Cape Town and the Southern Ocean. Once all samples can be analysed – currently a major challenge due to recent changes in the Department of Environmental Affairs research priorities – these and subsequent CPR tows will provide an opportunity to examine seasonal variations in the abundance, distribution, and diversity of phyto- and zooplankton assemblages in the Atlantic and Indian sectors of the Southern Ocean and also make significant contributions to the CPR databases of SCAR’s international SO-CPR Survey and GACS’ global CPR Survey.
- Since 2013, France has towed CPRs once per year during the Austral Summer from the R/V *Marion Dufresne* in the Indian part of the Southern Ocean between the French Southern Antarctic Territories (TAAF of Crozet, Kerguelen, Saint Paul and New Amsterdam). The oceanographic survey is supported by IPEV, the French Polar Institute. Results on the total abundance of major planktonic taxon are at the moment used in a project to delineate ecoregions for designing the future extent of the actual marine reserve of TAAF around Crozet and Kerguelen. These data will be used to support the ecological significance of oceanographic regions determined by physical, geographic and chlorophyll parameters. The CPR is considered an important input for determining major pelagic ecological regions based on trophic web functioning between plankton and top predators. The future extent of the project will be considered by the French administration during the coming months.

7.4 Other Organizations

7.4.1 Partnership for Observation of the Global Oceans (POGO)

Shapovalov

Partnership for Observation of the Global Oceans (POGO)

Report to SCOR Annual General Meeting 2016

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 sixteen 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 five regional, collaborative research projects and one outreach project.

Since 2011, POGO has taken a leadership role with GEO in the formulation of an initiative, "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).
- In 2015 and 2016, SCOR and POGO Secretariats have been working on an impact evaluation questionnaire to send all past trainees of their respective and joint training programmes. They are planning on using the data obtained for joint publications on the POGO-SCOR fellowship and professorship programmes.
- 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. The Science Plan was published in 2015. The Sloan Foundation was instrumental in starting up this initiative, and in providing seed funding for coordination. Subsequently, POGO members are co-leading a working group meeting regularly to further the research collaboration and dialogue on the IQOE.
- 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.

- POGO has been in correspondence with SCOR regarding possible input in the second round of the World Ocean Assessment.

Priorities for 2016

At the last POGO Annual Meeting (POGO-16) held in Yokohama, Japan, in January 2016, four workshops were held on the following themes that were identified as priority areas for POGO:

- Engaging with industry (Leaders Andy Steven and Steve de Mora)
- Observations in estuaries (Leaders Antonio Baptista and Margaret Leinen)
- Polar observations (Leaders Paul Overduin and Karen Wiltshire)
- Ocean observations and Marine Protected Areas (Leader Margaret Leinen)

As of 2015, POGO has started providing funding for Working Groups and new training initiatives proposed by its members. A call for proposals was issued in February 2015, and four proposals were successful:

- WG on Observing and Modeling the Meridional Overturning Circulation in the South Atlantic (SAMOC), led by Edmo Campos (Brazil).
- WG on Implementation of IQOE Science Recommendations on Marine Noise Exposure and Broad-Scale Acoustic Monitoring, led by Alexander Vedenev (Russia) and Peter Tyack (UK).
- International Training Course on ‘Emerging trends in Ocean Observations with special emphasis on Moored Buoys and Time series Data Analysis and Applications’ at INCOIS, India.
- Technical Training in Continuous Plankton Recorder Survey Operations at the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) –funding for participants from NIO, India.

Subsequently, in February 2016, another call for new proposals was issued and three proposals for Working Groups were submitted and were successful:

- WG for Industry Liaison, led by Steve de Mora (UK).
- WG for Our Global Estuary, led by Megan Davis (USA) and Antonio Baptista (USA).
- WG for Observing and understanding the ocean below the Antarctic sea ice and ice shelves (OASIIS), led by Richard Coleman (AUS).

During the meeting, the members discussed the importance of providing some feedback to the United Nations, Division for Ocean Affairs and the Law of the Sea (DOALAS) with some recommendations for the next round of the World Ocean Assessment. A letter was subsequently submitted by POGO to DOALAS to include the recommendations and dialogue has been initiated with representatives of DOALAS.

In addition, ahead of the G7 Summit, POGO submitted a letter to the G7 representatives highlighting the importance of ocean observations. In the communiqué of the G7 Leaders, the

7-40

declaration stated that they support scientific work to enhance global ocean observation and assessment for the science-based managements, conservation and sustainable use of marine resources.