Joint SCAR/SCOR Coordination of Southern Ocean Studies

Summary

A Joint SCAR/SCOR Coordinating Group on Inter-disciplinary Southern Ocean Science (ISOS) consisting of 6-8 people is being established with the following broad objectives to

- facilitate coordination between the different discipline research groups currently active and those planning research in the Southern Ocean;
- encourage an inter-disciplinary approach to Southern Ocean observations, modelling and research, recognising the inter-dependence of physical, chemical and biological processes in the ocean;
- identify historical and reference data sets of value to researchers; and
- coordinate the transfer of near real-time data (or a sub-set of such data) to operational users.

The work of ISOS should greatly improve the coordination of Southern Ocean research, both at the national and international levels, to the benefit of the nations and research programmes presently active there. These activities are intended to be complementary to, and not to duplicate, the activities of groups such as the GLOBEC Southern Ocean project and the CLIVAR-CliC Southern Ocean Panel, as well as the research activities of the Surface Ocean – Lower Atmosphere Study (SOLAS), the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project, the GEOTRACES project, and other national and international research activities.

Introduction

The circulation of the Southern Ocean, including the Antarctic Circumpolar Current, plays a vital role in isolating Antarctica thermally, in linking the Atlantic, Indian and Pacific oceans, and in providing an avenue for the influence of northern hemisphere variability on the south polar region and for the influence of Antarctica on the rest of the world. It is evident that the physics of the circulation influences the chemistry and, in turn, the biology of the region, and that the eventual impact of these physical, chemical and biological processes is global as well as Antarctic in scope. As a result, this is a time of increasing inter-disciplinary investigations within Southern Ocean science.

While some aspects of Southern Ocean science are already under active consideration by international groups of scientists, these commonly have a particular focus. The GLOBEC Southern Ocean project, for instance, focused on the year-round life cycle of Antarctic zooplankton, particularly krill. The CLIVAR/CliC Southern Ocean Implementation Panel aims to design a strategy to assess the climate variability and predictability of the coupled ocean-ice-atmosphere system in the Southern Ocean region, and to this end will enhance interaction between the meteorology, oceanography, cryosphere, biogeochemistry and paleoclimate communities having climate interests. Other projects plan to study fluxes of greenhouse gases in the Southern Ocean (SOLAS), interactions between ocean biogeochemistry and

ecosystems (IMBER), and the distributions and controls on the concentrations of trace elements and isotopes (GEOTRACES).

Aside from these focused activities, many nations undertake annual oceanographic cruises to the Southern Ocean to collect physical, chemical and biological data that are not considered to be parts of these large international efforts. Much value can be added to those national efforts by ensuring that they are known and, where possible, coordinated, and that their results are readily available to others.

This document (i) reviews the current involvement of SCAR and SCOR with the Southern Ocean marine science community, (ii) makes recommendations on how coordination and liaison could be better improved within and between these organisations on Southern Ocean issues and (iii) considers the requirements for improved collection, archiving and dissemination of Southern Ocean marine science data.

The Intergovernmental Oceanographic Commission (IOC) also has activities in the Southern Ocean, with its responsibilities for developing the Global Ocean Observing System (GOOS), its activities under the management of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), and its responsibility for the development of National Ocean Data Centres (NODCs), some of which are in the Southern Ocean region or hold data from the region. The idea that the IOC may join ISOS in the future is currently being explored; IOC will consider its position during the next IOC Assembly (June 2005).

SCAR

During the International Geophysical Year (IGY) of 1957-58, ICSU was responsible for coordinating scientific activities in the Antarctic region and elsewhere, and decided that this coordination should continue after the IGY through a Special Committee – now the Scientific Committee on Antarctic Research (SCAR) – which was formed in February 1958. SCAR's responsibilities included oceanography, and from 1961 to 1980 the coordination of oceanographic activities was the responsibility of an Oceanography Working Group (WG). This WG was disbanded at the 17th session of SCAR, with SCOR being expected to take up the focus on oceanography in the Southern Ocean. Even so, SCAR continued to take an interest in aspects of Southern Ocean oceanography, through Working Groups on the Physics and Chemistry of the Atmosphere (PACA) and on Glaciology. In addition the GLOCHANT (Global Change in Antarctica) group of specialists was concerned with questions of sea ice extent and air-sea interactions. The Biology WG was extensively involved in considering the effects of specific environmental conditions on the biota and the effects of ocean variability on the marine and terrestrial ecosystems, with an emphasis on the pack-ice zone in the marine realm. Its main activity was the BIOMASS programme (Biological Investigations of Marine Antarctic Systems and Stocks), run jointly with SCOR, which led to the establishment of the Convention on the Conservation of Living Marine Resources in the Antarctic region (CCAMLR). The Geophysics WG was involved in marine sediment drilling programmes that investigated the paleoclimate history of the Antarctic region and Antarctic Bottom Water. However, there was little coordination of oceanographic activities in general,

and most of the SCAR member countries separately implemented national programmes concerned with oceanography of the Southern Ocean.

Towards the end of the century, with the advent and eventual success of activities such as the World Ocean Circulation Experiment (WOCE) and the Joint Global Ocean Flux Study (JGOFS), it became clear that the Southern Ocean was a key feature of the climate of the Antarctic region and mediated the transfers of heat, freshwater and greenhouse gases between Antarctica and the rest of the world. SCAR realised that it could play a useful role in coordinating the activities of SCAR Member countries in the Southern Ocean, and began discussions with SCOR regarding the responsibility for coordinating oceanographic activities in the Southern Ocean. In 2001, the Presidents of SCAR and SCOR produced the joint letter given in Annex 1, calling for the development of an appropriate coordinating mechanism.

In 2002, at its 27th session, SCAR adopted a new structure, which included an Action Group on Oceanography. SCAR also began developing a set of flagship scientific research programmes, one of which will integrate atmospheric, ice and ocean research to study "Antarctic and the Global Climate System". Assuming that it is approved at the 28th SCAR meeting in October 2004, this major programme will have a lifetime of 5-10 years.

The Action Group has held one meeting, in Rome on 22-24 October 2003. Representatives of SCAR, SCOR, IOC, IPAB and CLIVAR attended the meeting, from which developed the plan for ISOS.

Reflecting SCAR's renewed interest in the Southern Ocean, SCAR is in the process of finalising an agreement with the World Climate Research Programme (WCRP) to co-sponsor the Cryosphere and Climate programme (CliC), the joint CLIVAR-CliC Southern Ocean Implementation Panel, and the International Programme of Antarctic Buoys (IPAB). SCAR is also in discussions regarding co-sponsorship of the Southern Ocean GLOBEC Panel In addition SCAR is considering co-sponsoring the Antarctic component of the Census of Marine Life (CoML).

SCOR

SCOR was formed in 1957 as ICSU's first interdisciplinary committee. SCOR has sponsored several working groups and large-scale ocean research projects in the Southern Ocean, particularly since SCAR disbanded its Working Group on Oceanography. WG 54 focused on the topic of Southern Ocean Ecosystems and Their Living Resources. This group was also the SCAR Group of Specialists on Living Resources of the Southern Ocean, and IABO also participated in this activity. The BIOMASS program (jointly with SCAR) was also related to this group and resulted in many reports. Other completed SCOR working groups relevant to Southern Ocean topics include WG 74 on General Circulation of the Southern Ocean, WG 82 on Polar Deep Sea Paleoenvironments, and WG 86 on Ecology of Sea Ice.

SCOR-sponsored large-scale ocean research projects with past, ongoing, or planned Southern Ocean activities include

- JGOFS
- GLOBEC
- SOLAS
- IMBER
- GEOTRACES

JGOFS sponsored a Southern Ocean research program in 1991-1999.

Southern Ocean GLOBEC is a completed activity that brought together scientists from several nations and from the International Whaling Commission to study the year-round life cycle of Antarctic zooplankton, particularly krill. Southern Ocean GLOBEC also studied the predators of krill, such as marine mammals and seabirds. As such it builds on the extensive previous work undertaken by the *Discovery* investigations, and more recently by the BIOMASS programme.

The Surface Ocean – Lower Atmosphere Study (SOLAS) is a new project sponsored by SCOR, IGBP, the World Climate Research Programme (WCRP), and the Commission on Atmospheric Chemistry and Global Pollution (CACGP) of the International Association of Meteorology and Atmospheric Sciences. The effects of ice on air-sea exchange of gases and particles significant for global climate will be an important element of SOLAS research. A specific task team will be developed related to Air-Ice Chemical Interactions (AICI), which will be a joint activity with the International Global Atmospheric Chemistry (IGAC) project of IGBP, starting in 2004.

Another new activity being developed by SCOR and IGBP is the Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) project. High-latitude areas (including polar regions) are an area of special focus identified by IMBER, in recognition of the importance of these areas in global change. Biogeochemical cycles and ecosystems will be linked, as will natural and human systems. A joint activity between IMBER and GLOBEC under development is the Integrated Analysis of Circumpolar Climate Interactions and Ecosystem Dynamics in the Southern Ocean (ICCED) project. It is likely to continue some of the work of Southern Ocean GLOBEC, but to broaden it to meet the goals of IMBER.

The GEOTRACES Planning Group will plan and implement an international research project to study the global marine biogeochemical cycles of trace elements and their isotopes. Although the primary objective of the GEOTRACES project is an improved understanding of the marine biogeochemistry of trace elements, benefits of the project will extend into multiple sub-disciplines of oceanography. The project will be global in its scope and international in the composition of its participants. GEOTRACES is working on a science plan, which it hopes to complete by the end of 2004 for review by SCOR. The GEOTRACES Planning Committee is in the process of designing a program of hydrographic surveys of trace element and isotope distributions, including segments in the Southern Ocean.

SCOR also has a system of project affiliation to help SCOR interact with other international organizations. Projects and programmes affiliated with SCOR include the Census of Marine Life (CoML), International Antarctic Zone Program (iAnZone), International Marine Global Change Study (IMAGES), International Ocean Colour Co-ordinating Group (IOCCG) and the International RIDGE Studies (InterRidge). Each of these projects/programmes has ongoing or potential activities in the Southern Ocean.

Recommendations

Following the meeting between the Presidents of SCAR and SCOR in April 2001, and the preparation of their statement on the need for improved coordination in Southern Ocean matters (Annex 1), a discussion on possible ways of improving cooperation in the Southern Ocean took place immediately before the 2001 SCOR Executive Committee meeting, and involved IOC, SCAR, SCOR, CLIVAR, GLOBEC, iAnZone, and SOLAS. As reported in the 2001 SCOR Proceedings (section 4.1.1), "Participants agreed that a mechanism to share information about Southern Ocean research plans could be useful, as long as it doesn't create a new bureaucracy. Intergovernmental organisations should only be involved to the extent that they need to be. One idea was to have a Web site for exchange of information on cruise schedules, meetings, activities, where to find data sets, and other relevant information. Establishment of a new Web site would require some funds for a Webmaster." Participants were asked to send relevant URLs to the Executive Director of SCOR to see how this activity might proceed. It was suggested that contacts should be made with CCAMLR and COMNAP to see whether they would like to be involved in this activity.

At the time of writing (July 2004), neither the ad hoc Working Group nor the Web site had been created, due to lack of interest by potential financial sponsors.

The SCAR and SCOR Presidents have continued their dialogue at subsequent SCOR meetings, and, as mentioned above, their ideas were fleshed out at the SCAR Oceanography meeting in Rome (22-24 October 2003).

Based on these various developments, SCAR and SCOR have agreed to consider establishing a SCAR/SCOR Coordinating Group on Inter-disciplinary Southern Ocean Science (ISOS) consisting of 6-8 people. This group would have, as part of its terms of reference, the following five responsibilities:

1. Coordination of ongoing national research in the Southern Ocean.

2. Liaison between ongoing specifically Southern Ocean initiatives, such as Southern Ocean GLOBEC, iAnZone, the CLIVAR-CliC Panel on the Southern Ocean, and Southern Ocean carbon activities.

3. Liaison with other appropriate SCAR/SCOR/IOC groups concerned with the Southern Ocean, such as OOPC, GOOS, JCOMM, SOLAS, IMBER and GEOTRACES.

4. Encouragement of an inter-disciplinary approach to Southern Ocean observational

and modelling research, recognising the inter-dependence of physical, chemical and biological processes therein.

5. Coordination of the transfer of near real-time data (or a sub-set of such data) to operational users, and identification of historical and reference data sets of value to researchers.

Acronyms

AABW	Antarctic Bottom Water
ACW	Antarctic Circumpolar Wave
AIW	Antarctic Intermediate Water
APIS	Antarctic Pack Ice Seals
ASPeCt	Antarctic Sea-Ice Processes and Climate
BIOMASS	Biological Investigations of Marine Antarctic Systems and Stocks
CACGP	Commission on Atmospheric Chemistry and Global Pollution
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CLiC	Climate and Cryosphere
CLIVAR	Climate Variability Project of WCRP
COMNAP	Committee of Managers of National Antarctic Programmes
EASIZ	Ecology of the Antarctic Sea Ice Zone
ENSO	El Niño – Southern Oscillation
EVOLANTA	Evolution in Antarctica
GCOS	Global Climate Observing System
GEOHAB	Global Ecology and Oceanography of Harmful Algal Blooms
GLOBEC	Global Ocean Ecosystem Dynamics
GLOCHANT	Group of Specialists on Global Change and the Antarctic
GOOS	Global Ocean Observing System
IAnZone	International Antarctic Zone Programme
IABO	International Association for Biological Oceanography
IAPSO	International Association for the Physical Sciences of the Oceans
IGBP	International Geosphere-Biosphere Programme
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research project
IOC	Intergovernmental Oceanographic Commission
IOCSOC	IOC Southern Ocean Committee
ISOS	SCAR/SCOR/IOC Coordinating Group on Inter-disciplinary Southern Ocean Science
IUGG	International Union of Geodesy and Geophysics
JCADM	Joint (SCAR–COMNAP) Committee on Antarctic Data Management
JCOMM	Joint WMO/IOC Technical Commission for oceanography and Marine Meteorology
JGOFS	Joint Global Ocean Flux Study
OOPC	Ocean Observations Panel for Climate (of GCOS, GOOS and WCRP)
PACA	Physics and Chemistry of the Atmosphere
POGO	Partnership for Observations of the Global Ocean

SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SOLAS	Surface Ocean Lower Atmosphere Study
SSG	Standing Scientific Group
WCRP	World Climate Research Programme
WG	Working Group
WMO	World Meteorological Organisation
WOCE	World Ocean Circulation Experiment

ANNEX I

(from ANNEX 5 of SCOR Proceedings Vol. 37, Mar del Plata, Argentina, October 2001)

SCAR, SCOR, AND OCEANOGRAPHY IN THE SOUTHERN OCEAN

The Presidents of SCAR (Robert Rutford) and SCOR (Robert Duce) met at Texas A& M University on 6 April 2001 to discuss

1. A possible joint response to the request from IOC for comments about the ways in which there could be increased coordination between SCAR, SCOR, IOC, and WMO concerning research in the Southern Ocean, and

2. Areas where there could be increased cooperation and coordination between SCAR and SCOR in general.

Relative to the first topic, we support strongly increased cooperation and coordination between SCAR, SCOR, IOC, WCRP, and WMO in the Southern Ocean Region. The scientific community is increasingly recognizing the importance of the Southern Ocean relative to possible climate change, air-sea exchange of carbon dioxide, nutrient and biological community dynamics, etc, as shown by new research efforts planned or underway in programs such as GLOBEC, SOLAS, WCRP , and others. If such a coordinating effort were to take place, it would need to reach across a wide range of disciplines in both the ocean and atmospheric sciences. This has never happened before but, we believe that if all the organizations listed above approached this issue jointly, the likelihood of meaningful results could be high.

We suggest that a relatively small (perhaps 6 to 8 individuals) working group of experts representing the necessary disciplines in the ocean and atmospheric sciences, supported by the organizations above, meet to develop a strategy and goals for the development of a somewhat larger coordinating and advisory panel. One possible location for such an initial meeting might be the Joint IAPSO/IABO General Assembly to be held in Mar del Plata, Argentina 21-28 October 2001. It is likely that a number of the individuals who would be involved in such a joint group would already be at that meeting.

Relative to the second topic, we both agreed that increased coordination between SCAR and SCOR is important and could be beneficial to both groups. We agreed to approach our respective Executive Committees to discuss the possibility of having liaison people attend each other's General and Executive Committee meetings, perhaps an officer or Executive Director/Secretary. We also agreed that at some time in the future it could be beneficial to both SCAR and SCOR if our Executive Committees could hold occasional joint meetings.

Robert Rutford — President, SCAR

Robert Duce — President, SCOR

GLOBEC Global Ocean Ecosystems Dynamics project
IABO International Association of Biological Oceanography

IAPSO International Association for the Physical Sciences of the Ocean
IOC Intergovernmental Oceanographic Commission
SCAR Scientific Committee on Antarctic Research
SCOR Scientific Committee on Oceanic Research
SOLAS Surface Ocean Lower Atmosphere Study
WCRP World Climate Research Programme
WMO World Meteorological Organization