

REPORT OF THE 1990 ACTIVITIES OF THE
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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ORGANIZATIONAL MATTERS:

General Meeting -

The Scientific Committee on Oceanic Research (SCOR) held its Twentieth General Meeting from October 1 - 3 at the Institut fuer Meereskunde in Rostock-Warnemuende in Germany. The General Meeting, as always, was followed by a two day scientific symposium. This year's topic of small-scale turbulence in the ocean and its effects on productivity was selected in honour of a former President of SCOR, Konstantin N. Fedorov, who died very shortly after he had attended the previous General Meeting in 1988.

A review of the future directions of SCOR was completed during 1990. This resulted from the growing tension between the demands on SCOR to take the lead in the planning of large international scientific programmes relevant to global climate change and the need to maintain the traditional SCOR working group mechanism which is a unique means of promoting international collaboration in more narrowly-defined topics in ocean science. The consensus reached at the General Meeting was that a balance must be found between these competing demands. SCOR has a strong role to play as an initiator of large-scale programmes in oceanography and should continue to take the lead when there are appropriate scientific reasons to do so. This seems to require an intense involvement in planning and administration for about three years. The nature of SCOR, with a very small secretariat, makes it impossible for it to play such a role in more than one or two such programmes at the same time. Large international programmes should, therefore, be expected to become largely independent of SCOR administratively, within three to five years, although SCOR sponsorship should continue for the purposes of international scientific review and assessment of progress.

The General Meeting also reviewed a report of an ad hoc group established in 1989 to review the rationale and need for the Joint Oceanographic Assembly, a large interdisciplinary meeting which has traditionally been organized by SCOR every six years in collaboration with other international organizations. The review also considered the role of SCOR in relation to other large international meetings, such as the IUGG Assembly. The recommendation of the Executive Committee that the traditional JOA be discontinued in favour of more frequent, more focused interdisciplinary meetings on oceanographic topics was ratified.

Membership -

One highlight of the General Meeting was the acceptance of applications for SCOR membership from Pakistan and Korea, bringing the number of countries participating in SCOR to forty. The application from Bangladesh, which had been accepted late in 1989, also took effect in 1990. Almost simultaneously, SCOR lost another member because there will now be only one German SCOR Committee with representation of oceanographers from both the western and eastern parts of Germany.

Prof. Terry Healy (New Zealand) was elected Vice-President of SCOR to replace Prof. G. Ross Heath (USA) whose term had expired. There were no other changes in the SCOR Executive Committee during 1990.

Relations with Unesco -

SCOR continues to serve as an official scientific advisory body to the

Intergovernmental Oceanographic Commission of Unesco. The IOC cosponsors and provides some financial support for a number of SCOR working groups and other activities of mutual interest.

Activities involving developing countries -

A grant from the US National Science Foundation continues to make possible a programme of travel grants for oceanographers from developing countries wishing to participate in international scientific meetings which are organized or cosponsored by SCOR. Between twenty-five and thirty such awards are made annually.

SCIENTIFIC ACTIVITIES

A SCOR General Meeting is always an occasion for the rigorous review of the activities of each of SCOR's scientific subsidiary bodies. A large number were disbanded, having completed their objectives, many with the publication of a report such as the one produced for Springer Verlag by WG 85 entitled "Enclosed Experimental Marine Ecosystems: A Review and Recommendations". Continuing groups include WG 83 on Wave Modelling, WG 86 on Sea Ice Ecology, and WG 89 on Sea Level and Erosion of the World's Coastlines, among others. New working groups were established on topics such as the comparison of satellite altimeter data and in situ current observations, acoustic monitoring of the ocean, and fluxes between ocean sediments and near-bottom seawater. These actions bring the number of active SCOR Working Groups to eleven. A few highlights of working group activities in 1990 are presented here:

WG 77 Laboratory Tests Related to Basic Physical Measurements at Sea

An unprecedented laboratory intercomparison of CTD's was organized by WG 77 and took place late in 1988. It involved the use of the high pressure laboratory of the Institute of Applied Physics at the University of Kiel to compare a number of CTD's supplied by several institutes around the world, both with reference instruments and with each other, under a wide range of temperature, pressure and salinity conditions. Planners of both the TOGA and WOCE experiments have expressed great interest in the results of this intercomparison, and are anxious that the results be made available as quickly as possible. The Chairman of WG 77 presented the report of the intercomparison experiment at the SCOR General Meeting. The results of tests carried out in a pool were presented, but the analysis of the results from tests in the pressure tank had not yet been completed. The Executive Committee established a small editorial panel to ensure that the task is completed in 1991.

WG 80 Phase Transfer Processes in Estuarine Trace Metal Cycling

Following the extremely useful Workshop in Plymouth, UK in October 1989, the Working Group has continued to work by correspondence. A report is being prepared for publication by Unesco and the working papers from the Plymouth meeting will themselves provide a series of detailed technical annexes. The report in preparation should provide a good basis for meeting the requirements of the first two terms of reference given to the Working Group. However, before meeting the third term of reference, the development of strategies for the preparation of predictive models, it will be necessary to consider in more detail the problems associated with the experimental and theoretical characterisation of particle-water interactions. As a result, WG 80 will meet in early 1991 to address this final part of its charge.

WG 83 Wave Modelling

The main task assigned to WG 83 is the development of a third generation spectral wave model to permit global-scale wave prediction. The group has served to broaden the international participation in WAM, a large, European wave modelling research group, for which WG 83 now acts as an executive body. WG 83 has recently reported on the following achievements: Joint development of a third generation wave model is progressing well with the collaboration of scientists from several countries. A working model is in place on the CRAY supercomputer at the ECMWF and copies are being used by a number of scientists to test various aspects of its performance. Regional versions of the third generation model have been implemented for various regions of the world. A global version of the model has been implemented at ECMWF and various tests that pertain to medium range forecasting are being done. WG 83 encourages attention to particular areas of wave dynamics where additional studies are required to improve wave modelling. Many of the group's members are directly involved in planning and conducting such physical studies. Data assimilation is an important aspect of the work of WG 83 and it is encouraging the establishment of data assimilation techniques for global wave modelling. The anticipated launch of the ERS-1 satellite in 1991 makes this an urgent task.

WG 85 Experimental Ecosystems

WG 85 completed its activities during 1990 with the publication of two contributions:

Enclosed Experimental Marine Ecosystems: A Review and Recommendations. C.M. Lalli (Ed.). In: Coastal and Estuarine Studies, No. 37. Springer-Verlag.

A Manual of Marine Experimental Ecosystems. SCOR Report Series No. 2. This will also be published for broader distribution by UNESCO.

WG 86 Ecology of Sea Ice

The first formal meeting of WG 86 took place in Bremerhaven in September 1990. It followed several important events featuring studies of polar oceans and involving substantial participation of the scientists involved in sea ice ecology. The WG 86 meeting was planned so as to take advantage of these events to synthesize the available information on bi-polar aspects of sea ice ecology. All members prepared discussion papers in advance. The General Meeting endorsed the plans of WG 86 to publish three articles in the journal, Polar Biology, to assemble a bibliography in the area of its expertise for publication in 1991, and to organize an international symposium on the Ecology of Sea Ice Biota in 1992 or 93.

WG 89 Sea Level and Erosion of the World's Coastlines

The first meeting of WG 89 took place in Delft, The Netherlands in conjunction with the International Coastal Engineering Conference in July. The existence of this group has been brought to the attention of the planners of IGBP's Core Project on Land Ocean Interactions in the Coastal Zone. The group made excellent progress during 1990 and has prepared a major report for publication in the Journal of Coastal Research. The SCOR General Meeting agreed that an extended version of this report would be published in the SCOR Report Series so as to include a number of detailed appendices and an extensive bibliography relevant to models of beach responses to increased sea levels which has also been prepared by WG 89. This report will

include the conclusions and recommendations of WG 89 with regard to the use of certain models to predict coastal erosion due to sea level rise, and as to the need for field and laboratory studies required to improve the fundamental understanding of the processes which are parameterized in the models.

SCOR/UNESCO/ICES/IAPSO Joint Panel on Oceanographic Tables and Standards

- Sub-panel on Standards for CO₂ Measurements

The sub-panel held its final meeting in December 1990 and has submitted its report to UNESCO for publication. Its Chairman, Dr. Andrew Dickson, has become involved in the JGOFS/WOCE joint effort to conduct a global survey of oceanic CO₂ and the report is expected to be published in time for a meeting of the JGOFS/CCCO CO₂ working group in April 1991. It contains recommendations for the production and dissemination of standard reference materials to be used in the analysis of dissolved organic carbon, alkalinity and fugacity of CO₂.

- Sub-panel on an Oceanographic Manual

This sub-panel also completed its work in 1990 with meetings in Copenhagen and Paris. The manuscript for a special UNESCO publication entitled "The Processing of Oceanographic Station Data" has been submitted and will be available by mid-1991.

SPECIAL PROJECTS

The General Meeting also reviewed the progress of the large-scale oceanographic programmes which are sponsored by SCOR. These include the World Ocean Circulation Experiment (WOCE) and the study of the Tropical Ocean and Global Atmosphere (TOGA), both of which are important components of the World Climate Research Programme and were conceived by the SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO). The Joint Global Ocean Flux Study (JGOFS) is a biological and chemical counterpart to the WCRP programmes and is being planned and implemented by SCOR as a Core Project of the IGBP.

Joint SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO)

The Eleventh Session of the CCCO took place in Paris in May 1990. The Committee addressed scientific planning, intergovernmental climate initiatives, and the implementation of its WOCE, TOGA, and ocean observing system development activities.

The Committee sought to identify current gaps not covered by existing international programmes (e.g., WOCE, TOGA, JGOFS, and GEWEX) related to climate change. The following themes emerged as being scientifically important and international in scope upon which the Committee should focus its intersessional efforts:

1. Ocean Observing System Development. The development of a scientifically based plan for long-term climate related ocean observations was identified as a matter requiring urgent attention. The highest priority should be given to elements necessary for operational modelling and the prediction of events such as El-Nino. It was agreed that a means of monitoring near-surface salinity was urgently required to meet the needs of GEWEX (the WCRP Global Energy and Water Cycle Experiment).

2. Carbon Dioxide Gas Exchange on Gyre-Global Scale. The design of a plan to acquire a global oceanic data set, including pCO₂, total CO₂, and alkalinity was addressed as an important international priority. The CCCO

and JGOFS have agreed that their joint Carbon Dioxide Panel will address this matter through reconstituted terms of reference and membership.

3. Review of IPCC Working Group-I Report. The Committee established a working group to undertake a review of the relevant ocean related sections of the IPCC WG-I report, including source references, and new material as appropriate. The group will assess the degree to which the report is an accurate and comprehensive summary of current knowledge of ocean dynamics, ocean-atmosphere interaction and ocean chemistry in relation to global climate prediction and change, and propose appropriate action to be undertaken by the CCCO.

4. Fresh Water Budget. More information on the energy and mass exchanges with the ocean surface and the upper ocean transports of heat and salt is required in order to improve our understanding of global energy and water cycles. Ocean general circulation models will need to be developed to assimilate satellite data with in situ surface and subsurface measurements. There is a gap in the availability of observations of heat and freshwater content in the upper ocean which are required to narrow the uncertainty on the surface fluxes and in methods to determine the surface fluxes as constraints on the energy and water cycles. The CCCO officers will address these questions and make recommendations for action by the Committee at its next session.

5. Improving Predictions of Regional Impact of Climate Change on the Coastal Environment. There is a need to encourage further investigation on how a global rise in mean sea level would be manifested in steric heights, and how changes in ocean currents would affect regional sea level. The CCCO Atlantic, Indian and Pacific Ocean Climate Studies Panels have been asked to examine these questions and to report to the CCCO on the feasibility of improving predictions on a regional basis and identifying potential studies toward this end.

6. Control of Thermohaline Circulation. Consideration of the influence of the Arctic Ocean on climate represents a gap in the programmes being conducted within the WCRP. The feasibility of an Arctic experiment regarding the relation between circulation, salinity structure, freezing and melting, and freshwater budget in the Arctic Ocean and the deep water production on the North Atlantic needs to be investigated. The recently formed JSC-CCCO Working Group on Sea-Ice and Climate was requested to address and present a report at the next meetings of the CCCO and JSC.

As TOGA and WOCE have matured and are well under way, CCCO is now turning its attention to these new activities and SCOR endorsed this programme.

Joint Global Ocean Flux Study

The Joint Global Ocean Flux Study was formally reviewed by SCOR for the first time since its establishment in 1988. Important milestones include the designation of JGOFS as a Core Project of the IGBP, the successful completion of the first major field activity, the publication of the JGOFS Science Plan, planning for process studies in the equatorial Pacific, Indian and Antarctic Oceans, an important modelling workshop and a unique data analysis and interpretation workshop and an international scientific symposium at which the first JGOFS field results were presented.

The JGOFS Committee met twice in 1990 (Kiel, March and Washington, November). The Science Plan was approved at the first meeting and was published in August 1990. It sets out the core scientific problems and

detailed objectives for JGOFS and puts forward plans for the research strategies required to advance our understanding of these problems. The plan is also intended to provide a framework within which to develop the international cooperation and collaboration which will be essential in this large set of research problems to be addressed successfully. Each of the two goals of JGOFS are developed into a series of more detailed scientific objectives which emphasize the scientific questions which need to be resolved to meet these goals. Late in 1990 a condensed, glossy version of the Science Plan was published. Entitled "Oceans, Carbon and Climate Change", it provides a brief overview of the scientific problems being addressed by JGOFS, its goals, the strategies for meeting them and some of the plans for the implementation of the programme.

The JGOFS Committee has also devoted a great deal of its attention to its first major field programme, the JGOFS North Atlantic Pilot Study, also known as the North Atlantic Bloom Experiment. The Pilot Study grew out of the fortuitous convergence of plans in five nations for work in the northeast Atlantic during the 1989 field season, and it came to be regarded as a prototype for future JGOFS Process Studies. Its focus was a detailed examination of the development, evolution and decay of the annual phytoplankton bloom and associated phenomena during its northward progression. In 1989 this study involved six research vessels and more than 250 scientists, as well as a NASA remote sensing aircraft. A number of the nations involved continued work in the same area in 1990. The benefits of the international cooperation promoted by the JGOFS Committee became obvious as agreements were crafted on a set of core measurements and the related protocols and levels of accuracy to be achieved. This collaboration also made possible extensive intercalibration exercises on several occasions when more than one research vessel was present at the same station. This spirit of cooperation was most evident at a JGOFS Pilot Study Data Workshop (Kiel, March 1990) at which about 150 participants shared their data from the 1989 field season and merged them to create truly international data sets for the Study. A mechanism for the submission, archiving and sharing of these data was established. Finally, in late November 1990 a JGOFS symposium in Washington provided a forum for the presentation of the results of the Bloom Experiment. The abstracts of the sixty-five papers and posters presented at the symposium will be published by SCOR in early 1991.

The planning for the next JGOFS Process Study, in the equatorial Pacific Ocean in 1992-1993, is now well advanced as a result of a workshop held in Tokyo in April 1990. The equatorial Pacific is the largest single oceanographic province and it has been suggested that this region may supply as much as half of the global new production. The province differs from most oceanic systems in that its interannual variability, which results from its response to the El Niño-Southern Oscillation phenomenon, is greater than its seasonal variability, and appears to dominate the controls on biological fluxes. Similarly, plans are beginning to be made for process studies in the Southern Ocean and the Indian Ocean and planning groups for each of these studies have held their first meetings.

During 1990 the JGOFS Committee began to translate its International Science Plan into a detailed Implementation Plan. A preliminary schedule of JGOFS Process Studies for the decade was discussed. The first four (the North Atlantic Bloom Experiment, the equatorial Pacific study, the Southern Ocean and the Indian Ocean) have a firm basis in current national plans. The JGOFS Committee has also undertaken to ensure that a global survey of oceanic CO₂ is conducted by assuming the responsibility, through the JGOFS/CCCO₂ Panel, for placing JGOFS scientists on the WOCE Hydrographic Programme cruises in accordance with an agreement between the two programmes. The

development of a detailed JGOFS Implementation Plan, however, requires a concerted effort. This will be achieved through a set of strategy-oriented Task Teams on Process Studies, Global Survey, Time Series Stations, Historical Record, Benthic Processes, Modelling and Data Management.

The next meeting of SCOR is the 30th Executive Committee Meeting which will take place at the University of Waikato, Hamilton, New Zealand from November 11-15, 1991. Readers are encouraged to refer to SCOR Proceedings, the SCOR Handbook, or to contact the Executive Director of SCOR, E. Tidmarsh, for information on SCOR activities. The SCOR Secretariat is located in the Oceanography Department, Dalhousie University, Halifax, N.S., Canada B3H 4J1.

SCOR Subsidiary Bodies as at December 1990

WG 80 Phase Transfer Processes in the Cycling of Trace Metals in Estuaries
WG 83 Wave Modelling
WG 86 Sea Ice Ecology
WG 89 Sea Level and Erosion of the World's Coastlines
WG 90 Chemical and Biological Oceanographic Sensor Technology
WG 91 Chemical Evolution and Origin of Life in Marine Hydrothermal Systems
WG 92 Ocean/Atmosphere Palaeochemistry
WG 93 Pelagic Biogeography
WG 94 Altimeter data and in situ Current Observation
WG 95 Sediment Suspension and Sea Bed Properties
WG 96 Acoustic Monitoring of the World Ocean
CCCO Joint SCOR/IOC Committee on Climatic Changes and the Ocean
JGOFS Committee for the Joint Global Ocean Flux Study
Editorial Panel for the Ocean Modelling Newsletter