

**REPORT OF THE  
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**

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This report covers the period from July 1984 to June 1985.

ORGANIZATION

SCOR held its XVII General Meeting at the Station Marine in Roscoff, France in October 1984. A symposium on "Biogeochemical Processes at the Land-Sea Boundary" was held at the same time, in the SCOR tradition of including a scientific event in conjunction with all General Meetings. Both events were well attended. In accordance with SCOR procedures, the activities of all scientific working groups, committees and panels were critically reviewed and decisions were made to disband groups whose tasks were completed, to renew others, and to establish new ones on the basis of proposals received. The achievements of SCOR's subsidiary bodies are discussed below. Other highlights of the General Meeting included the acceptance of revisions to SCOR's Constitution which will facilitate the application for membership in SCOR of the Chinese Committee for Oceanic Research. The General Meeting was attended, for the first time, by three observers from China. The election of SCOR Officers also took place: Prof. Gerold Siedler (FRG) was elected as President for 1984-88, Dr. Alan Longhurst (Canada) was re-elected Secretary for two years, and Dr. Roger Chesselet (France), Prof. J.-O. Stromberg (Sweden) and Prof. G. Ross Heath (USA) are serving as Vice-Presidents.

PUBLICATIONS

The report of the XVII General Meeting is contained in SCOR Proceedings, Vol. 20 and a SCOR Handbook is in preparation for distribution in July 1985. A large number of publications have arisen from the scientific activities of SCOR's subsidiary bodies. Information on these is given in SCOR Proceedings.

SCIENTIFIC ACTIVITIES

There are currently twenty-two active SCOR Working Groups, Committees and Panels, and four others are in the process of preparing their final reports to SCOR. These four have all produced major contributions to the scientific literature, or will do so in the near future. WG 70 (Remote Measurement of the Oceans from Satellites), for example, is preparing a state-of-the-art report on satellite sensing which will be useful to many scientists who are not experts in this field, but who wish to know more about its applications. Similarly, WG 51 is producing a guide to

the acquisition and analysis of high quality CTD (conductivity, temperature, depth) data which will improve our ability to accurately measure the salinity of seawater.

Seventeen subsidiary bodies were renewed by the General Meeting. Reports from all of them were considered and may be found in SCOR Proceedings; a few highlights will be given here. WG 42 (Pollution of the Baltic) is participating in three major collaborative projects in the Baltic Sea: a sediment study, planning for a multi-ship patchiness study, and a baseline study of contaminants in fish and shellfish. These projects will be ongoing in the 1985-86 period which will be designated the Second International Baltic Year by ICES which cosponsors WG 42. The working group on Southern Ocean Ecosystems and Their Living Resources (WG 54) remains heavily committed to the BIOMASS programme. When BIOMASS ends, as planned, in 1986, both SCOR and SCAR will examine in detail future needs in the field of antarctic oceanography. WG 56 organized a major international symposium on Vertical Motion in the Equatorial Ocean and its Effects on the Atmosphere and Living Resources which took place in May, 1985 and was cosponsored by UNESCO and IOC. This meeting was attended by a number of scientists from developing countries, thanks to the support made available by the cosponsors. The proceedings will be published in Oceanologica Acta. Similarly, WG 65 (Coastal-Offshore Ecosystem Relationships) is planning a workshop in early 1986 as a conclusion to its work. A symposium entitled the "Influence of Biosphere on Atmosphere" is being organized by WG 72 (The Ocean as a Source and Sink for Atmospheric Constituents) and will take place in Mainz, FRG at about the same time. One of the two sessions at this symposium will concentrate on air-sea exchanges. The General Meeting approved a proposal from WG 73 (Ecological Theory in Relation to Biological Oceanography) to proceed with two projects; the testing and comparison of various methods of analyzing existing sets of data on whole marine ecosystems, and an integrated biological-physical study of oceanic interfaces (fronts, pycnoclines, ice-water, interfaces, etc.). WG 75 (Methodology for Oceanic CO<sub>2</sub> Measurements) will meet in September 1985. This group has proposed an integrated international programme for a study of CO<sub>2</sub> in the oceans which is expected to be incorporated into the programme of the Joint SCOR/IOC Committee on Climatic Changes and the Ocean (CCCO).

The General Meeting considered an unusually large number of proposals for the establishment of new working groups. Some were deferred for further development or for review by SCOR Committees, while others were approved in Roscoff. A UNESCO proposal for a group entitled "Determination of Photosynthetic Pigments in Seawater" was approved. This group will examine the various techniques used to determine plant pigments in seawater - these techniques need reassessment if biological oceanographers are to use them to accurately calculate plant biomass and primary productivity of the oceans. One new working group will investigate the Effects of Hydrothermal Processes in the Ocean and yet another will consider problems related to the geological record of variations in atmospheric and oceanic CO<sub>2</sub> and the global carbon cycle. Two of the new groups will address related topics; Deep Water Palaeo-oceanography and Polar Deep Sea Palaeoenvironments. Proposals for new groups on the cycling of materials in estuaries, experimental

ecosystems, and data assimilation in ocean models will be developed in more detail for consideration by SCOR in 1985.

#### Joint SCOR/IOC Committee on Climatic Changes and the Ocean

This activity of SCOR has become so important as to warrant special attention. This report presents the status of several of the oceanographic activities of the WCRP being organized or proposed by CCCO in cooperation with the WMO/ICSU Joint Scientific Committee (JSC) for the WCRP and other IOC and SCOR bodies. For information on the overall objectives and strategy of the WCRP and other oceanographic activities one may refer to SCOR Proceedings, Vol. 20, Annex X, or the Scientific Plan for the WCRP, WCP Series No. 2, 1984. The WCRP has become operational in several respects and, therefore, CCCO's activities have been focussed on organizing operational programme elements and the involvement of governments and intergovernmental agencies.

Study of the Tropical Oceans and Global Atmosphere (TOGA): TOGA's experimental design is based on the concept that air-sea interactions in the tropics can significantly affect climatic events on regional to planetary scales. As such, the design of the programme has been divided into three major components: Ten-year measurements will be conducted which consist of monitoring atmospheric, interface, and oceanic variables; Surveillance of the tropical ocean and global atmosphere in real-time in order to enhance the awareness of impending events, e.g., Los Ninos and monsoons; Modelling Studies of the coupled ocean-atmosphere system and model sensitivity studies.

The TOGA "ten year measurement" component began in January 1985. That implies that comprehensive data sets comprising observations of sea surface temperature, sea level, subsurface thermal structure, ocean circulation, surface fluxes, surface and upper level winds and others and products derived from these data sets, will be available in good time for use by the research community and to those conducting the "surveillance" of ocean and atmosphere for anomalous events. A major activity of TOGA, therefore, has been to organize the collection, processing and dissemination of data obtained from in situ and remote sensors. A network of international data centers has been proposed and negotiations are underway with laboratories, data centers and governments to establish these centers, hopefully in 1985.

The ultimate goal of the TOGA modelling effort is to develop coupled ocean-atmosphere models which are capable of successful long-range and seasonal forecasting. Progress in modelling will depend upon several important factors. One of the most essential elements in achieving this progress is the availability of a highly quality-controlled data set. The observing systems and their implementation are, to a large degree, driven by modelling requirements. Research into the various aspects of modelling is performed by individuals and/or groups coordinated by the SSG. The CCCO Modelling Panel and the JSC Working Group on Numerical Experimentation have collaborated in a study of the sensitivity of atmospheric models to SST and the organization of a conference on Coupled Models (May 1984). Twelve major meteorological centers are involved in the Sensitivity Study. A Workshop on Inverse Modelling and

Data assimilation was held in April 1985 and another Workshop on Coupled Models is planned for late 1986.

World Ocean Circulation Experiment (WOCE): The Strategy for WOCE will be described in the WOCE Scientific Plan being prepared for initial review in 1985 and dissemination in 1986. The details of the research programme will continue to evolve in consultation with the members of the international community of oceanographers. The goals of WOCE are: to develop models for predicting climate change and to collect the data necessary to test them; to determine whether specific WOCE data sets are representative of the long-term behaviour of the ocean, and to find methods for determining long-term changes in the ocean.

In order to develop a practical experimental design for WOCE, three Core Projects have been identified that will require special attention because of the need to overcome logistical difficulties, to obtain special resources and to co-ordinate the activities of many groups.

1) The Global Perspective: The aim of testing global circulation models will not be achieved unless the WOCE data set is truly global in extent. Satellites provide the systematic global coverage, for the first time. In situ measurements will be designed to fill gaps in the existing coverage and to increase the sampling density in areas of special importance for the understanding of the global circulation.

2) Inter-ocean Fluxes: The global balances of heat and water depend on large-scale fluxes within and between the oceans. Special attention will be paid in this Core Project to the linkage between the Pacific and Indian Oceans effected by the Antarctic Circumpolar Current.

3) Gyre Dynamics: The third Core Project is concerned with testing and understanding of the dynamical balance of the ocean within a basin. The aim will be to test, using information from the North Atlantic Ocean, current ideas concerning the effects of transient eddies, diabatic processes in and below the seasonal boundary layer, exchange with peripheral basins, etc., and to test their representation in computer models of large scale circulation.

The resources required for WOCE are of two categories; those that already exist in oceanographic institutions which can in principle be obtained through the normal funding mechanisms available to principal investigators; and resources that are not now available and which cannot be obtained by the normal mechanisms. Resources of the second category will be included as specific highlighted items in the WCRP Implementation Plan. They include satellites, a dedicated research ship, floats and drifters, expandable instruments, Voluntary Observing Ship meteorology and current profilers, data management, a sea level network, and vastly improved computers for modelling.

The WOCE timetable calls for an intensive observation period starting with the launch of the new generation of ocean-observing satellites (TOPEX-POSEIDON, ERS-1, NROSS) in about 1990 and continuing for 5 years. In situ measurements that have to be made while the satellites are operating will be concentrated into that intensive observation

period. Other oceanographic measurements less directly related to the satellites may start earlier than 1990 and extend over a longer period, up to ten years if logistically necessary. The analysis of WOCE data is expected to continue for five years after the intensive observing period, taking ten years in all (nominally 1990-1999).

#### CCCO Activities Begun in 1985

Flux of CO<sub>2</sub> between the Global Ocean and Global Atmosphere: An important aspect of Stream 3 of the WCRP is the question of the rate of uptake of CO<sub>2</sub> by the ocean and the evolution of this rate as oceanic chemistry changes because of increased dissolved inorganic carbon (DIC), and as oceanic physics changes because of increased green house effect and changes in atmospheric circulation. To attack the problem in the ocean requires inputs from physicists, chemists and biologists. It was concluded that it is necessary to appraise the state of the science to determine whether it is yet feasible to mount a comprehensive global study of CO<sub>2</sub> uptake in the ocean. CCCO therefore established a CO<sub>2</sub> Advisory Panel led by Professor Revelle to specify quantitatively what global budgets and regional fluxes related to the carbon cycle would be useful for the WCRP and to identify measurement techniques needed to achieve that goal. The Panel will specify a modelling programme needed to interpret and integrate these measurements, outline a measurement strategy and compare that strategy with the TOGA and WOCE plans.

Palaeoclimatology: One way to better understand the dynamics of the Earth's climate is to obtain high resolution climatic records of the last climatic cycle. Ice core data indicate that major variations in the CO<sub>2</sub> content of the atmosphere accompanied the climatic variations of the last ice age. The CO<sub>2</sub> changes in the atmosphere indicated in ice cores are such as to amplify the climate change indicated in the geologic record. Since CCCO is concerned with the possible effects of anthropogenic CO<sub>2</sub> on the Earth's future climate, and the role of the ocean, it has reconstituted the Palaeoclimatology Panel with the charge to focus on promoting research on that part of the geologic record which may lead to an understanding of the ocean's role in the global carbon cycle and its variability.

SCOR continues to respond as appropriate to requests of other organizations for cosponsorship of international scientific meetings. For example, CHEMRAWN IV, the Global Ocean, Its Chemistry and Resources which will take place in Woods Hole in September 1985 under the auspices of IUPAC, is being cosponsored by SCOR. SCOR has also continued to act as the official scientific advisory body to the Division of Marine Sciences of UNESCO and the Intergovernmental Oceanographic Commission.

Further information on SCOR activities may be obtained in Volume 20 of SCOR Proceedings or from E. Tidmarsh, Executive Secretary of SCOR, Department of Oceanography, Dalhousie University, Halifax, Nova Scotia, Canada, B3H 4J1.