Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Programme Group on Ocean Processes and Climate

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In this Series

Reports of Governing and Major Subsidiary Bodies, which was initiated at the beginning of 1984, the reports of the following meetings have already been issued:

- Eleventh Session of the Working Committee on International Oceanographic Data Exchange
- Seventeenth Session of the Executive Council
- Fourth Session of the Working Committee for Training, Education and Mutual Assistance
- Fifth Session of the Working Committee for the Global Investigation of Pollution in the Marine Environment
- First Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions
- Third Session of the *ad hoc* Task Team to Study the Implications, for the Commission, of the UN Convention on the Law of the Sea and the New Ocean Regime
- First Session of the Programme Group on Ocean Processes and Climate
- Eighteenth Session of the Executive Council
- Thirteenth Session of the Assembly
- Tenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific
- Nineteenth Session of the Executive Council
- Sixth Session of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment
- Twelfth Session of the IOC Working Committee on International Oceanographic Data Exchange
- Second Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions
- First Session of the IOC Regional Committee for the Central Eastern Atlantic

This document has been printed
in English, French and Spanish

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1. OPENING

The Chairman of the Programme Group, Prof. K. Voigt, opened the Session and welcomed the participants. He then passed the floor to Mr. Mario Ruivo, Secretary of IOC. 1

The Secretary of IOC, Mr. Mario Ruivo, welcomed the participants on behalf of IOC. 2

He noted that following the decisions of IOC Governing bodies the IOC jointly with WMO and SCOR has been actively involved since 1979 in planning and development of oceanographic components of the World Climate Research Programme and in particular TOGA and WOCE Programmes. Since the First Session of the Programme Group, major efforts of the Commission have been aimed at developing ocean observing systems (IGOSS XBT ship-of-opportunity programme (jointly with WMO), GLOSS and Drifting buoy Programme (jointly with WMO) and further expansion and development of international oceanographic data exchange (through WC/IODE) to meet new requirements of scientific community within the WCRP. The progress in implementation of those activities would be discussed during this session and he expected that the Programme Group would advise and recommend to the Fourteenth Session of the IOC Assembly (to be held in the following week) further steps and actions leading to the development of global ocean observing system. He continued with the following words: 3

"Progress in the implementation of the TOGA and WOCE programmes depends mainly on the willingness of Member States to participate and contribute in different forms to observational, data management and scientific components of the programmes. It also depends on the type of international mechanism needed for co-ordination of those programmes, in order to ensure proper co-ordination between the international organizations involved in the programmes both intergovernmental (IOC and WMO) and non-governmental (ICSU, SCOR). The IOC Executive Council at its Nineteenth Session invited the Programme Group to review the present arrangements and advise the IOC Assembly on simplification and streamlining of this mechanism. This is important not only for international organizations involved but first-of-all for co-ordination of those activities on national level to avoid duplication of efforts and financial and human resources rather limited in many countries of the world. We should use with maximum extent the existing mechanism and bodies within IOC and WMO. Particular attention should be given to clarification of relationship between the International TOGA Project Office and the International WOCE Planning Office and IOC, which are not satisfactory at present for IOC, and future intergovernmental mechanism for WOCE Programme co-ordination and future role of the IOC Programme on Ocean Processes and Climate. The Programme Group plays an important role as a focal point of IOC in co-ordinating various activities leading to the creation of the international global observing system or in other words World Ocean Watch". 4

"To create really global programmes participation of almost all Member States is required, many of which need assistance in various forms. The IOC Assembly will need your advice how to organize in a most efficient way such assistance". 5

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

6 The Programme Group adopted the Agenda as amended which is Annex I to this report.

2.2 DESIGNATION OF A RAPPORTEUR

7 The Programme Group designated Mr. S. Ragoonaden as Rapporteur for the Session, in accordance with IOC Rule of Procedure 25 (3).

2.3 CONDUCT OF THE SESSION

8 The IOC Senior Technical Secretary, Dr. A. Tolkachev, reviewed the arrangements and documentation for the Session. The list of Documents is given in Annex IV, hereto.

3. PLANNING AND IMPLEMENTATION OF THE LARGE-SCALE STUDIES WITHIN THE WORLD CLIMATE RESEARCH PROGRAMME (WCRP)

3.1 TROPICAL OCEANS AND GLOBAL ATMOSPHERE (TOGA)

9 Prof. P. Morel, Director of the World Climate Research Programme (WCRP), informed the Programme Group on the objectives and status of implementation of TOGA Programme and associated scientific and organizational problems. He also referred to the relevant conclusions of the WMO-ICSU-IOC First Informal Planning Meeting on the World Climate Research Programme, held in Geneva from 12 to 16 May 1986 (Summary Report of this Meeting was made available to the participants). Prof. P. Morel pointed out the following points:

Scientific orientation

10 The overall scientific strategy of the Tropical Ocean and Global Atmosphere Programme (TOGA) has been made clearer by defining two "thrusts".

11 Thrust 1 will experiment with coupled models of the tropical ocean and the overlying (tropical) atmosphere in a predictive mode, for the purpose of actually forecasting the evolution of the tropical ocean circulation and temperature, and corresponding atmospheric response, for periods of several months, starting from an initial state determined by observation.

12 Tropical ocean circulation and SST prediction experiments have been attempted in the Pacific with encouraging results since the El Nino event in 1986-87 was actually foreseen about six months in advance although no clear indication of its (weak) amplitude was given. This lead us to believe that the underlying physics is known well enough to plan the implementation of an observing and data management system for "operational oceanography" in the Tropics.

Thrust 2 aims to understand the mechanisms which cause or control the recurrence of successive tropical ocean circulation events (such as El Nino). This second thrust is exploratory research over a wide range of possible physical or dynamical processes in the ocean and the global atmosphere. 13

Status of implementation

Operational ocean observations and data management

The implementation of systematic (operational) sub-surface and sea-level observations is developing satisfactorily in the Tropical Pacific Ocean. At present time a basic sub-surface observing system is in place in the Tropical Atlantic Ocean as is a sea-level system in the Indian Ocean. However, much improvement is required in the sea-level system in both the Atlantic and Indian Ocean and the sub-surface network for the Indian Ocean. WMO is pleased to assist in the development of this operational ocean observing systems by making available the real-time data management systems and special data links of the World Weather Watch, through the Joint IGOSS and other real-time communications links using satellites (ARGOS, INMARSAT, etc.). 14

Predictive Ocean Models

Realistic dynamical (and to some extent, thermodynamical) models of the tropical oceans are being actively developed and have already been tested with encouraging success in the Pacific Ocean. The assimilation of time-dependent/wind stress observations and real-time oceanographic data is being pursued actively. 15

Atmospheric forcing

The problem of determining the global fields of momentum flux (wind stress) and heat fluxes from a combination of atmospheric and ocean surface observation, assembled through a process of 3-dimensional or time-space analysis, is not solved, but progress is being made especially in the major global meteorological forecasting centres. Complete data sets of such fluxes will be made available by at least one forecasting centre. 16

Atmospheric prediction

Last, but not least, the considerable skill achieved by atmospheric general circulation model in simulating realistically the response of the atmosphere has not yet reached the point where an unambiguous signal is seen about the climatological effect of specified SST anomalies in the extratropics. This response is however clear in the tropical atmosphere. Much work is therefore needed to improve the atmospheric climate models to meet the goals of TOGA. 17

International organization

18 WMO has expressed its satisfaction about the way the intergovernmental co-ordination of the TOGA Programme has been progressing, including the organizing, jointly with IOC and ICSU, of an (intergovernmental) Informal Planning Meeting on the WCRP (May 1986) and the establishment of an Intergovernmental TOGA Board co-sponsored by IOC and WMO. WMO has agreed to take a further step in bringing the International TOGA Project Office into the WMO Secretariat, to facilitate its operation as a component of the WMO/ICSU Joint Planning Staff for WCRP.

19 The attention of the Group was brought to the conclusions and proposals of the First Informal Planning Meeting on the World Climate Research Programme which are directly relevant to the Commission (WCRP Publications Series No. 8):

> "national and international support to the development of the IOC Global Sea-Level Observing System (GLOSS) and the IOC-WMO Integrated Global Ocean Services System (IGOSS), with emphasis on the Indian Ocean region which now constitutes a serious gap in the worldwide ocean observing network".

20 The Meeting further recognized that:

> "the Tropical Ocean and Global Atmosphere (TOGA) Project must consolidate a wide range of scientific activities into a coherent programme, as well as co-ordinate worldwide observing and data processing systems closely related to the operation of the WWW, IGOSS and GLOSS".

21 The attention of the participants was also brought to the decisions of the WMO Executive Council at its Thirty-eighth Session (2-16 June 1986) which adopted Resolution 13 (EC-XXXVIII) establishing the WMO-IOC Intergovernmental TOGA Board and defining its terms of reference (Annex V). The First Session of the TOGA Board is scheduled to be held in September 1987 in Geneva. By Joint IOC/WMO Circular Letter of 31 October 1986 Member States (listed in Annex V) were invited to designate national representatives on the Intergovernmental TOGA Board. The WMO Executive Council also agreed that "an international TOGA Project Office, operating as a component of the Joint Planning Staff for WCRP, constitutes an effective instrument for carrying out the international co-ordination activities needed for the successful implementation of the TOGA programme. The Council also endorses the arrangements made by the Secretary-General to ensure effective liaison between IOC and WMO for international co-ordination of WCRP oceanographic research activities requiring action by the IOC".

3.2 WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

22 Dr. G. Needler, Director of the International WOCE Planning Office, informed on the progress of WOCE planning since the First Session of the IOC Programme Group on Ocean Processes and Climate in 1985 and the present status of the Draft WOCE Implementation Plan. He wished to emphasize the following points:

At the time of the first session of the Programme Group in March, 1985, WOCE was a programme with clear goals and objectives but with scientific ideas that were still evolving into the more coherent form that is the basis of the present WOCE Scientific Plan. This was approved by the WOCE Scientific Steering Group (SSG) in December, 1985 and later published as Number 6 of the WCRP Publication Series. 23

The Scientific Plan states that the first goal of WOCE is "to develop models useful for predicting climate change and to collect the data necessary to test them". It also states specific objectives which should be met in this regard. Of prime importance for the future planning of WOCE was the decision to translate these goals and objectives into practical experimental design by identifying three Core Projects that should be given top priority when decisions are being made on allocating the resources available within the international community for WOCE. These are: Core Project 1, the Global Description; Core Project 2, the Southern Ocean; and Core Project 3, the Gyre Dynamics Experiment. The Scientific Plan provides the rationale for the selection of these Core Projects and an outline of their experimental design. 24

During 1986, a large part of the international planning for WOCE was centered on the Core Project Planning Meetings that were held to further develop each Core Project and to take the first steps towards detailed experimental plans. Each meeting was attended by more than 50 scientists from a wide variety of oceanographic and national backgrounds, many of whom will have to be involved in WOCE if it is to be a success. On many issues the participants were able to reach consensus on the most appropriate way to meet WOCE objectives. The SSG has decided to publish the reports of these meetings in the WCRP series. Planning for each of the Core Projects is continuing though the efforts of working groups that have recently been formed and which have the support of the WOCE International Planning Office (IPO). The first task of the working groups will be to refine the Core Project Experimental Plans to the extent that they will be properly described in the first WOCE Implementation Plan which is now in the first stage of preparation. 25

The initial global experimental plans have been estimated to require some 7 or 8 years of ship-time for the collection of high-quality hydrographic-geochemical tracer data. The details of this measurement programme, now called the WOCE Hydrographic Programme (WHP), have yet to be determined since ship-tracks depend on the evolving Core Project plans. The frequency and accuracy of sampling for certain parameters, for example, large volume tracers, remains to be justified. It is clear, however, that the WHP will require the fullest co-operation between institutions and nations if a uniform data set including all the required parameters with measurements of sufficiently high quality is to be obtained. In order to advise the SSG on the scientific issues which must be addressed, the SSG has formed a WHP Planning Committee of sea-going scientists. Ways of managing the required co-ordinated programme of ships and shore-based laboratory facilities are being investigated by interested nations. 26

27 Modelling in the WOCE context has been carried forward by the Numerical Experimentation Group (NEG). A sponsored meeting has addressed assimilation and inverse modelling. A comparison of North Atlantic models has led to identification of differences between models and to the idea of a high resolution "Community Model" to investigate which of the continuing model problems arise from low resolution. The utility of geochemical tracers for determining physical oceanographic fields and for testing models is also being pursued by the NEG.

28 The SSG has promoted efforts to determine the large scale surface fluxes of momentum, heat and fresh-water using satellite measurements and in situ surface data in combination with the numerical weather forecast models. A working group has been set up with the co-operation of the CCCO and the JSC.

29 The Scientific Plan outlines the principle WOCE data management issues, including the function of a Data Co-ordination Unit which would keep track of WOCE-related data sets, their state of analysis, and how they might be obtained by WOCE scientists. The SSG has accepted a UK offer to run such a Unit as a pilot project. To the extent possible, WOCE will use existing international mechanisms for data exchange but Special Analysis Centres serving similar functions as for TOGA are informally being sought.

30 National Committees for WOCE have been established in the Federal Republic of Germany, France, Japan, South Africa, the United Kingdom and the United States of America. A number of other countries are considering forming such committees or are using other mechanisms to organize and co-ordinate national support for WOCE. In some nations, relatively detailed national plans for WOCE have been developed; in others such planning is just now taking place. Of concern is that taken in total the national plans will address the required global objectives of WOCE. At present there is no reason not to be optimistic in this respect.

31 Since March 1985, the International Planning Office for WOCE has taken new shape. Initially started in the UK with only UK support, the office now has a Director supported by Canada who arrived in June 1985 and a scientist supported by the FRG who has taken up his post this week. Additional help that is needed to continue the detailed planning of the WOCE field programme and is, at least partially, expected to be available in the near future from the contributions of other nations. The IPO with UK support has started a Newsletter to publicize WOCE activities.

32 In the immediate future, international WOCE activities will be mostly directed to the preparation of the First WOCE Implementation Plan. It is intended to have this Plan approved by the SSG in November, 1987 in preparation for an informal intergovernmental WOCE meeting in the fall of 1988. Through the international planning process, the activities of nations, and the increasing involvement of institutions and individual scientists, WOCE is rapidly taking shape, although its evolution will continue to the end of its Intensive Observation Period now set for 1990 to 1995. It is to be hoped that nations will find the resources necessary for its completion.

Of importance to this meeting are the opportunities and needs for IOC participation in WOCE. In addition to the data management aspects mentioned above, the IOC can assist WOCE through the Global Sea-Level Observing System (GLOSS) and co-operation in expanded XBT surveys from ships-of-opportunity. Helping to obtain access of ships carrying out WOCE projects in nations' exclusive economic zones is another service IOC can provide for WOCE. Participation in these and others of common concern could be facilitated by the secondment of an IOC staff member to the WOCE-IPO. 33

Prof. R. Stewart, Chairman of the IOC-SCOR CCCO, made comments on overall development of oceanographic components of WCRP, TOGA and WOCE in particular and activities of the CCCO. He pointed out that: 34

As has been indicated by Prof. P. Morel and Dr. G. Needler, important advances are being made in both TOGA and WOCE. There are, however, several matters which might be advanced by governmental and intergovernmental action. 35

The cancellation of NROSS causes nervousness about the certainty of obtaining satellite data considered crucial for TOGA and essential for WOCE. Clear statements of intent with regard to satellites would greatly help planning. 36

There remains a problem of "sea truth" for satellite data. In particular he noted that there are uncertainties in the algorithms linking scatterometer reflectivities and wind stress. Groups capable of direct stress measurements, for these calibration purposes, should be supported. 37

It is unfortunate that much data taken at sea never reaches the international data systems. In some cases the scientists themselves are responsible. That problem was considered by SCOR in its November 1986 meeting and some progress was made. However there are other data, taken by navies and fishermen, which could be used with advantage. For good reasons, these data may not be available in "near-real-time", but could be made available after some delay. National efforts to make possible the use of such data for climate purposes would be valuable contributions. 38

The scientific community looks to intergovernmental agencies, particularly IOC, to help assure that data are obtained, and made available from EEZ'S. Where, for whatever reason, a country wishes not to allow data to be collected by nationals of other countries, it is surely incumbent on that country to collect necessary data itself and make these available. IOC is also looked to help obtain port access for resupply and crew changes. 39

40 Some decisions relative to these matters are made by junior officials from agencies with no responsibility for climate studies. It would be useful if governments, at a high level, made and prolongated the decision to support the WCRP, so that such junior officials would have guidance to the effect that co-operation was consistent with government policies.

41 TEMA is always high in the priorities of IOC. However, it appears that present TEMA resources are too strained by other tasks to take on the responsibility for dealing with training opportunities which arise within TOGA and WOCE. This warrants IOC attention.

42 A final point: there are pressures on the CCCO to divert some of its attention to programmes only peripheral to the WCRP: regional programmes and broad aspects of geochemistry and ocean biology. The CCCO believes that it should concentrate its attention on the already broad and difficult problems closely associated with climate studies. The CCCO seeks support for this attitude.

43 The delegates discussed the IOC activities in oceanographic components of WCRP, including TOGA and WOCE.

44 Noting new initiatives proposed by ICSU and SCOR regarding the International Geosphere Biosphere Programme and Global Ocean Flux Study, some participants felt that although co-operation of WCRP and CCCO on some aspects of those programmes related to global climate studies is desirable, CCCO should concentrate on oceanographic activities relat ed to climate studies.

45 Some delegates stressed the importance of close collaboration between WOCE and IGOSS activities in view of the interest of WOCE programme for IGOSS data and products and in order to encourage scientists to provide data for international exchange. It was also proposed that the WMO scheme of Port Meteorological officers should be actively used in the interest of IGOSS programme. This matter can be addressed to WMO at the next WMO Congress.

46 Some delegates expressed disappointment with regard to the postponement of the launching scatterometer by the U.S.A. The Delegate of Canada noted that observations from operational U.S. satellites equipped with SSM/I can be used for wind stress estimation and negotiations are underway between Canada and USA to insert this data for international exchange through GTS.

47 In considering the role of IOC in further promoting of WCRP and its oceanographic components, some delegates wished to emphasize that IOC has an important role in: facilitating access to exclusive economic zones and sea ports for ships participating in WCRP programmes; strengthening its training and assistance programme; strengthening support for international oceanographic data exchange; and developing ocean observing system including GLOSS, IGOSS XBT Ship-of-Opportunity Programme.

The Programme Group considered the terms of reference of the Joint WMO-IOC Intergovernmental TOGA Board established by the WMO Executive Council at its Thirty-eighth Session (Annex V) and expressed its full support for those terms of reference. The Programme Group wished to point out that IOC should play an active role and provide support for participation of oceanographic experts from developing countries contributing to TOGA in relevant activities of the ITB and arrange IOC representation in the First Session of the Intergovernmental TOGA Board scheduled to be held in September 1987 in Geneva, and urged Member States selected for Intergovernmental TOGA Board (Annex VI) to nominate without delay their representatives to the Board. 48

The Programme Group also supported IOC convening of the First WOCE International Conference in October 1988 in Paris to consider the Draft Scientific WOCE Implementation Plan. This Conference should be organized under the joint sponsorship of IOC, WMO , ICSU and SCOR and include national representatives and scientists involved in WOCE planning. It was noted that SSG for WOCE at its forthcoming meeting in April 1987 and CCCO-VIII at its 8th session in May 1987 will consider the programme for the conference and provide advice to IOC and other co-sponsoring organizations on actions to be taken regarding the Conference. 49

Organizational matters related to oceanographic activities within WCRP, including TOGA and WOCE, were further discussed under Agenda Item 6. 50

The Programme Group adopted Resolution PG-OPC-II.1 related to Agenda Items 3 and 6. 51

4. DEVELOPMENT OF OCEAN OBSERVING SYSTEMS IN SUPPORT OF WCRP

4.1 GLOBAL SEA-LEVEL OBSERVING SYSTEM

Dr. D. Pugh, Chairman of the IOC Task Team of Experts on the Global Sea-Level Observing System (GLOSS) presented the GLOSS Implementation Plan (doc. IOC/INF-663 rev.). He pointed out the multipurpose nature of the GLOSS, as a permanent international system for sea-level measurement, sea-level data collection and exchange, and preparation of sea-level products required in support of WCRP, long-term climate studies, studies of tectonic movements as well as for other international, regional and national research and practical applications. He noted that requirement of WOCE for sea-level measurements should be further elaborated, and attention should be given to relating GLOSS stations to absolute global geodetic network through GPS , and VLBI positioning systems. He also drew the attention of the Programme Group to the publication in 4 languages of IOC Manual on Sea Level Measurements and Interpretation. 52

53 The Senior Technical Secretary, Dr. A. Tolkachev, then presented the progress report on GLOSS Implementation (Doc. IOC/PG-OPC-II/8 Annex 3). He pointed out the following major points.

54 Since the approval, in principle, of the GLOSS Implementation Plan (doc. IOC/INF-653) by the IOC Executive Council at its Nineteenth Session (Resolution EC-XIX.6) 41 Member States of IOC have confirmed their participation in the GLOSS and provided information on their GLOSS stations.

55 The Fourth Training Course on Sea-Level Measurements and Analysis was held in Bidston, at the Institute of Oceanographic Sciences, UK, from 23 June to 11 July 1986 with the support of IOC with participation of trainees from Indonesia, Nigeria, Seychelles and Sierra Leone. The Fifth Sea-Level Training Course will be held from 22 June to 10 July 1987.

56 France has offered to arrange a sea-level training course for french speaking countries in 1988.

57 Two missions of experts to advise on setting up national GLOSS stations were organized in 1986 with IOC support:

- Mozambique: mission of experts from the Hydrographic Institute of Portugal in February 1986; two stations were visited: Pemba and Maputo.

- Countries of the IOCEA region: Morocco, Mauritania, Senegal, Guinea, Sierra Leone, Ghana, Nigeria and Cameroon were visited by a French expert, Mr. J.-M. Verstraete, ORSTOM, in April 1986.

58 Since 1985, sea-level stations have been established in the following sites with assistance of USA:

- Kapingamarangi, Fed. Micronesia (Telemetered)
- Wake & Johnston Is., USA (Telemetered)
- Funafuti, Tuvalu (Telemetered)
- Canton Is., Kiribati (Telemetered)
- Penrhyn Is., New Zealand (Telemetered)
- Nuku Hiva, French Polynesia (Telemetered)
- La Libertad, Ecuador (Telemetered)
- Callao & Lobos Is., Peru (Telemetered)
- Arica, Caldera, Valparaiso, San Felix Is. (installation underway) and Easter Is., Chile (all telemetered)
- Diego Garcia
- Male (Maldives)
- Mahe Is. (Seychelles)
- Port Louis Harbor (Mauritius)
- Rodrigues (Mauritius)
- Mogadishu (Somalia)
- Mombasa (Kenya)
- Dar-es-Salaam & Zanzibar (Tanzania)

Sea-level stations have been also established at Christmas and Cocos Islands (Australia), Pelabuhan Ratu (Indonesia) with the assistance of Australia; at islands St. Helena and Tristan da Cunha (UK), and Gwadar (Pakistan). 59

The People's Republic of China has offered two tide gauges. This offer was made to Somalia, where installation of 2 GLOSS stations was proposed (Hafun and Mogadishu). No answer has been received so far from Somalia. 60

Australia has embarked on the programme to assist ASEAN countries: Indonesia, Malaysia, Philippines, Singapore, and Thailand in setting up their sea-level stations. 61

Development of sea-level networks in support of TOGA, WOCE and regional studies was discussed at the WMO-ICSU-IOC Informal Planning Meeting on the World Climate Research Programme (May 1986); Sixth and Seventh Sessions of the SCOR-JSC SSG for WOCE (April, December 1986); First Session of the IOC Programme Group on IOCEA (January 1987); Second Session of the IOC Sub-Commission for IOCARIBE (December 1986); Fifth Session of the CCCO Tropical Pacific Panel (October 1986); Fifth Session of the Joint IOC-WMO-CPPS Working Group on "El Nino" (November 1986). 62

As recommended by the IOC Executive Council (Resolution EC-XIX.6) close contact had been established with the International Hydrographic Organization (IHO) on the GLOSS programme, and GLOSS will be discussed at the Thirteenth Session of IHO (May 1987). Development of sea-level network in the Southern Ocean will be considered at the Fifth Session of the IOC Regional Committee for the Southern Ocean (June 1987). 63

The Programme Group noted with satisfaction the development of GLOSS and willingness of many countries to participate in it. 64

Delegates expressed their full support to the GLOSS Programme and emphasized that many developing countries had expressed their willingness to participate in the Programme. The delegates of Spain and the USSR indicated their intention to participate in GLOSS and provide in near future information on their GLOSS stations. 65

The Programme Group noted that many developing countries, as shown in the GLOSS Implementation Plan, would need assistance with regard to provision and installation of tide-gauges, and training of specialists, and that Member States of IOC should be urged to provide such assistance either through TEMA activities of IOC or on bilateral and/or multilateral basis in the real spirit of co-operation in the field of science. The Programme Group noted with satisfaction that at the recent meetings of IOCEA (January 1987) and IOCARIBE (December 1986) , regional sea-level projects had been adopted which would provide an important contribution to GLOSS. 66

67 The Programme Group recommended that the forthcoming meetings of other IOC regional bodies consider the implementation of regional components of GLOSS (WESTPAC-IV, Bangkok, June 1987), IOCINCWIO-II (Tanzania, May 1987), IOCINDIO-I (Pakistan, September-October 1987), IOCSOC-V (Paris, June 1987) and designate regional GLOSS contacts. It was also recommended that GLOSS experts be invited to participate in these meetings.

68 Dr. S. Morcos reported on the recent actions of the Unesco Division of Marine Sciences related to GLOSS in the area of the Indian Ocean, the Red Sea, and Gulf, particularly in the People's Republic of Yemen, Oman and Madagascar, as well as within the framework of Unesco extrabudgetary projects and regular programme. Whenever possible they are carried out in co-operation with PERSGA and ROPME (Kuwait Action Plan). Most countries of the region need assistance. He proposed that a popular brochure on GLOSS be prepared for demonstration of practical and scientific value of sea-level measurements.

69 Many delegates noted that GLOSS development could serve as a good example how service oriented projects could be implemented.

70 The Programme Group reviewed the updated GLOSS Implementation Plan (Doc. IOC/INF-663 rev.) to be published in the IOC Technical series in accordance with Resolution of the Nineteenth Session of the IOC Executive Council.

71 The Programme Group recommended that IOC convene a meeting of experts in 1987 in order to review and update the GLOSS Implementation Plan and advise IOC on actions needed to improve GLOSS implementation.

72 Some delegates noted that the Plan would need regular review and updating (once every 2-3 years) in view of the new technology development, new requirements by scientists and results of scientific programmes implementation. When discussing possible international mechanism for monitoring of GLOSS implementation, some delegates felt that existing IOC bodies (particularly IGOSS) could be used for such purposes, although, in order to assist the Secretariat in updating GLOSS Plan, meetings of Task Team of Experts could be organized on a periodic basis. It was therefore suggested that references to the international mechanism in the GLOSS Plan should be deleted (pages 44-45). It was also suggested that proper corrections be made in the GLOSS Plan regarding identification of countries and areas (territories), participating in the GLOSS.

73 The Programme Group adopted Recommendation PG-OPC-II.1.

4.2 IGOSS SHIP-OF-OPPORTUNITY PROGRAMME

74 Mr. J. Withrow, IGOSS Operations Co-ordinator, reported on the progress in the development and implementation of the IGOSS Ship-of-Opportunity Programme. The Programme Group noted that the

total number of reports submitted in 1986 had exceeded all previous years. Unfortunately the increase had come mostly in the number of BATHY messages and Member States were asked to encourage the submission of TESAC messages particularly from their research ships. There continues to be a need to increase the number of ships in the system particularly in the Atlantic and Indian Oceans and southern Pacific. In many cases ships operating out of developing countries transit data sparse areas. These countries have expressed interest in participating in the ship-of-opportunity programme but require equipment and training.

It was noted that in addition to the existing IGOSS Specialized Oceanographic Centers SOCs, new SOCs were being planned in France, Argentina and Australia. The terms of reference of these new SOCs were still under negotiation. Other National centers are encouraged to identify areas of interest within IGOSS and investigate the possibility of becoming SOCs. To assist in this effort, the new IGOSS Guide to SOCs is presently under review and should be distributed to Member States by the end of the year. 75

It was noted that Member States should be encouraged to arrange with their INMARSAT Coastal Earth Stations to accept BATHY/TESAC messages free of charge, and to invoice the relevant agency of the state rather than the transmitting unit; this would lead to a greater flow of such messages. INMARSAT is a much faster medium of transmission and less prone to transmission errors. The trend towards more automated equipment was viewed as an encouraging trend resulting in higher quality data. 76

The Programme Group expressed its satisfaction with regard to initiation of regular monitoring of IGOSS data. The Programme Group also noted some encouraging tendency in the growth of IGOSS data entered into GTS. The Delegate of Canada informed the Group that his country was considering hosting the next meeting on IGOSS XBT Ship-of-Opportunity Programme in August 1987. 77

Mr. J. Withrow further reported on the development of the IGOSS Subsurface Thermal Structure Pilot Project which was started in 1986. The new Specialized Oceanographic Center (SOC) in USA has just begun distributing products. The coming year will be spent refining the products and in investigating the possible expansion of the project into the Tropical Atlantic Ocean. 78

In reviewing the present status of coverage of different oceans by IGOSS data the Programme Group noted that the substantial progress had been achieved in the Pacific Ocean due to the basic motive offered by new diagnostic and prognostic capabilities for El Nino phenomena and atmospheric climatic changes. Some IGOSS subsurface thermal products, presented by Mr. J. Withrow, demonstrated the possibility to monitor mild El Nino. In the Atlantic Ocean, some countries have started or 79

plan to expand oceanographic observations, particularly within the framework of "EAZO-Sections" programme. The Programme Group expressed a strong hope that it will result in the increase of IGOSS data and products from the area.

80 As it was stressed by many delegates particular efforts are needed in the Indian Ocean with very sparse oceanographic data coverage. It was noted with satisfaction that discussion was underway to designate Mr. S. Ragoonaden (Mauritius) as a regional focal point for XBT programme in the Indian Ocean. Some delegates stressed the need to intensify research efforts related to the development of diagnostic and prediction capabilities related to monsoon, as an important consideration for the participation of Member States of the Indian Ocean in IGOSS XBT Programme. Being informed by the USSR on possible oceanographic expeditions in the Indian Ocean, the delegate of the USSR was requested to provide information to the SCOR-IOC CCCO on its "EAZO-Sections" Programme in the Indian Ocean. The Programme Group was informed on the establishment at Brest, France of a TOGA Subsurface Data Center which had initiated some actions aimed at collecting subsurface data for tropical oceans since 1985, i.e. from the beginning of TOGA Programme.

81 Dr. Y. Oliounine, IOC Senior Assistant Secretary, emphasized that a number of developing countries had indicated their interest in participating in the XBT Programme but they need financial support in order to purchase the required equipment. He also informed the Programme Group on the IGOSS training course organized in Argentina in 1985.

82 The Programme Group emphasized the need for accelerated development of IGOSS, especially in tropical zones in support of TOGA with priority to be given to the Indian Ocean and for assistance to be provided to developing countries to enable them participate actively in the WCRP, particularly with regard to provision of instruments, their installation and training of specialists.

83 The Programme Group recommended that the IOC Assembly urged Member States to provide increased assistance to developing countries. This was included in Recommendation PG-OPC-II.2 adopted under Item 7.

4.3 JOINT IOC-WMO DRIFTING BUOY PROGRAMME

84 Mr. T. Treglos, Assistant Secretary, informed the Programme Group on the development and implementation of the Joint WMO-IOC Drifting Buoy Programme and the outcome of the Second Session of the WMO-IOC Drifting Buoy Co-operation Panel (Geneva, 15-17 October 1986). After having briefly reviewed the work accomplished by the Drifting Buoy Co-operation Panel, he stressed that very little actual progress could be achieved unless a Technical Co-ordinator for the Panel is appointed. Hopefully this question would find a solution before mid-1987. Notwithstanding the delay in implementing co-ordination activities, considerable progress was achieved in the use of drifting buoys. Within a two and a half year period (from mid-1983 to end

1986), the number of drifting buoys handled by CLS (Collect - Localisation - Satellites, previously known as Service ARGOS) nearly doubled and the percentage of these drifting buoys that report data onto the Global Telecommunication System (GTS) of WMO doubled too. The number of DRIBU reports (i.e. observations from drifting buoys encoded in the proper WMO code form called DRIBU) exchanged daily onto the GTS increased from some 750 to some 2300, i.e. three-fold. On the other hand, it should be emphasized that if all drifting buoys were reporting onto the GTS, the daily number of DRIBU reports would have reached around 5,500. It is therefore expected that buoy deployers will be urged to make their data available widely, preferably by using the GTS.

As far as future is concerned, a 17% increase in the number of platforms handled by CLS is foreseen in 1987, according to the ARGOS Global Tariff Agreement for 1987. It is expected that a similar increase will apply to the number of drifting buoys. Furthermore, a new Memorandum of Understanding was signed between French and US concerned agencies to foresee (i) the space segment of ARGOS System up to the satellite NOAA-M (to be launched in 1993, according to present schedule), with an increased capacity in terms of platform location and data collection, and (ii) the implementation of an ARGOS Processing Centre in the USA, to be operational by April 1987. 85

It was noted that the formation of a SOC for drifting buoys at the Service Central d'Exploitation Meteorologique in France under Dr. Billard is nearly complete. This center will work closely with the Responsible National Oceanographic Data Center (RNODC) for drifting buoy data located in Canada, MEDS (Marine Environmental Data Service). The need for increased co-operation between IGOSS, IODE and the Drifting Buoy Co-operation Panel (DBCP) on matters pertaining to quality control was emphasized. 86

Mr. A. Alexiou (CCCO Secretariat) informed the Programme Group on the results of the investigations made by the CCCO Secretariat on drifting buoy data reporting for international exchange. 87

At the 7th Session of the SCOR-IOC/CCCO, the perennial question of how to motivate more scientists to share their data was addressed. During the discussion of this subject relative to drifting buoys, several plausible explanations were considered as to why much of the ARGOS acquired drifting buoy data was not being received by RNODC (MEDS). Since the data were already being encoded for telemetering via satellite, it seemed, on the surface at least, that it would be a relatively easy step to have the data automatically go to MEDS. There was a strong belief prevalent in the CCCO that more buoy operators would give permission for the automatic submission of their data by Service ARGOS to the MEDS RNODC if they as originators, would be assured that their data would be withheld from exchange for a period of time, in order to protect against earlier publication by others of the results of their own research. 88

89 To test this belief and to delve into the presumptions on which it is based, a simple questionnaire was designed for drifting buoy operators. On 16 June 1986, the questionnaire was sent to the 50 addressees on a mailing list of the ARGOS users supplied to the CCCO by the ARGOS Promotion Department. From the 50 questionnaires sent out, 37 responses were received.

90 The results tend to support the idea that limited distribution on prior to preparation of scientific papers is one reason why some scientists are not sharing data currently but would be willing to do so after some given time (which varied from 3-36 months). This does not seem to be a fundamental problem then. There was a fundamental quality control problem put forth, however, that will probably have to be addressed if useful data exchange is going to be increased measurably.

91 On the other hand, the statistics from this exercise are encouraging. Thirteen respondants of the 37 received indicated that they currently enter their data on the GTS system (from where MEDS acquires it). Of the remaining 24 replies, 10 were operators of other than conventional ocean drifting buoys (e.g. 1 land station, 4 moored stations, 3 SOFAR buoys, and 2 equipment manufacturers), one had completed a 3-month short-term experiment and was no longer an operator, 2 didn't know whether their data reached MEDS, 8 would agree to send to MEDS with a time delay (one of these is a SOFAR operator), 2 were collecting data confidential to their sponsors, and 4 believed that post-acquisition quality control was necessary for the data without which data exchange was unlikely to be useful to anyone. These latter four respondants operate a large number of buoys.

92 The full results and individual commentaries were tabulated and distributed to the respondees as well as to the Drifting Buoy Co-operation Panel.

93 The problem of input of data to the distribution system is intertwined with quality control. Some scientists conscientiously send in their data after a short time after they have verified its quality, some wait till after then after they have written papers. But it is generally recognized that unless data is input very soon after it is acquired the chances diminish rapidly with time that it will ever reach the data center(s) at all. On the other hand, data made available immediately has only the minimum quality control that the center can apply, and may contain no recognizable information other than position data. The options for resolving this issue have been discussed at the yearly meeting on ARGOS Joint Tariff Agreement and at the Second Session of the Drifting Buoy Co-operation Panel. One of the most attractive options for increasing the number of data made readily available for wide exchange seemed to be to have the future funding. On the other hand, the question of real- time quality control of data was considered as of a very high priority by the DBCP. Experiments to solve this problem were to be conducted in the USA through a joint action by the new ARGOS processing centre and the NDBC, and the Technical Co-ordinator for the DBCP was entrusted with the task to study the possibility of implementing real-time quality control procedures in the French ARGOS processing centre.

The Programme Group pointed out that the drifting buoy activities are considered as an important element of the ocean observing system required for the WCRP, TOGA and WOCE. In this regard, the attention of the Group was directed to the discussion of this matter at the First WMO/ICSU/IOC Informal Planning Meeting on the World Climate Research Programme (Geneva, 12-16 May 1986) at which some countries had provided information on tneir plans to deploy drifting buoys. 94

The Delegate of Canada informed the Programme Group that the Director of RNODC for drifting buoy data (MEDS) plans to discuss this month the matter of drifting buoy data submission to RNODC, including data quality control, with the representative of ARGOS in Toulouse. 95

The Representative of Mauritius indicated his country's interest in receiving meteorological drifting buoy data which can be used for surface analysis and forecasts for shippping but that there had been difficulties in obtaining these data from GTS Center in Nairobi, due to the low priority given to such data. Some delegates indicated that "local user terminal" could be used to obtain these data from satellites. 96

The Programme Group noted that still 30-35% of buoy data are now made available for either near-real-time exchange via GTS or ultimately deposited for archival on a delayed mode in the RNODC for drifting buoy data (MEDS, Canada). It therefore requested the Joint WMO-IOC Drifting Buoy Panel to give particular attention to the problem of drifting buoy data management, in co-operation with the Working Committee on IODE. 97

4.4 OPPORTUNITIES OFFERED BY NEW OCEAN TECHNOLOGIES

Mr. A. Alexiou (CCCO Secretariat) presented document IOC/PG-OPC-II/8 Annex 2 "Acoustic Doppler Current Profiler", which provided information on the present status of this instrument. 98

The growing number of acoustic doppler current profilers (ADCP) being introduced on oceanographic vessels is beginning to provide the oceanographic community with an ocean currents data set of a size and resolution never seen before. At present, countries currently, or soon to be, employing ADCP's include the United States (the predominant user), the People's Republic of China, Italy, the United Kingdom, Federal Republic of Germany, Norway, Japan, the Netherlands, Canada and Australia. In U.S. dollars, the cost per unit ranges between $60-80K. 99

The oceanographic scientific community is generally enthusiastic. While some very experienced operators have come to consider their ADCP's as an operational tool, the instrument is still generally recognized as developmental in nature and great care in the control of the quality and interpretation of the measurements is needed. 100

101 The National Oceanic and Atmospheric Administration (NOAA) of the U.S.A. is developing a capability for collecting ADCP data from ships-of-opportunity in near-real-time. It is the intent to telemeter current data along with other data from the ships via a GOES satellite link using the NOAA developed Shipboard Environmental Data Acquisition System (SEAS). SEAS allows standard oceanographic data in BATHY or TESAC format to be sent directly to the National Meteorological Center in Maryland.

102 The U.S. Office of Naval Research has anticipated a major deployment of drifting buoys with ADCP's sounding the upper ocean in a project (OCEAN STORMS) with Canadian participation.

103 Some investigators participating in the Tropical Ocean and Global Atmosphere (TOGA) Project believe that the use of a relatively small number of ADCP's on a selected number of ships operating in the tropical oceans may prove to be a very promising means of building a long-term data set.

104 The ADCP is rapidly approaching the stage where it will be routinely used at many stations, generating vast amounts of data. Prudence dictates that those agencies involved with international exchange and storage of data begin to prepare for this eventuality.

105 The attention of the Programme Group was drawn to the discussion of a code for reporting of data from doppler current-profiling systems that took place during the Joint IOC/WMO Meeting of Experts on IGOSS Operations and Data Exchange (Hamburg, 10-14 December 1984). The meeting proposed a modification to code form FM-64 V TESAC. This proposal was accepted by the CBS/Ext (1985), and this code amendment will become effective as from 1 November 1987.

106 A new application of the ADCP will be investigated in 1987 by the Brookhaven National Laboratory. Under a grant from the Office of Naval Research, scientists there will study the ability of the ADCP to measure zooplankton biomass. The acoustic backscatterers are primarily zooplankton and the energy backscattered is related to zooplankton biomass. Scattering efficiency of the individual organism is, to first order, a function of its volume and internal density. The investigations will be conducted in the field to determine the degree to which backscattered energy can be interpreted as biomass. Both bottom mounted and shipboard units will be employed. They will be modified by RD Instruments to be able to get a more accurate measure of backscatter amplitude. Preliminary results may be available by midsummer. It is hoped the study can be completed in time for the fall 1987.

107 The Programme Group noted that the future ocean observing system required in support of the World Climate Research Programme, and in particular WOCE, in addition to those elements discussed under items 4.1, 4.2, 4.3, will include:

- dedicated altimetry satellite missions to determine the dynamic topography of the mean ocean surface,

- scatterometer satellite missions to measure the surface wind or wind stress vector over the global ocean,
- active and passive microwave radiometers
- moored instruments, especially current meters,
- specialized systems, such as towed CTDs, acoustic current profilers, acoustic tomography,
- dedicated research vessels for hydrographic and hydrochemical measurements.

Those observational elements are described in the Scientific Plan for the World Ocean Circulation Experiment (WCRP Publications Series No. 6, July 1986), and their use for WOCE will be further elaborated in the Draft WOCE Implementation Plan being prepared by the SSG for WOCE. 108

With regard to long-term moorings for current measurements, the attention of the Group was directed to the studies made by a SSG/WOCE expert, Mr. M.G. Briscoe, results of which were published in the WOCE Newsletter No. 3, September 1986, under the title "Survey of Long-Term Mooring Sites and Current Meter Resources". The Group welcomed the decision of the Working Committee on IODE to extend the European Current Inventory to have global coverage and to prepare Terms of reference for RNODC-Currents. 109

During the First Informal Planning Meeting of the World Climate Research Programme, several countries (Australia, Brazil, People's Republic of China, France and USA) reported on their present and planned activities related to development of current meter moorings. 110

The Programme Group noted that the ocean observing system both for TOGA and WOCE requires extremely diverse types of oceanographic observations and that rapid development of new technology for ocean observations makes it possible to establish in near future a trully global ocean monitoring system. 111

It noted that there are several expert groups involved in consideration of new technology development for ocean observations: 112

- JSC-CCCO Working Group on Satellite Observing Systems for Climate Research (satellite ocean remote sensing)
- WOCE Technology Group of the SSG for WOCE (current meter moorings, drifters and floats, acoustic tomography, satellites, specialized research vessels)
- IGOSS Group of Experts on Operations and Technical Applications (satellites and buoy systems, applications to IGOSS Programmes)
- SCOR WG 88 Intercalibration of Drifting buoys
- SCOR WG 75 Methodology for Oceanic CO_2 Measurement

- GLOSS Task Team of Experts (methodology for sea-level measurements)
- SCOR WG 77 Laboratory Tests related to basic physical measurements at sea
- CCCO OOSDP Group (development OOSDP plan)

113 Many delegates noted that, in developing global ocean observing systems and in introducing new technology for oceanographic observations, particular attention should be given to the problem of standardization and intercalibration of measurements by different instruments so that scientists could have access to continuous and compatible historical records for long-term research, particularly for climatic studies.

114 The Programme Group felt that IOC, in developing an international global ocean monitoring system, should rely on the advice of those existing expert groups. The Programme Group recommended that the SCOR-IOC CCCO or IOC advisory bodies be requested to prepare a report on new technologies being developed for ocean observations for distribution to IOC Member States (Recommendations PG-OPC-II.3 and PG-OPC-II.2).

5. OCEANOGRAPHIC DATA MANAGEMENT WITHIN THE WCRP

115 The Secretary of the Joint SCOR-IOC CCCO, Mr. B. Thompson, reviewed the data management plans for an implementation of the Tropical Ocean Global Atmosphere (TOGA) programme and the World Ocean Circulation Experiment (WOCE). These activities require a variety of data assembly and quality control centres as well as special analysis centres to generate data sets and regional and global analyses for climate research.

116 Four data centres have been established for TOGA: Sea Surface Temperature - Climate Analysis Centre, Washington D.C.; Subsurface Data Centre - IFREMER, Brest, France; Sea Level Data Centre - University of Hawaii, Honolulu; and TOGA Level III, Atmospheric Data Centre, European Centre for Medium Range Weather Forecasts (ECMWF). In addition, final negotiations are underway for the establishment of several other centres. To be effective and to meet the requirements of TOGA, these centres will require the full support of the ocean science and service communities of the IOC.

117 The data management plans for WOCE (See Scientific Plan for WOCE, Chapter 7, WMO/TD-No. 122, July 1986) are not as well defined as those for TOGA. The concept of utilizing Assembly Centres, Special Analysis Centres (SAC) and the WDCs is being considered, but it is essential that WOCE scientists be directly involved with the assembly and analysis of the WOCE research data sets.

Data management needs of WOCE will be determined by the WOCE Scientific Steering Group during the next 12 to 18 months and they will be described in the WOCE Implementation Plan to be submitted to Member States and to an International Conference for WOCE in 1988. 118

The ocean satellites to be launched in the 1990's are a specific promising data source for WOCE and TOGA. The data resulted from national or multinational satellite projects (ERS-1, TOPEX/POSEIDON) will be provided to the WOCE and TOGA Assembly Centres and subsequently submitted to WDCs along with other WOCE and TOGA data in accordance with the data management plans. 119

Finally, the Secretary CCCO informed the Programme Group that a Pilot Data Information Unit was being established to keep track of and to foster the exchange of WOCE (and evenutally TOGA) data. This pilot effort will be undertaken by the UK Institute of Oceanographic Sciences. The unit will also investigate and test the use of on-line data tracking and exchange systems. 120

The Programme Group recommended that the Working Committee on IODE should continue to give high priority to the oceanographic data management in support of WCRP in co-operation with the SCOR-IOC CCCO. The Programme Group noted with appreciation contribution by USA and France to the activities of some TOGA centres dealing with oceanographic data and data products. 121

Dr. Y. Oliounine (Senior Assistant Secretary) informed the Programme Group on the actions taken by the Working Committee on IODE in support of the implementation of data management plans of WOCE and TOGA by noting that, in spite of the progress made, the main deficiency of the system - delay in availability of data to users, has not been overcome during the last few years. This deficiency is caused not only by the reluctance of some data originators and NODCs to give data for international exchange, but also due to the lack of resources available in data centres for the effective participation in the IODE system. 122

The Programme Group noted with appreciation the efforts made by IOC and SCOR in urging their Member States to comply with existing international agreements on data exchange. The Programme Group was concerned with the results of query made by the Working Committee on IODE on the available NODC facilities. The Programme Group supported the conclusions of the query that the present resources available to the IODE System are not sufficient to provide efficient distribution and archiving of even the present data volumes. The Programme Group recommended that the IOC Assembly encourage its Member States to increase their support at the national level to the development and operation of oceanographic data centres. 123

Some delegates emphasized that existing mechanisms and procedures within IODE should be used by participants of the WCRP and that close co-ordination between meteorological and oceanographic data management schemes should be established. 124

125 The Programme Group was then informed on the deliberations of the Working Committee on IODE at its Twelfth Session (Moscow, USSR, 10-17 December 1986) relevant to IODE support to the oceanographic elements of the WCRP. The Programme Group welcomed the intention expressed by the Working Committee on IODE to develop all the organizational structure needed to interact in a timely way with the WCRP in order to ensure its effective use for climatic studies.

126 The Programme Group supported the recommendations of the Meeting of Experts on Climatic Oceanographic Data Management (Beijing, P.R. of China, April 1985) and the Twelfth Session of the Working Committee on IODE concerning oceanographic data management activities in support of the WCRP.

127 The Programme Group reiterated the importance of up-to-date information on national oceanographic programmes and on the data holdings and expressed its support to the idea of an electronic bulletin board for NOPs announcements. The Programme Group recommended also that the Working Committees on IODE and for IGOSS should give more attention to the monitoring of data flow.

128 The Programme Group was pleased to note the decision of the Working Committee on IODE to support TOGA in the development of IOC General Format (GF3) subsets for selected TOGA parameters and to support WOCE through the establishment of "data type" RNODCs, like RNODC-currents.

129 The Programme Group agreed that, at this stage, it is more than ever important to have close contact between data management units of TOGA and WOCE and the Working Committee on IODE. The Programme Group wished to express its support to organization of the Workshops on Ocean Climate Data Management and on Satellite Derived Sea Surface Temperature Data jointly with SCOR-IOC CCCO and WMO. It recommended that the oceanographic data management matter be given particular attention at the First Session of the Intergovernmental TOGA Board (1987) and International WOCE Conference (1988), and, that representatives of the Working Committee on IODE be invited to participate in those meetings.

6. NATIONAL, REGIONAL AND MULTINATIONAL PROGRAMMES RELATED TO WCRP

130 The Delegates of Australia, Japan, Federal Republic of Germany, Mauritius, United Kingdom, Brazil, France, Canada, German Democratic Republic , People's Republic of China and the United States submitted reports to the Programme Group on ongoing or planned research and monitoring activities related to WCRP. The Programme Group also received a written report of the Chairman of the Regional Committe for the Southern Ocean and it was informed on the implementation of multinational programme "EAZO-Sections" (Cuba, GDR, Poland, Bulgaria and USSR). The Programme Group recommended that the reports should be made available to the CCCO and its working groups as well as other IOC

bodies. These reports will be distributed in the form of IOC Information document. It was also noted that some IOC regional bodies had been active (IOCARIBE, El Nino, IOCEA) in developing regional observational and research projects related to WCRP. The Programme Group welcomed those initiatives and invited other regional bodies to intensify efforts in that direction.

Delegates felt that the Programme Group should play more 131
active role in facilitating dissemination of information on those activities and programmes in order to make maximum use of them to achieve the WCRP objectives, and the Programme Group recommended that such information be regularly prepared by the IOC Secretariat for submission to various WCRP-related meetings.

7. PROPOSALS ON TEMA ACTIVITIES RELATED TO WCRP

Dr. A. Tolkachev, Senior Technical Secretary, introduced 132
this item and presented document IOC/PG-OPC-II/8 Annex 1 "Proposals and Resources required for a Climate related TEMA Project". He drew the attention of the Programme Group to the relevant decisions of the Thirteenth Session of the IOC Assembly and the Nineteenth Session of the IOC Executive Council (Resolutions XIII-4 and EC-XIX.5). By those resolutions the IOC Governing bodies: urged Member States to strengthen their assistance in the framework of TEMA in order to enable the developing countries to participate more effectively in the oceanographic programmes within the WCRP; called on the Working Committee for TEMA to develop relevant TEMA actions in support of the WCRP and invited the Division of Marine Sciences of Unesco to provide support for the training education and development components of ocean observing activities.

At its Seventh Session the SCOR-IOC CCCO (January 1986) 133
"wished to draw the attention of the IOC WC for TEMA and the Unesco Division of Marine Sciences to the need to support the implementation of GLOSS and IGOSS as a means to strengthen the participation of developing countries in the field activities of the WCRP. Their ability to apply forthcoming research results and data products from long-term WCRP related activities to regional and subregional ocean research and services should also be enhanced". The CCCO, in particular drew the attention of WC/TEMA and the Unesco Division of Marine Sciences to the following requirements:

(i) the preparation of teaching curricula and textbook-like materials containing the basic scientific concepts behind TOGA and WOCE programmes;

(ii) the preparation of detailed descriptions of data products produced within the WCRP as well as ways and means of obtaining data and their potential applications at a regional level.

134 The CCCO also recommended that consideration be given to the establishment of TOGA and WOCE research fellowships for scientists from developing countries, to promote the application of expected results and to become aware of advanced observing techniques and related requirements through, for example, participation in the cruises of research vessels.

135 Such activities in the opinion of the CCCO will enhance the awareness of developing countries of the far-reaching objectives and future application of such a long-term research programme on ocean processes related to climate, and of the potential for the general advancement of marine sciences and their applications.

136 The WMO-ICSU-IOC First Informal Planning Meeting on the World Climate Research Programme held in Geneva in May 1986 expressed concern about the perceived shortage of manpower in the field of ocean modelling. There is an urgent need to increase the number of people who are able to contribute to this field. To some degree an increased level of funding will be required, but the main problem is an educational one. Universities and other appropriate institutions should be strongly encouraged to expand and intensify their efforts to involve more qualified researchers in this field.

137 The First Informal Planning Meeting on the WCRP (Geneva, 12-16 May 1986) emphasized that "the success of WCRP will depend very largely on an adequate base of global atmospheric and oceanographic observations". To make it really global these observing systems require participation of the vast majority of Member States and active efforts of IOC and WMO through their appropriate bodies in assisting developing countries (especially in tropical zone) in setting up required observational systems.

138 During the intersessional period, particular attention was given to the identification of requirements of developing countries in setting up their GLOSS sea-level stations, possible participation in XBT ship-of-opportunity programme, and training their technicians to make such measurements for a long-term period.

139 As shown in the GLOSS Implementation Plan 25 countries have specified their requirements for assistance.

140 Within the framework of GLOSS the Australia, People's Republic of China, France, Portugal, United Kingdom and United States of America have undertaken actions to assist developing countries in establishing their sea-level stations and training of specialists (as discussed under item 4.1 and shown in the GLOSS Implementation Plan). The Programme Group however noted that much more efforts are required in this direction.

141 Within the framework of IGOSS XBT Ship-of-Opportunity Programme TEMA related activities were discussed at the Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programme (Seattle, USA, 9-12 September 1985).

Dr. D. Troost, Unesco Division of Marine Sciences, indicated 142
interest and possibility of the Division of Marine Sciences to promote TOGA and WOCE research fellowships on the basis of the survey made by the Secretary of CCCO.

The Delegate of Mauritius brought to the attention of the 143
Programme Group that 6 month training courses dealing with Marine Meteorology and Oceanographic observations are being considered by WMO Commission of Marine Meteorology at the Regional Meteorological Training Centres for African countries. The Programme Group recommended that IOC should co-operate with WMO in organizing jointly such long-term training courses for the benefit of developing countries to enable them to increase their participation in the WCRP and other climate related programmes.

The IOC Assistant Secretary in charge of TEMA, Dr. S.M. Haq, 144
stated that in the formulation of TEMA component it is important at the outset to have a clear understanding of what IOC can possibly do from its own resources. He explained that IOC funds under the Regular Programme being limited, it is necessary to explore funding from outside sources to implement TEMA Component. In this context he pointed out some existing mechanisms, namely, contributing by donor Member States to IOC Trust Fund or in kind against a well-defined request; cost sharing by host institutions willing to organize training programme; supply of equipment under the IOC-VCP; contribution of fellowships by donor Member States under IOC-Research Fellowship Scheme; financial support to well-defined projects by extrabudgetary sources. TEMA component should be proposed in a "Package" defining in clear term: the nature of training, equipment and service required; indicating possible donor and recipient institutions willing to enter into partnership on the basis of mutual interest; identification of sources of funding; the immediate and long-term objectives. These would be essential for formulation of a project and its follow-up. Within specific reference to GLOSS, XBTs Ships-of-Opportunity programme, he suggested that, because of differing requirements of each of this activity, their TEMA components should be separately defined as part of one big "Package".

Dr. Haq stated that possible donor Member States as well as 145
the recipient Member States should identify who could be contacted as a follow-up to formulation of projects. He also suggested that delegates from potential donor Member States may also advise on the existing mechanism and sources in their respective countries who could be approached for possible funding. The following approach informulating specific TEMA project was recommended.

Elements for preparation of a project (GLOSS for example) 146

1. Definition of the problem and justification
2. Selection of Region (Countries)
3. Type and duration of Training (Individual/Group)
4. Equipment requirement

5. Services (experts, maintenance and repairs)
6. Institutional Commitment by recipient countries (dissemination of data towards the programme)
7. Preparation of Guide (identification of possible donors/recipient countries)
8. Allocation of funds by IOC under Regular Programme

147 Many delegates strongly supported the proposal to intensify efforts by IOC, its Member States and the Unesco Division of Marine Sciences aimed at assisting developing countries to enable them participate actively in WCRP, and TOGA in particular. These TEMA activities within the WCRP should cover wide range of required actions dealing with development of ocean observing system (GLOSS, XBT Ship-of-Opportunity) and involvement of scientists from developing countries into research activities related to climate studies and scientific applications of WCRP data and data products.

148 The Programme Group emphasized that training and assistance programme within the framework of WCRP should include the following elements:

- assistance within the framework of GLOSS and IGOSS XBT ship-of-opportunity programme in provision of instruments and their spare parts;
- assistance in their installation (in accordance with the requirements of those programmes);
- training of technicians through training courses or on-spot training;
- preparation of training manuals and guides, regarding observations and data analysis;
- scientific seminars related to TOGA and WOCE taking into account particular scientific and practical interests within the regional and sub-regional ocean research and services activities;
- support for participation of experts from developing countries in the WCRP meetings and symposia;
- preparation of teaching curricula and text-book-like material;
- establishment of TOGA and WOCE research fellowships for scientists from developing countries;
- consultants missions to the developing countries to advise on their participation in the relevant components of the WCRP.

149 The Programme Group adopted Recommendation PG-OPC-II.2.

8. INTERNATIONAL MECHANISMS FOR INTERGOVERNMENTAL CO-ORDINATION OF WCRP AND ROLE OF IOC

This item was introduced by Dr. A. Tolkachev who presented document IOC/PG-OPC-II/10 "International Mechanisms for Co-ordination and Development of Oceanographic Components of the World Climate Research Programme", pointing out that this matter was discussed at the First Session of the Programme Group, the Thirteenth Session of the IOC Assembly and the Nineteenth Session of the IOC Executive Council. 150

The IOC Executive Council, at its Nineteenth Session, "expressed its concern over the present complex arrangements for planning, promoting and co-ordinating the various components of the WCRP, involving WMO, IOC, ICSU and SCOR", and "instructed the Secretary to place this subject on the Provisional Agenda of the Second Session of the IOC Programme Group on Ocean Processes and Climate, planned for March 1987". 151

The document provides a description of the present international mechanisms for scientific planning and intergovernmental co-ordination in three of the major area of activities within the WCRP, all of which require major activities from the IOC: namely, TOGA, WOCE and the Ocean Observing System Development Programme. 152

The Programme Group first considered the organizational arrangements for the TOGA programme planning and co-ordination. The present international mechanism for TOGA includes: 153

- Joint CCCO-JSC Scientific Steering Group (TOGA/SSG) dealing with scientific planning and co-ordination of the Programme

- International TOGA Project Office (TOGA/IPO) established in 1985 in accordance with an agreement between USA and the Secretary General of WMO

- WMO-IOC Intergovernmental TOGA Board (ITB) established in 1986 by the WMO Executive Council at its Thirty-eighth Session (Resolution 13 (EC-XXXVIII)), (Terms of reference and composition of ITB is shown in Annex V)

In response to the Joint WMO-IOC Circular Letter No. 1 (12 February 1986) the following countries have designated national focal points for matters concerning the TOGA Programme: Brazil, Canada, Costa Rica, Cuba, Dominican Republic, Ecuador, Federal Republic of Germany, German Democratic Republic, Guatemala, Japan, Kenya, Morocco, Pakistan, People's Republic of China, Rwanda, Saudi Arabia, Thailand, United Kingdom and Uruguay (Annex VI). 154

Prof. P. Morel, Director of WCRP, pointed out that the present arrangements for the TOGA programme include scientific and intergovernmental aspects of TOGA planning and co-ordination. The International TOGA Project Office is considered as a component of the Joint Planning Staff for WCRP (it will move this year to Geneva) and 155

liaison with the IOC with regard to international co-ordination of WCRP oceanographic research activities requiring action by the IOC, is carried out by the Director of WCRP, in accordance with arrangements made by the Secretary General of WMO. These arrangements were agreed upon by the WMO Executive Council. All matters requiring co-ordination between the WMO and IOC go through the Secretary of IOC. Therefore, present arrangements are quite satisfactory and provide mechanism for effective collaboration between WMO and IOC.

156 The Programme Group concurred with this view.

157 The Programme Group welcomed the establishment of ITB and recommended that the IOC Assembly endorse the establishment of the Joint WMO-IOC-ITB, with the terms of reference and composition specified in WMO Resolution 13 of the Thirty-eighth Session of the WMO Executive Council (Resolution PG-OPC-II.1 was adopted). The Programme Group suggested that the First Session of the Intergovernmental TOGA Board should be organized as soon as possible in 1987.

158 The Programme Group reviewed then the arrangements for WOCE planning and co-ordination. Scientific planning and scientific guidance for WOCE is provided by the CCCO-JSC Scientific Steering Group (JSG) for WOCE established in 1983.

159 The International WOCE Planning Office (WOCE/IPO) was established in 1985 at the Institute of Oceanographic Sciences, Wormley, UK, on the basis of the exchange of letters between the UK Natural Environment Research Council (NERC) and CCCO in order to assist the SSG for WOCE in scientific planning.

160 Resolution XIII-4 of the Thirteenth Session of the IOC Assembly, called on the IOC Secretary, with the UK, to develop appropriate arrangements and liaison for dealing with those matters concerning the WOCE Planning Office which require intergovernmental actions through IOC. In response to Resolution XIII-4, the Secretary in September 1985 proposed a draft memorandum of understanding for consultation by the UK and SCOR. The Delegate of the United Kingdom at the Nineteenth Session of the IOC Executive Council indicated that, in the view of the United Kingdom, the present exchange of letters between the United Kingdom, NERC and CCCO for the operation of the Office were sufficient. The proposal of IOC was considered by the President of SCOR who noted "that it would not be necessary to conclude another memorandum of understanding and that arrangements concerning intergovernmental action through the IOC should rather be determined by exchange of letters between IOC, SCOR and the UK's representative Institution". He further proposed that the Terms of Reference of the WIPO be endorsed jointly by IOC and SCOR and that the Director of WOCE-IPO communicate closely with the IOC through the CCCO Secretariat on all matters needing intergovernmental action through the IOC.

161 The Delegate of the United Kingdom repeated their view that the NERC-CCCO exchange of letters provided a satisfactory basis for the WOCE-IPO, confirmed that the UK would continue to provide support the WOCE-IPO as specified in that arrangement, and expressed the view that the present arrangements worked well.

The Representative of the WOCE-SSG stated that the present arrangements of the WOCE-IPO are satisfactory. The WOCE-SSG expressed no requirement at this stage for more formal arrangements for dealing with intergovernmental aspects of WOCE. 162

The President of SCOR stated that the existing mechanisms had proved most effective in developing the WOCE Programme, with involvement of highly-qualified experts. Arrangements should therefore not be changed at this stage. It might be appropriate at the time of the WOCE Scientific Conference to consider additional mechanisms for the co-ordination of WOCE. 163

The Delegate of the United States indicated that IOC consideration of a formal mechanism for intergovernmental co-ordination of WOCE is premature. Any such co-ordination should await identification of needs for such a mechanism by the WOCE-SSG and the SCOR-IOC CCCO. 164

The Programme Group generally agreed with these views. 165

The Secretary of IOC recalled the previous views expressed by the IOC Assembly and IOC Executive Council regarding organizational arrangements for TOGA and WOCE Offices and their liaison with IOC, and wished to emphasize that Member States of IOC should be fully informed on a timely basis on the trends and institutional arrangements regarding projects and programmes for which they provide support and contributions. This is of importance for them to ensure proper liaison between scientific community and governmental agencies involved in the activities of IOC, WMO and SCOR. The WCRP, TOGA and WOCE, in particular, include considerable oceanographic components and it is therefore necessary to have formal agreements and regular consultation between partner agencies, particularly with regard to establishment and operation of TOGA and WOCE Offices. He felt that, the arrangements regarding the WOCE-IPO and its liaison with IOC, should be formalized with SCOR and the UK. The Secretary of IOC noted that he had not been consulted in the case of the establishment of the WOCE IPO. 166

The Secretary of the SCOR-IOC CCCO pointed out that the Secretary of IOC had been informed of the formation of the WOCE-IPO by the WOCE-SSG. 167

The Chairman of the SCOR-IOC CCCO and the Director of the WOCE-IPO stated that it might be desirable for IOC to consider seconding a specialist to work in the WOCE-IPO, and that such action would facilitate day-to-day liaison between the IWPO and the IOC Secretariat. 168

With regard to an intergovernment mechanism for co-ordination of WOCE, the Programme Group agreed that this matter could be considered at the time of the International WOCE Conference in 1988 when the Draft Implementation Plan for WOCE will be presented for consideration by scientists and national representatives. The Programme Group recommended that the WOCE Scientific Conference be hosted by IOC in 1988 and organized jointly with WMO, ICSU and SCOR (Resolution PG-OPC-II.1). 169

170 The Programme Group then discussed its future role. Many delegates point out the important role of the Programme Group in developing and co-ordinating global ocean observing systems and co-ordinating various national, multinational and regional Programmes related to WCRP. Its work should be conducted in close co-operation with SCOR-IOC CCCO. Some delegates however expressed the views that the role and functions of the Programme Group might need to be reconsidered in future in view of the establishment of the ITB and possible establishment in the future of an intergovernmental mechanism for WOCE.

171 The Programme Group noted that the intergovernmental aspects of the WCRP require close co-ordination between IOC and WMO and support of many of the subsidiary bodies of IOC. Several WMO/IOC actions have already been taken that are strengthening co-ordination: First WMO-ICSU-IOC Informal Planning Meeting on the WCRP (May 1986); establishment of the Joint WMO-IOC Intergovernmental TOGA Board; and close liaison between the Secretary of IOC and the Director of WCRP. Existing arrangements provide for liaison between IOC and the ITPO (as a part of JPS for WCRP) through the Director of WCRP and between the IWPO through the Secretary CCCO.

172 The Programme Group, having reviewed the present arrangements for scientific and intergovernmental co-ordination and planning of TOGA and WOCE, emphasized that IOC should support the activities of ITB, and accept present arrangements for intergovernmental planning and co-ordination of the TOGA Programme (including liaison with ITPO); approve organizing the International WOCE Conference to be sponsored jointly by IOC, WMO, ICSU and SCOR in late 1988. Recognizing that the development of global ocean observing systems needed for TOGA and WOCE, as well as for other scientific and practical applications by Member States, will require concerted actions of almost all IOC technical and regional bodies and close co-operation with WMO and other international organizations, the Programme Group agreed that it should continue to serve as a focal intergovernmental body within IOC for those activities.

173 The Programme Group adopted Resolution PG-OPC-II.1 on Agenda Item 8.

9. FUTURE IOC PROGRAMME OF WORK ON THE ROLE OF OCEANS IN CLIMATE VARIABILITY

174 Dr. A. Tolkachev presented the document IOC/PG-OPC-II/7 "Work Programme for 1987, 1988-1989 and budgetary and other forms of support required for the efficient implementation of the WCRP".

175 The Programme Group reviewed the proposed actions and recommended that the IOC Assembly approve the proposed Work Programme for 1987, 1988-1989 as amended by the Group and reproduced in Annex VII to this report, for inclusion in the IOC Draft Programme for 1988-1989. Some delegates suggested that this document should include identification of financial sources to be used for implementation of proposed activities.

10. ELECTION OF CHAIRMAN AND VICE-CHAIRMAN

Prof. Dr. sc. K. Voigt (German Democratic Republic) was unanimously reelected Chairman of the Programme Group, following his nomination by the Delegate of Mexico, seconded by the Delegate of the USSR. 176

Capt. L.C. Ferreira da Silva (Brazil) present Vice-Chairman of the Programme Group informed the Programme Group that he would not be able to continue his duty as Vice-Chairman and the Programme Group thanked him for contribution to the activities of the Group. 177

The Programme Group unanimously elected Mr. S. Ragoonaden (Mauritius) as Vice-Chairman of the Programme Group, following his nomination by the Delegate of Canada, seconded by the Delegate of Poland. 178

11. DATES AND PLACE OF THE THIRD SESSION

The Programme Group agreed that its Third Session should, if possible, be held in 1989, in Paris, prior to the Fifteenth Session of the IOC Assembly. 179

The Programme Group requested its Chairman to consult the Chairman of the SCOR-IOC CCCO on the possibility to organize a meeting of CCCO prior to the next session of the Programme Group. 180

Some delegates felt that the duration of the Programme Group's meetings could be limited to 3 days and it would be sufficient to prepare an Executive Summary for submission to the following session of the IOC Assembly. The Secretary of IOC reminded the participants in this connexion that the Programme Group should follow the Guidelines on the preparation of documentation and reports of IOC meetings as given in the IOC Manual. 181

12. ADOPTION OF THE SUMMARY REPORT

The Programme Group adopted the Summary Report and Recommendations and Resolution. It agreed to submit an Executive Summary, Recommendations and Resolution to the Fourteenth Session of the IOC Assembly. 182

13. CLOSURE

The Chairman of the Programme Group closed the Session on 13 March 1987, at 18h00. 183

ANNEX I

AGENDA

1. OPENING

2. ADMINISTRATIVE ARRANGEMENTS

   2.1 Adoption of the Agenda

   2.2 Designation of a Rapporteur

   2.3 Conduct of the Session

3. PLANNING AND IMPLEMENTATION OF THE LARGE-SCALE STUDIES WITHIN THE WCRP

   3.1 Tropical Ocean and Global Atmosphere (TOGA)

   3.2 World Ocean Circulation Experiment (WOCE)

4. DEVELOPMENT OF OCEAN-OBSERVING SYSTEMS IN SUPPORT OF THE WCRP

   4.1 Global Sea-Level Observing System (GLOSS)

   4.2 IGOSS Ship-of-Opportunity Programme

   4.3 Joint IOC-WMO Drifting Buoy Programme

   4.4 Opportunities offered by New Ocean Technologies

5. OCEANOGRAPHIC DATA MANAGEMENT WITHIN THE WCRP

6. INTERNATIONAL MECHANISMS FOR INTERGOVERNMENTAL CO-ORDINATION OF WCRP AND ROLE OF IOC

7. NATIONAL, REGIONAL AND MULTINATIONAL PROGRAMMES RELATED TO WCRP

8. PROPOSALS ON TEMA ACTIVITIES RELATED TO WCRP

9. FUTURE IOC PROGRAMME OF WORK ON THE ROLE OF OCEANS IN CLIMATE VARIABILITY

10. ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN

11. DATES AND PLACE OF THIRD SESSION

12. ADOPTION OF THE REPORT

13. CLOSURE

ANNEX II

ADOPTED RECOMMENDATIONS AND RESOLUTION

Recommendation PG-OPC-II.1

GLOBAL SEA-LEVEL OBSERVING SYSTEM

The IOC Programme Group on Ocean Processes and Climate,

Recalling Resolution EC-XIX.6 of the Nineteenth Session of the IOC Executive Council by which the GLOSS Implementation Plan was accepted in principle,

Having reviewed the revised version of the GLOSS Implementation Plan (Doc. IOC/INF-663 rev.) which will be published in the IOC Technical Series after incorporation of comments and statements of commitments from Member States,

Noting the recent progress achieved in development of GLOSS,

Desiring to promote increased support from Member States for TEMA activities of GLOSS,

Recommends that the IOC Assembly:

(i) approve a meeting of the Task Team of Experts on GLOSS in 1987 to: (a) review and update the GLOSS Implementation Plan, and (b) advise IOC on actions needed to improve GLOSS implementation;

(ii) urge Member States to provide assistance to developing countries to broaden and improve their participation in GLOSS, especially in areas identified in the GLOSS Implementation Plan;

(iii) approve organizing in co-operation with France of a sea-level training course for French speaking countries in 1988 in Brest;

(iv) urge Member States to submit sea-level data to the Permanent Service for Mean Sea Level, TOGA Sea Level Centre and the Specialized Oceanographic Centre for the IGOSS Sea Level Pilot Project in the Pacific, in accordance with the GLOSS Implementation Plan;

(v) request the IOC regional bodies to consider at their forthcoming sessions implementation of regional GLOSS projects.

Funding implications:

1987 -	Meeting of the Task Team of Experts on GLOSS		US $ 15,000
	Expert missions (2)		US $ 10,000
		Total	US $ 25,000
1988 -	Expert missions (2)		US $ 10,000
	Sea-level training course		US $ 15,000
		Total	US $ 25,000

Recommendation PG-OPC-II.2

IOC/TEMA ACTIVITIES IN SUPPORT OF THE WCRP

The IOC Programme Group on Ocean Processes and Climate,

Noting Resolution XIII-4 of the Thirteenth Session of the IOC Assembly, and Resolutions EC-XIX.5 and EC-XIX.6 of the Nineteenth Session of the IOC Executive Council,

Recognizing the urgent need to assist developing countries to participate more broadly in the TOGA programme, especially in implementing ocean observations in the Indian Ocean and other data sparse areas,

Taking into account proposals made by the CCCO and IOC subsidiary bodies for TEMA related activities in support of WCRP,

Recommends that the IOC:

(i) approve a joint IOC/Unesco OCE TEMA activity to address the various training and assistance requirements, identified by the CCCO and IOC subsdiary bodies to increase participation of developing countries in the WCRP. The TEMA activity should address specific needs of programmes, such as GLOSS, IGOSS and IODE as well as identifying other needs such as research fellowships, preparation of technical literature, teaching materials and expert missions relevant to a comprehensive ocean climate programme;

(ii) request the SCOR-IOC CCCO or IOC advisory bodies to prepare a report on new technologies being developed for ocean observations for distribution to IOC Member States;

(iii) consider new ocean observing technologies as a possible theme for future Bruun Memorial lectures;

(iv) explore with WMO the organizing of joint climate related training programmes for developing countries. Such programmes are already being considered for the African countries by WMO at the Regional Training Centres of Nairobi and Algiers for english and french speaking countries respectively and are being anticipated in similar training centres in other areas;

(v) urge Member States to provide equipment, spares, technical assistance, experts, training courses, grants and fellowships and other support to developing countries in order that they may participate more fully in the ocean climate related programmes of the WCRP.

Funding implications:

(i) - Training courses US $ 30,000 (1988-1989)
- Fellowships (under IOC Research Fellowship Scheme) US $ 50,000 (1988-1989)
- Scientific seminars US $ 30,000 (1987, 1988-1989)
- Expert missions US $ 30,000 (1988-1989)

(ii) Experts/consultations US $ 10,000 (1988)

(iii) Participation of experts US $ 20,000 (1988-1989)

Recommendation PG-OPC-II.3

OCEAN OBSERVING SYSTEM DEVELOPMENT

The IOC Programme Group on Ocean Processes and Climate,

Noting the rapid development of various new technologies for ocean observations which are already being used by certain countries and planned to be used within the framework of the WCRP, including satellite altimeter and satellite scatterometer and passive microwave radiometer measurements, ocean colour spectrometry, acoustic current profilers, acoustic tomography and other innovations for hydrographic and hydrochemical measurements,

Recognizing the need to ensure the compatibility of data arising from the use of these new technologies,

Recommends that the Assembly request its relevant subsidiary and advisory bodies to address the problems of intercalibration, standardization and data formats for these new technological advances as a matter of urgency.

Funding implications: None

Resolution PG-OPC-II.1

TO PROMOTE AND ENCOURAGE SUPPORT FOR THE WCRP BY THE IOC AND ITS MEMBER STATES

The IOC Programme Group on Ocean Processes and Climate,

Recognizing the importance of providing a forum in which requirements for intergovernmental operational support of WCRP oceanographic programmes can be presented by interested scientists and WCRP scientific planning groups,

Considering it essential to promote and encourage the strongest possible support for TOGA and WOCE by IOC Member States,

Further recognizing the need to define the appropriate role for the IOC in promoting and encouraging such operational support, especially with respect to a global ocean observing system,

Having been informed that the detailed scientific plan for WOCE, titled the "WOCE Implementation Plan", is scheduled to be distributed in early 1988, and

Noting the request addressed to the Programme Group by the IOC Assembly at its Thirteenth Session in 1985 to advise on international mechanisms for co-ordination and development of oceanographic components of the WCRP,

A

Expresses its appreciation to the Joint SCOR-IOC Committee on Climatic Changes and the Ocean (CCCO) for the effective planning it has undertaken for the WCRP, in particular through the Joint JSC/CCCO Scientific Steering Group (SSG's) for TOGA and WOCE;

Invites the TOGA and WOCE SSG's to bring to the attention of the IOC through the CCCO, needs for operational support of TOGA and WOCE which require action by the IOC;

B

Recommends that the Assembly endorse the establishment of the Joint WMO-IOC ITB, with the terms of reference and composition specified in WMO Resolution 13, Executive Council 38, 1986;

Encourage Member States to assure their effective national participation in the work of the ITB, taking into account the need to assure oceanographic, as well as meteorological expertise within the Board;

Requests the Secretary of IOC to arrange IOC representation in sessions of ITB, in consultation with the Chairman of the Programme Group on Ocean Processes and Climate;

Recommends that the IOC provide support for participation of oceanographic experts from developing countries contributing to TOGA in relevant activities of the ITB;

C

Welcomes and encourages the support provided for the International TOGA Project Office (TOGA/IPO) and the International WOCE Planning Office (WOCE/IPO) by individual Member States;

Recommends that the Programme Group on Ocean Process and Climate, in consultation with the SCOR/IOC CCCO and sponsoring countries keep under review the operation of these offices and bring to the attention of the IOC any problems or issues which may arise regarding these operations that require action by the IOC;

D

Thanks the SSG for WOCE and the WOCE/IPO for preparing the scientific plan for WOCE;

Recommends that the IOC Assembly approve organizing an International WOCE Scientific Conference to be sponsored jointly by IOC, WMO, ICSU and SCOR in late 1988 (now being planned by the SCOR-IOC CCCO and the JSC for WCRP with support from their parent organizations) for the purpose of presenting detailed plans for WOCE to scientists, scientific institutions, and agencies which may be interested in participating in WOCE, and to agencies and Member States which will be called upon to provide scientific and financial support for implementation of WOCE;

Further recommends that the IOC host this Conference and, in consultation with the other sponsoring organizations, explore the extent to which interested UN agencies could provide additional financial support for this Conference, especially to assure the fullest possible participation in the Conference by scientists and officials from developing Member States.

Funding implications:

1987 -	Participation in the ITB and joint publication	US $ 20,000
1988 -	International WOCE Scientific Conference:	
	- interpretation	US $ 15,000
	- experts participation	US $ 15,000
	- joint publication	US $ 5,000
	Total	US $ 35,000

ANNEX III

LIST OF PARTICIPANTS

I. PARTICIPANTS FROM MEMBER STATES

AUSTRALIA	Dr. A. McEwan Chief, Division of Oceanography CSIRO Marine Laboratories G.P.O. Box 1538 Hobart Tasmania 7001
BRAZIL	Mr. L.C. Ferreira da Silva Directorate of Hydrography and Navigation Rua Barao de Jaceguai s/n Ponta da Armacao 24000 Niteroi, Rio de Janeiro (Also Vice-Chairman of IOC PG on OPC)
CANADA	Mr. G.L. Holland Director General, Oceanographic Sciences Directorate Department of Fisheries and Oceans 200 Kent Street Ottawa, Ontario K1A OE6
	Mr. J.A.W. McCulloch Director-General Canadian Climate Centre 4905 Dufferin Street Downsview, Ontario M3H 5TA
CHINA, PEOPLE'S REP. OF	Mr. Ge You Xin Physical Oceanographer Director, Planning Department State Oceanic Administration 1, Fuxingmenwai Avenue Beijing
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	Mr. Jarrige ORSTOM 213 rue Lafayette 75480 Paris Cedex 10
	Mr. B. Voituriez IFREMER 66 avenue d'Iena 75116 Paris
GERMAN DEMOCRATIC REPUBLIC	Prof. Dr. sc. K. Voigt Director Institut fur Meereskunde der Akademie der Wissenchaften der DDR DDR - 2530 Rostock-Warnemunde (Also Chairman of IOC PG on OPC and Third Vice-Chairman IOC)
GERMANY, FEDERAL REPUBLIC OF	Prof. G. Siedler Institut fur Meereskunde Dusternbrooker Weg 20 D-2300 Kiel
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JAPAN	Dr. Yutaka Nagata Professor, Geophysical Institute University of Tokyo Bunkyo-ku, Tokyo
	Mr. Masayuki Inoue First Secretary Japanese Permanent Delegation to Unesco Unesco House 1 rue Miollis 75015 Paris France
MAURITIUS	Mr. S. Ragoonaden Meteorological Headquarters St. Paul Road Vacoas (Rapporteur)
MEXICO	Dr. A. Ayala-Castanares Director Instituto de Ciencias del Mar y Limnologia Universidad Nacional Autonoma de Mexico Apartado Postal 70-157 Mexico 04510, D.F.
	Dr. Maria Norma Suarez Paniagua Responsable Asuntos Cientificos Delegation Permanente du Mexique aupres de l'Unesco Maison de l'Unesco 1 rue Miollis 75015 Paris France
NETHERLANDS	Dr. L. Otto Head, Ocean Division Royal Dutch Meteorological Institute (KNMI) P.O. Box 201 NL-3730 AE de Bilt
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PHILIPPINES	Prof. I.A. Ronquillo Assistant Director Bureau of Fisheries & Aquatic Resources 860 Quezon Boulevard Manila (Also Chairman IOC)
POLAND	Prof. Dr. C. Druet Institute of Oceanology Polish Academy of Science ul. Powstancow Warsawy 2-4-6 81-967 Sopot
SPAIN	Mr. J.M. Garcia Moron Servicio de Mareas Instituto Espanol de Oceanografia 4 Alcala, 27-4o 28014 Madrid
UNION OF SOVIET SOCIALIST REPUBLICS	Mr. V.N. Jivago Oceanographic Committee of the Soviet Union 11 Gorky Street Moscow 103009
UNITED KINGDOM	Dr. W.J. Gould Institute of Oceanographic Sciences (IOS) Brook Road Wormley Godalming Surrey GU8 5UB
	Capt. J. Marsh DNOM, RM 841 Lacon House Theobald's Road Holborn, London WC1X 8RY
	Dr. D.T. Pugh Natural Environment Research Council Polaris House North Star Avenue Swindon SN2 1EU
	Dr. J.D. Woods Director, Marine Sciences Natural Environment Research Council Polaris House North Star Avenue Swindon SN2 1EU

UNITED STATES OF AMERICA	Mr. L. Brown Division of Ocean Sciences National Science Foundation 1800 Gt. St. N.W. Washington, D.C. 20550
	Dr. Manfred Cziesla Science Attache U.S. Embassy 2, avenue Gabriel 75008 Paris France
	Dr. R. Godin U.S. Naval Observatory Washington, D.C.
	Dr. M. Hall Director, Office of Climate Research NOAA/CAR 6010 Executive Blvd. Rockville, MD 20852
	Mr. Richard Lambert Ocean Sciences Division National Science Foundation 1800 G. St., N.W. Washington, D.C. 20550
	Dr. K. Mooney NOAA 6010 Executive Blvd. Rockville, MD 20852
	Mr. C. Noe Chief, Data Processing Branch/NODC NOAA Rockville, MD 20852
	Dr. R. Podgorny Chief, International Affairs/NOS NOAA 14th & Constitution Avenue, Room 4029 Washington, D.C. 20230
	Mr. Ferris Webster College of Marine Studies University of Delaware Lewes, DE 19958
VENEZUELA	Mr. P. Leon Direccion de Hidrografia y Navegacion - Comandancia General de la Armada Caracas

II. OBSERVERS FROM NON-MEMBER STATES OF IOC

DEMOCRATIC KAMPUCHEA	Mr. Pin Ngo Ambassador Deputy Permanent Delegate of Democratic Kampuchea to Unesco 2 place de Barcelone 75016 Paris France

III. REPRESENTATIVES AND/OR OBSERVERS OF ORGANIZATIONS

Scientific Committee on Oceanic Research (SCOR)	Prof. G. Siedler President, SCOR Institut fur Meereskunde Universitat Kiel Dusterbrooker Weg 20 D-2300 Kiel Federal Republic of Germany (Also representing the Federal Republic of Germany)
United Nations Educational, Scientific and Cultural Organization (Unesco)	Dr. D.C. Krause Director, Division of Marine Sciences Unesco 7 place de Fontenoy 75700 Paris France
	Dr. S. Morcos Division of Marine Sciences Unesco 7 place de Fontenoy 75700 Paris France
	Dr. D. Troost Division of Marine Sciences Unesco 7 place de Fontenoy 75700 Paris France
World Meteorological Organization (WMO)	Prof. P.Morel Director World Climate Research Programme WMO Case Postale No. 5 CH-1211 Geneva 20 Switzerland

Permanent Service for Mean Sea Level (PSMSL)	Dr. D.T. Pugh Director PSMSL Bidston Observatory Birkenhead Merseyside L43 74A United Kingdom (Also representing the United Kingdom)
International TOGA Project Office	Mr. J. Lyons Director, ITPO NOAA R/E3 ITPO 325 Broadway Boulder, CO 80303 U.S.A.
International WOCE Planning Office	Dr. G. Needler Director, WOCE-(IPO) Institute of Oceanographic Sciences Brook Road Wormley, Godalming Surrey GU8 5UB United Kingdom

IV. IOC SUBSIDIARY BODIES

Joint SCOR-IOC Committee on Climatic Changes and the Ocean (CCCO)	Dr. Robert W. Stewart Chairman, Joint SCOR-IOC CCCO President, Alberta Research Council P.O.B. 8330 Postal Station F Edmonton, Alberta T6H 5X2 Canada Dr. A. McEwan Vice-Chairman, Joint SCOR-IOC CCCO CSIRO Marine Laboratories G.P.O. Box 1538 Hobart Australia 7001 (Also representing Australia)
Joint IOC-WMO Working Committee for Integrated Global Ocean Station System (IGOSS)	Mr. Y. Tourre Chairman, WC/IGOSS ORSTOM/LODYC Universite Paris VI Tour 14, 2e etage 4 place Jussieu 75252 Paris Cedex 05 France

V. SECRETARIAT

Secretary	Mr. M. Ruivo
Technical Secretary	Mr. A. Tolkachev
Assistant Secretaries	Mr. S. Haq Mr. Y. Oliounine Mr. B. Thompson (Secretary, Joint SCOR-IOC CCCO) Mr. G. Kullenberg Mr. Y. Treglos Mr. R. Molcard (CCCO) Mr. J. Withrow (IGOSS Operations Co-ordinator) Mr. A. Alexiou (CCCO) Mr. Fernando Robles Secretario Principal Adjunto de la COI para IOCARIBE c/o Capitan Rafael Steer Ruiz Director, Centro de Investigaciones Oceanograficas e Hidrograficas Apartado Aereo 982 Cartagena Colombia
Consultant	Mr. J.-M. Verstraete ORSTOM Institut Oceanographique 195 rue St. Jacques 75005 Paris France

ANNEX IV

LIST OF DOCUMENTS

Document Code	Title
IOC/PG-OPC-II/1 prov.	Provisional Agenda
IOC/PG-OPC-II/2	Annotated Provisional Agenda
IOC/PG-OPC-II/3	Summary Report
IOC/PG-OPC-II/4	List of Documents
IOC/PG-OPC-II/5	List of Participants
IOC/PG-OPC-II/6	Summary of descriptions of National, Regional and Multinational Programmes related to WCRP
IOC/PG-OPC-II/7	Work Programme for 1987, 1988-1989 and budgetary and other forms of support required for the efficient implementation of the WCRP
IOC/PG-OPC-II/8	Action Paper
IOC/PG-OPC-II/8 Annex 1	Proposals and Resources required for a Climate related TEMA Project
IOC/PG-OPC-II/8 Annex 2	Proposals on the Use of Acoustic Current Profilers and Fixed Buoys within the TOGA and WOCE
IOC/PG-OPC-II/8 Annex 3	Progress Report on the GLOSS Development
IOC/PG-OPC-II/9	IGOSS XBT Ship-of-Opportunity Programme (Status Report)
IOC/PG-OPC-II/10	International Mechanisms for Co-ordination and Development of Oceanographic Components of the World Climate Research Programme
IOC/INF-663 rev.	GLOSS Implementation Plan

N.B. THIS LIST IS FOR REFERENCE ONLY. NO STOCKS OF THESE DOCUMENTS ARE MAINTAINED.

ANNEX V

COMPOSITION AND TERMS OF REFERENCE OF THE WMO-IOC INTERGOVERNMENTAL TOGA BOARD *

1. ESTABLISHMENT OF THE BOARD

The Intergovernmental TOGA Board has been established by Resolution 13 adopted at the thirty-eighth session of the Executive Council.

2. COMPOSITION

The Membership of the Board is comprised of:

(i) Representatives of Members of WMO and Member States of IOC

Subject to confirmation by concerned Members, the initial composition of the Board shall include representatives of the following countries:

Australia
Brazil
China
France
India
Indonesia
Japan
Mauritius
New Zealand
Pakistan
Peru
U.K.
U.S.A.
U.S.S.R.

(ii) Participants representing scientific bodies

The Chairman of the WMO/ICSU Joint Scientific Committee (JSC)
The Chairman of the IOC/SCOR Committee on Climatic Changes and the Ocean (CCCO)

The Board membership may be expanded at the initiative of the Board, with approval of the Executive Councils of WMO and IOC.

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* Annex to Resolution 13 (EC-XXXVIII) of the 38th Session of the WMO Executive Council.

3. FUNCTIONS

The main function of the Board is to provide an intergovernmental forum for the co-ordination of national resources that may be applied for implementing the TOGA Project and other WCRP projects needed to achieve the objectives of TOGA, including the following functions:

3.1 To review the requirements for the implementation of TOGA and other WCRP projects on which TOGA will depend,

3.2 To provide a forum for intergovernmental consultations to assure co-ordination of national resources that may be applied to the programme,

3.3 To review progress made in implementing TOGA, to identify gaps that may appear in the implementation of TOGA and other WCRP projects needed to achieve the objectives of TOGA and to take action, as appropriate, to fill these gaps,

3.4 To encourage scientific and technological initiatives, in the participating countries, to meet the TOGA objectives,

3.5 To report on its activities to the Executive Councils of WMO and IOC.

4. SCIENTIFIC ADVISORY BODIES

4.1 In discharging its tasksm the Board will be guided by the overall scientific objectives and research strategy formulated by the WMO/ICSU Joint Scientific Committee (JSC), which will be regarded as the main scientific advisory body to the Board. The Board will also roly on scientific advice from the IOC/SCOR Committee on Climatic Changes and the Ocean (CCCO) on oceanographic matters. Scientific guidance will also be forthcoming from the Scientific Steering Group for TOGA, jointly established by JSC and CCCO.

4.2 The Board will maintain close links with other scientific and technical bodies concerned with the programme, particularly CAS and CMM.

5. ORGANIZATION OF SESSIONS

5.1 The TOGA Board shall holds sessions at dates and places which will be decided by the Secretary-General of WMO, in consultation with the Secretary of IOC. Invitations to attend the sessions shall be sent to:

- Representatives designated by Members of WMO and Member States of IOC listed in 2(i) and scientific bodies listed in paragraph 2(ii) above,

- Experts invited by the Chairman of the Board, including firstly the Chairman of the JSC/CCCO Scientific Steering Group for TOGA.

5.2 At the close of each session, the Board will elect from its members a chairman who will serve in that capacity until the close of the next session.

5.3 The sessions shall, in principle, be arranged without financial cost to WMO and IOC, except for secretariat support, travel and per diem support to invited experts which will be shared equally by WMO and IOC. Sessions will be conducted, documentation will be provided and the report of each session will be prepared in one language only.

5.4 Secretariat support for the Board will be provided by the Secretary-General of WMO, primarily through the WMO/ICSU Joint Planning Staff, in collaboration with the Secretary of IOC.

ANNEX VI

NATIONAL FOCAL POINTS FOR MATTERS CONCERNING THE TOGA PROGRAMME

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Joint

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WORK PROGRAMME FOR 1987, 1988-1989
AND BUDGETARY AND OTHER FORMS OF SUPPORT REQUIRED
FOR THE EFFICIENT IMPLEMENTATION OF THE WCRP

Work Programme	1987	1988 **	1989 **
1. OCEANOGRAPHIC COMPONENTS OF THE WCRP			
1.1 Meetings of the IOC Programme Group on Ocean Processes and Climate (IPG-OPC)	IOC/PG-OPC-II 10-13 March Paris		IOC/PG-OPC-III March Paris
1.2 Meetings of the SCOR-IOC Committee on Climatic Changes and the Ocean (CCCO)	CCCO-VIII Kiel, FRG 25-29 May	CCCO-IX May-June Paris	CCCO-X mid-year
2. TROPICAL OCEANS AND GLOBAL ATMOSPHERE (TOGA)			
2.1 Meetings of the WMO-IOC Intergovernmental TOGA Board (ITB)	ITB-I September ?	ITB-II	ITB-III
2.2 Meetings of the JSC/CCCO TOGA Scientific Steering Group	SSG-TOGA-VI Australia Aug.-Sept.	SSG-TOGA-VII	SSG-TOGA-VIII
2.3 CCCO Tropical Atlantic Ocean Climate Studies Panel (TAP)	TAP-IV Paris, 22-24 June		+
2.4 Tropical Pacific Ocean Climate Studies Panel (TPP)	TPP-V * Oct.-Nov.	+	+
2.5 CCCO Indian Ocean Climate Studies Panel (IOP)	IOP 6-10 April Mauritius		+
2.6 TOGA Numerical Experimentation Group	8-9 June Hamburg, FRG	+	+
3. WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)			
3.1 International WOCE Conference (IWC)		IWC Sept.-Oct., Paris	
3.2 Meetings of the JSC/CCCO WOCE Scientific Steering Group (WOCE)	WOCE-VIII Wormley, UK 18-21 May	WOCE-X	WOCE-XI
	WOCE IX Cambridge, USA Nov.-Dec.	WOCE-XI	WOCE-XIII
3.3 Planning Meeting on WOCE Hydrographic Programme (WHP)	Wormley, UK 27-28 April	+	+

Work Programme	1987	1988 **	1989 **
3.4 Workshop on Tracer Modelling	X/or early 1988		
3.5 WOCE Regional Co-ordination Meetings	Mid-year Brazil	+	
3.6 WOCE Numerical Experimentation Group	Mid-year *	+	+
4. OCEAN OBSERVING SYSTEM DEVELOPMENT PROGRAMME (OOSDP)	IPG-OPC-II		IOC-OPC-III
4.1 Subsurface * heat storage - XBT ship-of-opportunity programme within the IGOSS			
4.1.1 IOC-WMO Working Committee for IGOSS		IGOSS-V November, Paris	
4.1.2 XBT ship-of-opportunity meeting	mid. *		
4.1.3 Regional components (participation of staff experts in meetings) of IOC regional bodies and CCCO panel meetings shown in 2.3, 2.4, 2.5 and 4.2.2 (short term missions)	5-6 (IOCEA/IOCINCWIO/ IOCINDIO/IOCSOC/ WESTPAC)	5-7	5-7
4.1.4 Experts mission to advise and assist Member States on participation in the project (short term mission under contract)	2-3 *	2-3	2-3
4.2 Global Sea-Level Observing System (GLOSS)			
4.2.1 Meetings IOC Task Team of Experts on GLOSS		GLOSS-II	GLOSS-III
4.2.2 Regional components of GLOSS (experts and staff participation in the meetings of IOC regional bodies and meetings of CCCO Panels shown under 2.3, 2.4 and 2.5) (short-term missions)	5-6 WESTPAC-IV * Jin Phuket Thailand IOCEA-I 19-24 January Praia, Cape Verde IOCINCWIO-II * 14-17 May Arusha, Tanzania IOCINDIO-I * Sept./Oct. Pakistan IOCSOC-V * 8-13 June Paris	5-7	5-7

Work Programme	1987	1988 **	1989 **
4.2.3 Experts mission to advise and assist in installation and up-grading of GLOSS stations. Installation of about 10 tide gauges a year by Member States or with the assistance of Member States (through VCP, bilateral or multilateral co-operation) (short-term missions under contract)	2-3 missions	2-3 missions	2-3 missions
4.2.4 Sea-Level Training Course (SLTC) (4-8 trainees every year)	1 training course * 1. Bidston, IOS, UK (June-July) SLTC-V	2 training courses 1. Bidston, IOS, SLTC-VI 2. possibly also in Brest, France and/or Portugal (not yet confirmed)	2 training courses Bidston, IOS, UK SLTC-VII
4.3 Drifting-Buoy Programme			
4.3.1 Meeting of Drifting-Buoy Co-operation Panel (WMO-IOC)	DRIBU-2 15-17 October Geneva	+	+
4.4 New Ocean Observing System			
4.4.1 Expert consultation on New Ocean Observing Systems (current measurements)	CCCO OOSDP-WG fall		+
5. CCCO CO2 ADVISORY PANEL	Sept.-Oct.	+	+
6. CCCO PALEOCLIMATOLOGY PANEL	mid.	+	+
7. JSC/CCCO AIR-SEA FLUXES WORKING GROUP	January & June Reading, UK	+	
8. JOINT JSC/CCCO WORKING GROUP ON SATELLITE OBSERVING SYSTEMS FOR CLIMATE RESEARCH	October	+	+

* not covered by IOC RP funds (PAD-87) (or SCOR)
** similar type of financial support will be needed for 1988 and 1989