Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Committee on Ocean Processes and Climate

Third Session

Paris, 27-29 June 1989

Unesco

In this Series	*Languages*
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:	
1. Eleventh Session of the Working Committee on International Oceanographic Data Exchange	E, F, S, R
2. Seventeenth Session of the Executive Council	E, F, S, R, Ar
3. Fourth Session of the Working Committee for Training, Education and Mutual Assistance	E, F, S, R
4. Fifth Session of the Working Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S, R
5. First Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions	E, F, S
6. 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	E, F, S, R
7. First Session of the Programme Group on Ocean Processes and Climate	E, F, S, R
8. Eighteenth Session of the Executive Council	E, F, S, R, Ar
9. Thirteenth Session of the Assembly	E, F, S, R, Ar
10. Tenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific	E, F, S, R
11. Nineteenth Session of the Executive Council	E, F, S, R, Ar
12. Sixth Session of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S
13. Twelfth Session of the IOC Working Committee on International Oceanographic Data Exchange	E, F, S, R
14. Second Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions	E, F, S
15. First Session of the IOC Regional Committee for the Central Eastern Atlantic	E, F, S
16. Second Session of the IOC Programme Group on Ocean Processes and Climate	E, F, S
17. Twentieth Session of the Executive Council	E, F, S, R, Ar
18. Fourteenth Session of the Assembly	E, F, S, R, Ar
19. Fifth Session of the IOC Regional Committee for the Southern Ocean	E, F, S, R
20. Eleventh Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific	E, F, S, R
21. Second Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean	E, F
22. Fourth Session of the IOC Regional Committee for the Western Pacific	E only
23. Twenty-first Session of the Executive Council	E, F, S, R
24. Twenty-second Session of the Executive Council	E, F, S, R
25. Fifteenth Session of the Assembly	E, F, S, R
26. Third Session of the IOC Committee on Ocean Processes and Climate	E, F, S, R

TABLE OF CONTENTS

ANNEXES

1. OPENING

1 The Chairman of the IOC Technical Committee on Ocean Processes and Climate, Prof. K. Voigt, opened the Session and welcomed the participants.

2 The Secretary of IOC, Dr. G. Kullenberg, welcomed the participants on behalf of IOC. He wished to emphasize the important role of the Committee in intergovernmental co-ordination of oceanographic aspects of WCRP; in formulating proposals on IOC Strategy in the issues related to the problem of climate change; and the need to work in close collaboration with the scientific community in order to make sound scientific assessments of ocean variability and its role in climate and climate change. There is also the need to develop further an effective international collection and exchange of intercomparable data; both at regional and global levels. Close collaboration of the IOC with other concerned international governmental and non-governmental organizations is essential to help solving global problems related to climate change and the marine environment.

3 Dr. Kullenberg referred to the decisions of the Fourteenth Session of the IOC Assembly and the Twenty-first Session of the IOC Executive Council related to the ocean climate programmes, particularly TOGA, WOCE and global ocean observing system development. Recognizing the importance of a global approach in each study, it is important that the Committee look at their relationship with regional oceanographic phenomena which are of particular scientific and practical interest to many countries. One important function of the Committee is to advise IOC on the progressive implementation of elements of a global ocean observing system, leading to a world ocean watch. This certainly will be needed to address the coastal and shelf sea regions with a wider regard for dynamics, and physical processes and modelling.

4 Dr. Kullenberg then referred to the Medium Term Plan and the Programme for 1990-1991, to be discussed at the IOC Assembly. He invited the Committee to provide advice on relevant issues with regard to programme implementation and identification of priorities of the Commission in the field of ocean climate activities and ocean observing system developments. In conclusion he wished the Committee every success in its endeavour.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

5 The Agenda of the session as adopted by the Committee is given in Annex I.

2.2. DESIGNATION OF A RAPPORTEUR

6 The Committee designated Dr. David Goodrich as Rapporteur for the Session.

2.3 CONDUCT OF THE SESSION

7 The Technical Secretary, Dr. A. Tolkachev, IOC Senior Assistant Secretary, reviewed the arrangements and documentation for the session (the List of Participants is given in Annex III).

3. REPORT ON THE INTERSESSIONAL ACTIVITIES

3.1 REPORT OF THE SECRETARY ON THE INTERSESSIONAL ACTIVITIES OF THE COMMITTEE

8 The Technical Secretary, Dr. A. Tolkachev presented the report on the intersessional activities (Document IOC/TC-OPC-III/6). In his presentation, Dr. Tolkachev pointed out that the Committee in accordance with its terms of reference, concentrated on the intergovernmental aspects of coordination of WCRP programmes, TOGA and WOCE, and the preparation of proposals on the development of ocean observing system and data management. This work was carried out in close collaboration and co-ordination with the activities of the WMO, the CCCO, the Intergovernmental TOGA Board, and other subsidiary bodies of IOC, particularly the IOC-WMO Committee on IGOSS, the IOC Committee on IODE, the DBCP and the GE/GLOSS.

9 The intergovernmental co-ordination of the TOGA programme was provided by the WMO-IOC Intergovernmental TOGA Board, established in 1986, which held two sessions in 1987 and 1988.

10 The WOCE Implementation Plan was prepared by the WOCE Scientific Steering Group (SSG) and considered at the IOC-WMO-ICSU-SCOR International WOCE Scientific Conference, Paris, 28 November - 2 December 1988. Participants expressed positive and general support for the scientific objectives and elements of the WOCE Implementation Plan.

11 Following Resolution EC-XXI.1, proposals for institutional arrangements for WOCE were prepared by the Chairmen of the CCCO, WOCE SSG and OPC and discussed at the WOCE Conference. Based on these considerations the Chairman of IOC and the President of SCOR prepared the proposal on WOCE institutional arrangements presented to this Session.

12 Development of various ocean observing systems and related data management needed in support of WCRP and TOGA and WOCE in particular were considered by JWC/IGOSS, IODE, DBCP and GE/GLOSS. The IOC Group of Experts on GLOSS held its First Session in March 1989 and its report has been submitted to this Session.

13 Upon the proposal of the IOC Executive Council at its Twenty-first Session, an ad hoc expert consultation was organized in March 1989 to review the present ocean observing monitoring and data management systems and to prepare proposals on the progressive development of integrated global ocean observing systems leading to a world ocean watch. The report and proposal of this ad hoc expert consultation were presented to this Session. The WMO Executive Council, at its Forty-first Session (June 1989), recommended support of the continued development of an operational ocean observing system in co-operation with IOC.

14 An ad hoc expert consultation was arranged by the IOC Secretariat in January 1989 with the aim of proposing an IOC programme activity on physical oceanography studies in coastal and shelf sea areas. The report of the ad hoc expert consultation was submitted to this session.

15 Dr. Tolkachev listed some major issues that will need consideration and solicited recommendations of the Committee, which, in addition to issues of TOGA, WOCE and the global ocean observing system, include the role of IOC in the ocean satellite observing systems; possible support of the operation of ocean weather stations in the North Atlantic by the oceanographic community; and participation of IOC in the activities of the Joint WMO-UNEP Intergovernmental Panel on Climate Change.

3.2 REPORT OF THE CHAIRMAN OF THE JOINT SCOR-IOC COMMITTEE ON CLIMATIC CHANGES AND THE OCEAN

16 The Chairman of CCCO, Dr. A. McEwan, presented the report to the Committee on the CCCO activities. He highlighted the following points.

17 The last two years have seen a remarkable rise in public awareness of the prospect of climate change and a need by governments for reliable scientific advice, free from hysterical overstatement, on which to base response strategies of profound social and economic significance. As a committee of oceanographic specialists the CCCO is acutely aware of the deficiency in existing knowledge to provide this advice and more convinced than ever of the critical part played by the oceanographic programmes of the WCRP in enabling the global climate to be modelled and predicted with confidence.

18 The Committee is concerned that the importance of the oceans remains undervalued in high-level consideration by governments of the research for predicting climate. There also remains some misunderstanding of the differences in both the nature and state of observational networks for the ocean, compared with atmosphere. The Committee is particularly concerned by the slippage or postponement of some satellite programmes of vital importance to TOGA and WOCE and the hiatus in satellite observations that will follow the completion of the present sequence of experimental satellites. We are also aware that oceanographic programmes remain sponsored largely by existing national research appropriations that are unsuited to long term observational programmes. The limitation in capacity is not confined to financial and technical resources, but also in scientific manpower whose participation is necessary for the creation, leadership and effective use of the observational networks. The increased demand is reflected in the increase of meetings of groups and panels affiliated with TOGA and WOCE which will double between 1988 and 1990.

19 All of the above concerns relate to the scientific policy of governments toward climate research and prediction. The CCCO hopes the Committee will articulate them specifically in relation to its tasks to facilitate the implementation of TOGA and WOCE as key components of the WCRP.

20 Against this background Dr. McEwan was pleased to report CCCOs' satisfaction with the impressive scientific progress made in the programmes

under its purview.

21 The SSG for TOGA has reported substantial advances toward its objectives with expansion of the monitoring programme, activity by TOGA-NEG, the establishment of a real time operational ocean model by the U.S. NOAA NMC, the conduct of several process experiments, and development of the TOGA-COARE proposal.

22 At its Tenth Session held in Halifax last week, the CCCO endorsed TOGA-COARE as a scientifically appropriate addition to the TOGA programme within its prevailing objectives. In so doing, CCCO noted that TOGA-COARE should not compete for existing TOGA resources. It also stressed that TOGA-COARE, being a comprehensive observational study of the processes of ocean-atmosphere interaction, should have as a major final goal the better parameterization of heat and fresh water flux that is urgently needed for incorporation in both short and long term climate prediction models.

23 CCCO endorsed the creation of MONEG as a separate group to advance modelling efforts on the Indian Ocean monsoon. The Committee recognized that such efforts could provide a more focussed research effort on TOGA objectives for this ocean.

24 CCCO also lent its support for the proposed International TOGA Scientific Conference next year and the suggestion to arrange contiguous meetings of its ocean panels at that conference.

25 WOCE has taken a life of its own with the preparation of an implementation plan and a high level of international interest shown at the International WOCE Scientific Conference last November. As Chairman of CCCO, Dr. McEwan has participated in the discussions between IOC and SCOR on the proposed organizational arrangements which will hopefully have their penultimate review at this meeting. In commending them to the Committee he would like to stress the effective use of existing mechanisms and the need to ensure the greatest opportunity for international participation in whatever form it can be provided. WOCE remains the only blueprint on the drawing board from which future global ocean/atmosphere models can be built and its success should not be jeopardized by administrative structures. Intending participants will have to decide whether they can work within a programme that is strongly constrained in the interests of scientific quality. WOCE planners must take into account the value of national activities which presently lie outside WOCE boundaries.

26 CCCO shared the concern of the WOCE planners in the delayed launching of scatterometer and radar altimeter instruments. The lack of a coherent forward plan for satellite observations and policy issues on access and charging for data also raise serious doubts in relation to long term observational strategy for the ocean. The CCCO has endorsed the WOCE-SSG suggestion for an enhanced interim OOSDP group to provide input to the UNEP-WMO/IPCC Working Group 1 report highlighting the importance of ocean research and the inadequacy of present state ocean monitoring. To integrate with the requirements for WOCE Goal 2, the CCCO also supported the creation of a restructured and expanded Ocean Observing System Development Programme (OOSDP) group under the joint sponsorship of the JSC and CCCO.

27 CCCO noted the need for a widened 'constituency' in support of long term observations of the ocean and the necessity for governments to support them, particularly for the purpose of unambiguously quantifying climatic trends. In the context the committee learned of a promising proposal by Prof. Munk of the Scripps Institution of Oceanography to use trans oceanic acoustic signals as an integrating measurement of temperature.

28 The CCCO received a very comprehensive report by a Special Working Group on in situ measurement of surface flux, which identified existing deficiencies in getting surface fluxes on a global basis, and identified steps to improve quality and quantity of data, stressing the need for good time series on various scales of resolution. It is worth noting that recurring theme in both TOGA and WOCE discussions has been the failure of coupled ocean atmosphere models to reconcile heat and water fluxes with surface temperature. A co-ordinated strategy needs to be developed for process experiments to lead to improved parameterization within or eternal to the framework of TOGA and WOCE.

29 With the expansion and proliferation of international research initiatives external to WCRP, the CCCO sees a shift in the nature of its service to SCOR and IOC. Its Ocean Panels will reflect this change by contributing more to WOCE implementation and to new regional programmes. The CCCO retains connections with JGOFS through a joint JGOFS/CCCO Carbon Dioxide Panel. Linkages with IGBP are weak but may be strengthened through alliance with the JSC. The CCCO also proposed with JSC to jointly sponsor a Sea Ice Group to consider both the oceanic and atmospheric aspects of sea ice regions. In relation to the continental shelf programme proposed by IOC, the CCCO is prepared to assist in establishing links with WCRP elements.

30 Dr. McEwan noted that we are entering a new era in which the public demand for informed advice on climate issues and even the changes in climate we seeking to describe may outstrip the capacity of the small oceanographic community to respond. Efficient use of this scientific capital, and a very much higher awareness by government of the place of the WCRP oceanographic programmes is needed if we are to meet the challenge.

31 In discussing the report of the Secretary and the Chairman of CCCO, the Committee expressed satisfaction with the progress and with the close collaboration of these two bodies in promoting ocean climate activities of IOC and the close collaboration with WMO in implementing oceanographic elements of WCRP. It was noted with concern, however, that at some international activities dealing with the climate change problem, the importance of the ocean was not adequately reflected and the IOC activities were neglected. This is particularly relevant to the activities of the UNEP-WMO Intergovernmental Panel on Climate Change and the Committee therefore wished to bring this matter to the attention of the IOC Assembly.

32 The **Committee also emphasized** the need to ensure close collaboration between the CCCO and the JSC in considering research and observational programmes required to achieve major objectives of the WCRP in dealing with different time scales of climate change for which requirements of oceanographic data are different. Close collaboration also needed between IOC and WMO in developing activities dealing with the use of

satellites for oceanographic and meteorological observations and with regard to communication with national satellite agencies.

4. PLANNING AND INSTITUTIONAL ARRANGEMENTS FOR THE WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

33 In introducing the Report of the International WOCE Scientific Conference, the Director of the International WOCE Project Office, Dr. P. Koltermann, reported on the developments since the International WOCE Scientific Conference in November 1988. This Conference had given the unique opportunity to present the science and the WOCE implementation strategy to a wide international audience. It also was the first and crucial test of matching the needs of WOCE with the potential resource commitments. The Conference proved very successful in that the science community that had designed WOCE and the governmental and inter-governmental agencies whose support is badly needed for implementing WOCE, agreed that the Implementation Plan presents an appropriate way to proceed.

34 With the commitments forwarded by participants at the Conference and the subsequent substantiation of these commitments in the interim, the implementation of WOCE is looking very promising. This assessment by the WOCE-SSG and a preceding review by its Core Project Working Groups had identified no major shortfalls in support. It had also set priorities on how to address some remaining unsettled questions like the Surface Layer Programme and agreed for the Core Project 3, the Gyre Dynamics Experiment, to peak later in the WOCE Intensive Observation Period, to coincide with adequate satellite coverage.

35 The Conference had discussed appropriate links between the scientific structure of WOCE and the intergovernmental side. This had been further substantiated by the Chairmen of IOC, of the CCCO, of the WOCE-SSG and of SCOR. The draft proposal, tabled as Document IOC/TC-OPC-III/7, for this Committee is seen by all parties concerned as a very appropriate, effective mechanism to establish close links in order to provide adequate intergovernmental linkage and support for WOCE.

36 The Conference had also underlined some areas where it felt further activities need to be focussed on. These were: (i) to broaden the basis of scientists and countries that are involved in doing WOCE; (ii) to facilitate the establishment of bilateral agreements to provide support for specific components of WOCE; and (iii) to highlight the areas in WOCE where scientists or laboratories could be involved in order to benefit from mutual training and education aspects of the WOCE programme. The WOCE-SSG had always, and is continuing, to involve new scientists in its panels and committees. The recent increase in public awareness to climate research in general and of the ocean's role in particular have lent even more support to the main need to do WOCE, the shortage of adequately trained, and experienced scientists. It will therefore continue to arrange for WOCE workshops addressing particular regional aspects or scientific topics. To do so it will co-operate with IOC in a number of activities already in the planning phase. The WOCE-SSG has also encouraged its IWPO to extend the information and details necessary to enable interested parties for arranging bilateral work in WOCE. It has also underlined for the ongoing

implementation phase, that all WOCE Data Centres, Special Analysis Centres and research groups have planned to enroll participants from those regions where WOCE has major research efforts.

37 Finally, the Report of the International WOCE Scientific Conference has just been published in the WCRP series. Dr. Koltermann concluded that WOCE has found a wide support, it looks healthy and well, and is eager to start in 1990. He asked for the support of the Committee and IOC for carrying out this desperately needed, well-designed experiment which promises to be adequately supported.

38 The **Committee considered** it essential that the IOC develops and maintain co-operation between the IOC and other intergovernmental organizations interested in WOCE. It was expected that organizations such as UNEP, FAO and IAEA would be among these. The **Committee stressed** the need for IOC to assure effective interaction between the proposed Intergovernmental WOCE Panel (IWP) and other IOC subsidiary bodies, both technical and regional. The **Committee emphasized** further the need to assist developing Member States to acquire and/or improve their scientific and technical capabilities to participate in WOCE and to develop regional activities which would contribute to WOCE.

39 The **Committee reviewed** the proposals on the WOCE Institutional Arrangements presented by the Chairmen of IOC and the President of SCOR and expressed its satisfaction with the presented proposal, which adequately reflect views expressed by different countries at the Twenty-first Session of the IOC Executive Council and the International WOCE Scientific Conference.

40 It was noted that the presented proposal offers the opportunity for various countries from different regions to participate in WOCE planning and implementation.

41 The **Committee also considered** the future interaction of the WOCE International Project Office with IOC and the CCCO and WOCE SSG in order to ensure progress in the WOCE planning and implementation. It was proposed to establish direct links between IOC and WOCE-IPO in order to ensure efficient use of funds and staff available and to co-ordinate various aspects (governmental and non-governmental) of the WOCE Programme. The **Committee also agreed** that representatives of other governmental and non-governmental organizations, such as UNEP, IAEA and regional organizations be invited to the sessions of the Intergovernmental WOCE Panel. Co-ordination with IOC regional activities will be particularly needed in order to assist in training of specialists of the countries to enable them to participate actively in WOCE. The proposed organization for the World Ocean Circulation Experiment is shown in Annex V.

42 The **Committee requested** the IOC Assembly to consider possible ways to arrange more frequent meetings of the IWP and the Committee.

43 The **Committee also recommended** that the provisional agenda and preparations for the First Session of the IWP be developed by the Secretary of IOC in consultation with the Chairmen of the Committee, of CCCO, of JSC and of WOCE SSG.

44 The **Committee noted** that 15 countries had already established National WOCE Committees and Groups that help to organize co-ordination both on national and international levels. It encouraged other countries willing to participate in WOCE to consider possible arrangements for improving co-ordination of participation of scientists and national institutions in WOCE.

45 The **Committee adopted** Recommendation OPC-III.1 on the above matters.

5. IMPLEMENTATION OF THE TROPICAL OCEAN AND GLOBAL ATMOSPHERE PROGRAMME (TOGA)

46 The Director of ITPO, Dr. J. Marsh, presented the report and recommendations of the Second Session of the WMO-IOC Intergovernmental TOGA Board, held in Geneva, 5-9 December 1988.

47 The Director, ITPO, reported also on the status of planning for the International TOGA Scientific Conference scheduled to be held in Honolulu, 16-20 July 1990, with the following objectives:

- to take stock of the scientific achievements of TOGA during the period 1985 to 1990;
- to assess the prospects for attaining the scientific objectives of TOGA by 1995;
- to offer guidance to the TOGA Scientific Steering Group regarding the emphasis for TOGA research through the next part of the programme.

48 The **Committee concluded** that this Conference would attract very strong interest from the international TOGA scientific community and would be a major milestone in the life of TOGA, at its mid-term point.

49 The **Committee welcomed** the commitment of resources to support this Conference by the US TOGA Project Office. The **Committee also welcomed** the planned allocation of funds by the WMO/ICSU Joint Climate Research Fund (JCRF) (US $ 60,000), the TOGA Trust Fund (US $ 20,000) and SCOR (up to 10 travel grants). The **Committee requested** the IOC Assembly to consider possible contribution to the Conference.

50 The **Committee noted** the report of the Director, ITPO, on the status of planning for the proposed TOGA Coupled Ocean-Atmosphere Response Experiment (TOGA COARE) in the warm pool region of the tropical western Pacific ocean. The **Committee recalled** that the CCCO at its Tenth Session had endorsed TOGA COARE as a scientifically appropriate addition to the TOGA programme, whilst noting that it should not compete for existing TOGA resources. The **Committee endorsed** the guidance to the TOGA SSG provided by the CCCO that a major goal of TOGA COARE should be the better parameterization of heat and fresh water fluxes.

51 The recommendation OPC-III.2 was adopted by the Committee on this matter.

6. GLOBAL OCEAN OBSERVING SYSTEMS DEVELOPMENT

52 The report of the ad hoc Expert Consultation on Global Ocean Observing Systems Development, held in Paris, 20-22 March 1989, was presented to the Committee by Dr. J. Baker, Chairman of the ad hoc expert consultation. The report of the meeting was made available to the Committee as Document IOC/INF-777.

53 The ad hoc expert consultation, in accordance with the proposals of the Twenty-first Session of the IOC Executive Council, reviewed the present ocean observing and data management systems, co-ordinated by IOC and WMO; the requirements of current climate research and future climate monitoring programmes as well as of other programmes, such as GIPME, JGOFS and IGBP, for an operational ocean observing system.

54 The Committee agreed that the total ocean must be monitored in such programmes but that the initial step could focus on the heat content of the upper ocean, ocean salinity and global sea level. The Committee therefore recommended that IOC, in co-operation with WMO, initiate without delay the development of detailed plan for an operational ocean observing system covering the variables noted above with the advice of the CCCO, JSC and other groups. It was suggested that the system should be implemented through the strengthening of the existing operational systems of IOC and WMO (particularly IGOSS and WWW) and other relevant bodies. Some proposals were also made on the strengthening of relevant training programmes and assistance to developing countries to enable them to participate actively in the global ocean observing system and on the more active work of IOC and WMO relating to availability, access and application of oceanographic satellite data.

55 The Committee discussed the proposals contained in the report of the ad hoc expert consultation and emphasized the need to initiate actions by IOC and WMO towards developing a global ocean observing system. This activity is of great importance in view of the growing interest and concern of governments and the public to the problem of global climate change and the need to support climate monitoring programmes. Close interaction, in this connexion, should be established with the UNEP-WMO Intergovernmental Panel on Climate Change (IPCC) in order to obtain support of the IPCC for the implementation of the operational ocean observing system. The Committee stressed the need for providing concrete justification to the requirements for ocean monitoring if governments are to support the implementation of a proposed ocean observing system.

56 The Committee agreed that although ocean monitoring is required for various practical and research applications (fisheries, pollution, sedimentation, etc.) the priority at this time should be given to ocean monitoring needed for global climate monitoring and prediction, and that the Committee should play an important role in developing such system, in co-operation with WMO and other organizations. The important task of the Committee in this connection will be the co-ordination of relevant activities of various scientific, technical and regional bodies of IOC.

57 Concern was expressed by some delegates as to the use of the term "World Ocean Watch" prior to adequate definition of this system.

58 The use of new technology for ocean observations is required to ensure global coverage of the ocean. This, as well as the expanded use of existing observational systems, will need substantial resources to be provided by the Governments. The **Committee wished** to stress that global climate change has been widely recognized as a concern for all nations and it is the responsibility of countries to commit financial resources to set up an operational ocean monitoring system required for monitoring and prediction of climate change.

59 The **Committee adopted** Recommendation OPC-III.3 on this matter.

6.1 SATELLITES

60 Under this item the Committee considered the report on "The Evolution of Satellite Observing System in the 1990's and the Possible Role of IOC", prepared by an IOC Consultant, Dr. T. Allan and submitted to the Committee as Doc. IOC/TC-OPC-III/9. The **Committee emphasized** that monitoring the oceans from space should become a reality in the next decade; that the satellite will play a central role in future ocean monitoring programmes; and that IOC could play an important role acting as an intermediary between the space agencies and the wider community of marine scientists, engineers and administrators. The **Committee supported** recommendations, contained in the report, particularly with regard to the role of IOC in the organization of a remote sensing training programme for graduate oceanographers in consultation with space agencies, and in facilitating access to and dissemination of satellite data needed for oceanographic research and operational programmes. This work should be organized in co-operation with WMO. In this connection the Committee noted the establishment of a Joint CMM/IGOSS Group of Experts on Satellites to advise IOC and WMO as to facilitating availability of remotely sensed data for operational and non-operational purposes. This Group of Experts will also address the issue of intercalibration of remotely-sensed data with conventional ocean data. The IOC Technical Committee on IODE also has a Task Team on Remotely-Sensed Oceanographic Data to consider issues on formats and procedures for exchange of satellite oceanographic data on non-operational mode.

61 The **Committee recommended** that the IOC Assembly consider possible strengthening of activities in this field in co-operation with WMO and national space agencies. The work and advice of SCOR on this matter should be taken into consideration.

6.2 OCEAN WEATHER STATIONS (OWS) IN THE NORTH ATLANTIC

62 Dr. Y. Tréglos, IOC Assistant Secretary, presented the document "Ocean Weather Stations (OWS) in the North Atlantic" (Document IOC/TC-OPC-III/8) prepared by the Secretariat at the request of the Secretary-General of WMO, addressed to the IOC Secretary and the IOC Committee on Ocean Processes and Climate, to consider possible means by which future operation of ocean weather ships can be financially supported by oceanographic community. The **Committee was informed** that the present Agreement for the

Joint Financing of North Atlantic Ocean Stations will come to an end on 30 November 1989. Norway, the United Kingdom and the USSR, currently operating ocean weather ships M ("Mike"), L ("Lima) and C ("Charlie"), have expressed their willingness to continue to do so, bearing a large part of the financial burden. This amounts to approx. £1 million per year for Norway and the United Kingdom and over £ 3 million per year for the USSR. While some additional support may be forthcoming from FRG, Ireland, the Netherlands and possibly Spain, this is still far from sufficient, and the NAOS Board has approached IOC through the Secretary-General of WMO with the request for financial support from the oceanographic community for the operation of the ocean weather stations.

63 The **Committee noted** that the present ocean weather ships in additional to meteorological observations provide long duration time series of ocean measurements that are highly valuable for climate monitoring. The **Committee recalled** that the Meeting on Time Series of Ocean Measurements (Tokyo, Japan, 11-15 May 1981) pointed out that "long time series of ocean measurements are extremely rare and their value increases non-linearly with longevity and strongly recommended that the highest priority should be given to the continuation of existing long-term measurements of the ocean". The **Committee also recognized** the potential usefulness of OWS for training of specialists from developing countries with regard to oceanographic observations at sea.

64 Some delegates noted that at present it would be very difficult to convince the national administrations to provide support for operation of ocean weather ships purely for oceanographic needs. There may be, however, possibility to retain ocean stations in the North Atlantic for seasonal operation for climate purposes on a principle of rotation of vessels, although it may not satisfy the requirements of meteorologists.

65 Nevertheless the **Committee requested** the IOC Assembly to appeal to Member States of IOC for possible support of operation of North Atlantic Ocean Stations in view of their great value for climate monitoring and future global ocean observing system.

6.3 GLOBAL SEA-LEVEL OBSERVING SYSTEM (GLOSS)

66 The Technical Secretary, Dr. A. Tolkachev, presented the Executive Summary and recommendations of the First Session of the IOC Group of Experts on GLOSS, held at the Proudman Oceanographic Laboratory, Bidston Observatory, United Kingdom from 19 to 23 June 1989 (Doc. IOC/TC-OPC-III/10). The proposed Implementation Plan for GLOSS (Doc. IOC-XV/8 Annex 4) to be submitted to the Fifteenth Session of IOC Assembly for approval, was also made available to the participants.

67 The **Committee noted** with satisfaction the continuing progress in the implementation of GLOSS, especially in the Pacific and Indian Ocean and the important role of PSMSL, SOC for ISLP-PAC and TOGA Sea Level Centre in promoting GLOSS development. In the Pacific Ocean 82 stations in 30 countries provide data to SOC for ISLP-PAC and this programme became operational. Twenty-three stations have been installed in the Indian Ocean with the help of the University of Hawaii and NOAA since 1985.

68 Some progress has been made in the Atlantic Ocean. This include the recent installation of 6 pressure type tide-gauges by France; installation of 5 tide-gauges in IOCARIBE region with the help of NOAA; assistance being provided by Sweden and the Federal Republic of Germany in setting up GLOSS stations in 5 countries of West Africa and installation of 5 tide-gauges in key locations of South Atlantic by United Kingdom. Actions are underway to initiate IGOSS Sea Level Pilot Project in the North and Tropical Atlantic with the support of MEDS (Canada).

69 The Committee wished to express appreciation to USA, UK, FRG, Sweden and Australia for assistance provided to developing countries in setting up their GLOSS stations and training of their technicians. It was noted, however, that more efforts will be required by Member States in installing GLOSS stations in Antarctica and in providing sea-level on a more regular and timely manner to international sea level centres. Additional financial and staff support will be also required from Member States to ensure international activities provided by the IOC Secretariat.

70 The Committee reviewed the recommendation and proposed work plan for 1990-1991, prepared by the Group of Experts, and adopted Recommendation TC-OPC-III.4 on this matter.

7. OCEAN DYNAMICS AND CIRCULATION ON THE CONTINENTAL SHELF

71 Dr. G. Soares, IOC Assistant Secretary, presented the proposal on an "International Programme for the Dynamics and Oceanography of Coastal and Shelf Seas and Exchanges: Rationale and Elements", prepared by the ad hoc expert meeting, held in Paris from 4 to 7 January 1989. The report of the ad hoc expert meeting was made available to the Committee as document IOC/TC-OPC-III/Inf.1. The rationale for this proposal is that the circulation and the associated dynamical processes and forcing, and the exchanges between the open sea and shelf are fundamental for proper understanding of the conditions in the transition zone from the land to the open seas. This is also the zone where human activities and influences are potentially largest and where many marine resources are concentrated.

72 The ad hoc expert meeting recommended the following steps in developing an International Programme for the Dynamics and Oceanography of Coastal and Shelf Seas and Exchanges:

(i) Training and education should be taken as the foremost step.

(ii) Each shelf regional project should involve a four phase development:

(a) Collection of historical data, data analysis, and identification of problems.

(b) Development of models and kinematical and process experiments.

(c) Process-oriented experiments and initiation of monitoring network.

(d) Initiation of a inter-disciplinary network and application and management programme for coastal and shelf seas.

(iii) Before the international programme is launched, a large and comprehensive workshop is proposed to be held in 1990 or 1991 for assessing the state-of-the-art and transfer of technology. The workshop should have a representation from developed and developing countries. A comprehensive participation from all interested member nations should be encouraged.

(iv) The time period involved for a developed country to achieve a fully developed programme from a new start-up is estimated to be about ten years. For a developing country, a longer period must be anticipated.

73 The Committee noted with satisfaction the initiative of IOC and proposals of the ad hoc Group of Experts to initiate such a programme in view of its great potential value for coastal zone management and the studies and assessment of living and non-living resources in the coastal zone and shelf seas. The Committee also emphasized the importance of such programmes, already initiated or proposed in a number of IOC regional activities, for the programmes dealing with the global study of the oceans and climate, and others such as Ocean Science and Non-Living Resources (OSNLR), Ocean Science and Living Resources (OSLR), GIPME, WOCE and JGOFS and the need for creation of efficient coupling with those.

74 The Committee, recognizing that the development of such programmes will be carried out on regional and sub-regional basis, pointed out the important role of IOC in providing guidelines and assistance on the availability of experts, application of regional models and exchange of experience and methodology. It also noted the need to co-ordinate these programmes with global programmes, such as WOCE and development of future global ocean observing system. The Committee therefore recommended that IOC Assembly endorse the initiation of this proposed programme and seek possible funds for its implementation from various funding agencies.

8. OTHER INTERNATIONAL AND NATIONAL PROGRAMMES RELATED TO THE WCRP

8.1 JOINT GLOBAL OCEAN FLUX STUDY (JGOFS)

75 The Executive Secretary of SCOR, Mrs E. Tidmarsh, provided information on the status of planning for the JGOFS. She noted that SCOR established its Committee for JGOFS in late 1987. This Committee has held two meetings and will have its Third Session at the East-West Centre in Hawaii in September 1989. In accordance with an agreement between SCOR and IOC, liaison between IOC and JGOFS has been successfully achieved through the active participation of a representative of SC/GIPME in all aspects of JGOFS planning.

76 JGOFS is currently intensely involved in the development of a draft Science Plan for consideration at its Third Session. This document will present the scientific rationale for JGOFS, an elaboration of the basic goal for JGOFS into a series of scientific objectives, and the broad

strategies for achieving these objectives. These approaches will include a large-scale global survey, modelling activities and a number of process studies, in addition to regional and basin-scale studies.

77 Until the JGOFS Science Plan has been approved by its Committee and widely disseminated within the scientific community, no detailed consideration has been given to implementation of the programme. In the mean time, however, the fortunate convergence of national plans in six countries for 1989 field studies in the North Atlantic have provided an opportunity to conduct a JGOFS Pilot Study, a North Atlantic Bloom Experiment, which is now underway. At its mid-point there is growing consensus that this Pilot Study has successfully demonstrated the benefits of the co-ordination and incorporation of national activities into a truly international programme.

78 Using the Science Plan as the foundation for further development of its programme, the JGOFS Committee will begin to consider the detailed scientific requirements for studies of biogeochemical cycles fluxes in other areas of the world ocean. In particular, a JGOFS Pacific Planning Workshop will be convened in Hawaii immediately after the Third Session of the JGOFS Committee. The Committee will also receive preliminary information on various national plans for flux studies in the Southern Ocean in the early 1990's.

79 JGOFS is working in very close collaboration with the WOCE SSG, in particular with regard to an oceanic CO_2 programme. An agreement has recently been conducted between SCOR and ICSU's Special Committee for the IGBP which designates JGOFS as a Core Project of the IGBP with SCOR maintaining full responsibility for all phases of its planning.

8.2 OCEAN CLIMATE WORKSHOP IN THE SOUTH AMERICA

80 The Delegate of Chile informed the Committee on the Scientific Workshop on Ocean Dynamics and Climate in South America, held in Buenos Aires, Argentina from 18 to 22 July 1988. Specialists from Argentina, Brazil, Chile, Peru and Uruguay attended the Workshop. They discussed and made proposals on future co-ordinated efforts in order to participate actively in TOGA and WOCE programmes. The Workshop recommended the formats of national committees or equivalent mechanisms to co-ordinate scientific participation in these programmes to develop scientific national programmes in support of WOCE (and TOGA) and to enhance the communication and interaction of scientists involved in these experiments in South America. The expert consultation on these programmes, held prior to the Workshop, emphasized the need for IOC support for training in matters related to ocean dynamics and climate.

8.3 PARTICIPATION OF AUSTRALIA IN WCRP

81 The Delegate of Australia reported that in recognition of the great importance of climate prediction and Australia's location in the Southern hemisphere, the TOGA and WOCE programmes and other climate-related research occupied a significant proportion of national oceanographic activity. This included establishment and maintenance of regional XBT and tide-gauge networks, process experiments and ocean modelling, in some cases

involving bilateral experiments planned or underway with several countries.

82 Recently the Australian Government has increased its sponsorship of climate change research and related activity, including feasibility studies for sea-level and climate monitoring network for South Pacific Forum countries. It is also sponsoring a seconded Officer to assist the IOC Secretariat in the Office of the CCCO.

9. IOC PROGRAMME ACTIVITIES IN THE FIELD OF OCEAN DYNAMICS AND CLIMATE FOR 1990-1991 AND 1990-1995

83 Two documents prepared for the Fifteenth Session of the IOC Assembly were presented to the Committee under this item:

1. Draft Unesco Medium-Term Plan: IOC Contribution and Role (Document IOC-XV/8 Annex 6).

2. Proposal on the IOC Programme of Work and Budget for 1990-1991 (Document IOC-XV/8 Annex 7).

84 Some delegates felt that the Draft Unesco Medium-Term Plan (Document IOC-XV/8 Annex 6, page 3, para 15) does not reflect adequately the role of IOC in the study of climate. The growing interest and concern of international community regarding the problem of climate change, need substantial strengthening of the role of IOC in the activities related to study and monitoring of the ocean and climate change. The weak statement in the Medium-Term Plan may be considered as representative of the low priority given by Unesco to these activities.

85 The **Committee noted** that the proper implementation of such programmes as TOGA, WOCE, development of ocean observing systems (including implementation of GLOSS), and the proposed programme on coastal dynamics will need substantial and urgent increase in staff and financial support of IOC. The **Committee therefore requested** the IOC Assembly to give particular consideration to this matter in order to identify ways and means to increase such support.

86 The Delegate of USSR informed the Committee that in order to assist IOC Secretariat in implementing its function, particularly, in GLOSS development, the USSR will second another Soviet expert, Dr. V. Jivago, to the IOC Secretariat. The **Committee expressed** its appreciation to USSR for such support and expressed also the hope that other countries will provide similar support to the activities of IOC in the field of ocean dynamics and climate and, in particular, for the development of the global ocean observing system.

87 Some delegates also pointed out that in order to strengthen support to IOC there is a need: (i) to increase support and priorities to oceanographic activities on national level; (ii) to gain recognition of the role of IOC as the central intergovernmental mechanism for ocean science and services; and (iii) increase effectiveness of IOC in priority areas.

88 In the light of the discussion on previous agenda items and adopted recommendations the Committee prepared proposals on the work plan for 1990-1991 as shown in Annex VI.

10. ELECTION OF CHAIRMAN OF THE COMMITTEE

89 The Committee elected unanimously Dr. James Baker (USA) as Chairman and Dr. Mario Ruivo (Portugal) as Vice-Chairman of the Committee.

90 The Committee expressed its thanks and appreciation to Prof. Dr. Klaus Voigt (outgoing) and Mr. S. Ragoonaden for their contribution to the activities of the Committee.

11. ADOPTION OF THE REPORT

91 The Committee adopted the Summary Report and Recommendations of the Session.

92 It agreed to submit an Executive Summary and Recommendations of the Session to the Fifteenth Session of the IOC Assembly.

12. CLOSURE

93 The Chairman of the Committee closed the Session on 29 June 1989 at 18h00.

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. **REPORTS ON THE INTERSESSIONAL ACTIVITIES**

   3.1 REPORT OF THE SECRETARY ON THE INTERSESSIONAL ACTIVITIES OF THE COMMITTEE
   3.2 REPORT OF THE CHAIRMAN OF THE SCOR-IOC COMMITTEE ON CLIMATIC CHANGES AND THE OCEAN

4. **PLANNING AND INSTITUTIONAL ARRANGEMENTS FOR THE WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)**

5. **IMPLEMENTATION OF THE TROPICAL OCEAN AND GLOBAL ATMOSPHERE PROGRAMME (TOGA)**

6. **GLOBAL OCEAN OBSERVING SYSTEMS DEVELOPMENT**

7. **OCEAN DYNAMICS AND CIRCULATION ON THE CONTINENTAL SHELF**

8. **OTHER INTERNATIONAL AND NATIONAL PROGRAMMES RELATED TO THE WCRP**

9. **IOC PROGRAMME ACTIVITIES IN THE FIELD OF OCEAN DYNAMICS AND CLIMATE FOR 1990-1991 AND 1990-1995**

10. **ELECTION OF CHAIRMAN OF THE TECHNICAL COMMITTEE**

11. **ADOPTION OF THE REPORT**

12. **CLOSURE**

ANNEX II

ADOPTED RECOMMENDATIONS

Recommendation OPC-III.1

INSTITUTIONAL ARRANGEMENTS FOR WOCE

The IOC Committee on Ocean Processes and Climate,

Noting Resolution XIV-2 of the Fourteenth Session of the IOC Assembly and Resolution EC-XXI.1 of the Twenty-first Session of the IOC Executive Council,

Having considered the proposals made by the Chairman of the Commission and the President of SCOR, based on recommendations of the Chairmen of the CCCO, the WOCE SSG and the OPC and the discussions of this matter at the International WOCE Scientific Conference (Paris, 28 November-2 December 1988),

Noting with satisfaction the progress in the planning of the World Ocean Circulation Experiment which is to start in 1990,

Recognizing that the establishment of the WOCE International Project Office (WOCE-IPO) provides staff support for the WOCE SSG, with communication links to the IOC Secretariat and the CCCO Secretariat,

Recommends that the IOC Assembly, at its Fifteenth Session:

(a) Intergovernmental WOCE Panel

Approve the establishment of the Intergovernmental WOCE Panel as a subsidiary body of the IOC Committee on Ocean Processes and Climate, with specific responsibilities for intergovernmental WOCE matters;

Invite WMO to co-sponsor with IOC the Intergovernmental WOCE Panel;

Approve, subject to concurrence by WMO, the Terms of Reference and composition of the Panel as shown in the Annex to this recommendation;

Invite the IOC Member States that have indicated their on-going involvement or intention to participate in the implementation of WOCE through a letter to the Secretary to nominate their representatives to the Panel if necessary in consultation with their Permanent Representatives of WMO Member States;

Request the Scientific Steering Group for WOCE, the SCOR-IOC CCCO and the WMO-ICSU JSC to provide scientific guidance to the Intergovernmental WOCE Panel for the conduct of WOCE, including the requirements for ocean observing and data management systems needed to achieve the scientific objectives of WOCE;

Approve the convening of the First Session of the Intergovernmental WOCE Panel in Paris in November 1990;

(b) **WOCE International Project Office**

Authorize the Secretary of IOC to develop arrangements with the WOCE International Project Office for joint activities in support of WOCE.

Appendix to Recommendation OPC-III.1

TERMS OF REFERENCE AND COMPOSITION OF THE INTERGOVERNMENTAL WOCE PANEL (IWP)

1. **FUNCTIONS**

The Intergovernmental WOCE (the World Ocean Circulation Experiment) Panel (IWP) is established as a subsidiary body of the Committee on Ocean Processes and Climate in order to meet the scientific, managerial, implementational, and resource needs of WOCE as defined by the Scientific Steering Group (SSG). The IWP will carry out the following functions:

1.1 To provide advice and recommendations to the WOCE SSG on intergovernmental matters related to the implementation of WOCE and achievement of its goals, on the basis of briefings and requests by the SSG.

1.2 To review requirements as identified by the SSG for efficient and cost-effective implementation of the WOCE Implementation Plan requiring intergovernmental functions and formulate recommendations accordingly.

1.3 To address means of providing, on the basis of defined requirements, those resources required to meet WOCE needs.

1.4 To ensure, through an appropriate mechanism, interaction and coordination with IOC and WMO programmes and committees relevant to the implementation of WOCE, including WCRP, IGOSS, DBCP, IODE, TEMA, GIPME, GLOSS, WWW, VOS, and CMM.

1.5 To monitor the activities of the relevant IOC and WMO operational programmes and to advise the SSG to what extent these are able to meet WOCE needs and on possible specific supplementary requirements for WOCE to be addressed to these bodies and programmes.

1.6 To interact with the WOCE SSG, the SCOR-IOC CCCO and the WMO-ICSU JSC concerning the scientific matters related to the implementation of WOCE and the state of progress in the implementation.

1.7 To report to the Assembly and the Executive Council of IOC on these matters through the OPC and to the Executive Council of WMO.

2. SCIENTIFIC AND TECHNICAL ADVICE

2.1 In discharging its tasks, the Panel will be guided by the overall scientific objectives and research strategy formulated by the WOCE SSG and the SCOR-IOC Committee on Climatic Changes and the Ocean.

2.2 The Panel will also be guided by the emerging overall intergovernmental operational strategy being formulated by the IOC Committee on Ocean Processes and Climate and by the relevant WMO bodies.

3. COMPOSITION

The membership of the IWP is comprised of those Member States of IOC and of WMO that have declared through a letter to the Secretary of IOC or the Secretary-General of WMO their on-going involvement or intention to participate in the implementation of WOCE, including those committed to participation in WOCE, whether on global scale or on regional aspects of WOCE implementation.

The composition will also include the chairmen or designated representatives of the CCCO, JSC, WOCE SSG and OPC.

4. ORGANIZATION OF SESSIONS

4.1 The IWP shall hold sessions at the dates and places which will be recommended by the Panel and arranged by the Secretary of the IOC in consultation with the Secretary-General of WMO and the Chairman of OPC. Sessions shall normally be held every 18 months. Invitations to attend the sessions shall be sent to:

(i) Member States of the Panel.
(ii) The SCOR-IOC CCCO, the WMC-ICSU JSC, WOCE SSG and OPC.
(iii) Other intergovernmental and non-governmental organizations interested in WOCE.
(iv) Other experts as determined by the Panel.

4.2 Prior to the closure of each session, the Panel will elect from its members a chairman who will serve in that capacity until the closure of the next session.

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

4.4 Secretariat support for the Panel will be provided by the Secretary of IOC with assistance of the CCCO Secretary. Both will maintain close liaison with the WOCE SSG and its International Project Office (WOCE-IPO) as well as the Secretariat of WMO.

Recommendation OPC-III.2

SECOND SESSION OF THE WMO-IOC INTERGOVERNMENTAL TOGA BOARD

The IOC Committee on Ocean Processes and Climate,

Having considered the Summary Report of the Second Session of the WMO-IOC Intergovernmental TOGA Board (Geneva, 5-9 December 1988),

Noting WMO Resolution EC-XLI-11 on the same topic.

Recommends that the IOC Assembly, at its Fifteenth Session:

Endorse the Summary Report of the Second Session of the WMO-IOC Intergovernmental TOGA Board;

Endorse the concept of the TOGA Coupled Ocean-Atmosphere Response Experiment (TOGA COARE) as an integral part of the TOGA programme;

Request the Secretary to support planning of TOGA COARE through the SCOR-IOC CCCO and TOGA SSG;

Request the Secretary to provide support for the International TOGA Scientific Conference to be convened jointly by WMO, ICSU, SCOR and IOC in Honolulu, USA, 16-20 July 1990;

Invite Member States to encourage and support participation in the Conference of oceanographers who are active in TOGA;

Invite the Third Joint IOC-WMO Meeting for the Implementation of IGOSS XBT Ship-of-Opportunity programme (Hamburg, 16-20 October 1989) to consider and recommend actions needed to achieve TOGA goals in the Indian and Atlantic oceans;

Invite the Group of Experts on GLOSS to consider and advise on actions to implement the planned TOGA sea-level observing network, particularly in the Atlantic ocean.

Recommendation OPC-III.3

GLOBAL OCEAN OBSERVING SYSTEM DEVELOPMENT

The IOC Committee on Ocean Processes and Climate,

Noting

(i) the revised statutes of the IOC by which the Commission was entrusted to promote, plan and co-ordinate ocean observing and monitoring system,

(ii) the proposals of the Twenty-first Session of the IOC Executive Council regarding the accelerated progressive development of a global operational ocean observing system and related ocean services,

(iii) Resolution 11 (EC-XLI) from the WMO Executive Council on the development of a global operational ocean observing system,

(iv) the proposals of the Second Session of the WMO-IOC Intergovernmental TOGA Board to initiate planning for the implementation of such a system,

(v) the preparation of long-term plans for some operational elements of such a system including IGOSS, GLOSS, and IODE,

(vi) the preparation of implementation plans and initiation of scientific programs that will provide information for development of such a system including TOGA, WOCE, JGOFS, and GEWEX,

(vii) the reestablishment by CCCO and JSC of an Ocean Observations System Development Programme group, and

(viii) with concern the possible termination of the North Atlantic Ocean Weather Stations at the end of 1989,

Recognizing

(i) the necessity of systematic global ocean observations for understanding, monitoring, and predicting the state of and changes in the physical and chemical ocean environment and large-scale biological systems involved in climate change,

(ii) that an adequate ocean observing system must resolve the energy containing structures in the ocean, and that existing oceanographical observing systems are insufficient for such resolution in space and time,

(iii) that the emerging developments of new technology will make it possible to enhance the scope of an integrated global operational ocean observing system, and

(iv) that new commitments from governments will be required to implement a global ocean observing system, and that the internationally recognized importance of monitoring and predicting change in the global environment provides the justification for developing such commitments,

Urges the IOC, in co-operation with WMO, strengthen their respective Secretariats in order to assist in developing, implementing, and maintaining the global operational ocean observing system and to develop the necessary training and assistance activities to support the operational measurements, including a remote-sensing training programme through appropriate mechanisms;

Recommends that the IOC Assembly, at its Fifteenth Session;

Reaffirm that the Intergovernmental Oceanographic Commission is the appropriate governmental organization for the promotion, planning and co-ordination of an integrated global operational ocean observing system;

Agree on the urgent need to design and implement a global operational ocean observing system through accelerated deployment of existing observing systems and through progressive integration of new technology both in situ and satellite-borne with existing system into an integrated system that can lead to a world ocean watch in analogy with the World Weather Watch;

Request the Secretary of the IOC, in consultation with the WMO, and with the advice of the OPC, and the CCCO to develop a statement on the importance of the ocean in global environmental change and the consequent need for a global operational ocean observing system as part of a global system for monitoring and predicting environmental change, such statement to be presented by the President of the IOC to Member States, IOC Governing Bodies, to the WMO-UNEP Intergovernmental Panel on Climate Change, and to the United Nations as a proposed protocol on the ocean component of a global observing system as part of the UN consideration of a "Framework Convention on Global Change";

Establish an ad hoc group of experts to support the Ocean Observing Systems Development Programme group of the CCCO/JSC to develop a plan for a global integrated operational ocean observing system that will include requirements, techniques, and an initial implementation strategy; the first initial report should be presented to the Twenty-third Session of the IOC Executive Council in 1990 and the further elaborated report to be presented to the Fourth Session of the OPC in 1991;

Invite also Member States to consider ways and means by which the operation of long-term ocean measurements that have been collected from Ocean Weather Ships, can be continued when the Weather Ship operations are terminated, since these time series are among the longest and most useful of oceanographic data series;

Consider strengthening IOC activities in the application of satellite remote sensed data for study of the marine environment. These include facilitating access of scientists and national organizations to remotely sensed oceanographic data; establishing liaison with satellite operational agencies; and organizing training programmes for graduate oceanographers.

Appendix to Recommendation OPC-III.3

CRITERIA AND APPROACH FOR THE DEVELOPMENT OF A GLOBAL INTEGRATED OPERATIONAL OCEAN OBSERVING SYSTEM

1. A statement on the need for and requirements of a global integrated operational ocean observing system which will be, inter alia, a major component of a global system for monitoring and predicting global change should be presented as a matter of urgency to the IOC Member States and IOC Governing Bodies as well as the WMO/UNEP Intergovernmental Panel on Climate Change (IPCC), and to the United Nations as a proposed protocol on

the ocean component of the global observing systems as part of the UN consideration of a Framework Convention for Global Change.

2. Such a statement will include a short review of the present state and achievements of existing ocean observing system, which (despite their limitation) has already permitted identification of some significant variations and trends in global climate, and are already providing information to decision makers responsible for formulating policies designed to respond to the ecological and socio-economic effects of future climate change.

It should clearly state that immediate action can be taken in implementing on-going systematic observations of a number of key elements of the ocean, of high priority in monitoring and predicting global change, using techniques available today. These immediate elements should include the following specific observations with annual or more frequent sampling resolution when appropriate:

(i) Global Sea Level
(ii) Global distribution of sea surface temperature
(iii) Global distribution of upper ocean temperature
(iv) Sea ice concentration
(v) Heat carried by ocean currents, initially in the Atlantic
(vi) Structure of major elements of the ocean circulation
(vii) Statistics of the transient motions in the ocean
(viii) Global distribution of ocean heat content

The statement should also draw attention to the need to continue work on developing methods to monitor those elements of the oceans system - for example ocean-atmosphere fluxes - and upper ocean salinity - which cannot be adequately measured and yet which are crucial to prediction of global change.

3. A detailed plan for a global integrated operational ocean observing system must be developed under the initiative of IOC as a matter of urgency. The initial elements of such a system can be identified now; they have been noted in para 2 above.

4. The system plan should take into account already completed or ongoing studies in this field and the existing operational systems of IOC and WMO.

5. The system should be designed by relevant groups of experts and intergovernmental groups to meet the stated requirements for climate monitoring, research and forecasting, as well as those of operational applications. The CCCO/JSC Ocean Observing System Development Programme group should determine the requirements for this system, with the support of an ad hoc group of experts appointed by the OPC.

6. The ad hoc group of experts will be appointed by the Chair, OPC, in consultation with the Secretary, IOC, on the basis of their expertise in implementation of operational ocean observing systems. The ad hoc group will be responsible for providing information on existing operational programs such as the DBCP (drifting buoys), the IGOSS BATHY/TESAC

operational programme (XBT, CTD), GLOSS (sea level), the WMO/CMM PMO system (VOS), and the IOC/IODE (data management) to the design of the observation system.

Recommendation OPC-III.4

GLOBAL SEA-LEVEL OBSERVING SYSTEM (GLOSS)

The IOC Committee on Ocean Processes and Climate,

Having reviewed the proposed Implementation Plan for GLOSS (Doc. IOC-XV/8 Annex 4),

Having also reviewed the Executive Summary and recommendations of the First Session of the Group of Experts on GLOSS,

Recommends that the IOC Assembly, at its Fifteenth Session:

(i) **approve** the GLOSS Implementation Plan (Doc. IOC-XV/8 Annex 4);

(ii) **note** with appreciation the assistance provided by Australia, Federal Republic of Germany, Sweden, United Kingdom and United States to developing countries in setting up GLOSS stations;

(iii) **urge** Member States to participate actively in the GLOSS by installing and up-grading GLOSS stations and providing sea-level data for international exchange in accordance with the GLOSS Implementation Plan;

(iv) **approve** the GLOSS Work Plan for 1990-1991 and invite Member States to provide contributions to the IOC Trust Fund for implementation of actions proposed in the Work Plan;

(v) **invite** Member States to continue their assistance to developing countries in setting up GLOSS stations and training of their specialists through IOC or on bilateral and/or multilateral basis;

(vi) **approve** the publication of GLOSS Brochure, GLOSS Newsletter and GLOSS Handbook, and invite Member States to provide support for the publication of this material;

(vii) **request** the Regional Association for IOCARIBE and the Regional Committee for IOCEA to consider at their forthcoming meetings the implementation of regional components of GLOSS.

ANNEX III

LIST OF PARTICIPANTS

I. PARTICIPANTS FROM MEMBER STATES

ARGENTINA

Mr. Alberto CARRI
Counsellor
Permanent Delegation of Argentina
to Unesco
Unesco House
1 rue Miollis
75015 Paris
France
Tel: (1) 45.68.34.38

Mr. Ricardo L. BOCALANDRO
Third Secretary
(same address as above)

Mr. Carlos GIANOTTI
Attaché de presse
(same address as above)

AUSTRALIA

Dr. Angus McEWAN
CSIRO, Division of Oceanography
Box 1538
Hobart, Tasmania 7001
Australia
Tel: + 61-02-206212
Tlx: 57182AA
Fax: 61-02-240530
Tlm: A.MCEWAN
(Also Chairman CCCO)

BANGLADESH

Mr. Ali YAKUB
First Secretary
Permanent Delegation of Bangladesh to
Unesco
Ambassade du Bangladesh
5 Square Pétrarque
75016 Paris
France
Tel: (1) 45.53.41.20

BRAZIL

Mr. Caio-Marcio RANIERI-COLOMBO
Troisième Secrétaire
Délégation permanente du Brésil auprès
de l'Unesco
Maison de l'Unesco
1 rue Miollis
75015 Paris
France
Tel: (1) 45.68.82.29

CANADA

Dr. G.L. HOLLAND
Director-General
Physical and Chemical Sciences
Directorate
Department of Fisheries and Oceans
12th Floor, 200 Kent Street
Ottawa, Ontario K1A OE6
Tel: 613-990.02.98
Tlx: 534228
Fax: 990 60 50
Tlm: OCEANSCIENCE.OTTAWA

Dr. J.A. ELLIOTT
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth
Nova Scotia B2Y 4A2
Tel: 902-426.8478
Tlx: 019-31552
Tlm: BEDFORD.INST

Dr. P. LEBLOND
Department Oceanography
University of British Columbia
Vancouver V6T IW5
Tel: 604-228.24.82
Tlm: UBC.OCGY

CHILE

Mr. Bernardo UCCELLETTI
Secretario Ejecutivo
Comité Oceanografico Nacional
Errazuriz 232
Valparaiso
Tel: 251.056
Tlx: 230262 HIDRO CL
Fax: 56 32 25 32 83

Dr. Rolando KELLY
Jefe Departamento Oceanografia
Instituto de Fomento Pesquero
Jose Domingo Canas 2277
Santiago
Tel: 49.15.62

CHINA, PEOPLE'S REPUBLIC OF

Mr. Youxin GE
Director, Dept. of International Co-operation
State Oceanic Administration
1, Fuxingmenwai Avenue
Beijing
Tel: 867283
Tlx: 22536 NBO CN

Mr. Haiqing LI
Deputy Chief, Div. of International Organizations
State Oceanic Administration
1, Fuxingmenwai Avenue
Beijing
Tel: 867283
Tlx: 22536 NBO CN

DENMARK

Dr. Aksel WIIN-NIELSEN
Geophysical Institute
University of Copenhagen
Haraldsgade 6
DK - Copenhagen N
Tel: 31-81.81.66

FEDERAL REPUBLIC OF GERMANY

Prof. Gerold SIEDLER
Institut für Meereskunde
Düsternbrooker Weg 20
D-2300 Kiel 1
Tel: 49-431-597.38.90
Tlx: 292619 IFM D
Tlg: MEERESKUNDE KIEL
Tlm: G.SIEDLER

FRANCE

Mr. B. VOITURIEZ
Responsable des programmes d'océanographie physique
Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER)
66 avenue d'Iéna
75116 Paris
Tel: 47.23.55.28
Tlx: 610775
Tlm: B.VOITURIEZ

GERMAN DEMOCRATIC REPUBLIC

Prof. Dr. sc. Klaus VOIGT
Director, Institut für Meereskunde der Akademie der Wissenschaften der DDR
DDR - 2530 Rostock-Warnemünde
Tel: (Rostock 81) 58288
Tlx: 31153 IFM DD
(Also Chairman OPC)

INDIA

Mr. M.G. GUPTA
Director
India Meteorological Department
Lodi Road
New Delhi 110003
Tel: 61.58.15
Tlx: 3166494 MOGM IN
Tlg: DIRGENMET N.DELHI

Mr. V. RAVINDRANATHAN
Principal Scientific Officer, Dept. of Ocean Development, Govt. of India
Block-12, C G O Complex, Lodi Road
New Delhi 110003
Tel: 36.25.14
Tlx: 3161535 DOD IN

ITALY

Prof. Arturo DE MAIO
Istituto Universitario Navale
Faculté des Sciences de la Mer
Institut de Météorologie et Océanographie
Via F. Acton, 38
80133 Napoli
Tel: 081-551.39.79

Prof. Michele COLACINO
Directeur de l'Institut de Physique de l'Atmosphère
C.N.R.
P.le Luigi Sturzo, 31
00144 Roma
Tel: 06/591.09.41
Tlx: 614344

JAPAN

Dr. Yutaka NAGATA
Professor, Geophysical Institute
University of Tokyo
2-11-16 Yayoi, Bunkyo-ku
Tokyo
Tel: 03.812.21.11 Ext. 4288
Tlx: 2722126 VTGAB

MEXICO

Dr. A. AYALA-CASTANARES
Instituto de Ciencias del Mar y Limnologia
Universidad Nacional Autonoma de Mexico
Apartado Postal 70-157
Mexico 04510 DF
Tel: 548.27.66
554.91.52 (Home)
Tlx: 1760155
Tlm: A.AYALA

Dr. R. ROLANDO DE LASSE
Director General de Educacion Tecnologica, Agropecuaria y Ciencias del Mar
Secretaria de Educacion Publica
Conj. Pino Suarez "F" 2° Piso
Mexico
Tel: 542.70.62

Dr. V. ARENAS
ICMYL
Cd. Universitaria
70-153 Mexico DF
Tel: 550.58.74
Tlx: 1760155

Prof. J. BARBERAN
Instituto Ciencias Mar
04040 Mexico DF
Tel: 550.58.73
Tlx: 1760155

Mrs. Norma SUAREZ-PANIAGUA
Encargada de Asuntos Cientificos
Delegacion Permanente de Mexico ante
la Unesco
Maison de l'Unesco
1 rue Miollis
75015 Paris
France
Tel: 45.68.33.70

THE NETHERLANDS

Mr. L. OTTO
Netherlands Institute for Sea Research
Horntje
Texel
Tel: 02220-19541
Fax: 02220-19674

NORWAY

Prof. Ulf LIE
Department of Marine Biology
University of Bergen
N-5065 Blomsterdalen
Tel: (475) 22.62.00
Fax: (475) 22.62.01
Tlm: U.LIE
(Also Chairman IOC)

Mr. Johan BLINDHEIM
Oceanographer, Institute of
Marine Research
P.O. Box 1870 - NORDNES
N-5024 Bergen
Tel: + 47 5 23.85.00
Tlx: 42297 OCEAN-N
Tlg: INMARE
Fax: (475) 23.85.31

PORTUGAL

Dr. Mario RUIVO
Member of the Consultative Board of JNICT,
Co-ordinator National Programme for Marine Science and Technology
National Agency for Scientific and Technological Research (JNICT)
Av. D. Carlos I - N° 126/2°
1200 Lisbon
Tel: 351-1 60.08.86
Tlx: 12250 JUNIC P
Fax: 351 1 60 74 81

Dr. Armando FIUZA
Grupo de Oceanografia/Departamento de Fisica & Centro de Geofisica
Rua Da Escola Politecnica 58
1200 Lisbon
Tel: 351-1-608.028/9
Tlx: 65869 FCULIS P
Fax: 351 1 7597716

SWEDEN

Prof. Jarl-Ove STROMBERG
Kristineberg Marine Biological Station
Kristineberg 2130
S-450 34 Fiskebäckskil
Tel: 46-523-22007
Tlx: 17073 ROYACAD S
(Also representing SCOR)

SYRIAN ARAB REPUBLIC

Dr. Abd Elkarim SAOUD
Permanent Delegate
Permanent Delegation of the Syrian Arab Republic to Unesco
Unesco House
1 rue Miollis
75732 Paris Cedex 15
France
Tel: (33 1) 45.68.34.97

THAILAND

Prof. Prida THIMAKORN
Director
Regional Research & Development Center
Asian Institute of Technology
P.O. Box 2754
Bangkok
Tel: 529.01.00
Tlx: 84276 TH

UNION OF SOVIET SOCIALIST REPUBLICS

Dr. P. AGAFONOV
Secretary, Oceanographic Committee of the Soviet Union
11 Gorky Street
Moscow 103009
Tel: 229.25.72
Tlx: 411354 DMNTS SU
or 411241 SU
Tlg: MOSCOW OCEAN

Dr. G.P. KURBATKIN
USSR Committee for Hydrometeorology
12 P. Morozov Str.
Moscow D376
Tel: 252.11.18

UNITED KINGDOM

Dr. Colin SUMMERHAYES
Director
Institute of Oceanographic Sciences
Deacon Laboratory
Brook Road
Wormley, Godalming, Surrey GU8 5UB
Tel: (042879) 4141
Tlx: 858833
Fax: (042879) 3066

Dr. John WOODS
Natural Environment Research Council
Polaris House
Swindon SN2 1EU
Tel: 0793-41.16.37
Tlx: 444293 ENVRE G

UNITED STATES OF AMERICA

Dr. Thomas SPENCE
Program Director
National Science Foundation
1800 G. St. N.W.
Washington, DC 20550
Tel: 202-357.79.06

Dr. David GOODRICH (Rapporteur)
Director, Ocean Circulation Studies
National Oceanic & Atmospheric Administration
Department of Commerce
6001 Executive Boulevard
Rockville, MD 20852
Tel: 301-443.84.15
Tlx: RCA 248376

Dr. James BAKER
President, Joint Oceanographic
Institutions Inc.
1755 Massachusetts Av. N.W., Suite 800
Washington, DC 20036
Tel: 1-202-232.39.00
Tlx: 257828
Tlm: JOI.INC
(Also Co-Chairman WOCE SSG)

Dr. William WOODWARD
Chief, Ocean Observations Division
National Ocean Service
National Oceanic & Atmospheric
Administration
Department of Commerce
6001 Executive Boulevard
Rockville, MD 20852
Tel: 301-443.60.76
Tlx: RCA 248376
Tlm: W.WOODWARD

Mr. Louis BROWN
International Science Associate
Directorate for Geosciences
National Science Foundation
1800 G. Street N.W., Room 609
Washington, DC 20550
Tel: 1-202-357.98.09
Tlx: 7401424 NSFO UC
Fax: 202-357 77 45
Tlm: L.BROWN

Dr. Richard PODGORNY
Chief, International Affairs
NOS/NOAA
1825 Connecticut Avenue N.W., Room 607
Washington, DC 20235
Tel: 202/673.51.78
Tlx: 7400311
Fax: 202-673 38 50
Tlm: R.PODGORNY

VENEZUELA

Dr. Herman PEREZ NIETO
Presidente, Comision Nactional de
Oceanologia
Consejo Nacional de Investigaciones
Cientificas y Tecnicas (CONICIT)
Apartado Postal 70617
Lois Rloices
Caracas
Tel: 582 239 31 45
Tlx: 25205 VE
Fax: 239 86 77

Mrs. Guadalupe PULIDO DE CASTET
Attaché
Permanent Delegation of Venezuela to Unesco
Unesco House
1 rue Miollis
75015 Paris
France
Tel: (1) 45.68.25.32
Tlx: DELAVEN 200230F

II. REPRESENTATIVES AND/OR OBSERVERS OF ORGANIZATIONS

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
Tel: 45.68.39.68
Tlx: 204461 F
Fax: (1) 43 06 11 22 (attn. SC/OCE)
Tlm: c/o IOC.SECRETARIAT

World Meteorological Organization (WMO)

Prof. P. MOREL
Director, World Climate Research Programme
WMO
Case Postale No. 2300
CH-1211 Geneva 2
Switzerland
Tel: 41 22 730 81 11
Tlx: 23260 OMM CH
Fax: 41 22 734 23 26
Tlm: P.MOREL

Commission internationale pour l'exploration scientifique de la Méditerranée (CIESM)

Mr. C. MILLOT
Vice-Président du Comité d'Océanographie Physique de la C.I.E.S.M.
Centre d'Océanologie de Marseille
Antenne de Toulon, c/o IFREMER
B.P. 330
83507 La-Seyne-sur-Mer
France
Tel: 94.94.18.36
Tlx: 400205F

Joint SCOR-IOC Committee on Climatic Changes and the Ocean (SCOR-IOC CCCO)	Dr. Angus McEWAN Chairman CCCO CSIRO, Division of Oceanography Box 1538 Hobart, Tasmania 7001 Australia Tel: + 61-02-206212 Tlx: 57182AA Fax: 61-02-240530 Tlm: A.MCEWAN **(Also representing Australia)**
International TOGA Project Office (ITPO)	Dr. John MARSH Director International TOGA Project Office c/o WMO Case Postale No. 2300 CH-1211 Geneva 2 Switzerland Tel: 41 22 730 82 25 Tlx: 23260 OMM CH Fax: 41 22 734 23 26 Tlm: INT'L.TOGA
Organisation de l'Unité Africaine (OUA)	Dr. Moise Akle Scientific Officer OAU/STRC PMB 2359 Lagos Nigeria Tel: 633430 Tlx: 22199 TECOAU NG
Scientific Committee on Oceanic Research (SCOR)	Mrs. Elizabeth TIDMARSH Executive Secretary Department of Oceanography Dalhousie University Halifax, NS B3H 4JI Canada Tel: 902-424.88.65 Tlm: E.TIDMARSH
WOCE International Project Office (WOCE-IPO)	Dr. Klaus Peter KOLTERMANN Director, WOCE-IPO Institute of Oceanographic Sciences Deacon Laboratory, Brook Road Wormley, Godalming, Surrey GU8 5UB United Kingdom Tel: 42879/4141 Tlx: 858833 OCEAN G Fax: 42 879 30 66 Tlm: WOCE.IPO

Fondation Cousteau

Dr. Véronique SARANO SIMON
Rédactrice
25 av. de Wagram
75017 Paris
France
Tel: 47.66.02.46

III. **SECRETARIAT**

Dr. G. KULLENBERG
Secretary IOC
Intergovernmental Oceanographic Commission
Unesco
7 place de Fontenoy
75700 Paris - France
Tel: (33 1) 45.68.39.83
Tlx: 204461 PARIS
Fax: (33 1) 43.06.11.22
Tlm: IOC.SECRETARIAT

Dr. A. TOLKACHEV
IOC Senior Assistant Secretary
Head, Ocean Services Unit
(same Address, Tlx, Fax and Tlm as above)
Tel: (33 1) 45.68.39.78

Mr. R. GODIN
Secretary CCCO
(same Address, Tlx, Fax as above)
Tel: (33 1) 45.68.40.42
Tlm: CCCO.PARIS

Mr. Y. TREGLOS
IOC Assistant Secretary
(same Address, Tlx, Fax and Tlm as above)
Tel: (33 1) 45.68.39.76

Mr. C. BERMAN
IGOSS Operations Co-ordinator
(same Address, Tlx, Fax and Tlm as above)
Tel: (33 1) 45.68.39.75

Mr. T. SANKEY
IOC Assistant Secretary
(same Address, Tlx, Fax and Tlm as above)
Tel: (33 1) 45.68.40.08

Mr. G. SOARES
IOC Assistant Secretary
(same Address, Tlx, Fax and Tlm as above)
Tel: (33 1) 45.68.39.91

ANNEX IV

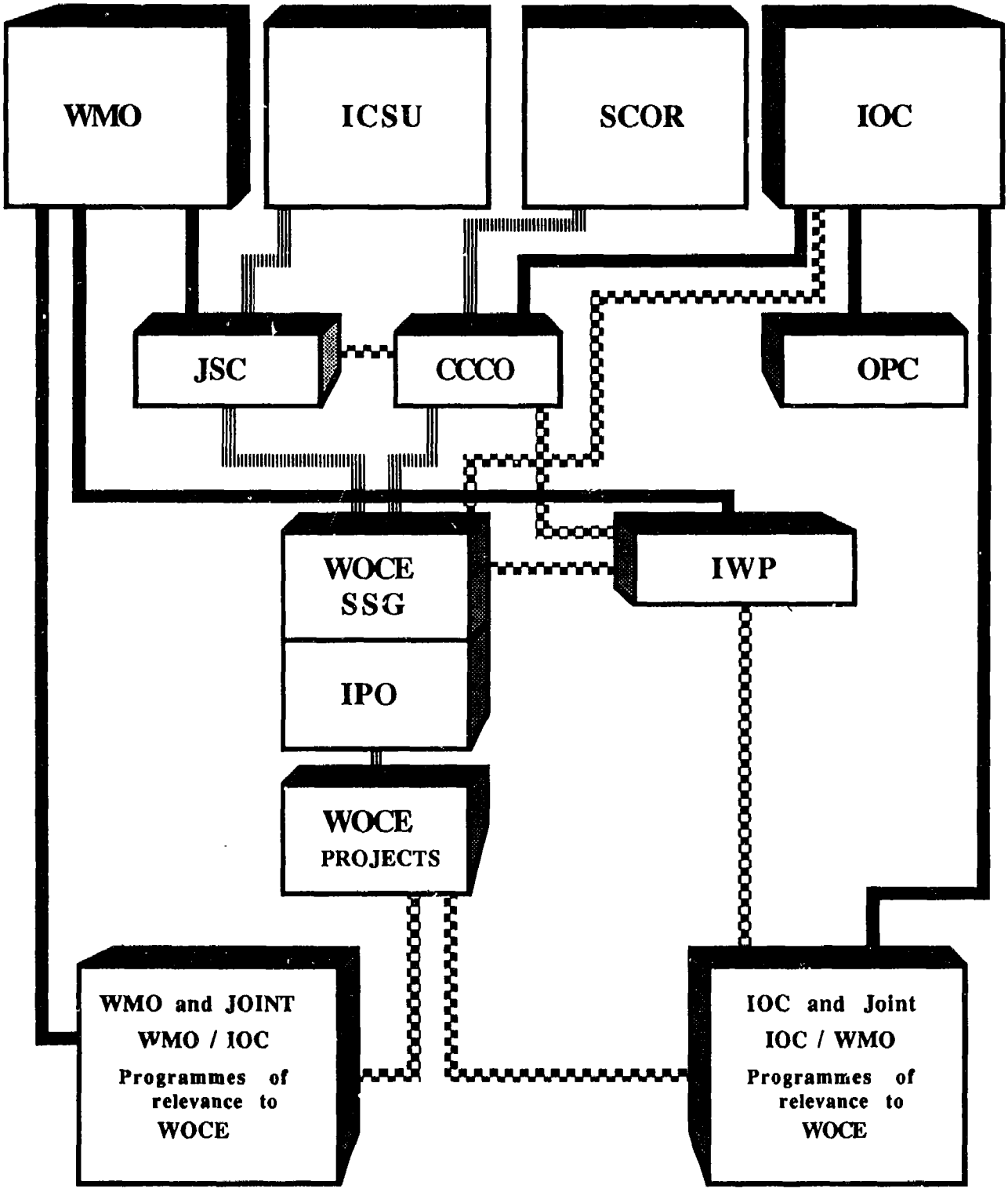
LIST OF WORKING DOCUMENTS [1]

Document Code	Title
IOC/TC-OPC-III/1	Provisional Agenda
IOC/TC-OPC-III/2	Annotated Provisional Agenda
IOC/TC-OPC-III/3	Summary Report
IOC/TC-OPC-III/4	List of Documents
IOC/TC-OPC-III/5	List of Participants
IOC/TC-OPC-III/6	Report on Intersessional Activities
IOC/TC-OPC-III/7	Proposals on the Institutional Arrangements for WOCE
IOC/TC-OPC-III/8	Ocean Weather Stations (OWS) in the North Atlantic
IOC/TC-OPC-III/9	The Evolution of Satellite System in the 1990's- and The Possible Role of IOC
IOC/TC-OPC-III/10	Executive Summary and Recommendations of the First Session of the IOC Group of Experts on the Global Sea-Level Observing Systems (GLOSS)
IOC/TC-OPC-III/Inf.1	An International Programme for the Dynamics and Oceanography of Coastal Shelf Seas and Exchanges: Rationale and Elements
IOC/TC-OPC-III/Inf.2	Some Information on the UNEP-WMO Intergovernmental Panel on Climate Changes
WCRP series	Report of the International WOCE Scientific Conference (Paris, 8 November - 2 December 1988)
WCRP series	Report of the Second Session of WMO-IOC Intergovernmental TOGA Board (Geneva, 5-9 December 1989)
IOC/INF-777	Report of the Ad hoc Expert Consultation on Global Ocean Observing System (Paris, 20-24 March 1989)
IOC-XV/8 Annex 4	Proposed Implementation Plan for the Global Sea-Level Observing System

[1] This list is for reference only. No stocks of these documents are maintained

ANNEX V

PROPOSED ORGANIZATION FOR THE WORLD OCEAN CIRCULATION EXPERIMENT



ANNEX VI

PROPOSED WORK PLAN FOR 1990-1991 FOR THE IOC ACTIVITIES RELATED TO THE PROGRAMME OF OCEAN PROCESSES AND CLIMATE

Actions	1990	1991
1. The First and Second Session of the Intergovernmental WOCE Panel	November Paris	November
2. The Fourth Session of the Committee		+
3. The Third and Fourth Session of the WMO-IOC Intergovernmental TOGA Board	January Geneva	+ -
4. Preparation of a plan for a global integrated ocean observing system (joint efforts of the IOC Ad hoc group of experts on global integrated ocean observing system and the CCCO-JSC Ocean Observing System Development Panel)	First initial report March IOC-EC-XXIII	Elaborated report March IOC-EC-XXIII
5. Implementation of GLOSS (in accordance with the GLOSS plan, attached)	+	+
6. Support of the International TOGA Scientific Conference	16-20 July Honolulu, USA	
7. Preparation of a statement on the importance of the ocean in global environmental change, for submission to IOC EC, IPCC and UN	March	+
8. Continuation of support for the activities of the CCCO, WOCE SSG, its working groups, and IWPO in planning WOCE activities	+	+
9. IGOSS activities (in accordance with the plan of JWC IGOSS), particularly Third Joint IOC-WMO Meeting for the Implementation of IGOSS XBT Ship-of-opportunity Programme	+ 16-20 October Hamburg, FRG	+
10. IOC activities in the field of remotely-sensed satellite oceanographic observations including:	+	+
- preparation of the training programme on remotely-sensed satellite oceanographic observations;		
- facilitating access to and dissemination of satellite data, through support of the Joint CMM/IGOSS Group of Experts on Satellites and the TC/IODE Task Team on Remotely-Sensed Oceanographic Data	+	+
11. Planning and development of programme for the Dynamics and Oceanography of Coastal and Shelf Seas and Exchange	+	+
12. Co-operation and co-ordination of IOC activities with JGOFS, IGBP and UNEP-WMO IPCC	+	+