Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Committee on Ocean Processes and Climate

Fifth Session

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1. OPENING

1 The Chairman of the IOC Committee on Ocean Processes and Climate, Dr. D.J. Baker, opened the Session and welcomed the participants.

2 The Secretary IOC, Dr. G. Kullenberg, welcomed the participants on behalf of IOC. He pointed out the importance of this Session for future IOC activities. Intersessionally, the agreement has been reached on joint development of the Global Climate Observing System, with WMO, IOC, UNEP and ICSU, and the establishment of a Joint Scientific and Technical Committee for GCOS and a Joint Planning Staff at WMO in Geneva. At the same time, IOC has negotiated a draft agreement with WMO, IOC and ICSU on co-sponsorship of the WCRP. This calls for a re-constituted JSC with a considerable oceanographic research representation as part of the membership. This would then replace the present arrangements with the CCCO Executive in the JSC. Part of the tasks of the CCCO would also be taken over by the JSC.

3 In parallel with all this, IOC has worked on formulating elements for the GOOS plan and development, including a proposal for an intergovernmental mechanism for guidance of and commitments towards the undertaking of GOOS, and an appropriate scientific and technical mechanism to formulate the scientific structure of GOOS adequate to meet the defined needs. Part of GOOS should meet the WOCE Goal 2 objectives. However, there are several additional requirements for GOOS. The GOOS aim is well beyond the climate related elements. These elements are indicated in the documents submitted to this Session, as are the proposed structures to govern the GOOS development in the international arena (Documents IOC/EC-XXV/8 Annex 1 and IOC/OPC-V/Inf.1).

4 Dr. Kullenberg spelled out from the start how he saw this structure, and stated that he considered it to be an extremely important part of this meeting to make adequate recommendations to the IOC Executive Council.

5 It is proposed that this committee be transformed into the intergovernmental committee for GOOS, including representation from the relevant governmental institutions, the ministries, and national operational and research institutions. Such a Committee must then include relevant representation so that commitments can be made. This needs to be supplemented by a strong and high-level scientific and technical group working at the same level as the intergovernmental committee. Terms of reference for both these mechanisms are outlined in the document IOC/OPC-V/9. He emphasized that the proposal is that the tasks of this Committee be focused on GOOS - not to establish a new committee. The proposed terms of reference may well need to be refined or fine-tuned, and it is therefore proposed that there be a sessional working group established to deal with this matter. He considered it very important that a concise recommendation emerge from this session of the OPC on both these mechanisms.

6 Dr. Kullenberg also urged the participants to realize and bear in mind that the GOOS covers a much wider range than climate related matters, although the climate module is a priority. The coastal zone - health of the ocean module is also a priority, however. He pointed out that a number of 'building blocks' are already established -although they may need to be adjusted. We have GLOSS, IGOSS, DBCP; the CPR, and the Marine Pollution Monitoring (MARPOLMON) System, with the International Mussel Watch going on with respect to the Health of the Ocean Module, and the Living Marine Resources module.

7 IOC also has established formal links on this development with UNEP through the GIPME Programme and through the development of the module on climate change impact related observations in the coastal zone, in which WMO and IUCN also participate in addition to UNEP and IOC. This established a clear link to the GEMS-EARTHWATCH System which is a UN system wide mechanism.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

8 The Agenda of the Session as adopted by the Commission is given in Annex I.

2.2 DESIGNATION OF A RAPPORTEUR

9 The Committee designated Dr. Rubén Lara Lara (Mexico) as Rapporteur for the Session.

2.3 CONDUCT OF THE SESSION

10 The Technical Secretary of the Committee, Dr. A. Tolkachev, IOC Senior Assistant Secretary, reviewed the arrangements, timetable and documentation for the Session.

11 The List of Participants is given in Annex III.

3. RESEARCH PROGRAMMES RELATED TO GLOBAL CLIMATE AND ENVIRONMENTAL CHANGE

3.1 WORLD CLIMATE RESEARCH PROGRAMME (WCRP)

3.1.1 IOC-WMO Intergovernmental WOCE Panel

12 Dr Leo Otto, Chairman of the Intergovernmental WOCE Panel (IWP), reported on the Panel's Second Session, Paris, 3-4 March 1992. The WOCE Scientific Steering Group (SSG) and International Project Office have completed and published a WOCE brochure which provides information on the experiment. The main responsibility for WOCE implementation lies with the WOCE SSG and IPO, supported by a broad WOCE community. The IWP acts as an interface with the IOC and the WMO. In the present phase of WOCE, the role of IWP is focussed on obtaining increased support for WOCE implementation at the intergovernmental level. As WOCE is now in the most critical years of the experiment, it is necessary that the IWP remains active to pursue a number of intersessional tasks.

13 The IWP recognized the assistance provided by the IOC Secretariat in helping to obtain clearances for WOCE work in coastal waters. It was noted that similar problems will require similar support in the future. The Panel noted that the full results of WOCE will only be available some time after the experiment has been completed. But the Panel came to the conclusion that, at an early date, the presentation of WOCE achievements is important to acquire additional national support needed for its completion. In a programme with an implementation period of seven years and involving many nations, the availability of the resources required is a matter of long-term concern. The Panel received information on this subject showing commitments and gaps in the resources, and an evaluation of the priorities for support. After a Panel discussion, a beginning was made in organizing support for additional resources on the basis of positive reactions from the members. This activity has to be continued intersessionally through close co-operation between the IWP, IOC Secretariat, WOCE IPO, JSC/WCRP, and the WOCE community.

14 The following recommendations were presented to the OPC:

(i) The Panel recommends that the CCCO and JSC, assisted by the SSG and IPO and their sponsoring organizations, plan a conference which demonstrates and reviews the results of WOCE to date, with a focus on its contribution to achieving the objectives of the WCRP. In addition, the conference should address how the WOCE results are impacting the design of other research programmes and the early phases of the Global Ocean Observing System. The conference should focus on global issues, possibly using modelling as a context, and should be held in late 1993 or early 1994 in order to assist in attracting the necessary resources to complete WOCE.

(ii) The Panel recommends that the Chairman, in collaboration with the IPO, establish a network of informal contacts among the resource managers in each country, in order to provide a rapid exchange of information and to facilitate solutions to unforeseen contingencies that arise during WOCE.

(iii) The Panel urges the WOCE Hydrographic Programme (WHP) Office to facilitate technical visits between institutions in order to transfer the engineering expertise involved in conducting CTD operations, in particular, the proper use and maintenance of winches, cables and blocks.

(iv) The Panel reiterated the importance of completing the one-time WHP sections in each ocean basin as synoptically as possible. It noted that the most recent plans have A17, A14 and A13 being done two years after the other one-time sections in the South Atlantic, and urges that the plans be changed to minimize this time delay.

15 The Committee endorsed the recommendations of the Second Session of the Intergovernmental WOCE Panel be adopted by the Executive Council.

16 The Committed adopted Recommendation OPC-IV.1.

3.1.2 WMO-IOC Intergovernmental TOGA Board

17 Mr. R. Godin, Secretary of the SCOR-IOC CCCO, presented the summary and recommendations of the Fifth Session of the WMO-IOC Intergovernmental TOGA Board, Paris, 14-16 January 1992. It was noted that the presentation was made to the OPC for information, as the TOGA Board is required by its terms of reference to report directly to the IOC Executive Council or Assembly.

(i) **CLIMATE PREDICTION CENTERS**

The Board noted with appreciation the initiative of the USA and welcomed the steps taken to develop further the plans for this core facility, in particular the constitution of a task group to prepare a detailed USA proposal based on multi-national consultation with other interested countries, in accordance with the principles stated in the report of the fourth session of the Board in 1991.

The Board further noted that this initiative could include a distributed network of regional or national application centers for the interpretation, validation and utilization of the information available from the core facility, to the benefit of all countries involved.

The Board encouraged Members to join efforts to define and implement such initiatives, for which purpose the International TOGA Project Office (ITPO), Geneva would serve as the initial point of contact and would keep members of the Board informed of progress.

The Board recognized that the successful exploitation of scientific capabilities for seasonal and interannual climate predictions critically requires the maintenance and, in some instances, the further development of essential TOGA observing systems. The Board urged Members to make provisions for continuing support of these systems, which will constitute a major component of the Global Climate Observing System (GCOS) and the climate module of the Global Ocean Observing System (GOOS).

(ii) **VANDALISM**

The delegate from Australia reported the recent theft of a mooring from a location in the tropical western Pacific. The Director of the TOGA Coupled Ocean Atmosphere Response Experiment (COARE) Project Office expressed his grave concern about incidents which illustrate the vulnerability to vandalism of moorings in the COARE area that will be crucial to the success of COARE. The member for the USA reported the loss of data transmissions from three moorings in the tropical Pacific, at least two of which are believed to have been vandalized.

The Board noted with concern that the incidence of vandalism to moored and drifting buoys is increasing, reflecting the rise in the number of buoys being deployed, and agreed that this will pose a serious long-term threat to oceanographic and climate research. The Board recommended that the Secretary of IOC, in consultation with the Secretary-General of WMO, should initiate actions, by what ever means are considered appropriate, to attempt to reduce the incidence of vandalism to moored and drifting buoys and other unattended platforms for oceanographic and meteorological instruments. In the short term, the Board identified the need for urgent action to make fishing communities aware of the importance of these buoys to a wide range of applications, including maritime operations. For longer term consideration, the Board requested that the matter be brought to the attention of the Executive Councils of IOC and WMO, and urged these

bodies to take firm action to expedite international negotiations to provide legal protection against vandalism of automatic scientific equipment in international waters, in the framework of the Draft Convention on Ocean Data Acquisition Systems, Aids and Devices (ODAS).

(iii) **ELECTION OF CHAIRMAN**

Dr A.D. Moura of Brazil was unanimously approved to continue as Chairman until the end of the Board's Sixth Session.

(iv) **SIXTH SESSION OF THE BOARD**

The Board considered that the frequency of its meetings could now start to be reduced and proposed that its next meeting should be delayed until the Summer or Autumn of 1993.

18 The Committee noted that the Secretary IOC had written letters to three western Pacific regional bodies with fishing industry association to inform them of the importance of moorings to climate change research and marine applications as well as the lost Australian mooring.

19 **The Committee noted** the summary and recommendations of the TOGA Board would be presented to the IOC and WMO Governing bodies for approval.

3.1.3 SCOR-IOC Committee on Climate Changes and the Ocean (CCCO)

20 Dr. James O'Brien, Chairman CCCO, presented a short report to the Committee on activities of CCCO in 1991-1992. It is widely recognized that CCCO has been the catalyst that has lead to the development of WOCE and the very strong oceanographic component of TOGA. SCOR-IOC leaders have decided that the group of independent experts called CCCO shall be the science and technical advisory body for all aspects of GOOS. This role will be broader than the physical aspects of climate. If they could forecast the SST, they could forecast short terms climate more accurately. The new Committee will expand its concern to all aspects of interannual, interdecadal and long term oceanic variability including physical, chemical and biological on the open ocean, deep ocean and coastal regimes. The important ongoing activities are:

(i) Interdecadal Variability; (ii) OOSDP with JSC; (iii) CO_2 with JGOFS; (iv) Physical and Modelling Aspects of GLOBEC; (v) Coastal Aspect of GOOS; (vi) Regional Ocean Climate Panels

(a) Pacific Ocean
(b) Indian Ocean
(c) Atlantic Ocean (to be reorganized)

21 He further noted that in accordance with the decisions of the Eleventh World Meteorological Congress and the Sixteenth Session of the IOC Assembly on the Joint sponsorship of the World Climate Research Programme, the Joint WMO-IOC-ICSU Scientific Committee for WCRP will take full responsibility for oceanographic activities of WCRP, with a focus on physical aspects of the climate.

22 In this connexion the CCCO, with possible expending functions for other aspects of climate, including marine chemistry, biology and coastal zone processes, could serve as an advisory body for GOOS planning and development.

23 **The Committee noted** with satisfaction the report on the CCCO activities as well as actions taken by the Secretary IOC and negotiations pursued concerning IOC co-sponsorship of the WCRP.

3.2 INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME (IGBP)

3.2.1 Land-Ocean Interaction in the Coastal Zone (LOICZ)

24 Dr. P. Holligan, Chairman of the LOICZ Planning Committee, informed the Committee on the planning of the IGBP Project on Land-Ocean Interaction in the Coastal Zone (LOICZ).

25 The goals of the project have yet to be defined in detail but will deal with the following general issues:

(i) Quantification of the exchange of materials between land and ocean (including riverine, groundwater and atmospheric fluxes), and the nature and rate of transformation of such materials within the coastal zone.

(ii) Characterization of the structure and function of coastal ecosystems, particularly in relation to biogeochemical and biogeomorphological feedback effects on coastal environments.

(iii) Development and validation of simulation models of coastal ecosystems as a basis for predicting the impacts of future environment changes.

(iv) Development of the scientific basis for economic and social policies on coastal zone management and the sustainable utilization of coastal resources.

26 The activities under the project, yet to be further defined, at this stage include process studies; prediction modelling: studies of the impacts of climate and sea level variability and of human activities on coastal processes and system and socio-economic studies.

27 The Scientific Plan for LOICZ is now being prepared by an appointed planning committee, and will be presented during 1992 to the IGBP Scientific Committee as the basis for deciding whether or not LOICZ should become an established core project.

28 Dr. Holligan noted that the next stage would then be further consultation with the scientific research community and with other agencies such as IOC that have comparable interests in coastal zone dynamics and prediction in order to prepare an implementation plan. An offer to establish the project office in the Netherlands is under consideration.

29 The LOICZ project will require development of global observation systems for coastal environments (e.g. GOOS) and of new technologies and sampling strategies to underpin the intensive process studies. New types of models will be needed.

30 Dr. Holligan emphasized the importance for partnership between national and international (e.g. those of the IOC) research initiatives and between developed and less-developed countries to deal adequately with the complexity of science and with events and processes that transcend behavioral boundaries.

31 The Representative of UNEP emphasized the importance of co-ordination of LOICZ activities with the pilot activities initiated by IOC, UNEP and WMO under the Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change.

32 **The Committee noted** that linkages between LOICZ and IOC coastal activities such as the pilot projects for monitoring of coastal phenomena related to climate change, and the harmful algal bloom studies would be beneficial and requested the Secretary to negotiate with the IGBP relevant bodies on future collaboration with LOICZ.

3.2.2 Joint Global Ocean Flux Study (JGOFS)

33 The Executive Director of SCOR, Ms. E. Gross, presented information on the current status of plans for various elements of the Joint Global Ocean Flux Study, in particular on three of the JGOFS process studies: the North Atlantic Bloom Experiment (completed) which investigated the phenomena associated with the onset, evolution and decay of a phytoplankton bloom; the Equatorial Pacific Ocean process study (under way) which is concerned with the oceanic carbon cycle in an area dominated by the strong interannual variability associated with the ENSO cycle; the Arabian Sea process study (to begin in early 1992) which will focus on the intense phytoplankton bloom which follows the upwelling of nutrient-rich water at the time of the southwest monsoon. The Arabian Sea is an area where the seasonal variability is much greater than the interannual variability.

34 The IOC is represented in the JGOFS Scientific Steering Committee by the Chairman of GIPME, who has been instrumental in arranging IOC contributions to JGOFS, especially training courses in the methods for the JGOFS Core Measurements to be held for scientists in the Indian Ocean region. These courses will take place in Mombasa (Kenya) and Oman with support from the IOC, the Netherlands and

the Federal Republic of Germany. The IOC is also assisting JGOFS by publishing and distributing the Protocols for the JGOFS Core Measurements. Ms. Gross also briefly reviewed other elements of JGOFS such as the efforts to establish time series stations, the design of a global survey, the development of models of the oceanic biogeochemical cycle which can be incorporated into physical models, and the data management activities necessary for a large-scale program such as JGOFS.

35 The **Committee noted** with satisfaction the report on JGOFS and the IOC collaboration with SCOR on this programme.

3.3 OTHER RESEARCH PROGRAMMES

36 Under this item the participants reported on ongoing and planned national activities and programmes relevant to GOOS. Presentations were given by the representatives of the following Member States: Canada, Chile, China, France, Germany, India, Japan, Malta, Mexico, Netherlands, Norway, Republic of Korea, Russian Federation, United Kingdom, USA and Venezuela.

37 The **Committee noted** these activities with a great deal of interest and viewed them as a significant underpinning for the development of GOOS.

38 These presentations are included in the Annex IV of the report.

4. DEVELOPMENT OF THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

4.1 EXISTING OCEAN OBSERVING COMPONENTS (IGOSS, GLOSS, DBCP, MARPOLMON-GIPME), WWW AND SATELLITES

39 Mr. J. Withrow informed the Committee of the status of existing components of the Global Ocean Observing System through the presentation of the 1991 Status Report of the Global Ocean Observing System (Doc. IOC/OPC-V/Inf.1). The **Committee noted** the progress that had been made to date in the existing systems and felt that it provided a good foundation upon which to build future activities. The **Committee reviewed** the status of the remote sensing elements of the Global Ocean Observing System and observed that it was necessary to begin to take near term action now to plan for instruments and spacecraft required in the year 2000 and beyond. The **Committee requested** that the Secretariat continue to actively inform relevant remote sensing organizations of the satellite requirements of the ocean community. In this regard, the **Committee noted** with approval the activity of the IOC as an affiliate of the Committee on Earth Observations Satellites, and urged the Secretariat to continue to promote ocean remote sensing at the CEOS meetings.

4.2 PLANNED OCEAN OBSERVING COMPONENTS - COASTAL

4.2.1 Pilot projects of the System of Long-Term Monitoring of Coastal and Near-Shore Phenomena Related to Climate Change

40 Ms. M. Cole reported on this matter. She noted that the Assembly, at its Sixteenth Session, approved the implementation of six pilot activities for a three year test period: (i) sea level changes and coastal flooding, (ii) coastal circulation, (iii) assessment of organic carbon accumulation in surface coastal sediments, (iv) changes in plankton community structure, (v) benthic communities: coral reef ecosystems and (vi) terrestrial vegetation: mangrove communities. Subsequently UNEP and WMO agreed to co-sponsor these projects. The decision was made to proceed first with the coral reef and mangrove pilot projects. An experts meeting was held in Monaco in December 1991, co-sponsored by the International Union for the Conservation of Nature (IUCN) in addition to IOC, UNEP and WMO (Document UNEP-IOC-WMO-IUCN/GCNSMS-II-3). Action plans were prepared which include proposed biological and physical parameters to be measured and representative sites. The ASEAN-Australia Living Coastal Resources Project manual of methodologies is being made available for publication by IOC for implementing the pilot phase. The **Committee noted** that funds are not presently on hand to implement both projects.

41 IOC has also been asked to jointly sponsor, with UNEP and the Association of Southeast Pacific Environmental Institutions, a global task team on coral reefs.

42 The **Committee indicated** that there should not be a duplication of effort between the pilot activities and present IOC programmes, but some attention

needs to be given to coordinating present coastal marine science efforts and clarifying the approach with regard to the study of climate change impacts in coastal areas, otherwise, there will not be adequate funding for all these projects. There is presently a gap in knowledge about climate change impacts on the coasts and a lack of global data and databases. Clearly there are linkages between the pilot activities and other IOC work which should be fostered as well as with the proposed IGBP study of Land-Ocean Interaction in the Coastal Zone described above.

43 **The Committed adopted Recommendation OPC-V.2.**

4.2.2 Programme on Coastal Ocean Circulation Dynamics and Fluxes

44 Mr. Yihang Jiang introduced two issues in relation to this topic:

45 A. With regard to the programme of Coastal Ocean Advance Science and Technology Study (COASTS), an Expert Consultation was organized in Liege, Belgium, 11-13 May 1991 to review the comments and suggestions received from different regions (IOC Workshop Report No. 73). The programme has been modified accordingly as follows:

(i) **SCIENTIFIC COVERAGE OF THE PROGRAMME**

Considering the complexity of processes in coastal and shelf seas, and also considering the need to maximize efficiency, the programme should be multidisciplinary and should address global problems such as global sea-level change and the global carbon cycle.

(ii) **GEOGRAPHIC SCOPE OF THE PROGRAMME**

It was proposed that estuarine areas, especially the related estuarine processes of water exchange and interaction with the shore-line, be included in the programme.

(iii) **NAME OF THE PROGRAMME**

Since the nature of programme has been modified, the title of the programme was suggested to be modified accordingly as: **Coastal Ocean Advanced Science and Technology Study (COASTS).**

46 The Expert Consultation also reviewed the progress of preparing a Workshop and took into consideration the financial constraints for the planned activity. It was agreed that a comprehensive review of coastal oceanography on a global basis is very important for the development of the programme. The widest possible involvement of scientists from various parts of the world dealing with various coastal processes is necessary for assessment of knowledge in global coastal and shelf seas, to assist in design of the programme plan and to judge the implementation. The Expert Consultation agreed to postpone the workshop until fall of 1992 in order to approach donor agencies who are interested in the programme and willing to provide financial support.

47 B. As recommended by Resolution XVI-10 a pilot activity on coastal ocean circulation within the framework of the GOOS module on coastal zone management and development should be pursued. It was proposed that pilot activities on coastal ocean circulation in one or two regions be initiated where relevant studies have been planned or carried out in co-ordination with the COASTS programme. Taking into consideration the ongoing projects in the WESTPAC and IOCINCWIO regions, the proposed areas could be located in these regions.

48 **The Committee recognized** the need to co-ordinate the proposed pilot activities on coastal ocean circulation (within the framework of GOOS) with other above-mentioned activities and **recommended** initiation of its planning, particularly in the WESTPAC and IOCINCWIO regions. **The Committee requested** UNEP to provide necessary support for such actions.

4.3 PLANNED OCEAN OBSERVING COMPONENTS - GLOBAL

4.3.1 Global Climate Observing System (GCOS)

49 **The Committee noted** that the Eleventh World Meteorological Congress, by its Resolution 9 (Cg-XI) decided to establish a Global Climate Observing System (GCOS) in co-operation with ICSU and IOC.

50 The Committee then reviewed actions taken by the Secretary, in accordance with Resolution XVI-8, regarding IOC participation in GCOS. The negotiations took place between the Secretary IOC, the Director WCRP and the Executive Director ICSU which resulted in a WMO-IOC-ICSU Memorandum of Understanding for GCOS (dated 24 October 1991).

51 In accordance with this Memorandum, the WMO, the IOC and the ICSU, as the initial sponsoring organizations agreed to co-operate in organizing a Global Climate Observing System (GCOS) and to establish a Joint Scientific and Technical Committee (JSTC) to provide scientific and technical guidance for the organization and further development of GOOS, and a Joint Planning Office.

52 The Memorandum of Understanding includes the following definition of the concept of the Global Climate Observing System:

(i) The goal of the Global Climate Observing System (GCOS) is to provide comprehensive information on the total climate system, involving multidisciplinary range of physical, chemical and biological properties and atmospheric, oceanic, hydrologic, cryospheric and terrestrial processes.

(ii) The GCOS is intended to meet the needs for:

(a) Climate system monitoring, climate change detection and monitoring of the response to climate change, especially in terrestrial ecosystems and mean sea-level;

(b) Data for application to national economic development;

(c) Research towards improved understanding, modelling and prediction of the climate system.

(iii) The GCOS will build, as far as possible, on existing operational and scientific observing, data management and information distribution systems, and further enhancement of these systems. The GCOS will be based upon:

(a) Improved World Weather Watch systems and the Integrated Global Ocean Services Systems;

(b) Data communication and other infrastructures necessary to support operational climate forecasting;

(c) The establishment of a Global Ocean Observing System for physical, chemical and biological measurements;

(d) The maintenance and enhancement of programmes monitoring other key components of the climate system, such as the distribution of important atmospheric constituents (including the Global Atmosphere Watch), terrestrial eco-systems (including the International Geopshere-Biosphere Programme), as well as clouds and the hydrological cycle, the earth's radiation budget, ice sheets and precipitation over the oceans (including the World Climate Research Programme).

53 The Committee noted that the first meeting of the JSTC is scheduled for 13-15 April 1992 and that financial and staff arrangements need to be solved in relation to the IOC contribution to the activities of the JSTC and Joint Planning Staff and invited the Executive Council to consider this matter.

54 The Committee expressed its appreciation to the Secretary IOC for the actions taken to involve IOC in the development of GCOS in co-operation with WMO and ICSU, and the arrangements for secondment of an oceanographer to the GCOS Planning Office from IOC.

55 The Committee fully supported the concept that the climate-related component of GOOS (climate module of GOOS) provide the oceanographic component of GCOS, the design of which has been already initiated by the CCCO-JSC Ocean Observing System Development Panel (COSDP).

56 The Committee requested the Secretary IOC to elaborate further practical steps jointly with the Secretariats of WMO and ICSU to ensure proper

interaction and co-ordination in the planning and development of climate module of GOOS and close co-ordination between co-sponsoring organizations of the GOOS and GCOS.

4.3.2 Continuous Plankton Recorder Survey (CPR)

57 Dr. R. Dickson presented the proposal on the extended Continuous Plankton Recorder Survey and the document IOC/INF-869 "The Role of the CPR in Global Ecosystem Studies" that includes the scientific justification and the cost of the proposed programme. He also reported on the present status of the CPR, particularly on the setting up in 1991 a new independent body - the Sir Alister Hardy Foundation to run the survey and the support provided by 9 nations and international bodies, including Canada, France, Iceland, the Netherlands, the UK, the USA, the EEC and the IOC, to maintain 15 time-series routes of the North Atlantic. The **Committee noted** that the proposed global plans for the CPR had already received the support of the IOC-SCOR GLOBEC (May 1991), ICC expert meetings on the Development of Coastal Monitoring System (December 1990 and 1991). The **Committee agreed** that the proposed extended CPR survey is a practical feasible and necessary component of GOOS and the GOOS modules for monitoring and assessment of marine living resources, climate monitoring and predicting, and coastal zone management and development, particularly in relation to the pilot project on monitoring of changes in plankton community structure.

58 The **Committee, therefore, recommended** that the IOC Executive Council approve this proposal as an international effort in support of GOOS and decide on the mechanism required for international planning of CPR surveys and their co-ordination with the activities of the IOC Programme on Ocean Science in relation to Living Resources (OSLR).

59 A brief presentation was given on the concept of Large Marine Ecosystems (IOC/OPC-V/Inf.2) a potential holistic approach to ocean monitoring, particularly for coastal and ecosystem monitoring. Much of our present understanding is based on monitoring only limited aspects of ecosystems. The **Committee** was not prepared to thoroughly evaluate the concept for use in GOOS and **suggested** that the issue be reviewed by the proposed GOOS Technical and Scientific Advisory Panel and other appropriate bodies, including the Group of Experts on OSLR.

4.4 NEW TECHNOLOGY FOR OCEAN OBSERVATIONS

4.4.1 Marine Acoustics

60 This agenda item was introduced by Mr. Jiang referring to the document IOC/INF-870. He informed the Committee that following the instruction of the IOC Assembly, at its Sixteenth Session, discussion and consultations with scientists and with members of the SCOR Working Group on Acoustic Monitoring of the World Ocean were carried out by the IOC Secretariat. The reaction from them are identical: in order to meet the requirements of scientific research and ocean services: (i) an IOC Group of Experts in this field is highly desirable with Terms of Reference formulated so as to take into account those of the SCOR Working Group; and (ii) co-operation and co-ordination between the SCOR Working Group and the IOC Group of Experts should and can be established from the beginning.

61 The Executive Director of SCOR, Ms. E. Gross, informed the Committee that an informal meeting of the SCOR Working Group 96 was held in Vienna, August 1991. A letter from the Chairman of the Working Group was received and stated that since the SCOR Working Group covers only large scale tomography of the ocean, it would be appropriate for an IOC group to consider other areas. She indicated that there will be no duplication of efforts between SCOR Working Group and a proposed IOC Group if appropriate terms of reference could be prepared.

62 The **Committee believed** however that it would be premature to establish the proposed Group of experts on marine acoustics within the framework of GOOS and **requested** the IOC Executive Council to consider Workshops and/or designation of rapporteurs to deal with this matter. This topic could also be taken up by the new GOOS Technical and Scientific Advisory Panel.

4.5 DRAFT PLAN FOR THE DEVELOPMENT OF THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

63 Dr. Tolkachev, presented the Draft GOOS Development Plan (Doc. IOC/EC-XXV/8 Annex 1) prepared by the Secretariat with the assistance of an expert

consultation (Paris, 2-4 December 1991) and with contributions from individual scientists.

64 The Draft Plan provides description of the GOOS Objectives and Basic Concept; GOOS Modules; GOOS Major Elements; Relationship between GOOS and International Research and Operational Programmes; initial assessment of resources required for operational GOOS; required international mechanisms for GOOS planning, development and co-ordination; and identifies actions to be taken both on national and international levels required for successful planning and implementation of GOOS, particularly during the 1992-1995 period.

65 The Draft GOOS Development Plan defines that, the GOOS is intended to meet the needs for: (i) monitoring, assessment and subsequent prediction of environmental and climate changes globally, regionally and nationally; (ii) data and data products required by nations for efficient and rational use of ocean resources, protection of marine environment, and coastal zone management as well as for other practical applications; and (iii) research towards improved understanding, modelling and prediction of the state of ocean system and the role of the ocean in the climate and environmental change.

66 A primary initial objective of the Global Ocean Observing System (GOOS) is to ensure commitment to long-term measurements of the ocean. This includes observations of major physical, chemical and biological properties of the global ocean, the coastal zone and enclosed and semi-enclosed seas. Mechanisms and infrastructure required for operational exchange and dissemination of data, information and products are part of GOOS.

67 GOOS will be established by Member States through concerted and co-ordinated actions, and implemented through nationally-owned and operated facilities and services. Co-ordination will be provided by IOC in co-operation with WMO and UNEP. The data acquired by GOOS must be exchanged fully and freely on a timely basis for the benefit of all. GOOS will require that national and regional oceanographic services be established to enable countries to fully and efficiently apply the data and information resulting from GOOS.

68 For convenience the GOOS structure has been divided into different sets of aims and products to be achieved and produced.

69 This draft plan defines five GOOS modules:

(i) Climate Monitoring, Assessment and Prediction,
(ii) Monitoring and Assessment of Marine Living Resources,
(iii) Coastal Zone Management and Development,
(iv) Assessment and Prediction of the Health of the Ocean,
(v) Marine Meteorological and Oceanographic Services.

70 The GOOS will consist of the following major elements:

(i) Measurement System;
(ii) Data and Information Management;
(iii) Data Analysis, Preparation and Dissemination of Data Products;
(iv) Modelling;
(v) Technical Assistance, Training and Technology Transfer.

71 GOOS will be built as far as possible on existing ocean observing and data management systems (IGOSS, WWW, GLOSS, DBCP, IODE, GIPME-MARPOLMON, etc.) and requires close permanent interaction with ongoing and planned research programmes.

72 In reviewing the draft GOOS Plan the Committee made the following comments to be reflected in the amended draft Plan:

(i) need to define more clearly the limit of the domain covered by GOOS in a short preamble stating what GOOS is not in regard to anterior IOC activities;

(ii) the climate module together with the coastal module is the first priority. The paragraph 50 (Doc. IOC/EC-XXV/8 Annex 1) therefore should be redrafted to state only that the priorities will be reviewed regularly;

(iii) the parts of the Draft Plan referring to the planning, management and implementation of GOOS should be set out more clearly and consistently.

Clear definitions of steps of development for each observed parameter to be included in GOOS should be set out;

(iv) the Draft Plan should emphasize that the climate module of GOOS is identical with the ocean component of GCOS;

(v) the Draft Plan should clearly recognize the importance and relevance to GOOS of the Continuous Plankton Recorder Project;

(vi) LME concept, although of potential interest and relevance to GOOS, need further elaboration to be part of an ocean observing system.

(vii) Design, planning and implementation of GOOS need to be carried out in close collaboration with existing and planned relevant ocean research programmes, so as to ensure the required stimulation of the observing systems, and vice-versa.

73 **The Committee emphasized** the importance of the technical assistance, training and technology transfer programme as a major component of GOOS activities.

74 Some doubts were expressed with regard to the proposal for the establishment of single national GOOS offices in member countries. Many countries have more than one agency involved in GOOS. **The Committee noted** that the participating Member States should take the necessary steps to establish connections with GOOS through whatever means is appropriate for that Member State (for example, the IOC National Oceanographic Commission or equivalent bodies might be used, if such exists in a Member State).

75 **The Committee noted** that the coastal zone management module of GOOS is closely connected with the other modules of GOOS (health of the ocean, living resources, climate) and therefore it will need more clear definition.

76 In discussing GOOS Module on marine meteorological and oceanographic services the Committee recognized that the GOOS could provide additional data and information to the improved operational ocean services required for various national practical application, being presently provided within IGOSS and WMO.

77 **The Committee wished to emphasize** that GOOS is to meet the challenges that IOC Member States face regarding the new global aspects of changes of the marine environment. It should be built on the existing IOC programmes and services that have received long-term and extensive support from Member States. GOOS, therefore, in order to meet its objectives, has to adapt an active and progressive role in directing IOC efforts towards optimizing existing and developing programmes dealing with research operational services, regional activities and TEMA.

78 **The Committee noted** that the future operational GOOS will require stable and regular support and funding from various sources. An increased commitment will be required first from participating Member States. The Committee also believed that the extra-budgetary funds, such the Global Environmental Facility Fund seemed to be particularly suitable for the building up and operation of GOOS.

79 **The Committee recognized** the need to make estimates of costs for a fully operational system and to document the benefits that can be expected from GOOS so that Member States will sufficiently contribute to the international management scheme. The IOC Committee for GOOS and the IOC Executive Council are invited to consider possible sources of funds required for GOOS.

80 **The Committee reviewed** the financial implications for international planning and management of the GOOS. **The Committee recognized** that the resources of GOOS are a continuing requirement and that there is a need for regular updated information on budget requirements for planning and operation of GOOS and this be provided by the IOC Committee for GOOS.

81 **The Committee noted** that present funds and staff allocated for GOOS are far from adequate to provide the necessary support for its planning and development. A high priority for GOOS assigned by the IOC Governing Bodies will necessitate the identification of additional funds and a re-focussing of complementary programmes within the IOC towards GOOS objectives. Subsidiary bodies of the Commission should be invited to plan and implement contributions to GOOS, this applies in particular to TEMA and regional bodies. The IOC, as a joint specialized agency, should, through ICSPRO and any other appropriate mechanisms,

explore the question of additional support for the administration and organization of GOOS.

82 The Committee recommended that thorough analysis of the requirements for GOOS financial and staff support be made and requested the Executive Council to consider this issue and identify possible sources of national and international support that can be provided to ensure GOOS international planning and co-ordination.

83 The Committee agreed that the Draft GOOS Plan identifies basic principles governing the objectives of GOOS and action items to be taken by Member States and international groups and outlines the rational and next steps for the implementation of GOOS.

84 The Committee also agreed, in principle, with the actions, proposed in the Draft Plan, to be taken by Member States and international organizations for the 1992-1995 period.

85 The Committee, however, believed that the Draft Plan would need further careful and extensive review by Member States and therefore recommended that the Draft GOOS Plan with the amendments proposed during this meeting as well as during the Executive Council meeting be circulated to IOC Member States and interested international organization for review and comments by 1 October 1992. The Committee recommended that those comments with the Plan be presented to the First Session of the IOC Committee for GOOS.

86 The Committee adopted Recommendation OPC-V.3.

4.6 INTERNATIONAL MECHANISM FOR GOOS DESIGN, PLANNING, CO-ORDINATION AND THE ROLE OF THE COMMITTEE ON OCEAN PROCESSES AND CLIMATE

87 The Committee addressed the structures needed for GOOS planning and operation from three aspects: (i) intergovernmental, (ii) scientific and technical and (iii) national. An intergovernmental group for GOOS is necessary to coordinate the promotion of GOOS and the identification of the necessary resources. The Committee recommended that the present Committee on OPC be transformed into the IOC Committee for GOOS and proposed terms of reference and list of initial tasks to be performed. As with the OPC, the proposed Committee would consist of representatives of all Member States. It is expected, however, that representatives to meetings of this group will be those who are in a position to make national commitments to GOOS. The Committee is to maintain a close interaction with ongoing research activities and with existing IOC service functions. Recognizing that the climate module of GOOS is the ocean component of the GCOS, it is also important to establish close liaison with the GCOS efforts.

88 Secondly, the Committee recommended that a GOOS Scientific and Technical Advisory Panel be established and prepared the proposed terms of reference and a set of initial tasks. It requested that the Commission pursue negotiations with ICSU, SCOR and other scientific and technical bodies, as appropriate, to facilitate the establishment of the Panel. The Committee agreed that the Panel should consist of about 12 members and that, when selecting members and members of future subsidiary groups, consideration should be given to highly qualified individuals from various geographic regions. Existing groups should be used to the maximum extent possible.

89 Finally, the Committee urged each Member State to designate appropriate bodies such as the IOC National Oceanographic Commission or equivalent bodies liaising with IOC a focal point for promoting the GOOS in the country to facilitate communications with international GOOS activities. The GOOS national focal point will be requested to interact with national contacts of other relevant IOC programmes such as IGOSS, GLOSS, DBCP, IODE, MARPOLMON, etc.

90 The Committee requested that the Chairman and the Vice-Chairman of the IOC Committee on OPC assist in organizing the First Session of the IOC Committee for GOOS and GOOS Scientific and Technical Advisory Panel upon approval by the IOC Executive Council.

91 The Committee recommended that the present bodies reporting to OPC, namely the Group of Experts on GLOSS will, in future, report directly to the IOC Committee for GOOS as the successor of the IOC/OPC.

92 The Committee adopted Recommendation OPC-V.4.

5. PARTICIPATION IN THE 1992 UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED), THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), AND THE PREPARATION OF A FRAMEWORK CONVENTION ON CLIMATE CHANGE

93 The Committee was informed by the Secretary IOC about preparations and relevant actions of the Secretariat with regard to the UNCED, the IPCC and the Intergovernmental Negotiating Committee on a Framework Convention for Climate Change. The IOC has put considerable efforts into informing these activities about the role of the oceans in climate and global change, especially in the context of environment and development. In particular, the need to provide for adequate global ocean observations, through the GOOS, has been emphasized and the related proposals have been presented to the Committees. The Committee requested the Secretariat to continue its excellent work in these activities and requested that Member States renew their efforts to keep their delegations to these activities informed of the need to firmly support a substantial ocean agenda.

6. ADOPTION OF THE REPORT

94 The Committee reviewed and adopted the Executive Summary of the Report and the attached Recommendations for submission to the Twenty-fifth Session of the IOC Executive Council.

7. CLOSURE

95 The Session was closed at 13.00 hours on 7 March 1992.

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. **RESEARCH PROGRAMMES RELATED TO GLOBAL CLIMATE AND ENVIRONMENTAL CHANGE**

3.1 WORLD CLIMATE RESEARCH PROGRAMME (WCRP)

3.2 INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME (IGBP)

3.3 OTHER RESEARCH PROGRAMMES

4. **DEVELOPMENT OF THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)**

4.1 EXISTING OCEAN OBSERVING COMPONENTS (IGOSS, GLOSS, DBCP, MARPOLMON-GIPME), WWW AND SATELLITES

4.2 PLANNED OCEAN OBSERVING COMPONENTS - COASTAL

- 4.2.1 Pilot projects of the System of Long-Term Monitoring of Coastal and Near-Shore Phenomena Related to Climate Change
- 4.2.2 Programme on Coastal Ocean Circulation Dynamics and Fluxes

4.3 PLANNED OCEAN OBSERVING COMPONENTS - GLOBAL

- 4.3.1 Global Climate Observing System (GCOS)
- 4.3.2 Continuous Plankton Recorder Survey (CPR)

4.4 NEW TECHNOLOGY FOR OCEAN OBSERVATIONS

- 4.4.1 Satellites
- 4.4.2 Marine Acoustics

4.5 DRAFT PLAN FOR THE DEVELOPMENT OF THE GLOBAL OCEAN OBSERVING SYSTEM (GOOS)

4.6 INTERNATIONAL MECHANISM FOR GOOS DESIGN, PLANNING, CO-ORDINATION AND THE ROLE OF THE COMMITTEE ON OCEAN PROCESSES AND CLIMATE

5. **PARTICIPATION IN THE 1992 UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED)**

6. **INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)**

7. **PREPARATION OF A FRAMEWORK CONVENTION ON CLIMATE CHANGE**

8. **ADOPTION OF THE REPORT**

9. **CLOSURE**

ANNEX II

RECOMMENDATIONS

Recommendation OPC-V.1

SUPPORT FOR THE WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

The IOC Committee on Ocean Processes and Climate,

Noting the Report of the Second Session of the IOC-WMO Intergovernmental WOCE Panel (IOC-WMO/IWP-II/3),

Taking into account the findings and recommendations of the above Panel, which met 3-4 March 1992,

Recommends that the SCOR-IOC CCCO and JSC for WCRP, assisted by the SSG, WOCE-IPO and their sponsoring organizations, plan a conference which demonstrates and reviews the results of WOCE to date, with a focus on its contribution to achieving the objectives of the WCRP. In addition, the conference should address how the WOCE results are impacting the design of other research programmes and the early phases of the Global Ocean Observing System. The conference should focus on global issues, possibly using modelling as a context, and should be held in late 1993 or early 1994 in order to assist in attracting the necessary resources to complete WOCE;

Recommends that the Chairman of the Intergovernmental WOCE Panel, in collaboration with the WOCE-IPO, establish a network of informal contacts among the resource managers in each country, in order to provide a rapid exchange of information and to facilitate solutions to unforeseen contingencies that arise during WOCE;

Urges the WOCE Hydrographic Programme (WHP) Office to facilitate technical visits between institutions in order to transfer the engineering expertise involved in conducting CTD operations, in particular the proper use and maintenance of winches, cables and blocks;

Reiterates the importance of completing the one-time WHP sections in each ocean basin as synoptically as possible, notes that the most recent plans have A17, A14 and A13 being done two years after the other one-time sections in the South Atlantic, and urges that the plans be changed to minimize this time delay.

Recommendation OPC-V.2

GLOBAL MONITORING SYSTEM OF COASTAL AND NEAR-SHORE PHENOMENA RELATED TO CLIMATE CHANGE

The IOC Committee on Ocean Processes and Climate,

Noting Resolution XVI-10 by which the IOC Assembly adopted the goals and objectives of the System as a contribution to GOOS and GCOS, and recommended the implementation of its pilot phase through relevant regional programmes and activities of IOC, UNEP and WMO,

Also noting that the Eleventh World Meteorological Congress and the Sixteenth Session of the UNEP Governing Council reiterated their importance of working with IOC in the development and implementation of a Global Ocean Observing System,

Having considered the report of the UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change, Pilot Projects on Coral Reefs and Mangroves (Monaco, 9-13 December 1991),

Recommends that the IOC Executive Council:

(i) receive with appreciation the report of the UNEP-IOC-WMO-IUCN Meeting of Experts on the implementation of the pilot activities relating to Coral Reefs and Mangroves;

(ii) welcome the intention of the IUCN to co-sponsor these activities;

(iii) suggest that if the required resources are not available to proceed with all the coastal observation and modeling efforts simultaneously, that phased implementation of a series of pilot activities be pursued based on the high priority needs of the Member States;

(iv) instruct the Secretary to continue the IOC's co-operative efforts with other agencies, in particular UNEP and WMO, to develop the coastal aspects of an ocean observing system;

(v) invite the Chairman of the Group of Experts on the Global Sea-Level Observing System (GLOSS) to initiate the preparation of the Action Plan for the Sea Level Changes and Coastal Flooding Pilot Project particularly in the Indian Ocean regions and submit a Draft Plan to the 1993 meeting of the IOC Committee for GOOS;

(vi) invite the UNEP Governing Council and the WMO Executive Committee to continue their support of developing pilot activities for long-term monitoring in the coastal ocean;

(vii) approve the co-sponsorship of the Global Task Team on Coral Reefs to be sponsored jointly with UNEP and the Association of South Pacific Environmental Institutions (ASPEI).

Recommendation OPC-V.3

**GLOBAL OCEAN OBSERVING SYSTEM (GOOS)
DEVELOPMENT PLAN**

The IOC Committee on Ocean Processes and Climate,

Noting Resolutions XV-4 and XVI-8 by which the IOC decided to undertake development of a Global Ocean Observing System (GOOS),

Also noting Resolution 9 of the Eleventh WMO Congress on the establishment of a Global Climate Observing System in co-operation with IOC and ICSU, and Resolution 21 (Cg-XI) on WMO's involvement in the development of a Global Ocean Observing System and the relevant UNEP decisions adopted by the Governing Council at its Sixteenth Session,

Having reviewed the GOOS Draft Development Plan (Doc. IOC/EC-XXV/8 Annex 1),

Adopts the revisions to the first draft plan as proposed during the Session;

Invites Member States to comment on the draft plan as amended by 1 October 1992;

Invites also international organizations concerned and relevant international bodies to review the draft plan as amended;

Requests the Secretary IOC to provide the plan as amended and comments to the First Session of the IOC Committee for GOOS.

Recommendation OPC-V.4

INTERNATIONAL MECHANISMS FOR GOOS DEVELOPMENT

The IOC Committee on Ocean Processes and Climate,

Recommends that the Twenty-Fifth Session of the Executive Council adopt the following resolution:

Draft Resolution

Considering the requirements to plan and develop a Global Ocean Observing System and coordinate this planning with other relevant bodies,

Recognizing the need to have commitments from Member States because implementation of a comprehensive, long-term Global Ocean Observing System can only be achieved through national services and facilities,

Recognizing further the establishment of the Intergovernmental TOGA Board and the Intergovernmental WOCE Panel and recognizing that they serve a function formerly assigned to the Committee on Ocean Processes and Climate,

Recognizing further that the ocean component of the Global Climate Observing System constitutes the climate component of GOOS,

Decides that the Committee on Ocean Processes and Climate be transformed into the IOC Committee for GOOS to serve as the intergovernmental forum for promoting the Global Ocean Observing System;

Further decides that the new Committee will have the following terms of reference:

The IOC Committee for GOOS will :

(i) **be responsible for promotion, co-ordination, implementation and operation of the Global Ocean Observing System (GOOS);**

(ii) **identify the resources needed for operating GOOS and the means for obtaining them;**

(iii) **develop and update plans for the implementation of GOOS;**

(iv) **base such plans on the advice of the GOOS Scientific and Technical Advisory Panel and other scientific and technical groups as appropriate;**

(v) **maintain on-going interaction with appropriate research projects as input to the design of GOOS and to help GOOS respond to research needs;**

(vi) **be responsible for the representation of GOOS at meetings of other bodies;**

Further decides to assign initial tasks to the Committee as listed in Annex I;

Invites Member States to designate representatives to the Committee and encourages Member States to include in their delegations those who are responsible for national contributions to GOOS;

Further invites interested international organizations to participate;

Decides also to establish a GOOS Scientific and Technical Advisory Panel to advise the Intergovernmental Committee for GOOS on all scientific and technical aspects of GOOS and to undertake negotiations with ICSU and its SCOR and other appropriate scientific and technical bodies to facilitate its establishment;

Further decides that the Panel will have the following terms of reference:

The GOOS Scientific and Technical Advisory Panel will:

(i) advise the IOC Committee for GOOS on all scientific and technical aspects of GOOS, including on the plans for various aspects of GOOS;

(ii) collaborate with the Joint Scientific and Technical Committee for GCOS and other appropriate bodies.

Further decides that membership will consist of about twelve experts taking into account the global aspects of task;

Decides also to assign initial tasks to the Panel as listed in Annex II;

Further decides that the Intergovernmental WOCE Panel should henceforth report directly to the IOC Assembly and Executive Council.

Annex 1 to the Draft Resolution

IOC Committee for GOOS
Initial Tasks

(i) Assess user requirements;

(ii) Prepare the first operational plan for GOOS, based primarily on the advice of the GOOS Scientific and Technical Advisory Panel, taking into account advice of other relevant bodies;

(iii) Develop a strategy for introducing new observing technology into GOOS;

(iv) Develop a plan for providing training and technical assistance;

(v) Recognizing that the climate module of GOOS is the ocean component of GCOS, develop effective liaison with the relevant GCOS bodies;

(vi) Develop effective linkages with relevant bodies of other UN organizations such as WMO, UNEP, and FAO, and with other intergovernmental bodies such as ICES and non-governmental bodies, notably ICSU and its SCOR;

(vii) Develop effective linkages with existing systems such as IGOSS, IODE, DBCP, and GLOSS;

(viii) Develop a strategy for relating GOOS to the observing needs of research projects sponsored by the IOC.

Annex 2 to the Draft Resolution

GOOS Scientific and Technical Advisory Panel
Initial Tasks

(i) Prepare a clear statement of deliverables expected from GOOS at each stage of its development;

(ii) Develop a specification for GOOS to meet these deliverables;

(iii) Develop the scientific basis for that specification;

(iv) Develop a plan for technical aspects of GOOS including the introduction of new technology;

(v) Develop a review mechanism for assessing the extent to which GOOS achieves its design objectives;

(vi) Consider the establishment of a scientific and technical subgroup to define the rationale, criteria, scope, and initial elements of the coastal aspects of a Global Ocean Observing System. This subgroup would be similar in purpose to the Ocean Observing System Development Panel which has been charged with developing the conceptual design of the climate aspects of a GOOS. The subgroup should examine the needs for globally consistent coastal ocean observations relative to all aspects of global and regional change including sea level change, global warming, and other anthropogenic effects. This subgroup would report to the GOOS-STAP.

ANNEX III

LIST OF PARTICIPANTS

I. PARTICIPANTS FROM MEMBER STATES

ALGERIA

Mr. Rachid OUAHMED
Conseiller Scientifique à la
Délégation Permanente de
l'Algérie auprès de l'UNESCO
Maison de l'UNESCO
1 rue Miollis
75015 Paris
France
Tel: (1) 45 68 29 60

CANADA

Mr. Geoffrey L. HOLLAND
Director-General
Physical and Chemical Sciences
Directorate
Department of Fisheries and Oceans
200 Kent Street, 12th Floor,
Bureau 1208
Ottawa, Ontario K1A OE6
Tel: (1) 613 990 0298
Fax: (1) 613 990 5510
Tlm: OCEANSCIENCE.OTTAWA

Dr. Richard Allyn CLARKE
Head, Ocean Circulation Division
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, N.S.
Tel: (1) 902 426 25 02
Fax: (1) 902 426 78 27

CHILE

Captain Carlos BIDART
Presidente del
Comite Oceanografico Nacional
Errazuriz 232, Playa Ancha
Valparaiso
Tel: (56) (32) 282 704
Fax: (56) (32) 283 537

Mr. Bernardo UCCELLETTI
Secratorio Ejecutivo del
Comite Oceanografico Nacional
Errazuriz 232, Playa Ancha
Valparaiso
Tel: (56) (32) 282 697
Fax: (56) (32) 283 537

CHINA

Dr. SU Jilan
Second Institute of Oceanography
P.O. Box 1207
Hangzhou, Zhejiang
Tel: (571) 87 69 24
Fax: (571) 87 15 39

Mr. LI Haiqing
Deputy Chief, Division of International
Organizations
State Oceanic Administration
1 Fuxingmenwai Avenue
Beijing
Tel: 86 72 83
Fax: 80 33 515

COSTA RICA

Dr. Leda-Maria MELENDEZ-HOWELL
Attachée à la Délégation Permanente de
Costa Rica auprès de l'UNESCO
65 Bvld. Hippolyte Marquès
Bât. 7, No. 25
94200 Ivry/Seine
France
Tel: (1) 40 12 50 83

ESTONIA

Prof. Ain AITSAM
Institute of Thermo- and Electrophysics
Academy of Sciences
Paldiski Str. 1
EE0001 Tallinn
Tel: 45 35 90
Fax: 45 24 35

FRANCE

Mr. Jacques MERLE
Directeur de recherche
Laboratoire d'Océanographie Dynamique
et de Climatologie (LODYC)
Université Pierre et Marie Curie
Tour 14 - 4, place Jussieu
75252 Paris Cedex 05
Tel: (1) 44 27 34 81
Fax: (1) 44 27 38 05

GERMANY

Prof. Dieter **KOHNKE**
Director, Bundesanstalt für
Seeschiffahrt und Hydrographie
P.O.B. 30 12 20
D (W) - 2000 Hamburg 36
Tel: (49 40) 31 90 34 00
Fax: (49 40) 31 90 51 50

Dr. Klaus Peter **KOLTERMANN**
Bundesamt für Seeschiffahrt
und Hydrographie
P.O.B. 30 12 20
D (W) - 2000 Hamburg 36
Germany
Tel: (49 40) 31 90 32 50
Fax: (49 40) 31 90 50 00

GREECE

Mr. Miltiadis **HISKAKIS**
Conseiller d'Ambassade
Ministère des Affaires Etrangères
Athens
Tel: 363 10 39

Mr. Alexander **THEOCHARIS**
National Centre for Marine Research
Aghios Kosmas
Hellinikon GR 16604
Tel: (1) 981 57 03
Fax: (1) 983 30 95

GUINEA

Mr. Fodé **CISSE**
Conseiller chargé de l'UNESCO
Délégation Permanente de la Guinée
auprès de l'UNESCO
51 rue de la Faisanderie
75016 Paris
France
Tel: (1) 47 04 81 48

INDIA

Dr. K.S. **YAJNIK**
C-MMACS
CSIR Centre for Mathematical
Modelling & Computer Simulation
National Aeronautical Laboratory
(Belor Campus)
Bangalore 560017
Tel: (812) 57 46 67
Fax: (812) 56 03 92

ITALY

Dr. Michele **COLACINO**
Directeur de l'Institut de Physique
de l'Atmosphère du Conseil
National Italien pour la Recherche
(C.N.R.)
Istituto di Fisica dell' Atmosfera
P.le Luigi Sturzo, 31
00144 Roma
Tel: (39 6) 59 10 941
Tlx: 614344 ATMOS I

JAPAN

Prof. Nobuo **SUGINOHARA**
Centre for CLimate System Research
University of Tokyo
4-6-1 Komaba, Meguro-ku, Tokyo 153
Tel: (81 3) 54 53 39 56
Fax: (81 3) 54 53 39 64

Dr. Yoshiharu **NAGAYA**
Senior Staff, Ocean Development Div.
Science & Technology Agency
2-2-1 Kasumigaseki, Chiyoda-ku
Tokyo
Tel: (81 3) 35 80 65 61

Mr. Harumi **WATANABE**
Unit Chief, International Science Div.
Ministry of Education, Science and Culture
3-2-2 Kasumigaseki, Chiyoda-ku
Tokyo 100
Tel: (81 3) 35 81 27 54
Fax: (81 3) 35 81 73 54

Mr. Makoto **FUJIWARA**
First Secretary
Permanent Delegation of Japan
to UNESCO
UNESCO House
1 rue Miollis
75015 Paris
France
Tel: (1) 45 68 35 41

Mr. Kihei **MAEKAWA**
First Secretary
Permanent Delegation of Japan
to UNESCO
(Same Address and Tel. as above)

Mr. Kenji **SEYAMA**
Director, JAMSTEC
2-15 Natsushima, Yokosuka-City
Kanagawa Prefecture
Tel: (81 468) 66 38 11
Fax: (81 468) 66 30 61

MALTA

Mr. Aldo F. **DRAGO**
Co-ordinator, Marine Sciences Network
Malta Council for Science & Technology
112 West Street
Valletta
Tel: (356) 24 11 76
Fax: (356) 24 11 17

MEXICO

Dr. Mario **MARTINEZ GARCIA**
Director General del Centro de
Investigaction Cientifica y de
Edecucion Superior de Ensenada
(CICESE)
Espinoza 843 OTE, Col. Obrera
Ensenada, Baja California
Tel: (667) 449 00
Fax: (667) 448 80

Dr. Rubén **LARA LARA** **(Rapporteur)**
Director de la Division de
Oceanologia (CICESE)
Av. Espinoza 843
Ensenada, Baja California
Tel: (667) 442 00
Fax: (667) 451 54

M. en C. Trinidad Antonio **GONZALES MORALES**
Unidad de Educacion en Ciencia y
Tecnologia del Mar
Secretaria de Educacion Publica
Dr. Jimenez No. 47 Esquina con
Dr. Liceaga, Col. de los Doctores
Mexico D.F.
Tel: 5 78 57 21

Dr. Augusto **SOLIS ROSALES**
Unidad de Education en Ciencias y
Tecnologia del Mar
Secretaria de Educacion Publica
Dr. Jimenez No. 47 Esquina con
Dr. Liceaga, Col. de los Doctores
Mexico D.F.

NETHERLANDS (THE)

Dr. L. **OTTO**
Netherlands Institute for Sea
Research (NIOZ)
P.O. Box 59
1790 AB Den Burg, Texel
Tel: 31 22 20 694 27
Fax: 31 22 20 196 74

NORWAY

Dr. Svein Erling **HANSEN**
Oceanographer, Programme for Ocean
Monitoring and Forecasting
Ministry of the Environment
Alle Gt. 70
N-5008 Bergen
Tel: (475) 23 66 66
Fax: (475) 23 66 61

PERU

Mlle Ana Rosa **VALDIVIESO**
Tercera Secretaria
Delegacion Permanente del Peru
ante la UNESCO
Maison de l'UNESCO
1 rue Miollis
75015 Paris
France
Tel: (1) 45 68 29 32

PORTUGAL

Prof. Mario **RUIVO** **(Vice-Chairman)**
Chairman, Liaison Committee
with IOC
National UNESCO Commission
Av. Infante Santo 42/5°
1300 Lisbon
Tel: (351 1) 396 40 61
Fax: (351 1) 396 90 64

REPUBLIC OF KOREA

Mr. Moon-Sik **SUK**
Ocean Prediction Laboratory
Korea Ocean Research &
Development Institute (KORDI)
Ansan P.O. Box 29, Seoul 425-600
Tel: (82 2) 863 47 70
Fax: (82 345) 82 66 98

RUSSIAN FEDERATION

Prof. S. **LAPPO**
Director
State Oceanographic Institute
Kropotkynski per. 6
119034 Moscow
Tel: 246 21 55
Fax: 246 72 88

SPAIN

Dr. F. FERNANDEZ DE CASTILLEJO
Project Co-ordinator
Instituto Espanol de Oceanografia
Centro Oceanografico de Malaga
Malaga
Tel: (952) 47 19 07
Fax: (952) 46 38 08

SWITZERLAND

Mr. François NYFFELER
Université de Neuchâtel
Evole 112
CH-2003 NEUCHATEL
Tel: 41 38 30 46 65
Fax: 41 38 30 31 50

SYRIAN ARAB REPUBLIC

Dr. Abd Elkarim SAOUD
Permanent Delegate
Permanent Delegation of the Syrian
Arab Republic to UNESCO
UNESCO House
1 rue Miollis
75015 Paris
France
Tel: (1) 45 68 34 98

UNITED KINGDOM

Dr. John WOODS
Director, Marine Sciences
Natural Environmental Research
Council
Polaris House, North Star Ave.
Swindon, Wiltshire SN2 1EU
Tel: (793) 401 01 Ext. 420
Fax: (793) 41 15 45

Dr. R.T. POLLARD
Head, James Rennell Centre
for Ocean Circulation
Chilworth Research Centre
Chilworth, Southampton SO1 7NS
Tel: (703) 766 184
Fax: (703) 767 507

Dr. Nicholas C. FLEMMING
Institute of Oceanographic Sciences
Deacon Laboratory
Brook Road
Wormley, Godalming, Surrey GU8 5UB
Tel: (42868) 41 41
Fax: (42868) 30 66

Dr. David T. PUGH
(Same Address, Tel, Fax as above)

Dr. R.R. DICKSON
MAFF Fisheries Laboratory
Lowestoft, SUFFOLK NR33 0HT
Tel: (502) 56 22 44
Fax: (502) 51 38 65

UNITED STATES OF AMERICA

Dr. Dana KESTER
Senior Scientist, Office of the
Chief Scientist
National Oceanic and Atmospheric
Administration
Universal Building, Room 625
1825 Connecticut Avenue, NW
Washington, DC 20235
Tel: (1 202) 606 42 43
Fax: (1 202) 387 89 45

Dr. Richard LAMBERT
National Science Foundation
1800 G. Street, N.W.
Washington, DC 20550
Tel: (1 202) 357 96 14
Fax: (1 202) 357 76 21

Mr. William ERB
Director, Divison of Marine
Department of State
Washington, DC 20520
Tel: (1 202) 647 02 39
Fax: (1 202) 647 11 06

Dr. Grant GROSS
National Science Foundation
1800 G. Street, N.W.
Washington, DC 20550
Tel: (1 202) 357 96 39
Fax: (1 202) 357 76 21

Dr. David GOODRICH
Oceanographer, NOAA Office of
Global Programmes
1335 East West Highway
Silver Spring, MD 20910
Tel: (1 301) 427 20 89
Fax: (1 301) 427 20 82

Dr. D. James BAKER (Chairman)
President, Joint Oceanographic
Institutions Inc.
1755 Massachusetts Av., N.W.
Suite 800
Washington, DC 20036
Tel: (1 202) 232 39 00
Fax: (1 202) 232 82 03

VENEZUELA

Mr. Ruben **APARICIO-CASTRO**
Physical Oceanography (Researcher)
Universidad de Oriente
Instituto Oceanografico de Venezuela
Cumana, Estado Sucre
Tel: (93) 65 36 06
Fax: (93) 66 34 12

Capitan de Corbeta Mario **CAPALDO MENA**
Direccion de Hidrografia y Navegacion
Observatorio Naval J.M. Cagigal
La Planicie, Apartado Postal 6745
Caracas
Tel: 483 29 79
Tlx: 41 02 79

II. REPRESENTATIVES OF ORGANIZATIONS

World Meteorological Organization (WMO)

Dr. Peter **DEXTER**
Chief, Ocean Affairs Division
World Weather Watch Department
WMO
Case Postale No. 2300
CH-1211 Geneva 2
Switzerland
Tel: (41 22) 730 81 11
Fax: (41 22) 734 09 54

United Nations Environment Programme (UNEP)

Dr. Makram **GERGES**
Acting Deputy Director
Oceans & Coastal Areas Programme
Activity Centre (OCA/PAC)
UNEP
P.O. Box 30552
Nairobi, Kenya
Tel: (2542) 52 06 00
Fax: (2542) 23 01 27

Commission of the European Communities (CEC)

Dr. J. **BOISSONNAS**
Head of the EC-MAST Programme
Observer, CEC
Directorate General or Science
Research & Development
DG XII/E, 200 Rue de la Loi
B-1049 BRUSSELS
Belgium
Tel: (32 2) 235 67 87
Fax: (32 2) 236 30 24

International Geosphere-Biosphere Programme - Land Ocean Interaction in the Coastal Zone

Dr. P. **HOLLIGAN**
Chairman IGBP-LOICZ
Plymouth Marine Laboratory
West Hoe, Plymouth PL1 3DH
United Kingdom
Tel: (752) 22 27 72
Fax: (752) 67 06 37 (PP)
or Fax: (752) 22 68 65 (CH)

Organization of African Unity (OUA)

Mr. Noël **JOHNSON**
Scientific Research Officer, OUA/STRC
26 Marina, P.M.B. 2359
Lagos - Nigeria
Tel: 63 34 30
Tlx: 22199 TECOAU NG

Scientific Committee on Oceanic Research (SCOR)

Mrs. Elizabeth **GROSS**
Executive Director, SCOR
Department of Earth &
Planetary Science
John Hopkins University
Baltimore, MD 21218
Tel: (1 410) 516 40 70
Fax: (1 410) 516 79 33

WOCE International Project Office (WOCE-IPO)

Dr. N.P. **FOFONOFF**
Director, WOCE-IPO
Institute of Oceanographic Sciences
Deacon Laboratory
Brook Road
Wormley, Godalming, Surrey GU8 5UB
United Kingdom
Tel: (42868) 41 41
Fax: (42868) 30 66

Dr. George T. **NEEDLER**
WOCE Chief Scientist
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2
Tel: (1 902) 426 31 45
Tlm: G.NEEDLER

III. IOC SECRETARIAT

Dr. Gunnar KULLENBERG
Secretary IOC
UNESCO
7 Place Fontenoy
75700 Paris
France
Tel: (331) 45 68 39 83
Fax: (331) 40 56 93 16
Tlm: IOC.SECRETARIAT

Dr. K. VOIGT
Deputy Secretary IOC
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 90

Dr. A. TOLKACHEV
(Technical Secretary for the Meeting)
Senior Assistant Secretary
Ocean Services Unit
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 78

Ms. M. COLE
(Technical Secretary for the Meeting)
Assistant Secretary (GOOS)
Ocean Services Unit
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 60

Mr. J. WITHROW
Senior Assistant Secretary
Ocean Services Unit
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 40 08

Dr. Y. OLIOUNINE
Senior Assistant Secretary
Head, Ocean Services Unit
(Same Address, Fax,Tlm as above)
Tel: (331) 45 68 39 63

Mr. Y. TREGLOS
Senior Assistant Secretary
Ocean Services Unit
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 76

Mr. Y. JIANG
Assistant Secretary
Ocean Sciences Unit
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 94

Dr. T. OSBORN
Senior Assistant Secretary
for Ocean Sciences in relation
to Living Resources
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 87

Ms. F.L. SCHILLER
Secretary for Ocean Services Unit
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 39 77

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

Dr. James O'BRIEN
Chairman CCCO
Professor of Meteorology and
Oceanography
The Florida State University
B174, Love 020
Tallahassee, FL 32306
Tel: (1 904) 644 45 81
Fax: (1 904) 644 85 79

Mr. R. GODIN
Secretary CCCO
IOC Secretariat
UNESCO
7 Place Fontenoy
75700 Paris
France
Tel: (331) 45 68 40 42
Fax: (331) 40 56 93 16
Tlm: CCCO.PARIS

Mr. A. ALEXIOU
CCCO
(Same Address, Fax, Tlm as above)
Tel: (331) 45 68 40 40

ANNEX IV

NATIONAL PROGRAMMES RELEVANT TO GOOS

BRAZIL

In Brazil, the activities related to IGOSS, GLOSS and IODE are co-ordinated by the Directorate of Hydrography and Navigation (DHN) from the Ministry of Navy.

1. IGOSS

1.1 ACCOMPLISHED ACTIVITIES IN 1991

July - Co-ordination Meeting with the national research institutions and navigation enterprises which execute lines that cross the South Atlantic. It has been established that these ships should be used to install the XBT equipments:

(i) the communication system to be employed in the information transmission has been established (telefax or telex via INMARSAT);

(ii) computational programmes have been elaborated to obtain the final message for transmission;

(iii) the data collection system and the generation of information has been tested in ships from the Brazilian Navy.

1.2 PROGRAMMED ACTIVITIES IN 1992

(i) March/April - Inspection of the installation of ships that can be used for observations, pointing the places for equipment installation and giving instructions for the proceedings to data collection and transmission of information.

(b) Final installation of ship's equipments.

2. GLOSS

2.1 ACCOMPLISHED ACTIVITIES IN 1991

(i) July and November - There were two co-ordination meetings with the most important brazilian institutions involved with sea level data collection and analysis.

(ii) The GLOSS working document has been elaborated and sent to the GLOSS Chairman and to IOC.

(iii) The stations of Rio Grande (GLOSS # 193) were occupied with conventional tide gauges and the stations of Fernando de Noronha Island (GLOSS # 198), Penedos de Sao Pedro-Sao Paulo (GLOSS # 199) and Itaparica Island (GLOSS # 196) with pressure tide gauges.

(iv) The station of Ponta da Madeira, Maranhao state, was inspected in order to be included in GLOSS network substituting Itaqui station (GLOSS # 200). A proposal about this will be sent to the next GLOSS Experts Group.

(v) The historical series from Ilha Fiscal has been validated, registered into BNDP and sent to the databases of PSMSL and TOGA.

(vi) Periodical maintenances (02) have been done in Trindade and Itaparica Island stations.

(vii) A specific project has been elaborated and sent to the promoting institution, to acquire tide gauges and data remote transmission platforms. US $ 60,000.00 have been already received for this project.

(viii) The data from Cananeia (GLOSS # 194) have been registered in BNDO.

2.2 PROGRAMMED ACTIVITIES FOR 1992

(i) The following equipments are being acquired: two tide gauges with data transmission station via satellite and four pressure tide gauges to be used in the stations of Sao Pedro-Sao Paulo and Fernando de Noronha Island (remote transmission) and in the other stations with bottom tide gauges.

(ii) The station of Trindade Island will have maintenance at each 4 months. The stations of Fernando de Noronha and Sao Pedro-Sao Paulo will be maintained, with the change of tide gauge at each 6 months, the first in May 92.

(iii) The station of Natal (the only one from the GLOSS brazilian network which is out of order) will be occupied in June 92.

(iv) The negotiations with IOC for a course of "Observation and Analysis of Sea Level Data", supported by that Commission and made to specialists in portuguese and spanish languages, will continue.

3. IODE

3.1 ACCOMPLISHED ACTIVITIES IN 1991

(i) Elaboration of National Oceanographic Programme (PON/91) and sending to IOC.

(ii) Transmission of ROSCOP forms to the Data World Centres, as proclaimed by IOC. Because of the small number of Oceanographic Commissions accomplished during the last intersessional period, the last sending of ROSCOP forms has been done in April 90.

(iii) The SHIP meteorological data exchange is being done systematically with the German Marine Meteorological Service, as proclaimed by WMO. In August 91 the SHIP data referent to the years of 1989 and to the first term of 1990 were delivered.

(iv) Tidal forecasting - the tidal forecastings for 1992 were sent to Argentina, Germany, United States and UK in April 91.

(v) The First Meeting of BNDO took place during 27 and 28 June 91, with the participation of 50 representants of the scientific community, that is the user and the origin of oceanographic data.

(vi) As a result of this First Meeting of BNDO 10 Recommendations were approved, including the creation of a Biological Data System (SISBIO) and the publishing of a periodic Bulletin of BNDO. The SISBIO is being nationally co-ordinated and it would be good if Brazil could have the offer from IOC Member States for the establishment of technical co-operation in this area.

(vii) DHN has ordered to those who are qualified, the elaboration of a logical project for BNDO, in order to rationally plan its evolution, to specify the equipment that will give support to its natural development, in a ten year time, and to create a telecommunication system that will make possible the communication with national and foreign remote users.

(viii) Two people who work in BNDO were sent to the Argentinean Data Centre (CEADO) for training in GF3-PROC, in May 91, invited by that country.

CANADA

Canada stated that country's strong support for the future development of GOOS. Canada has participated extensively in the meetings leading to the initial formulation of GOOS and the present status of the discussions. For the

future GOOS Canada encourages the maximum use of existing mechanisms for the GOOS and in this regard has been concentrating on the retrieval of all Canadian data from federal and academic sources both real-time and non-real-time. A large amount of data presently taken in support of national programmes still fails to find its way into the global system. Improving the efficiency of the present mechanisms must be one of the top priorities in the development of GOOS.

Data management is another area where much needs to be done, and can be done immediately using existing systems.

The Marine Environmental Data Service in Ottawa is heavily involved in data management efforts that will be needed for the global system such as the GTSPP.

Finally Canada also believes that a GOOS

(i) will need to be more operational in character than present systems;

(ii) that scientific advice for all elements will be essential;

(iii) will need to be comprehensive from collection to application;

(iv) will need to address many physical, chemical and biological elements and many scales of the related processes; and

(v) will require a strong operational secretariat.

CHILE

Comments to GOOS

Chile is interested in co-operating with the worldwide programmes related to the ocean and climate investigations. This interest has been manifested with active participation of Chile in WOCE, TOGA, IGOSS and with relevant components of GLOSS and ships-of-opportunity programme.

We are aware of the importance of GOOS and would like to participate actively in an efficient way. We hope that GOOS will provide important benefits to developing countries like Chile.

GOOS will implicate high costs that Chile will not be able to meet, which is why co-operation and productive help is requested of all developing countries.

This help should principally consist of effective exchange of technology, technical consultancy, training, access to modern equipment and processing modern data systems with the use of latest models.

GOOS should not be considered at a disadvantage with respect to other investigation programmes of IOC which are of immediate benefit for developing Member States such as OSLR, ITSU, GIPME and others which have proved to be effective and useful.

ASPECTS THAT GOOS SHOULD CONSIDER:

1. Funding for GOOS should come from different sources than those now utilized by IOC.

2. Effective training and education should be included in GOOS as a priority action.

3. The transfer of technology and the access to data processing systems will allow the information to be received in time to be able to use such information to the benefit of developing countries.

4. Priority and importance should be given to national and regional programmes because GOOS is very ambitious and it does not seem possible for the whole programme to be developed at the same time.

5. Certain concepts should be clarified such as references to the management of coastal zones which are

under the jurisdiction of coastal states. Those rights of coastal states should be clearly indicated.

6. The other concept which should be clarified is that which refers to the financial resources of each State. GOOS cannot count on resources which States do not have; even in the case of partial existence of such resources, developing countries have vital social priorities.

With respect to the representation in the Committee which replaced the OPC, we would like to reiterate the following:

1. The Member States are sovereign to nominate their representatives to the IOC Committee for GOOS. It is not therefore necessary to specify that the representatives have the capacity to "pledge" national resources. It must also be taken into consideration that several different agencies and Ministries from each country will participate in GOOS. Therefore it is inappropriate to specify that the Committee has as one of its objectives to obtain financial resources.

2. The technical and scientific committee of GOOS should have balanced membership. That is to say it should integrate scientists and experts from all the regions of the world.

Finally, we would like to emphasize that GOOS, would in no way whatsoever, weaken the IOC.

By the above, we do not wish to give the impression that Chile is against GOOS, we would only like to present certain aspects which we judge important and which should be considered in order for GOOS to become really efficient and succeed in the objectives for which it was established.

Presentation to OPC

This presentation does not represent an official Chilean statement related to GOOS. It is given to inform about the principal national activities/operational programmes which can help GOOS.

Chile is involved in three global programmes in this respect:

(i) World Ocean Circulation Experiment (WOCE) (repeated hydrographic cruise PR 14 off Chilean coast and ships-of-opportunity from the East Pacific to Europe and West Pacific);

(ii) Tropical Ocean and the Global Atmosphere (TOGA) (co-operative work with the USA in the observational field);

(iii) Joint Global Ocean Flux Study (JGOFS) (research cruise off Chilean coast);

(iv) Chile is actively supporting the Integrated Global Ocean Services System (IGOSS).

1. IGOSS OBSERVING SYSTEM (IOS)

1.1 SHIP-OF-OPPORTUNITY

Chilean Merchant Vessels that follow oceanic routes have been recruited for the programme. During the intercessional period and through a bilateral arrangement with NOAA/USA, semiautomatic XBT recorders (SEAS III) have been installed aboard "O/O Vina Del Mar and M/N Andino", merchant vessels from Empremar S.A. and Sudamericana de Vapores, Chilean companies. The first one covers the route from Magellan Strait - Europe (North and South Atlantic Oceans) and the last one covers the route from Valparaiso to Japan (mainly South Pacific Ocean).

At present another two vessels, "M/N Copaipo and Imperial" from Sudamericana de Vapores have been recruited for the route Valparaiso-Tahiti (Pacific Ocean) and it is expected that these vessels will be also implemented with SEAS III equipments.

1.2 COASTAL AND ISLAND STATIONS

Chile participates actively since 1964 in the IGOSS Sea Level Programme (ISLP-PAC) by sending in real time the mean sea levels of six tide gauge stations handled by the SHOA (Africa, Antofagasta, Caldera, Valparaiso, Talcahuano and Isla de Pascua) to the Sea Level Specialized Oceanographic Centre (SOC) located at Hawaii in order for this centre to produce maps of monthly values and anomalies of sea level for the entire Pacific ocean.

On the other hand, it has been co-ordinated with NOAA the installation and maintenance of HANDAR coastal platforms at Arica, Caldera, Valparaiso, Isla de Pascua, Arch. Juan Fernandez and San Felix Island. These stations transmit sea level, air temperature and sea surface temperature to the GOES Satellite each hour (coastal) and each three hours (islands). Besides, at Isla San Felix a SYNERGETICS platform has been installed that transmit meteorological data (magnitude and wind direction, air temperature, atmospheric pressure and solar radiation to the GOES satellite at the same time interval.

Also, during this year, three platforms, denominated NGWLS (Next Generation Water Level System) have been installed at Isla de Pascua, Valparaiso and Diego Ramirez in co-ordination with the National Ocean Service (NOS) of NOAA/USA. These platforms transmit sea level, air and sea surface temperature, wind magnitude and direction and atmospheric pressure to the GOES Satellite at each hour. The advantages between these platforms and the HANDAR is that the previous ones use an acoustic sensor and also the platforms are accessible by telephone. The disadvantage is that the NGLWS do not have, at present, a Tsunami activation mode.

1.3 MOORED BUOYS

In co-ordination with NOAA and as part of the TOGA programme, Chile moored and maintain since 1986 an oceanographic - meteorological buoy located at 18°S y 85°W. This buoy transmit wind magnitude and direction, air and sea surface temperature, atmospheric pressure and waves (direction, height and spectra) each hour to the GOES satellite (the position of the buoy is sent to the TIROS satellite).

2. IGOSS DATA PROCESSING AND SERVICE SYSTEM (IDPSS)

The National Oceanographic Data Centre (CENDOC), located at Shoa, performs the functions of IGOSS National Oceanographic Centre (NOC), reducing, processing and archiving the oceanographic information pertaining to the operational programmes BATHY-TESAC and ISLP-PAC. Some products are obtained and they are mentioned in the IGOSS information service bulletin of oceanographic products issued by national centres.

3. IGOSS TELECOMMUNICATIONS ARRANGEMENTS (ITA)

3.1 INTERNATIONAL MOBIL MARITIME SERVICE (IMMS)

According to the ITA requirements related to the operational programme BATHY-TESAC, Chile through Shoa nominated and instructed three radio-coastal stations in order to receive and transmit BATHY messages. Also the flow of those messages was co-ordinated such that they could be incorporated to GTS.

3.2 LINK SATELLITE COMMUNICATIONS

As it was mentioned in the previous paragraphs, Chile is using the GOES satellite to send, in real time, oceanographic and meteorological data from ships-of-opportunity, HANDAR and SYNERGETIC coastal/island stations as well as the TOGA buoy.

Eventually, it is expected to count with a ground satellite station at SHOA in order to receive in real time oceanographic and meteorological data from the coastal stations and the buoy.

Finally Chile believes that Global Ocean Observing System (GOOS) is necessary. However, Chile expresses concern for a real assistance programme with transfer of relevant technology to support and involve developing countries in observational and data analysis.

CHINA

In addition to over 100 tidal stations established over the years, China has also maintained hydrographic sections in the Pohai Sea, Yellow Sea and East China Sea since the early 60's and in the South China Sea since the 70's. In the 80's oceanographic buoys have also been moored on the shelves but vandalism has been a constant problem. Recently, China has completed establishing coastal marine pollution monitoring networks, using coastal stations, vessels and airplanes.

A comprehensive general survey of the entire Chinese coastal zone was completed in the middle 80's. Currently we are conducting a more intensive survey of the coastal waters around the islands of China.

Following years of monitoring of the fishery species and stocks in the Yellow Sea, China is embarking on a programme to study the Pohai Sea ecosystem. Pohai Sea is a semi-enclosed sea with many distinct features including community trophodynamics.

The China-Japan Kuroshio programme (JRK) studies the Kuroshio and the interaction of the Kuroshio with the shelf waters. JRK is coming to an end this year, but both sides are interested in extending and possibly also expanding this co-operative programme.

China has committed itself to the IOP phase of TOGA-COARE. It also has committed itself to occupy several times the 9 WOCE sections along the western boundary of the North Pacific Ocean. The first WOCE cruise was conducted in late 1991. In addition China will also participate in the Antarctic VOS programme by using its resupply ship to its two antarctic bases. As to JGOFS China will start a margin flux study of the East China Sea shelf in 1992.

FRANCE

France is greatly interested in the implementation of a Global Ocean Observing System (GOOS) and gives the highest priority to its "Climate module" which should be shared with the Global Climate Observing System (GCOS). In order to proceed, a Committee of Heads of French Research Organizations involved in Global Change Oceanographic Programmes was established in 1991, with two aims:

(i) to ensure that means to implement WCRP (TOGA and WOCE) and IGBP (JGOFS) oceanographic programmes are made available;

(ii) in the longer term, to prepare for the establishment of a Global Ocean Observing System (GOOS).

As far as GOOS is concerned, IFREMER (Institut français de recherche pour l'exploitation de la mer) recommended the following to the French Ministry of Research and Technology, on behalf of the afore-mentioned Committee:

> - to establish within IFREMER a Department entrusted with the task of systematic and quasi-operational ocean monitoring for climate purposes. Such a Department should be able to take over research teams, beginning in 1995 (when TOGA and WOCE come to an end). It should also take care of space-based remote-sensing ocean monitoring programmes in connection with other responsible French agencies (Centre National d'Etudes Spatiales, Météo France). The Department should be the French focal point for the GOOS and GCOS offices in Paris and Geneva.

In order to proceed with the establishment of such a Department, IFREMER suggests to establish in 1993 a staffed and budgeted Project Team. The Team will prepare a French implementation plan for the GOOS climate module, which will allow for designing the organizational chart of the Department to be established sometimes in 1994. The Team would be the IOC and GCOS correspondent. The establishment of the Team is subject to the adoption of the IFREMER proposal within the 1993 budget.

GERMANY

Germany expresses great interest to participate in the planning development and implementation of a Global Ocean Observing System (GOOS). Tentative proposals of the Deutscher Wetterdienst (German Weather Service) and the Bundesamt für Seeschiffahrt und Hydrographie (Federal Maritime and Hydrographic Agency) for type and extent of a potential participation are presently under consideration with the Federal Government. The proposal stipulates the designation of a governmental agency to act as the national GOOS office which co-ordinates the German activities within GOOS and liaises with relevant international organizations and programmes. A final decision about the proposal, however, is not being expected before the end of 1992.

Furthermore, co-ordination of the shares of governmental and academic institutions within a GOOS remains to be initiated.

1. CURRENT PROGRAMME

Germany participate actively in the following research programmes:

(i) World Ocean Circulation Experiment (WOCE);
(repeated hydrographic section between Greenland and Ireland, ships-of-opportunity in North and South Atlantic Ocean, drifting buoys, RAFOS, Pegasus)

(ii) Joint Global Ocean Flux Study (JGOFS);
(research cruises in the North Atlantic Ocean, International JGOFS Office)

Germany is actively supporting the following services programmes:

(i) Monitoring of the oceans as contribution to the regional conventions on preventing marine pollution (Paris-, Oslo- and Helsinki Convention);

(ii) Integrated Global Ocean Services System (IGOSS);
(Ship-of-opportunity Programme with XBT, XCTD and SST measurements, IGOSS National Oceanographic Centre)

(iii) International Oceanographic Data and Information Exchange (IODE);
(German Oceanographic Data Centre, Specialized Analysis Centre for the WOCE-WHP)

It maintains in its waters:

(i) a network of automatic recording stations on the German continental shelf (see figure); (temperature, salinity, oxygen, currents, radiology; some records extend back to the 1920s);

(ii) sea-level observations at the German coasts;
(tide gauge "Cuxhaven" is part of GLOSS, its records extend back some 140 years)

A review of future application relevant to GOOS in underway for:

(i) Satellites:
Receipt, processing and archival of NOAA satellite images from the Northeast Atlantic Ocean and adjacent seas (preparation of SST and sea-ice charts). The evaluation of micro-wave data for operational purposes has started.

(ii) Modelling:
At present all ocean modelling work is provided at research institutions: coupled-ocean/atmosphere models, eddy-resolving North Atlantic models and global ocean circulation models. Links between research and agency groups are being enhanced.

2. PLANS FOR THE FUTURE

A German participation in GOOS will have to meet the needs for:

(i) climate research;
(ii) long-term monitoring of climate changes;
(iii) climate prediction;
(iv) protection of Germany's shoreline;
(v) identification and monitoring of the impact of global climate changes on regional and coastal ecosystems.

Therefore, it is planned to participate in programmes:

(i) to monitor the upper ocean to estimate the spatial distribution and temporal variability of heat, freshwater, salinity, CO_2, Plankton, sea-level as well as the transport of energy and substance through the

ocean/atmosphere interface;

(ii) to measure systematically, in suitable space and time intervals, the ocean circulation, the variability of important physical and chemical parameters, and the transport of CO_2 and particulate matters in the deep ocean.

The degree of involvement in modelling affairs still has to be determined.

Pending on future international programme agreements, the present tentative plan for a participation is for:

IGOSS: to increase the number of ship-of-opportunity lines from two to four and to drop both XBTs and XCTDs.

Hydrography: to take over responsibility for a hydrographic section and for two long-term moorings in the North Atlantic Ocean.

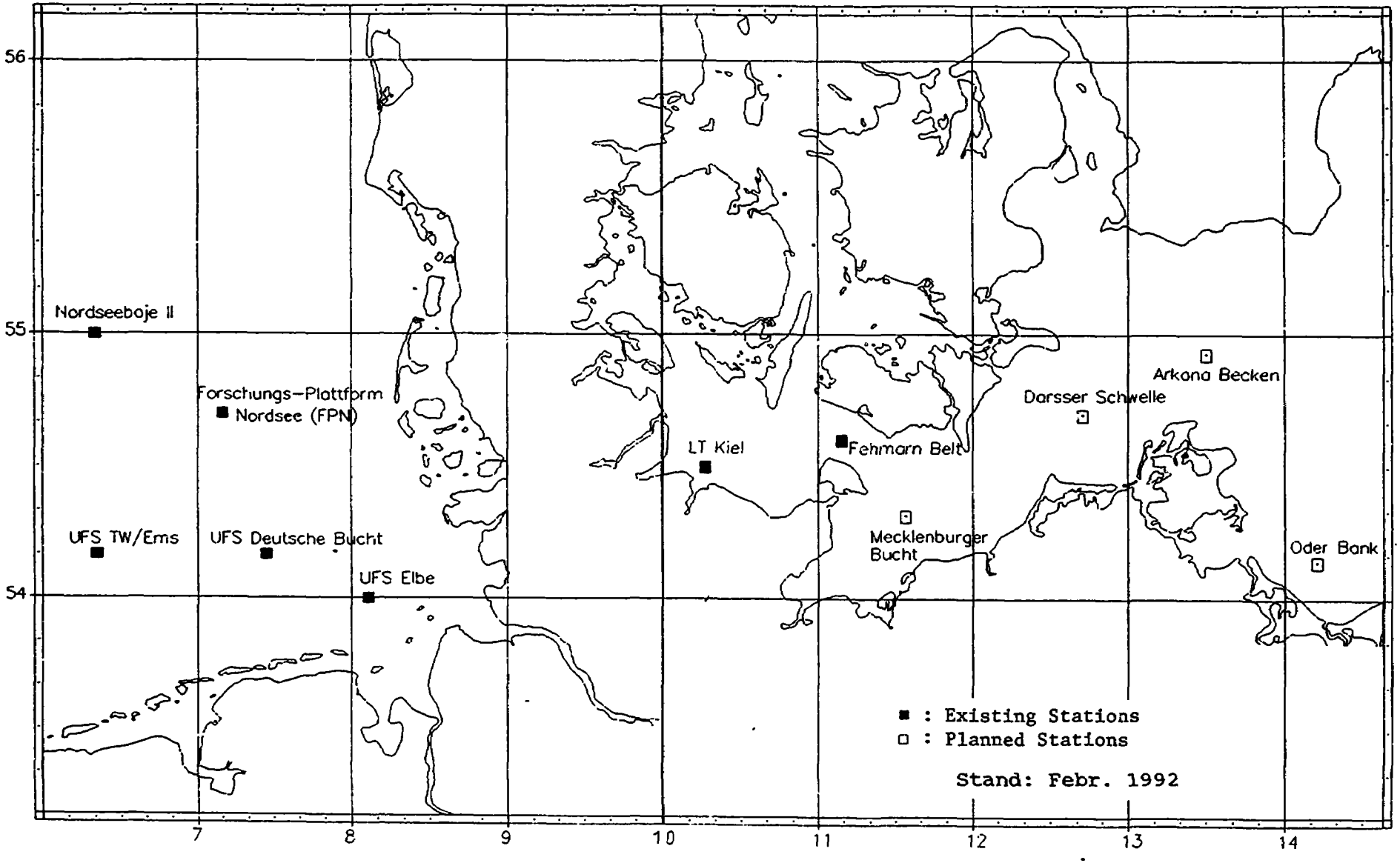
Drifting Buoys: (no plans yet for a nationally co-ordinated programme).

GLOSS: continuation of the tide gauge "Cuxhaven".

IODE: continuation of the present involvement. With respect to the WOCE-WHP SAC, supported by Germany, it is not clear at present whether the expertise gathered in the German Oceanographic Data Centre (DOD) will be available for similar work within an ocean observing system.

Satellites: continuation of the present involvement. Whether present work will be extended to active micro-wave sensors is undecided.

Modelling: planning to evaluate its use in the context of an ocean observing system with agency support is still proceeding. Assimilation techniques are strong candidates for agency support.



Positions of automated equipped observing stations by the former Federal Office for Shipping & Hydrography on the German Continental Shelf

INDIA

The Indian representative, Dr. K.S. Yajnik, welcomed the proposal of GOOS and expressed keen interest of the Indian scientific community in it. He then mentioned a few major developments in India which could provide a basis for future participation. They included (a) significant progress in setting up a national marine information system with wide dissemination of SST to user groups on a regular basis; (b) enhancements and improvements in tide-gauge measurements; (c) sediment trap measurements by NIO, Goa, with German collaboration; and (d) participation of NIO, Goa, and C-MMACS, Bangalore, in the Heard Island experiment. On the modelling front, he mentioned activities in institutions in over ten cities in the following areas:

(a) coastal circulation models for marine pollution and storm surge simulation,

(b) preparatory work for basin scale/global ocean circulation models and atmosphere-ocean coupled models,

(c) problems of air-sea interaction such as the effect of SST anomaly on development of cyclones,

(d) simulations of radiative transfer in tropical atmosphere for evaluation and refinements of SST algorithm,

(e) modelling of marine biological processes,

(f) software development for acoustic tomography.

He then showed few recent results on the simulation of Fashan's model under tropical conditions, which show sustained large oscillations and a tendency toward chaotic behavior under certain conditions. These could provide a possible mechanism for the observed phytoplankton patchiness. He also showed results on radiative transfer simulation which point to possible improvements in MCSST and CPSST for tropical conditions.

He mentioned that a national centre called C-CMMACS[1] has been set up in Bangalore for mathematical modelling and computer simulation. It is expected to give a thrust in modelling activities especially those related to oceans.

JAPAN

Japan is quite interested in the development of GOOS.

International research programmes such as TOGA, WOCE and JGOFS are under way and a new research programme LOICZ will be realized next fiscal year. Japan has also joined ocean observing and data management activities such as IGOSS, GLOSS and IODE.

It is noted that Japan has already established a routine ocean observation network around Japan.

Recent movements towards GOOS are as follows. Science and Technology Agency decided to start Feasibility Study on new technology for monitoring oceans and the Ministry of Education, Science and Culture is interested in promoting research programmes towards GOOS. Cooperational programmes for the Pacific monitoring and others were agreed to promote between Japan and the USA.

MALTA

(presented by Aldo Drago, Co-ordinator,
Marine Science Network, Malta Council for Science & Technology)

Issues such as that of the threat of global climate change are the common concern of all nations alike. The more technologically advanced countries have the responsibility to lead the less developed countries to abide to

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[1] CSIR Centre for Mathematical Modelling and Computer Simulation.

commitments that safeguard our common heritage that is our home planet earth.

It is important for small states with little scientific capability such as Malta to be given the opportunity to sound their voice, because such states are also part of the mosaic of international efforts towards the protection of the environment.

From the political point of view, the contribution of our country towards problems concerning climate change and sea issues are well known on an international level. We need only mention that it was the Government of Malta which in 1988 at the 43rd United Nations General Assembly put forward a resolution on the "Protection of the Global Climate for Present and Future Generation of Mankind".

Malta is also presently taking an active part within the Intergovernmental Negotiating Committee in the drafting of an effective framework convention on climate change. Malta is also keen to serve an essential part in the drafting of an ocean and sea level rise protocol which will eventually be annexed to the convention.

From the scientific point of view Malta, like many other small states or third world countries, has still to develop a full national capability in the physical sciences and in the marine field in particular. At the same time, scientific programmes such as GOOS cannot be effective unless the needs of such countries is also taken into consideration. It is well known that regions such as the Tropics, which are of particular importance for the understanding of mechanisms involved in climate change, are also regions that encompass countries with a lack of oceanographic and technological know-how. No global scientific programme or issue can therefore truly complete its goals unless the Governments of such countries are assisted in the development of the necessary elements which enable them to actively participate in the related research and monitoring.

If GOOS mechanisms are hopefully going to ask for national commitments from such states as well, the same mechanism must ensure the development of the required scientific capabilities in regions where these are lacking. The best way for GOOS to comply to such a role is probably that of assisting the scientific community in a particular country through the actual development of research and monitoring units in that country; these units will serve to complement the full suite of global observation of monitored parameters in GOOS projects while at the same time the units will provide the structure within which the scientists of the host country will be able to study and work in their own environment.

Finally mention must be made that the Mediterranean, considered as a small ocean, can offer a model study of the basic characteristics and mechanisms encountered in the major oceans. Malta, with its privileged position (both political and geographical) is able to play a leading role in the formulation of a common environmental monitoring strategy amongst all the Mediterranean countries, including those on the North African perimeter. Malta must however be first assisted to develop its own scientific capability in the marine sciences by receiving the necessary backing in the setting up of its various projects such as that of the building of a marine station and remote-sensing unit, or the deployment of sophisticated equipment such as a wave-rider buoy which is scheduled for the end of this year, on the strengthening of ongoing scientific research programmes such as the Coastal Environment Research Project (CERP) which is a pilot project in Malta and which falls within the framework of the OSNLR programme of IOC/ICSEM and aims to study erosional problems in insular systems.

MEXICO

(presented by Dr. Rubén Lara Lara)

The worldwide global changes are also affecting our national science and technology policy. There have been important changes in our main funding agency, Consejo Nacional de Ciencia y Tecnologia (CONACYT). Now there are no priorities to support science. Therefore, if our researchers submit projects of excellence in areas that the international community has recognized as important to understand the ocean processes, the possibilities of being funded are greater. Therefore, we foresee good opportunities for our investigators in oceanography, in areas related to climate change, and mainly in coastal processes. Now, with respect to projects in Mexico related to GOOS, for a long time we have operated a tide gauge network along the coast and main islands of our country. The data has been regularly sent to the Sea Level Centre at Hawaii. Three of our tide gauges are already connected via satellite to Hawaii. The rest are in regular conditions, new equipments are required to renew our network.

Since 1981 we started an intensive sampling programme (physics, chemistry and biology) in the Gulf of

California. The long term objective is to develop a carbon budget of this ecosystem. A similar programme is being planned for our coastal waters of Baja California.

In the Gulf of Mexico, several efforts have been done to understand the physical processes of that region, however, continuous programmes should be developed.

Together with researchers from USA, we are planning to do a series of oceanographic cruises in the Gulf of California and adjacent waters (1992-1994), to characterize the bio-optical properties (irradiance, fluorescence, etc.) of these waters. The main objective is to generate "ground truth" data to calibrate and validate the next color sensor (Sea Wifs). We are also planning, together with USA scientists, to have an "automatic oceanic optical buoy" in the Gulf of California.

We have also proposed that Mexico could attend a southern station to capture data from the next color satellite. This could permit to acquire data as far south as 5°S, and cover the eastern tropical Pacific. In the near future (months) we will have a station to capture temperature data from the NOAA satellites.

We are also interested in starting a CPR (Continuous Plankton Recording) programme in the Gulf of California and adjacent waters, using the touristic ferries, to generate long time and space series of plankton variability.

Although we don't have yet national committees for TOGA and WOCE, some of our researchers have had some participation in these programmes. We are planning to establish national committees in the near future. We are also very interested in the developments of the JGOFS and LOICZ projects. We feel that here we could participate very actively, specially in the LOICZ project.

Early 1993 we will have a new oceanographic coastal vessel (a 30 m). We are planning to have a fixed station to generate a time series of bio-optical and physical properties in the region of the California Current in front of the Baja California Peninsula. Other lines or stations could be attended. In Southern Mexico, the Mexican Navy (Secretaria de Marina) will have another research vessel. They are also planning to have long time series stations. Therefore we foresee good opportunities for collaboration with other countries using our research vessels.

Finally, the lack of human resources at the doctorate level in several of the disciplines in oceanography, is one of the main problems in Mexico and in Latino-america. Therefore, our country is doing great efforts to support students in foreign countries to get these degrees. However, in some fields we are already offering post-graduate programmes (master and doctorate). For example, in some areas of physical oceanography and marine ecology.

At present, 20% of our post-graduate students are from Latino-america (El Salvador, Panama, Cuba, Nicaragua, Costa Rica, Colombia, Chile and Argentina). However, one of the main problems for these countries is the lack of enough resources to support these students. Mexico has been supporting most of these students. Scholarships from international agencies could beneficiate more students from all over Latino-america. In the long term, this will be the best investment of developed countries to developing countries if we all are going to participate in understanding the global change problems of our planet.

THE NETHERLANDS

The present notes are not representing an official Netherlands Statement with respect to GOOS. They are given here to inform the OPC meeting on the interest in some of its elements, without aiming at completeness.

Scientists in the Netherlands take part in JGOFS and WOCE, and both scientists as national authorities are interested to support the creation of a LOICZ office in the Netherlands.

Operational activities are going on in the North Sea, both for the observations and the analysis and forecasting of physical conditions, and for similar developments in the observing and analysis of chemical and ecological conditions. These activities are mainly taking place in international co-operation. Furthermore the Netherlands take part in the Drifting Buoy Co-operation Panel. With respect to the transfer of knowledge the Netherlands did give opportunities for scientists in developing countries to be trained. The Netherlands Meteorological Institute assisted different developing countries with the setting-up of wave-forecasting programmes.

NORWAY

Brief Description of the Norwegian Real Time Transmission System for CTD and ADCP Data

(presented by Svein Erling Hansen, Oceanographer)

1. BACKGROUND

The Norwegian Monitoring and Forecasting Centre was established in 1990 with a pre-qualification period of three years. I this period the HOV centre belongs to the Norwegian Meteorological Institute. At the end of 1992 a decision will be taken to continue the HOV centre on a permanent basis and how it should be organized. There is two main objectives for the centre: first to provide oceanographic forecasting and secondly co-ordinate oceanographic monitoring activities in Norway. The situation today is that there is a limited interchange of information and data between the different institutions. The Ministry of Environment which is the Ministry responsible for the HOV centre, hope that an improved co-operation between the institutions will ideally increase the total outcome from the investment that is put into marine surveillance and data collection.

Our strategy to prepare an oceanographic forecasting service is to find technical solutions to transmit oceanographic data in real time. Further to develop and improve oceanographic models and to put these to run on an operational basis.

This presentation will give a brief description of our system for automatic transmission of CTD and ADCP data from ships. This type of dataflow will also be conducted to the GTS as part of the Norwegian contribution to IGOSS.

2. THE SHIP PROGRAMME

Two research vessels have got necessary equipment and have since February 1991, regularly transmitted data via the Meteosat system. We have not yet put the data to the GTS as we want to have more experience with the system before we release the data for IGOSS.

The research vessel belongs to The Norwegian Marine Research Institute, Bergen. "G.M. Dannevig" is normally operating in the Skagerrak. This vessel has only a CTD and not an ADCP installed. The next vessel "G.O. Sars" that operates in the North Sea, Skagerrak, Norwegian Sea and in the Barents Sea, uses CTD and ADCP regularly.

In 1992 we want to extend the system with three ships. That includes the newest ship of our research fleet; "Johan Hjort" which also belongs to the Norwegian Marine Research Institute. The next will probably be "Håkon Mosby" which belongs to the University of Bergen and the last system will be installed onboard "Polarfront" which is the weather ship, station "M". All together we hope that this will bring us valuable hydrographical data from the North Sea, Skagerrak, Norwegian Sea and the Barents Sea not only for the Norwegians but also for the IGOSS community.

3. DESCRIPTION OF THE SYSTEM

The system consists of a satellite communication unit that is a PC connected to the satellite-transmitter. This PC is further connected to a Data - reduction PC which reduce and prepare the data on a TESAC format. This PC communicates with the ADCP and the CTD server units which normally are 386 PCs. The data reduction PC is able to communicate with the ADCP and CTD units at the same time.

The TESAC code allow CTD-data and ADCP-data to be filled in separately or in combination. If there only CTD data available, the TESAC code is filled up with salinity and temperature data. The opposite will be done if there is only ADCP data available. Two codes received February 28 Gives is shown in the figure 1 below.

The challenge in preparing the TESAC format is to choose depths to minimize the error with the data reduction compared with a profile of higher resolution. The reduction is done in steps. First step includes the standard depths. Next step is to describe deflection points. In the figures 2 and 3 there is shown examples of profiles that has been transmitted via the system compared with the originally profile reconstructed based on the data stored onboard. The errors are not critical for forecasting purposes. Due to limitation of number of words that could be transmitted we have to accept a lower resolution. However one should keep in mind that the data transmitted give a better resolution compared with profiles taken with traditionally Nansen bottles at standard depths.

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SOVF11 ENMI 280900
KKXX 28 22 533/ 17209 02529 88871 20004 30456 43492 20005 30456
43492 20008 30455 43491 20010 30457 43493 20011 30457 43493 20012
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43497 20030 30468 43498 20040 30469 43498 20050 30471 43499 20060
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20090 30469 43500 20100 30466 43499 20150 30457 43500 20200 30442
43501 20242 30429 43502 66194 20000 00017 20008 00011 20024 01012
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00013 20088 00011 20104 00010 LLZG=



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42948 20005 30415 42982 20006 30441 43127 20009 30462 43249 20010
30463 43250 20011 30465 43254 20016 30550 43339 20020 30633 43397
20025 30732 43470 20030 30737 43486 20040 30762 43500 20050 30781
43507 20060 30800 43515 20070 30801 43519 20075 30801 43519 20080
30800 43520 20090 30799 43521 20100 30797 43522 20150 30787 43524
20200 30776 43524 20250 30761 43522 20276 30748 43522 20300 30734
43522 20350 30710 43521 20399 30689 43520 LNIW=
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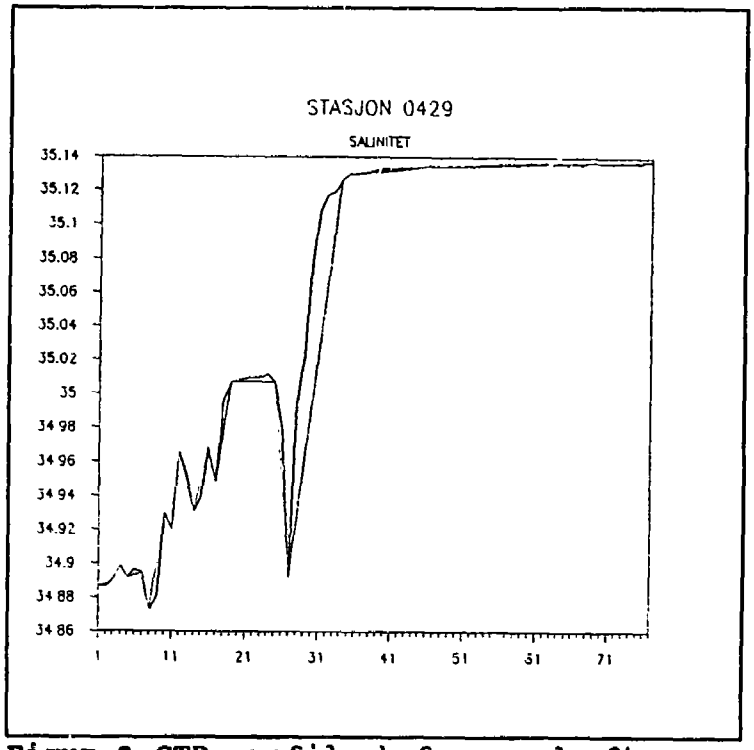
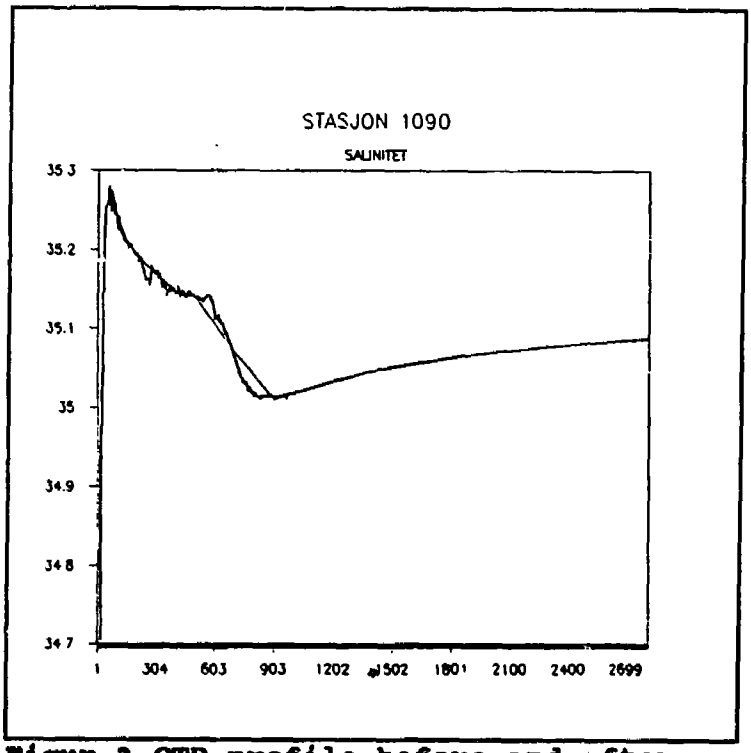
Figur 1 Tesac received from "G.Dannevig" (LNIW) and "G.O.Sars"(LLZG) February 28.



Figur 2 CTD profile before and after reduction. Depth: 76m



Figur 3 CTD profile before and after reduction. Depth 3000m

4. DEVELOPMENT PLANS

In 1992 HOV plans to add 3 more vessels to the system. All together these ships will cover large ocean-areas from Skagerrak in the South to the Barents Sea in the North. As the data transfer has been designed to also support IGOSS we hope that our technical solution could be used by other nations.

REPUBLIC OF KOREA

(presented by Moon-Sik Suk of KORDI)

Since 1961 on the basis of bi-monthly, Korea has maintained 22 hydrographic sections which include 175 stations around Korean waters; parts of the Yellow Sea, the East Sea (Sea of Japan), and the East China Sea. Korea also has 21 tidal observation stations along coastlines. Integrating existing systems to GOOS is desirable. In the scope of GOOS, Korea is applying standard techniques of measurement and quality control, so that data sets are consistent between adjacent coastal countries. Korea is supporting to develop data telemetry using HF bands for coastal zone monitoring and meso-scale ocean modelling efforts.

RUSSIAN FEDERATION

(presented by Dr. Lappo, State Oceanographic Institute)

1. THE ORGANIZATION OF OBSERVATIONS WITHIN THE MARITIME NETWORK

After the Second World War scientific institutes and other institutions of Hydrometeorological Service, Department of Fishery and Academy of Sciences had been supplied with ocean-going research vessels. This had allowed to commence more detailed researches at open seas and oceans.

Since mid-fifties the network of standard sections at seas was being worked out in order to collect the systematic data about hydrological and meteorological processes. The active observations on sections commenced in the period of International Geophysical Year 1957-1959.

The State Oceanographic Institution is a leading institution in Russia, responsible for organizing the observations within the Maritime Network of the Hydrometeorological Service.

The network of maritime coastal and estuarine stations, roadstead points, range stations and oceanographic sections was set up as "secular" (fundamental) network in 1960. Within this network the researches for studying the interannual variations of hydrological and hydrochemical characteristics at seas and in the estuarine regions of rivers inflowing into seas are carried out.

The location of the secular oceanographic sections selected from the network of standard sections is to fulfil the following conditions (see figures 1-12):

(i) the observations on secular sections are to describe the variability of hydrological and hydrochemical characteristics in the main sea regions;

(ii) the secular sections are to cross the jets of basic currents and basic circulation systems;

(iii) the secular sections are to cross the straits joining the seas or to be laid along the boundaries between the main sea regions;

(iv) the long-term series of systematically observed data are to have been collected on the secular sections.

In addition to their main purpose the secular observations are bench marks in researches of the time and spatial variability of marine hydrological and hydrochemical characteristics. They are used in calculations of water change, water, heat and salinity balances of seas and marine estuarine regions and in other calculations. The secular observations are also of great

operational importance and they are used in weather, hydrological and fishery forecasting.

The following marine hydrological and hydrochemical characteristics and pollutants are included into the secular observations:

(i) At coastal hydrometeostations: the sea level, the temperature and the salinity of sea water close inshore, the ice regime (the width and the thickness of fast ice, the thickness of snow cover on ice, the quantities of fixed ice and floating ice, the dates of ice phases, the duration of ice period). Notice: in sea regions where the ice cover is disturbed by human activity the dates of ice phases and the duration of ice period are included into the secular observations.

(ii) On oceanographic sections and at roadstead stations: sea water temperature and salinity, water color and transparency, radioactivity, dissolved oxygen (O_2), hydrogen ion exponent (pH), nitrite nitrogen (NO_2), nitrate nitrogen (NO_3), ammonium nitrogen (NH_4), total nitrogen, phosphate phosphorus (PO^{3-}_4), total phosphorus, silicon; the pollutants: oil products, chlorine organic pesticides, heavy metals, phenol, detergents and specific regional pollutants. In the Black, Caspian and Baltic Seas the content of sulfurated hydrogen is also determined.

(iii) The ice distribution, the quantity and the edge location of fast ice and floating ice at open sea by observations from ships and aircrafts.

(iv) At stations of ranges and at posts in the river estuarine regions (which are usually located at the delta top beyond the influence of tides and surges added by the one or two posts on main delta branches): water level, water temperature and turbidity, the ice regime, water and alluvia discharges, hydrochemical characteristics and specific pollutants; at hydrometeorological stations, at marine estuarine posts and on sections -the same observations as at maritime coastal stations and on oceanographic sections.

At coastal hydrometeostations the observations are carried out:

(i) for the sea level and the sea water temperature not less than 4 times a day (and the continuous registration of sea level by the recording level gauge);

(ii) for the water salinity 1-4 times a day;

(iii) for the ice cover (except the ice thickness) at least daily;

(iv) for the ice thickness close inshore not less than 1-2 times per decade and in profiling at least monthly.

At roadstead points the observations are carried out monthly close to the point's centre as the 24-hours' stations with the observation frequency of 1-3 hours. The water samples for determining the content of hydrochemicals and of regional specific pollutants are taken in the first day of carrying out the roadstead station.

On oceanographic sections the observations are carried out monthly or 1 time a season. At certain stations of a section (with approval of the Department of Hydrometeorological Service and a leading institution) the 24-hours' stations with observation frequency of 1-3 hours are carried out.

On oceanographic sections a full set of measurements of pollutants is carried out not less than at the one or two most deep-water stations. These stations are endorsed by the Department of Hydrometeorological Service with approval of a leading institution.

On sections the discontinuity layer depth and the location of hydrological front are specially marked.

For observations on the secular oceanographic sections the following standard depth levels are fixed:

(i) for the seas: Kara, Barents, Norwegian, Greenland, Black, Caspian, Japan, Okhotsk and Bering - 0, 10, 20, 30, 50, 75, 100, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1200, 1500, 2000, 2500, 3000, 4000 m and further with the depth step of 1000 m down to the bottom depth;

(ii) for the seas: White, Baltic, Azov, Aral, Chukotsk, East-Siberian, Laptev and shallow regions of deep seas - 0, 10, 20, 30, 40, 50, 60, 80, 100, 150 m and further with the depth step of 50 m down to the

bottom depth;

(iii) for marine estuarine regions - at depths less than 6 m: surface, 3 m, bottom; at greater depths: surface, 5, 10, 15, 20 m and further with the depth step of 10 m down to the bottom depth. Additional depth levels are obligatory set for precise determining the boundaries of the density discontinuity layer.

Water samples for the measurements of pollutants at roadstead points and on oceanographic sections are to be taken from the following depth levels:

(i) at depths less than 10 m - 0 m and the bottom depth
(ii) at depths less than 25 m - 0, 10 m and the bottom depth
(iii) at depths less than 100 m - 0, 10, 50 m and the bottom depth
(iv) at depths less than 500 m - 0, 10, 50, 100 m and the bottom depth

If the pronounced polluted layer has been determined, an additional depth level for the sample collection should be set in this layer.

On the mouth ranges of estuarine regions at depths less than 5 m the samples are taken from the two levels (0 m and the bottom), at the depths greater than 5 m the samples are taken from the three levels (0 m, the middle and the bottom). If the pronounced discontinuity layer has been determined, the samples should be taken from the depth just over the discontinuity layer instead of the middle level.

2. THE HYDROCHEMICAL MONITORING SYSTEM

At present the net of the hydrochemical control exists on all the seas surrounded Russia and contains more than 1200 stations (see figures 13-16).

The list of observation contains: salinity, alkalinity, pH, oxygen, hydrogen sulphide, biogen substances, heavy metals, chloro-organical pesticides, phenols, detergents.

Pollutants are measured in the bottom sediments too.

All hydrochemical observations are made by the Hydrometeorological Committee organizations according to joint programmes and methods of analysis. This helps to intercalibrate all this information.

The observations are made as in the coastal sea water, where the human activity is high, soon as in the open sea water. In the coastal regions net of the stations is denser and observations are made more often than in the open regions of the sea. In the more dangerous coastal regions, the observations are made every ten days.

Scientific analysis of all this chemical information is made in the State Oceanographic Institute (SOI). As a result of this work, the documents about pollution of the seas are published by the SOI every year.

Unique materials about hydrochemical and pollution situation is stocked in the SOI during more than 15 years period of monitoring system work.

Figure 13 - The network of hydrochemical stations at the Black Sea, 1990

Район: Все море

1. Станции наблюдения

Всего	По категориям		
	I	II	III
257	15	95	147

2. Контролирующие организации:
Грузинск. УГМ
Сев-Кавк. УГМ
Севаст.отд ГОИН
Украинское УГМ

3. Основные источники загрязнения:
г.Николаев
г.Голенщжик
г.Одесса
г.Херсон
г.Ильичевск
г.Очаков

4. Основные загрязняющие вещества:
Нефтепрод.
СПАВ
Фенолы

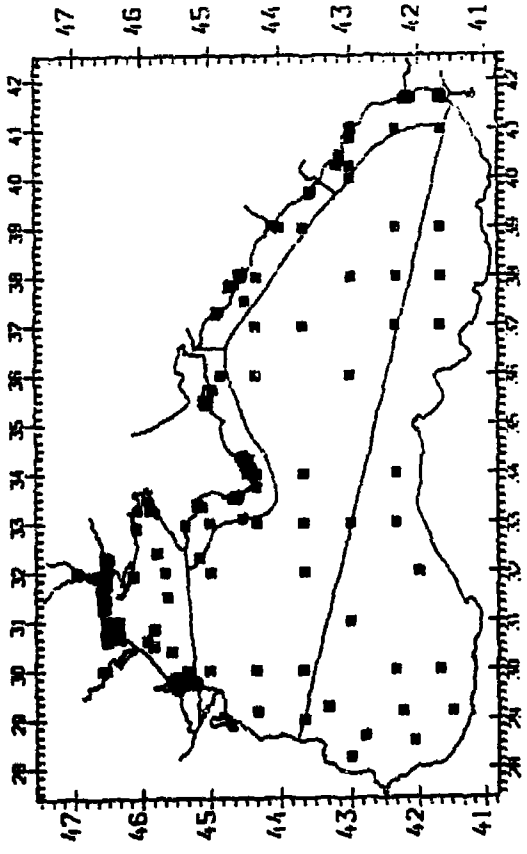


Figure 14 - The network of hydrochemical stations at the Caspian Sea, 1990

Район: Все море

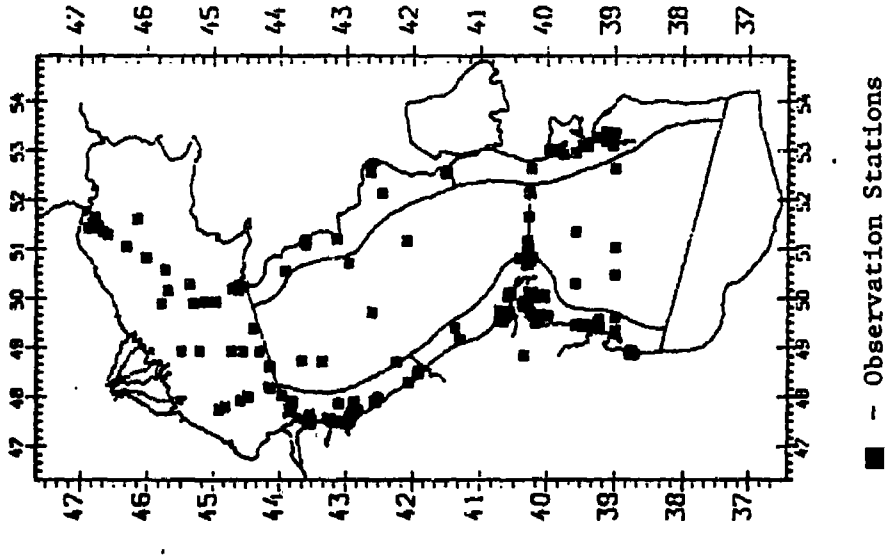
1. Станции наблюдения

Всего	По категориям		
	I	II	III
178	7	85	86

2. Контролирующие организации:
   Азербайдж. УГМ
   Казахское УГМ
   Сев-Кавк. УГМ

3. Основные источники загрязнения:
   г.Баку
   г.Сумгаит
   Нефтяные камни
   г.Махачкала
   г.Астрахань
   г.Красноводск

4. Основные загрязняющие вещества:
   Нефтепрод.
   Фенолы
   СПАВ



■ - Observation Stations

Figure 15 - The network of hydrochemical stations at the Baltic Sea, 1990

Район: Все море

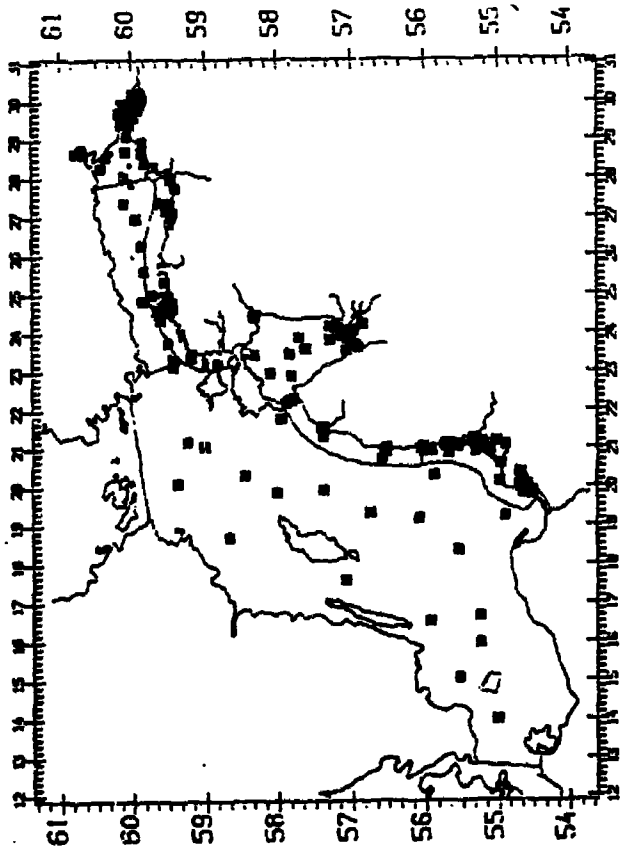
1. Станции наблюдения

Всего	По категориям		
	I	II	III
187	7	111	69

2. Контролирующие организации:
Латвийское УГМ
Литовское УГМ
Сев-Зап. УГМ
Эстонское УГМ

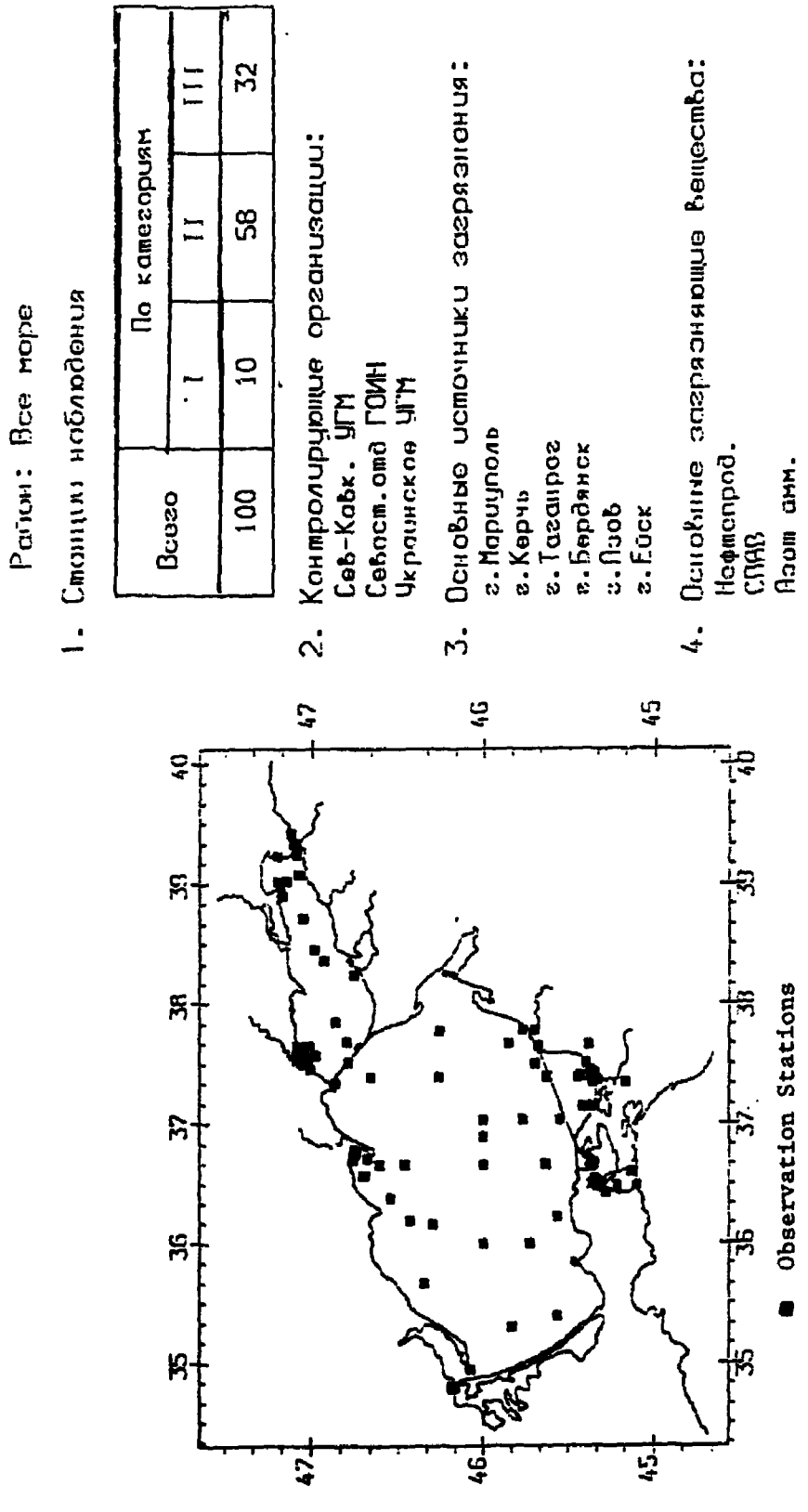
3. Основные источники загрязнения:
побережье
г.С-Петербург
р.Емельяновка
г.Клайпеда
г.Таллинн
р.Нева

4. Основные загрязняющие вещества:
Нефтепрод.
Фенолы



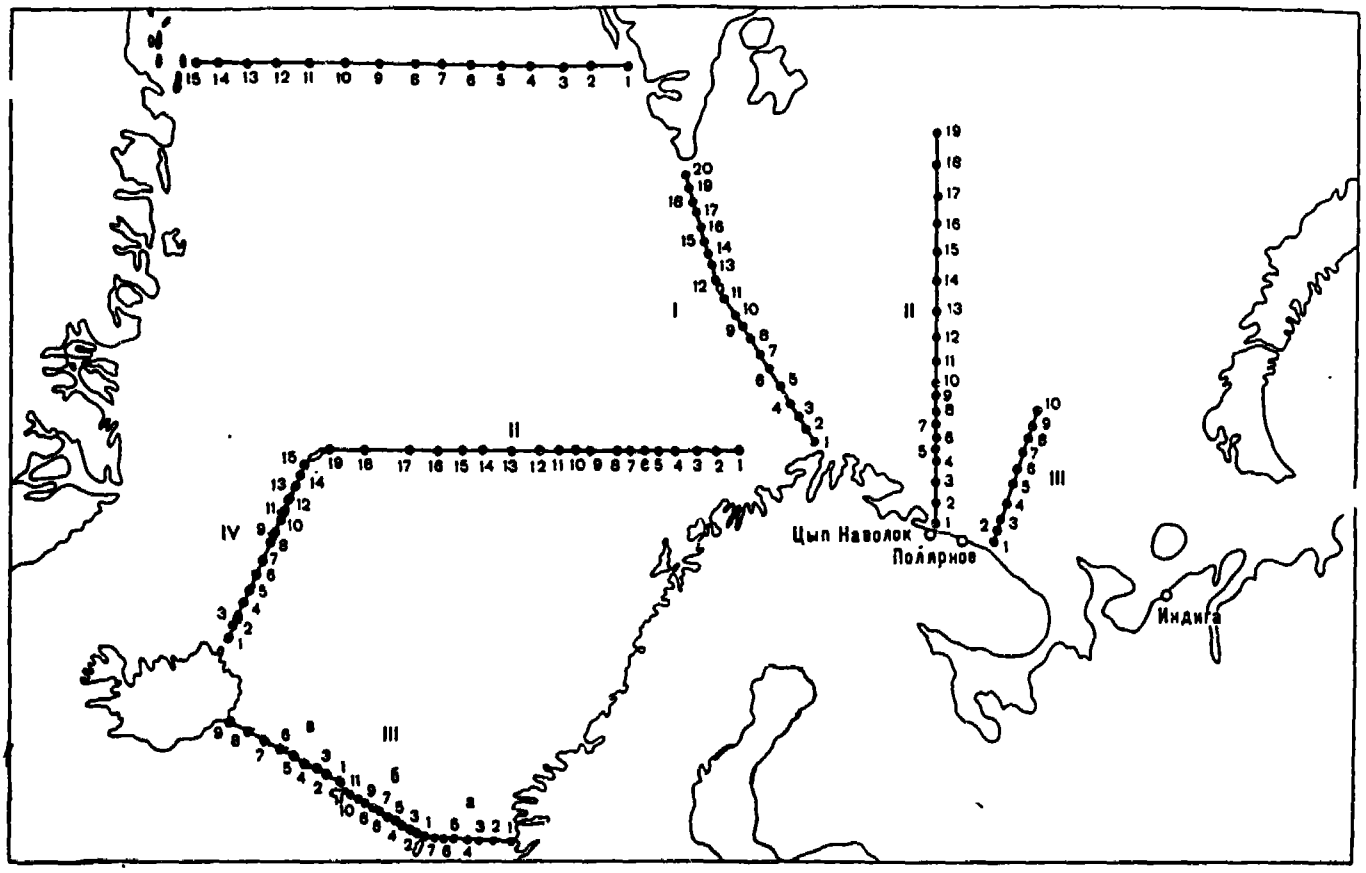
■ - Observation Stations

Figure 16 - **The network of hydrochemical stations at the Sea of Azov, 1990**



OCEANOGRAPHIC SECTIONS

Figure 1 - Barents, Greenland and Norwegian Seas



ПРИЛОЖЕНИЕ 2
Схемы размещения вековых океанографических разрезов (рис. 1—12)

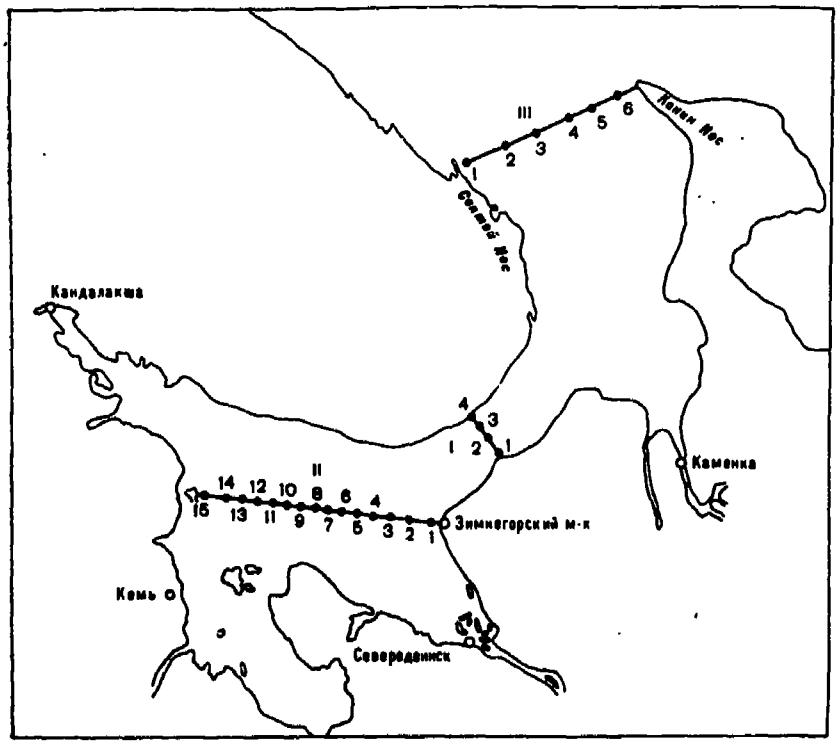


Figure 3 - The White Sea

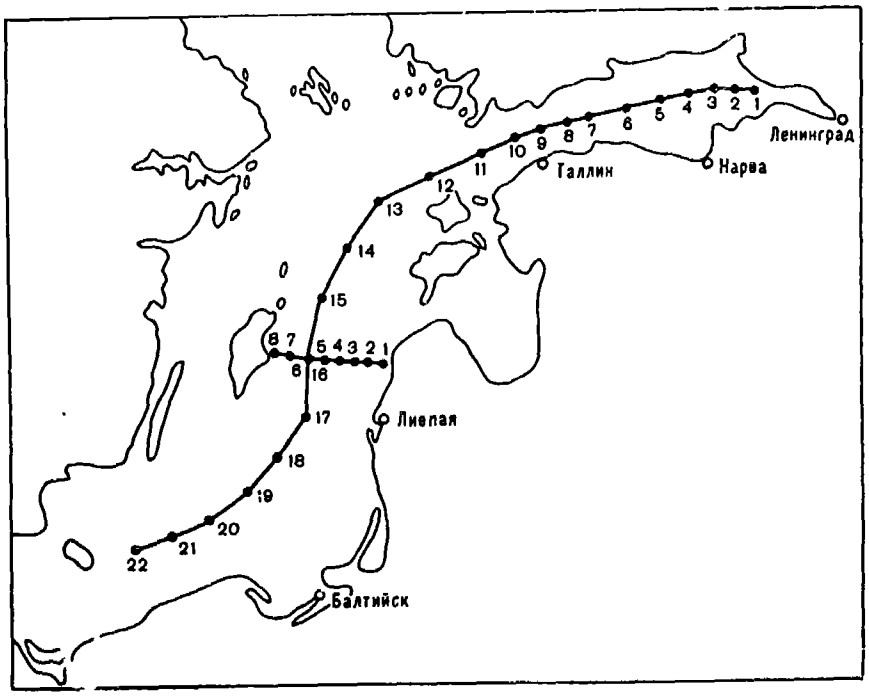


Figure 4 - The Caspian Sea

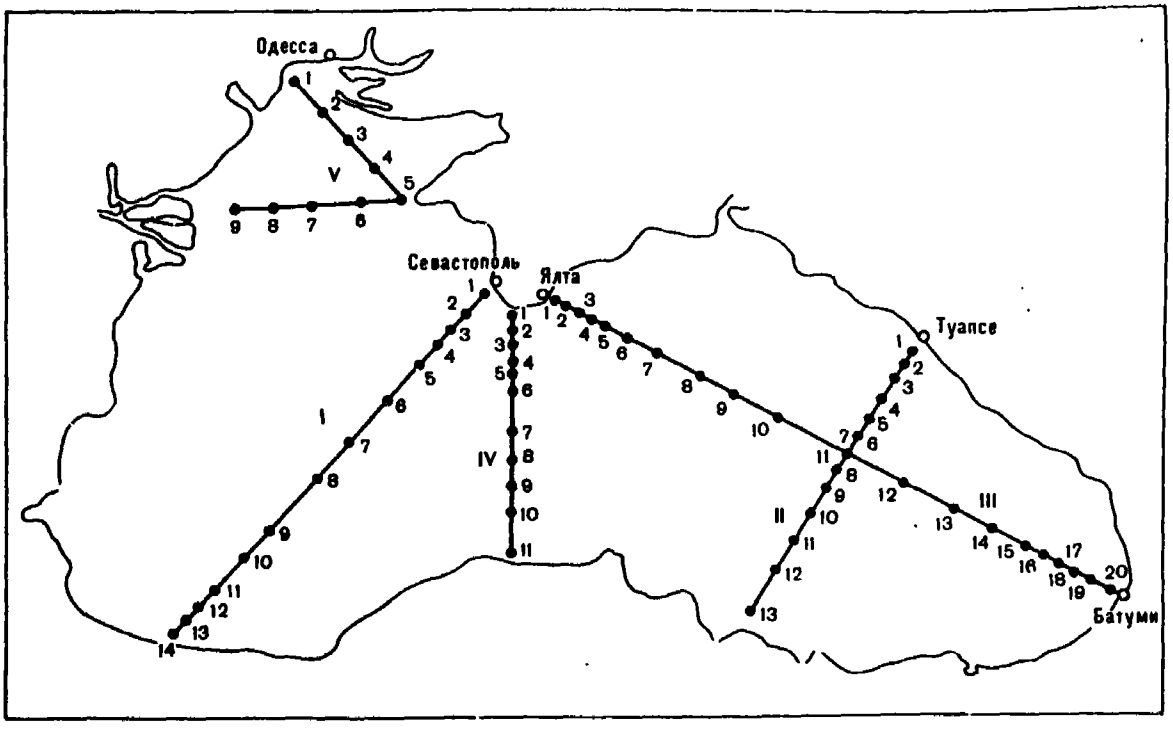


Figure 5 - The Bering Sea

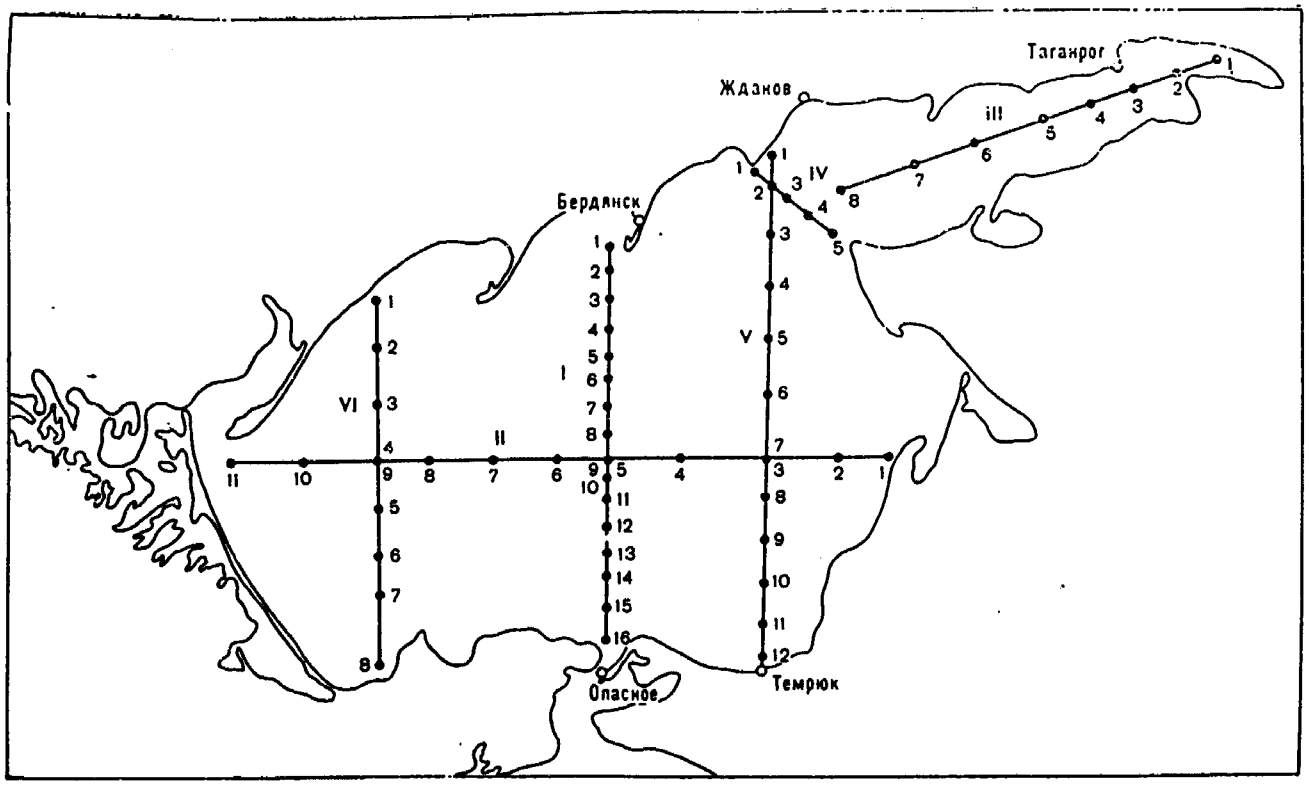


Figure 6 - The Sea of Okhotsk

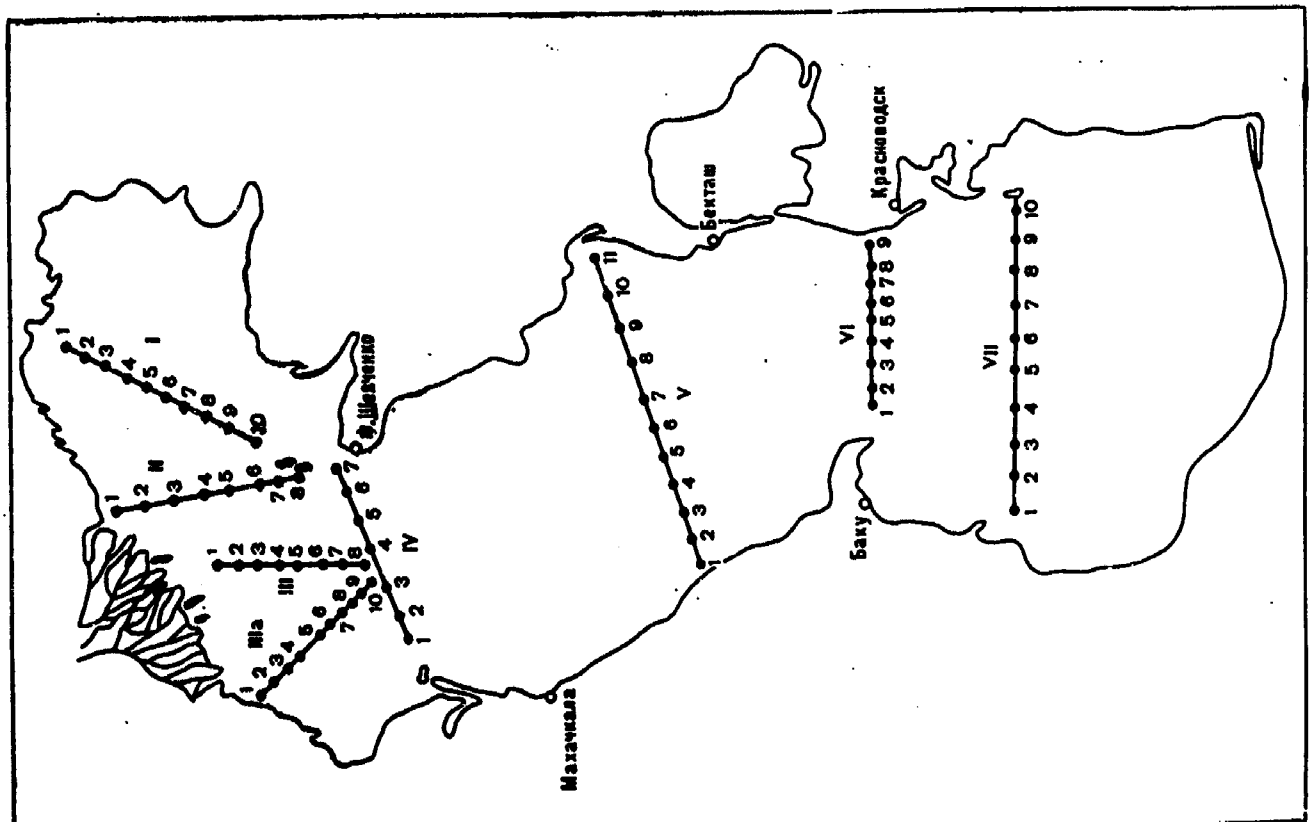


Figure 7 - The Black Sea

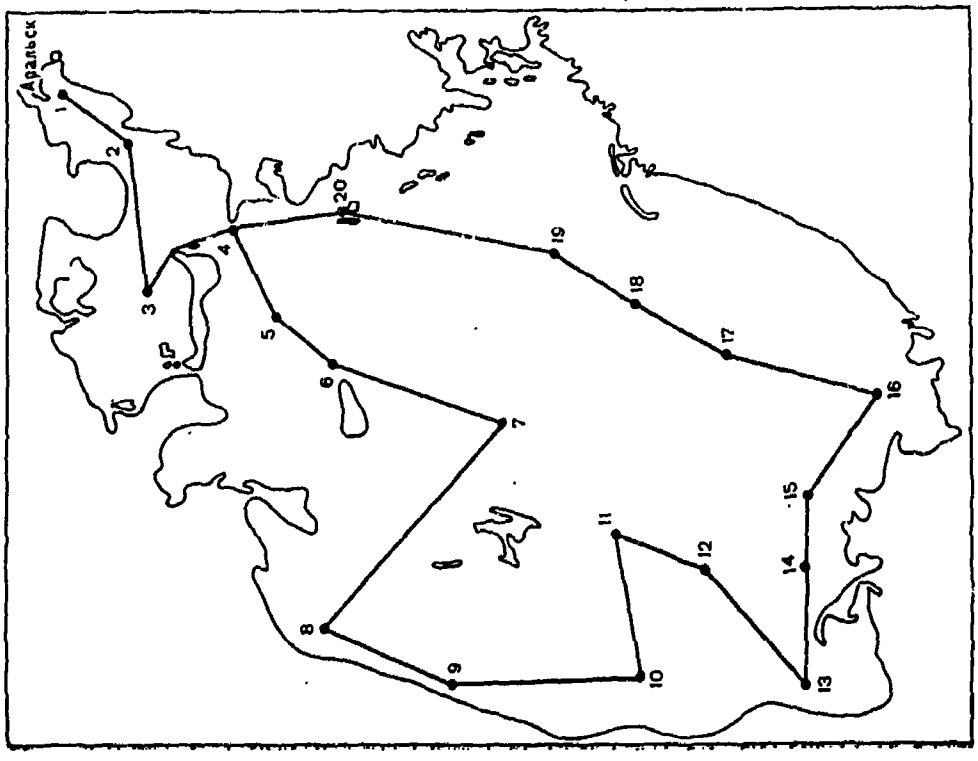


Figure 8 - The Baltic Sea

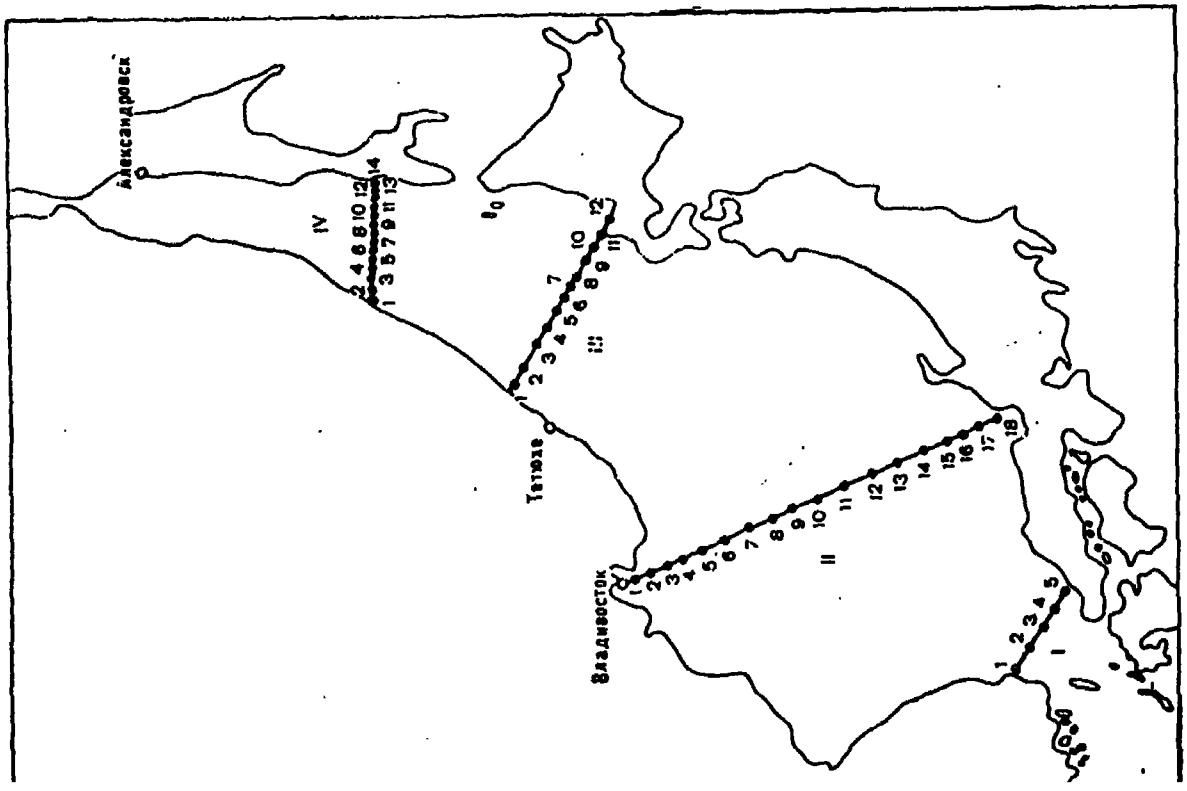


Figure 9 - The Sea of Japan

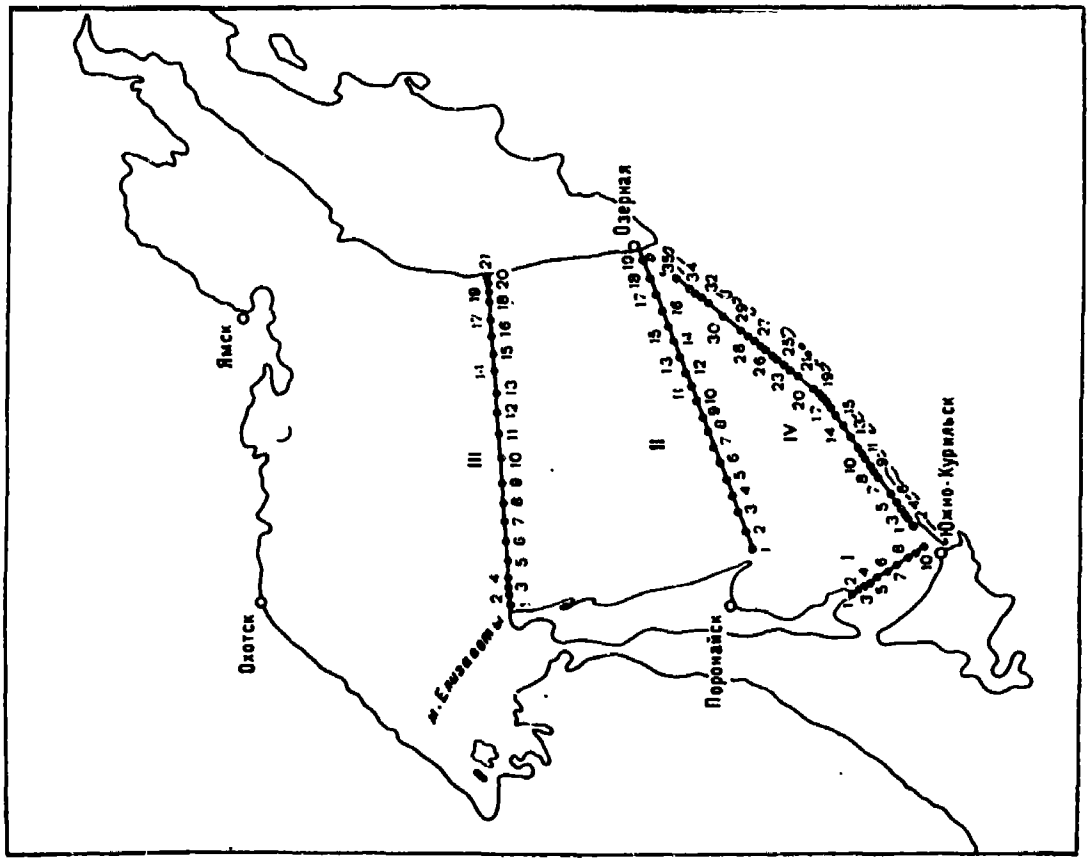


Figure 10 - The Aral Sea

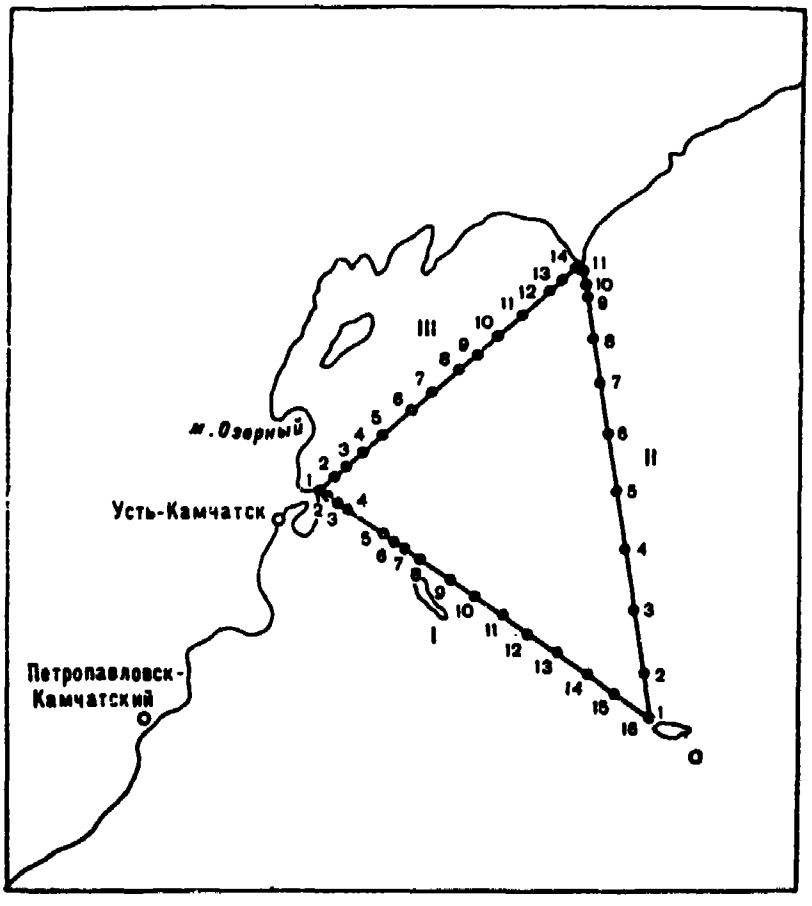


Figure 11 - The East-Siberian Sea and the Chukchi Sea

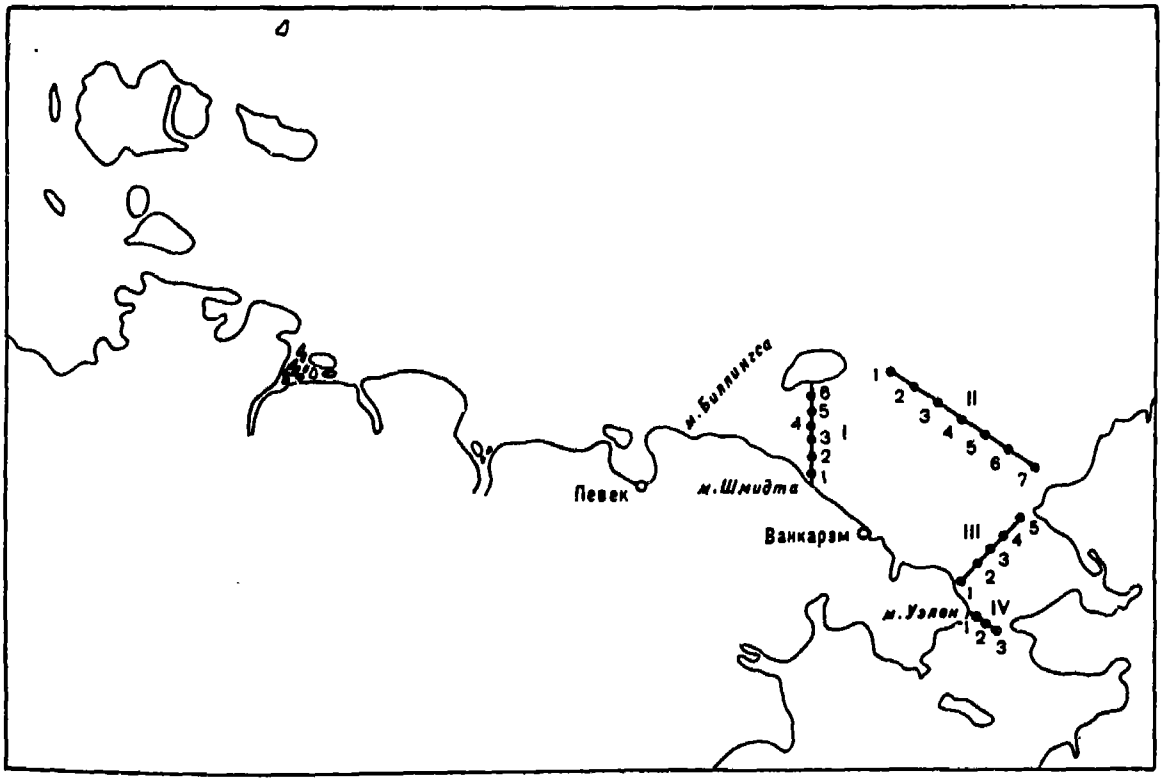
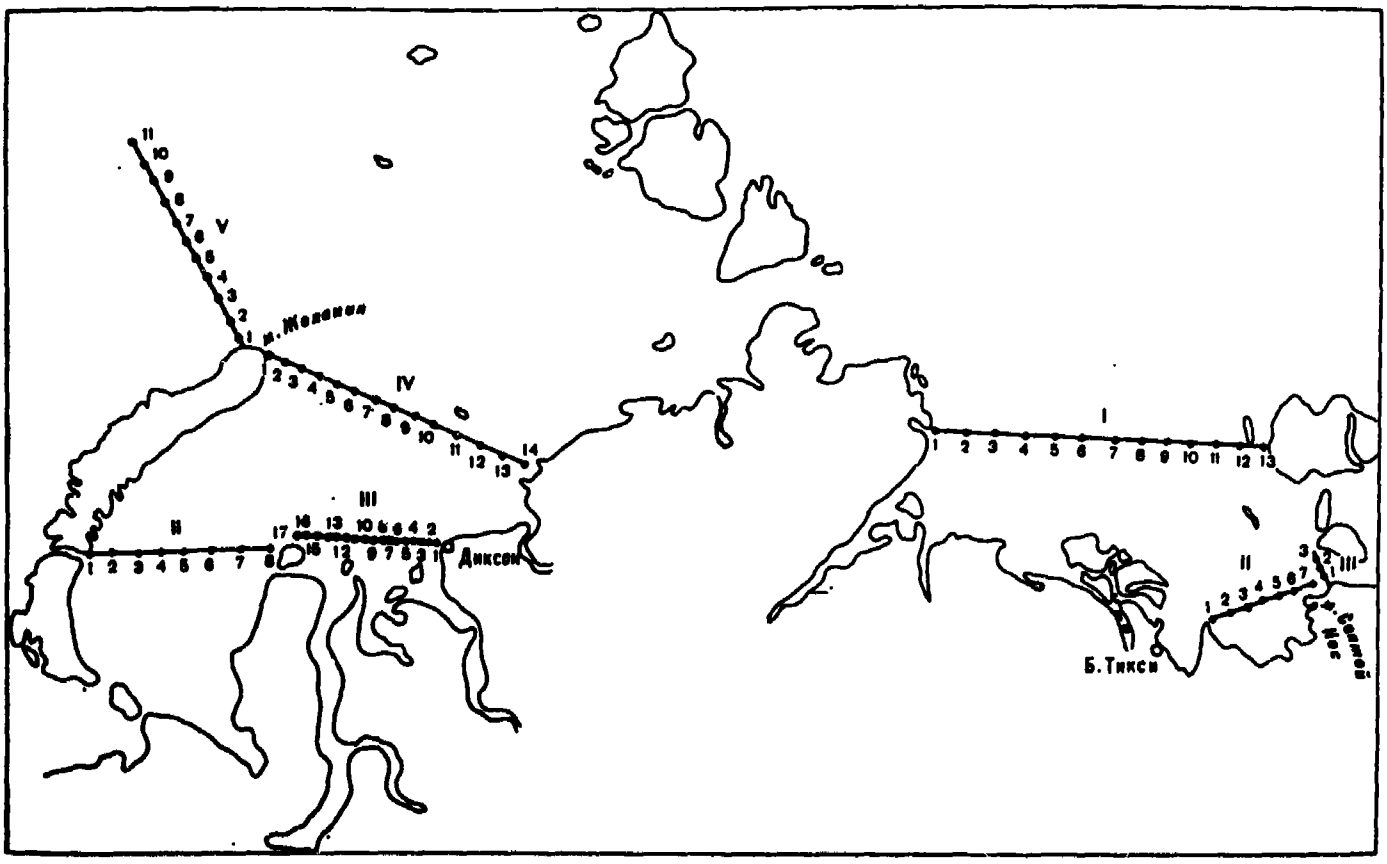


Figure 12 - The Kara Sea and the Laptev Sea



UNITED KINGDOM

UK Government Department base their policy on GOOS on the statements agreed at the Ministerial Conference of the Second World Climate Conference in October 1990. GOOS is seen as a part of GCOS, although the Department of Environment has stated that it will favor a GOOS programme which includes elements of water quality management and coastal protection, as well as climate monitoring and prediction. Government officials and contractors are working to assemble the data which will identify the UK benefits from GCOS and GOOS, the likely costs, and the activities within GCOS and GOOS which should be provided by UK. Preliminary statements will be available for the UNCED meeting in June 1992, though a full statement of policy and commitments may be later than that.

UK recognizes that the funding and implementation of GOOS will have to be supported largely by operational agencies. This will involve an extension of the effort in oceanography which is principally borne by the research budget at present. It is not possible to state the official policy yet, although the indications are generally favorable towards some support for GOOS. In the meantime, the UK research programme in oceanography is strongly oriented towards experiments and technology which will support the development and design of GOOS.

UK supports the WOCE IPO in Wormley. The Vivaldi sections carried out by the staff of the Rennell Centre for Ocean Circulation using Sear Soar and ADCP and CTD measurements are designed to be a pre-cursor of operational observations. The UK Meteorological Office supports a programme of drifting buoys, deep water moorings, an Ocean Weather Ship, in the North Atlantic, and analysis of reports from ships of opportunity. The Atlantic Isopycnal Model is being developed to provide predictions on the multi-decade timescale of oceanographic conditions. UK is supporting and managing the development of the Continuous Plankton Recorder as an international method for estimating plankton on sections across all world oceans. The UK component of JGOFS (BOFS) has been completed very successfully, with a very efficient data management system. UK supports GLOSS, and many of the data from sea level observations are archived at PSMSL in UK. The Dunstaffnage Marine Laboratory has carried out repeated salinity measurements in the North Atlantic for 40 years.

UK is placing an emphasis on technology development for GOOS. We recognize that it will be impossible to obtain the data coverage required for GOOS if most of the measurements are obtained from manned research vessels. For sea surface data the British National Space Centre (BNSC) will be involved in supporting remote sensing oceanographic observations. However, for *in situ* data, and subsurface data, there will be a strong incentive to use unmanned, automatic, or robotic, systems, including floats, moorings, sub-surface drifters, and automatic unmanned vehicles (AUVs).

UK has been active in developing large scale oceanographic models, and the FRAM programme has been particularly successful. An atlas of the products from the FRAM eddy-resolving model has been published.

In conclusion, the UK science budget for oceanography is being deployed in support of experiments, observations, and modelling, which will provide essential experience in the design and implementation of GOOS. UK Government is devoting a serious level of effort to assessing UK interests, benefits, and level of commitment, implied by the development of GOOS, and major policy statements will be made in the near future.

UNITED STATES OF AMERICA

We will not elaborate here on all of the specific activities underway in support of oceanic and atmospheric research and observational programmes related to GOOS. The USA supports activities of the WCRP and the IGBP such as TOGA, WOCE, JGOFS, and it maintains interest in emerging research programmes such as GLOBEC, GEWEX, LOICZ, the Arctic climate system, and others. The USA also supports and participates in a number of operational observing programmes of the IOC and the WMO such as IGOSS, IODE, GLOSS, and MARPOLMON.

Interest in the development of an improved global ocean observing system exists in a number of the USA governmental agencies as well as in a number of the academic institutions. During the past year there have been discussions about GOOS among individuals from NOAA, NASA, NSF, the Navy and other agencies. The USA supports a comprehensive approach to GOOS that will meet specific needs for improved observations and predictions about the future state of the marine environment and the Earth's climate system.

There are four separate reasons why we need to establish a Global Ocean Observing System now. (1) Human activities are changing the earth system on a global scale. (2) We are beginning to achieve useful skill in the prediction of the El Niño-Southern Oscillation (ENSO) phenomenon that has major economic impacts on the U.S. and other Pacific Basin countries. (3) Advances in numerical ocean circulation models have exceeded the ability of existing observational ocean data to constrain, validate, and apply these models to oceanic predictions. (4) During the next ten years the world's space agencies will place into Earth orbit more than one billion dollars worth of satellite systems to observe the oceans; without a complementary set of *in situ* ocean observations to calibrate the satellite data and to reveal the internal conditions of the ocean, much of the value of these satellite data will not be realized.

Human activity in recent decades has reached a level that is capable of causing global change. Significant changes are occurring in the concentrations of some atmospheric gases. Human habitation and agriculture have altered terrestrial ecosystems. The chemical composition of many of the world's rivers have been modified by domestic, industrial, and agricultural practices. Populations of some marine species have been reduced by fishing. There is concern that anthropogenic global change may result in shifts in climate, diminished environmental quality, and unsustainable natural ecosystems.

The climatic conditions of the tropical Pacific alternate every four to seven years from their "normal" state to the El Niño state in which warm waters occur in the eastern equatorial Pacific Ocean and along the coast of South America. The trade wind patterns and the tropical evaporation-rainfall convection cells change, causing significant changes in drought and flooding over much of the globe. Since 1985 the Tropical Ocean-Global Atmosphere (TOGA) research program has increased the observations and understanding of ENSO to the point where, for certain portions of the year, useful predictions of ENSO conditions are possible with a lead-time of about one year. This capability has major implications for more efficient agriculture, public safety, and other economic sectors influenced by climatic variations.

Advances in super-computer technology, and in our understanding of ocean processes and of the coupling between the ocean and the atmosphere, have made it possible to create global ocean circulation models with sufficient resolution to capture many of the features recognized in observational data. Without an expansion in the present level of ocean observations, however, it will not be possible to adequately set the boundary conditions required by these models or to verify their results. Over the next five to ten years we can expect that these numerical models can be applied to predicting oceanic conditions, climatic variability, and the effects in the ocean of anthropogenic activities.

In the late 1970s NASA, the Navy, and NOAA developed a range of ocean remote sensing capabilities with satellite technology (SeaSat, CZCS, GEOSAT, and AVHRR). In the 1990s we will see a second generation of most of these capabilities. NOAA maintains, on an operational basis, the polar orbiting AVHRR systems that provide a measure of sea surface temperature (SST). In July 1991 the European Space Agency launched the ERS-1 satellite, which now is returning data on the elevation of the sea surface, surface winds over the ocean, wave heights, and sea-ice extent. In February 1992 Japan will launch the JERS-1 satellite, and during the summer of 1992 France and the U.S. will launch the TOPEX-POSEIDON satellite which will provide additional ocean data. Many other satellite missions are scheduled over the next ten years including NASA's Earth Observing System (EOS) which will provide a wealth of ocean data. The total investment in space-based ocean remote sensing will exceed one billion dollars over the decade. With a parallel investment of only about 10% of this amount in enhanced *in situ* ocean observations, we can greatly increase the value and the applicability of the satellite data to economic, societal, and governmental needs.

In recognition of the need for ocean data, NOAA is formulating its approach to improved and enhanced long-term ocean observations, analyses, and predictions that will contribute to the international effort to establish a Global Ocean Observing System (GOOS) and a Global Climate Observing System (GCOS). Other U.S. agencies engaged in oceanic observations and research (NSF, NASA, Navy, DOE, and EPA) also are likely to participate in the U.S. contribution to GOOS and GCOS, as determined by their basic missions.

Analyses and predictions of global change require an understanding of the Earth system. Systematic, long-term observations on a global scale are the cornerstone for this understanding. While the goal is to achieve a global perspective, in many instances this will be achieved by the careful coordination of regional scale efforts. Environmental research programs are in progress to increase our knowledge of the Earth system. Complementary programs are needed to provide the observational data sets.

International organizations (the IOC, WMO, UNEP, ICSU, etc.) have begun to consider the long-term observational needs in the marine environment, and have embarked on defining, designing, and developing a Global Ocean Observing System (GOOS). We do not expect these organizations to actually perform measurements and manage large amounts of global data, but they will provide the mechanisms by which nations (either individually or through regional consortia) may pool their efforts and thus achieve a GOOS. To accomplish this integration of national efforts requires (1)

technical standards to assure global consistency; (2) exchange and dissemination of data; and (3) programs to enhance oceanographic capabilities worldwide through technology transfer and education.

In order to focus the purpose of GOOS, four modules have been identified that relate to specific needs for ocean data. Four elements have also been identified as important to the implementation of a GOOS: satellite remote sensing, *in situ* measurements, numerical modeling, and data management.

A series of basic premises can guide the formulation of GOOS:

(i) It must provide consistent, long-term data of known quality to meet specific requirements.

(ii) It should be a complete system with provisions for measurements, data transmission, data processing and quality control, assimilative and predictive models, and the generation of basic information (products) required by the GOOS user community.

(iii) It must be able to evolve over time, making use of the insights, understanding, and technologies produced by oceanic research programs (TOGA, WOCE, JGOFS, GEWEX, GLOBEC, etc.)

(iv) It should be designed to meet the data standards required by the research community, even when these standards exceed those of specific operational needs.

(v) It must assure continuity of data over many decades (essentially indefinitely).

If the world community is to be asked to support a program of enhanced global earth system observations, we need to demonstrate the benefits that will be derived from it. There are many practical and economic benefits that would result from achieving predictability of the Earth system over various time scales: months, years, decades, and centuries. Social and economic developments over many centuries have been based on extensive uses of the marine environment. Current demographic patterns show increasingly intense utilization of the coastal zone by mankind. Future development will be sustainable only if it is based on a solid understanding and predictability of marine environmental conditions.

VENEZUELA

1. INTRODUCTION

Oceanographic research in Venezuela has been focussed on its coastal boundaries, therefore recognizing the primary role of the Oceans on the regulation of the global climate and that programmes such as GOOS, demands specific attention to the coastal zone. We, the Venezuelan Delegates to this meeting, consider of great interest the participation of Venezuela in the development of GOOS.

The official agency for the co-ordination of marine activities in Venezuela, the "Comision Nacional de Oceanologia" (CNO), has recently created an *Ad hoc* Task Team to undertake the research related to the physical, chemical and geological aspects of the coastal processes of particular interest to Venezuela, and to organize our participation in the international programmation dedicated to the Global Changes topic.

2. ACTIVITIES ON GLOBAL PROGRAMMES RELATED TO OCEANIC PROCESSES AND CLIMATE

We have had an active participation in GLOSS through the tide gauge station located at La Guaira, on the Venezuelan central coastline, which has a length record of 40 years.

3. NATIONAL ACTIVITIES

Actual efforts are dedicated to:

(i) expand the national tide gauge network;

(ii) increase the hydrodynamic database in the main coastal bodies of regional and local interest.

Incoming project of relevance to the topic of Oceanic Processes and Climate are:

(i) Initiation of continuous sea level measurements on Aves Island and The Orchila Island, responding to the GLOSS request for monitoring sea level variation on insular locations at the tropical regions.

(ii) Initiation of a low-cost and permanent ocean margin time series oceanographic station that will seek understanding of physical and biogeochemical processes controlling nutrient and carbon deposition along continental margins. Specifically, the station will be located at the Cariaco Trench, a depression located on the Southern coastal boundary of the Caribbean Sea. We consider this study could be an important contribution to help fulfil the objectives of JGOFS by examining an area of active vertical nutrient and carbon exchange. This effort is being done under a co-operative interaction between local organizations and scientists from some USA universities.

Finally, although the lack of human resources in basic areas like **Physical Oceanography, Chemical Oceanography and Marine Geology**, continuous being one of the main weak points affecting the development of Oceanography in Venezuela, our technical facilities have been greatly improved with the recent acquisition of an ocean going research vessel "Arv Punta Brava", which is equipped with an integrated system of oceanographic data collection.

ANNEX V

LIST OF DOCUMENTS[1]

Document Code	Title
WORKING DOCUMENTS	
IOC/OPC-V/1	Agenda
IOC/OPC-V/1 Add.	Revised Timetable
IOC/OPC-V/2	Annotated Provisional Agenda
IOC/OPC-V/3	Summary Report of the Session
IOC/OPC-V/4	List of Documents
IOC/OPC-V/5	List of Participants
IOC/OPC-V/6	National Research/Observational Programmes (summaries of national presentations)
IOC/OPC-V/7	Not allocated
IOC/OPC-V/8	Action Paper
IOC/OPC-V/9	Proposal on International Mechanism for GOOS Design, Planning and Co-ordination and Future Role of the IOC Committee on Ocean Processes and Climate
IOC/EC-XXV/8 Annex 1	Draft Plan for the Development of the Global Ocean Observing System
UNEP-IOC-WMO-IUCN/GCNSMS-II/3	Report of the UNEP-IOC-WMO-IUCN Meeting of Experts Experts on a Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change, Pilot Projects on Mangroves and Coral Reefs (Monaco, 9-13 December 1991)
IOC/INF-870	Analysis of the Possible Establishment of an IOC Group of Experts on the Application of Marine Acoustics to IOC Programmes
IOC Workshop Report No. 73	Report of Expert consultation for the IOC Programme on Coastal Ocean Advanced Science and Technology Study (COASTS) (Liege, Belgium, 11-13 May 1991)
CCCO-JSC/OOSDP-III/3	Report of the Third Session of the CCCO-JSC Ocean Observing System Development Panel (Boston, USA, 2-4 October 1991)
IOC/OPC-V/Inf.1	Global Ocean Observing System (GOOS): Status Report, 1991
IOC/OPC-V/Inf.2	The Use of Large Marine Ecosystem Concept in GOOS
IOC/OPC-V/Inf.3	Events which may address the Planning and Development of GOOS -1992

[1] This list is for reference only. No stocks of these documents are maintained, except for the Summary Report.

OTHER INFORMATION/REFERENCE DOCUMENTS

IOC-WMO/IGOSS-VI/3	Summary Report of the Sixth Session of the IOC-WMO Committee on IGOSS (Geneva, 18-27 November 1991)
DBCP-VII	Summary Report of the Seventh Session of the WMO-IOC Drifting Buoy Co-operation Panel (Toulouse, 15-18 October 1991)
UNEP-IOC-WMO/GCNSMS-I/3	Summary Report of the UNEP-IOC-WMO Meeting of experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change (Paris, 10-14 December 1990)
IOC/INF-869	"Monitoring the health of the Ocean: Defining the role of the CPR in global eco-system studies" by R.R. Dickson
IOC Circular Letter No. 1319 of 31/10/91	Protection of Oceans, all kind of Seas including enclosed and semi-enclosed seas, coastal areas and the protection, rational use and development of their living resources (*document A/CONF151/PC/WG.II/L18 of the UNCED Preparatory Committee*)
A/CONF.151/PC/70 *(26/06/91)*	Global Ocean Observing System (*document of the UNCED Preparatory Committee*)
A/CONF.151/PC/100/Add.21 (17 December 1991)	Protection of Oceans, all kinds of Seas including enclosed and semi-enclosed seas, coastal areas and the protection, rational use and development of their living resources (Section II, Chapter 9 of Agenda 21) *(document of the UNCED Preparatory Committee)*
IOC Workshop Report No. 77	Report of the IOC/SAREC/KMFRI Regional Workshop on Causes and Consequences of Sea-Level Changes on the Western Indian Ocean Coasts and Islands (Mombasa, Kenya, 24-28 June 1991)
SCOR-IOC/CCCO-XII/3	Summary Report of the Twelfth Session of the Joint SCOR-IOC Committee on Climatic Changes and the Ocean (Woods Hole, USA, 4-8 June 1991)
IOC Technical Series No. 38	The Oceans and Climate: A Guide to Present Needs
WMO-UNEP-UNESCO-IOC-FAO-ICSU/ISBN	Climate Change: Science Impacts & Policy "Proceedings of the Second World Climate Conference"
-	Committee on Earth Observations Satellites: Consolidated Report 1991
-	Committee on Earth Observations Satellites: Draft Report of the Fifth Plenary Meeting (Herndon, 9-10 December 1991)