

**Intergovernmental Oceanographic Commission**  
*Reports of Meetings of Experts and Equivalent Bodies*



**Joint Scientific and Technical  
Committee for Global Ocean  
Observing System (J-GOOS)**

**Second Session**

Paris, France, 24-26 April 1995

In this Series, entitled

**Reports of Meetings of Experts and Equivalent Bodies**, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
3. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (*Also printed in Spanish*)
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping (*Also printed in French and Spanish*)
12. Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica (*Spanish only*)
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources (*Also printed in French and Spanish*)
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (*Also printed in French*)
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOC-ARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities (*Also printed in Spanish*)
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (*Also printed in Spanish*)
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
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48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
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52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic (*Also printed in French*)
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (*Also printed in Spanish*)
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans (*Also printed in French*)
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (*Spanish only*)
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (*Also printed in Spanish*)
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes

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# **Joint Scientific and Technical Committee for Global Ocean Observing System (J-GOOS)**

## **Second Session**

Paris, France, 24-26 April 1995

**UNESCO**



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## 1. OPENING

The second session of the Joint Scientific and Technical Committee for GOOS (J-GOOS) was hosted by the International Council of Scientific Unions (ICSU) in Paris, 24-26 April 1995. Chairman Otis Brown declared the meeting open at 2:00 pm and welcomed those present. To set the stage for later discussions Brown made some introductory remarks clarifying the J-GOOS role in GOOS, which he viewed as complementary to that of the Intergovernmental Committee for GOOS (I-GOOS). Participants were then invited to introduce themselves and to provide some brief comments on their relationships to GOOS within their countries.

Of the J-GOOS members, Allyn Clarke, Mike Bowers, Erlich Desa and Klaus Hasselmann were unable to attend due to schedule conflicts. In addition to the J-GOOS members, representatives from the sponsors and other invited experts were present. A complete list of participants with addresses, etc., is provided in Annex II.

## 2. REVIEW AND ADOPTION OF THE AGENDA

Brown introduced the Provisional Agenda and invited comments. After brief discussion the Agenda in Annex I was adopted.

## 3. APPROVAL OF THE REPORT OF J-GOOS-I

Brown invited amendments to the draft report of J-GOOS-I. With a few minor amendments, the draft report was approved. It was agreed this report would not be given wide distribution since its principal value was to the Committee itself as an historical document that provided background for the business to be concluded during J-GOOS-II.

## 4. REVIEW OF CURRENT J-GOOS STRUCTURE AND SUPPORT

J. Marton-Lefevre provided the Committee with information on the sponsorship structure and enabling actions for J-GOOS. She noted that the Memorandum of Understanding (MOU) setting up J-GOOS was signed by the three sponsors (ICSU, IOC and the WMO) in September 1993 and that subsequent agreements documented in a letter from the Secretary of the IOC dated July 1994 were considered as amending the MOU (see Annex III).

She explained the status of J-GOOS membership, reminding participants that the MOU provides for up to 12 ordinary members, and 10 had been selected. The term of office of these persons was for an initial three years (beginning in 1994) with the possibility of an additional 2 years. It was agreed that if new expertise would be needed for the Committee additional members would be suggested to the co-sponsors. It was also noted that the MOU provides for a Vice-Chairman position and that this had not yet been filled.

Regarding financing, it was noted that the three sponsors provide equal amounts for the J-GOOS.

As far as the J-GOOS Secretariat support is concerned, J. Marton-Lefevre explained that ICSU offered to provide the administrative backup for J-GOOS in preparation for the second meeting, and that this had been made possible with the help of A. Alexiou from IOC. G. Kullenberg explained that a position for GOOS Director would be advertised within the IOC and that this should be filled within a year. In the meanwhile J-P Rebert was occupying this position on a secondment basis. It was hoped that a person specifically responsible for J-GOOS would also be named as a part of the GOOS support office.

- 9 The representatives of the sponsoring bodies explained the support for J-GOOS from ICSU, IOC and WMO, and all agreed that this second meeting was extremely important for the development of the J-GOOS plans. Until some more permanent mechanism is formally developed, Marton-Lefevre agreed to be the intermediary between J-GOOS and the other sponsors regarding resources for decisions taken at J-GOOS-II.

## 5. RELATIONSHIPS WITH OTHER ACTIVITIES

### 5.1 RELATIONSHIPS WITH THE SPONSORS

- 10 Geoffrey Holland reviewed some of the IOC-GOOS history to enlighten those on the Committee who were being newly exposed to GOOS. Robert Shearman described the function of the Commission on Marine Meteorology (CMM) and its concerns with observing systems, including remote sensing systems. Shearman noted the long-term aims of CMM have much in common with GOOS. He believed the relationship with GOOS needed to be strengthened and that greater representation from the ocean community on the Commission would be helpful. Peter Dexter reminded the Committee that WMO has long been working with climate observing systems and services and stands ready to help with other GOOS module needs. He noted that WMO has been providing funding and personnel support for J-GOOS and for GOOS activities of direct interest to itself and suggested that secondments from WMO might be feasible for special one-time, short-term tasks. However, he indicated that no additional new money or new people could be realistically envisioned. Marton-Lefevre stressed that ICSU, being a science organization, is not a sponsor of intergovernmental organizations (e.g., I-GOOS). Being a sponsor of J-GOOS however, ICSU can be considered a supporter and sponsor of GOOS.

### 5.2 RELATIONSHIPS WITH I-GOOS

- 11 Nicholas Flemming covered the links between I-GOOS and J-GOOS with an overhead slide presentation. (His slides and complete remarks are included in Annex IV.) Flemming addressed the contrasting responsibilities by listing functions that each could undertake based on their terms of reference. He concluded that the Committees are complementary and do not overlap. He stressed that many actions required to implement GOOS are being carried out at the national and regional level and in some cases progress at these levels is ahead of I-GOOS and J-GOOS.

- 12 Flemming described weaknesses in the planning process, as he perceived them, that are impeding progress at the international level:

- (i) excessive complexity of groups and subgroups;
- (ii) delays caused by referring issues from one group to another;
- (iii) lack of funds to convene meetings of the subgroups;
- (iv) lack of contact with the world maritime commerce, engineering, and operations.

- 13 Flemming also suggested certain critical actions are needed to move GOOS ahead:

- (i) I-GOOS and J-GOOS need to develop agreed plans with defined time lines so that each Committee can work secure in the knowledge that the other is working on its allocated tasks. He believed it was essential that there be regular meetings between the Chairmen of I-GOOS and J-GOOS, in addition to communications through the GOOS Support Office.



- (ii) More decisions should be taken at meetings of the main committees (e.g., J-GOOS, I-GOOS, I-GOOS Strategy Subcommittee) based on detailed recommendations prepared by contractors, volunteers, or other agencies. At present, many years are lost due to delegation of tasks to sub-bodies which have no funds to hold meetings.
- (iii) I-GOOS and J-GOOS should explicitly delegate all implementation of GOOS to national and regional agencies dedicated to operational oceanography, and should work directly with these organizations.

14 In the ensuing discussion of these ideas, ways to tighten links between J-GOOS and I-GOOS were explored. Establishing priorities was complicated by the fact that nations are more likely to "buy in" on non climate issues, e.g., the coastal module. Recognizing that the module concept was useful politically, some members still expressed discomfort at being constrained with the existing GOOS modules framework in addressing scientific issues which often are in the purview of several modules. In practice, probably a large percentage of the individual module requirements intersect with those defined for climate. There was also concern expressed regarding the determination of which parameters are critical, since the ocean is everywhere undersampled. The chairman extracted the following key points:

- (i) There needs to be a tightening of J-GOOS - I-GOOS interactions; this requires that a mechanism be established for conducting intersessional business. This interaction should be broader than through the GOOS Support Office alone.
- (ii) The implementation of GOOS is not necessarily by means of the modules.
- (iii) Time lines for some critical actions must be set. It is particularly important to complete the analysis of the remaining three modules in 18-24 months.
- (iv) Many activities can be delegated to consultants, institutes or national groups, in addition to multinational panels and working groups.

15 Kullenberg cautioned that while the science planning may develop under a different pattern than the module framework generated by intergovernmental user needs, the eventual science plan must relate to the modules for funding and implementation.

16 Michel Glass briefed the Committee on the results of the recent meeting of the I-GOOS Strategy Subcommittee meeting held in Geneva, 27-30 April 1995. Most importantly, the meeting produced an outline (Annex V) titled "Outline of a Strategic Plan for GOOS" which lists a number of actions required to further the development of GOOS. Responsible bodies are assigned and time frames set for each action. The outline calls for J-GOOS to take action with regard to establishing appropriate module panels to further develop/design of GOOS. Glass noted that a decision was reached henceforth to refer to the "Coastal Module" rather than the "Coastal Zone Module" since it was believed that the words "Coastal Zone" had undesired connotations.

### 5.3 RELATIONSHIPS WITH GCOS

17 Angus McEwan, corresponding member of the Joint Scientific and Technical Committee (JSTC) for GCOS, reported on developments in GCOS relevant to GOOS. GCOS has entered its second triennium; its fourth meeting was held in Hamburg in September 94. JSTC structure is now well developed with a background Working Group on Socio-economic Benefits, three design panels (OOSDP, Atmospheric Observations and Terrestrial Observations) and two Task Groups (Data Systems and Space-Based Observations). Unlike GOOS, the GCOS structure does not separate implementational from planning functions.

- 18       **Space-Based Observations.** The task group has sought to prescribe user requirements according to seven specific missions which include "Ocean characteristics" and the "Ocean-Air Boundary". The group also recommended the creation of a more permanent Space Observation Panel.
- 19       **Data Systems.** The task group recommended the creation of a Data and Information Management Panel (DIMP) which was subsequently convened and met in early 1995. A report of that meeting is available from WMO (Doc WMO/TD No 673). Stress was laid on the need for a full and open data sharing policy and the use of existing systems when possible. Emerging client/server-type, distributed data-base systems are being considered by the panel, with a recommendation for existing Data Centres to make the inventory information available on Internet.
- 20       The JSTC believed that the GCOS system should be developed with flexible architecture to embrace non-climate data and it was strongly recommended that GOOS and GTOS should be represented in the planning process. Clarification of the relationship between GCOS, GOOS and GTOS Data activities was urgent and there needed to be a process for GCOS labelling of observations and products.
- 21       **Ocean Observing Systems.** Following the imminent completion of the OOSDP report and five subsidiary reports, the establishment of a follow-on Ocean Observations Panel for Climate (OOPC) was recommended but not given final endorsement. Initial business would include "oversights", prioritization of observational elements and consideration of alternative sampling strategies, and participation with DIMP in the preparation of an inventory of available ocean climate-related data.
- 22       **Terrestrial Observing and GTOS.** A GCOS/GTOS Terrestrial Observation Panel (TOP) has met. It has proposed a hierarchical system of surface observations ranging in intensity and complexity, from level I (10-50 obs. sites with sophisticated obs) to level IV (10,000 sites, simple obs.).
- 23       **Socio-Economic Benefit.** The WG met in mid 94. Main recommendations focussed on the need for sector-related value of forecasts, the methods needed for multi-annual prediction, bases of comparison and evidence of user response to new forecast products.
- 24       **National Activities and Promotion of GCOS.** The need for informational material was stressed, and in discussion the linking of GCOS, GOOS and GTOS was seen as important. A combined "top-down" (governmental) and "bottom-up" (points of scientific contact through working groups) approach was proposed. Packaged informational material on the three programmes was seen as important and an inventory of national expertise and needs would be helpful. Efforts were made by a sessional working group to draft a promotional package suitable for the FCC meeting in 1995.
- 25       **An Integrated Proposal.** An integrated proposal for GCOS and the climate parts of GOOS and GTOS was being prepared on behalf of the WCP, to be presented at a meeting of the Co-ordinating Committee for the WCP.
- 26       **Initial Operating System (IOS).** In supporting a GCOS proposal for an IOS, the WMO-EC has stressed the need to identify observing components presently contributing to GCOS as part of the IOS.
- 27       T. Spence reported that the overall GCOS Plan and plans for the data and information management, and space-based observations will be available in two months. He cited the need to stress commonalities with GOOS and the Global Terrestrial Observing System (GTOS). Spence assured the Committee that the GCOS office is anxious to participate in GOOS implementation. Resources are a problem; creative approaches will be required to fund and implement GOOS and GCOS. Advantage will have to be taken of situations where resources exist for other identified purposes that under some circumstances can be used to satisfy certain GOOS/GCOS requirements.

#### 5.4 RELATIONSHIPS WITH OTHER PROGRAMMES

28 It was suggested to the Committee that a major problem to be faced with other programmes was how to decide what is and what is not GOOS. GLOSS was cited as an example. The GLOSS network of sea level gauges was developed apart from GOOS needs to meet other specified requirements. The questions can be posed as to what part of that sea level network is required to satisfy GOOS needs and what gaps exist from a GOOS perspective.

29 It was clear that some agreed definition of GOOS-like characteristics must be developed. Some members cautioned that they be articulated in a way that allows nations flexibility in the way they contribute. After further discussion, the Committee agreed to develop a statement on the Integration of Observing Systems and Programmes as Part of GOOS. That statement is included as Annex VI. For easy reference Annex VII provides a brief description of GOOS Relationships with other International Programmes/Activities.

### 6. J-GOOS SCIENTIFIC STRATEGY

30 At J-GOOS-I it was agreed that a theme and some statement of fundamental guiding principles were needed to provide a context and underlying strategy for J-GOOS in developing GOOS. Toward this end, a document conceived at J-GOOS-I and further developed during the intersessional period by McEwan was presented to the Committee for review and endorsement. After discussion, a number of modifications were incorporated and the Committee adopted the final version provided in Annex VIII.

### 7. REVIEW OF STATUS OF GOOS PANELS

#### 7.1 OCEAN OBSERVING SYSTEM DEVELOPMENT PANEL (OOSDP)

31 Neville Smith briefed the Committee on the contents of the OOSDP Final Report. He provided some background regarding the OOSDP's decisions to take the approaches they did while rejecting other possibilities, and explained the rationale regarding the development of short term and longer term objectives and the assignment of priorities. A complete record of his presentation is included as Annex IX.

##### 7.1.1 Priority Issues

32 An extended discussion ensued ranging from questions regarding certain priority rankings specified in the Final Report, to how to make best use of the Report. The following is a distillation of the comments from the Committee regarding scientific conclusions and recommendations in the Report.

- (i) Emphasis on the global ocean circulation analysis and prediction problem that is not ENSO-related, may need to be reviewed. OOSDP gives it the lowest rank.
- (ii) The ranking of the goals needs to be periodically reviewed.
- (iii) The recommended sampling frequency and density do not always come out clearly enough.
- (iv) The lack of emphasis on monitoring throughflow (e.g., Indonesian Archipelago, ACC,) was questioned.
- (v) Water mass formation needed more emphasis.

- (vi) The ranking of the "sea level" goal and the recommended strategy was questioned from several viewpoints - is sea level useful for climate change assessment? Are *in situ* data useful? Should greater emphasis be given to altimeters?
- (vii) The overall importance attached to altimeters needs an expanded rationale.

#### 7.1.2 Design Issues

33 The following items surfaced regarding the design:

- (i) The concept and purpose of the evaluation unit called for in the report needs to be developed further.
- (ii) The evolution of the system perhaps needs greater emphasis.
- (iii) The CLIVAR partnership needs attention.
- (iv) The "Applications" need to be explained better, particularly the "Ocean Climate Assessment" application.
- (v) The interface to users and their needs (c.f. scientific objectives) needs further attention; perhaps it should be included explicitly in the follow-on group terms of reference.

#### 7.1.3 OOSDP Follow-On

34 It was concluded that the OOSDP report could serve a multiplicity of purposes. It contains many recommendations on which there exists unanimity. Spence indicated that GCOS was pressing ahead with these and he hoped that J-GOOS, I-GOOS and the JSTC could move ahead jointly with elements on which agreement exists. The Report's use as a basis for a public debate to stimulate interest in the merits of an ocean climate observing system was also suggested. The need for a follow-on Panel, the OOPC, was also deliberated. Both the JSTC for GCOS and the Joint Scientific Committee (JSC) for the World Climate research Programme (WCRP) had indicated their readiness to co-sponsor such a Panel with J-GOOS. Following discussion on these topics, the following decisions were reached:

- (i) J-GOOS will consider organizing a 3 or 4-day meeting as soon as possible of about 50 participants (to include representatives from the science and managerial sector) in 1996 on the climate module. A preliminary proposal for such a meeting is included as Annex X. Woods, with assistance from Smith, was named as the responsible individual for moving this forward.
- (ii) J-GOOS officially accepted the OOSDP Final Report and thanked the OOSDP for its meritorious efforts. **The Committee agreed** to forward it to I-GOOS with its endorsement and invite comment.
- (iii) A joint J-GOOS-WCRP-JSTC Panel to follow on the OOSDP will be established. The terms of reference, members and mode of co-sponsor support were to be negotiated by Marton-Lefevre (assisted by Brown and Smith) with the WCRP and the JSTC. Woods agreed to draft a one-year work plan to be considered for this new Panel. It was agreed that the Committee's comments summarized above would be brought to the attention of the follow-on panel.

#### 7.2 HEALTH OF THE OCEAN (HOTO) *AD HOC* PANEL

35 Neil Andersen briefed the Committee on the status of the HOTO Panel and on the progress of the design document. A hoped-for March 1995 meeting at which the document would be finalized did not

occur. That meeting was rescheduled for the fall of 1995 in Bangkok where a pilot project will also be planned with four Global Environment Fund (GEF) projects and the next phase of the IOC-UNEP International Mussel Watch Project. Some anticipated changes for the final draft include:

- (i) adding algae to the list of analyses; (Recent advice from medical science reviewers prompted this change; algae changes are related to human health, e.g., cholera, and climate change.)
- (ii) broaden the focus on damage assessment to consider predictability of damage as well.

36 The Committee found this module to be in an advanced state of development and expressed its appreciation for the efforts of chairman Neil Andersen and his *ad hoc* Panel in generating the prospectus for a GOOS Health of the Ocean module.

37 Questions arose regarding the relation of this module to others. Most ocean health issues are coastal, but the coastal ocean module has yet to be defined. Similarly, an important category being considered in the HOTO Module is seafood which in some manner might also be addressed by the LMR module.

38 One important aspect of ocean health consideration missing from the present description of this module is the relevant physics of the system. The distribution of a pollutant, for example, whether discharged from land or released at sea, will, prior to biological incorporation, be determined by the forces of physical dispersion. Clearly, any assessment of ocean health risks must include serious consideration of how local circulation influences the dispersion and dilution of chemical and biological agents that impair function of marine organisms and otherwise diminish quality of the marine environment for the uses of humanity. The assumption in the draft plan is that some of HOTO's basic measurement requirements (e.g., currents, temperature, salinity, etc.) are expected to be made in other modules to describe the physics. **The Committee, however, advised** that the HOTO Panel be quite specific about its observational needs from the other modules.

39 As the *ad hoc* HOTO Panel finalizes its report the Committee recommended that the Panel develop specific recommendations to both the LMR and Coastal Ocean groups as to both needs and expectations that the HOTO team can identify for these other modules.

40 Within HOTO an obvious area of research requirement that needs more emphasis is that of single or interactive effects of various marine pollutants. The identification of multiple levels of effects (sub-organismal to communities) helps greatly in focusing operational requirements at the appropriate level. However, the requisite understanding that decision makers will need in order to make informed decisions regarding the consequences of anthropogenic activities with potential to influence the health of the ocean is at present grossly inadequate. Thus it was strongly recommended that the HOTO document give greater attention to the research needs in this area, with as much specificity as possible.

41 In a related aspect, an example in the current HOTO document that borders on over-promise (on page 5 of the draft report) is the statement that initial emphasis will be on the "development of a set of *reliable, relatively easily applicable*, (italics emphasis added) biological distress indices of health in the marine environment". This is an understandably important aspect of an operational capability related to the health of the ocean. However, there is little guidance provided to indicate how this development might proceed. What might be an appropriate group to oversee this development? Clearly, this is also an area where research is needed in order to provide an operational capability to governments with interests in the health of the oceans.

42 A general comment relates to the need for bench marks to assess progress on the various tasks recommended for full implementation of the HOTO module. How is progress to be assessed?

43 Another question raised relates to the role of viruses in the health of the oceans. With respect to viruses that effect other marine organism, this is probably covered, but human pathogens in general will be considered in the near future and appropriately represented in the final draft describing a HOTO module.

44 While it is understood that the most of the ocean health issues are in near shore regions, might this change in a generic way with global scale climate alterations? Specifically, might diminished ventilation of the thermocline lead to greater rates of oxygen depletion in the deep ocean? This is a complex issue, and although beyond the present scope of HOTO, it is appropriate for J-GOOS to consider health of the ocean in the broader context of climate change.

45 An operational capability relating to the health of the ocean will require broad access to relevant data, such as those pertaining to the effects of particular agents alone or in combination with others on the multiple levels of ecosystem effects. It is in the best interest of all nations to freely exchange such data to ensure that the results of all research relevant to this topic are utilized efficiently.

46 **The Committee welcomed** the HOTO Panel as a Sub-Panel operating under J-GOOS and expressed appreciation for the willingness of the chair of the HOTO Panel to finalize their report, with input from the Committee. Furthermore, given the specificity of recommendations provided by the HOTO Panel and the urgency of several of these, the Committee agreed that it would be highly appropriate to forward these recommendations to I-GOOS as soon as possible for immediate consideration and action. The recommendations are contained in Annex XI.

47 **The Committee reviewed** the current terms of reference for the *ad hoc* Panel and modified the second term (page 4 of the draft report) to read: "Maintain liaison with research *and monitoring* activities....." The Committee expects to revisit the matter of continuation of the HOTO Panel next year.

### 7.3 LIVING MARINE RESOURCES (LMR) MODULE

48 The preliminary report of the Living Marine Resources working group had not developed beyond the draft examined by J-GOOS a year ago. The working group charged with developing this report has met only once, and no plans are in place for a subsequent meeting.

49 While some living marine resources exist in the open seas for part or all of their life cycle, the domain of most relevance to this topic is the coastal ocean. Hence this module has considerable potential overlap with the coastal ocean module. The distribution of marine organisms and the distribution and the nutritional quality of their food are strongly influenced by ocean physics. Upwelling, onshore, offshore, and along shore currents, eddies, etc., help to determine the quantity and quality of local biological production. Success of this module will require an effective state-of-the-art approach to coastal ocean circulation.

50 Many reservations were raised regarding the proposed stock assessment aspects of this module. It was not clear as to what GOOS could bring to existing national and international efforts of this sort that are already in place. Although FAO has been uninvolved in the development of this module to date, they are apparently interested in becoming so, and members of the J-GOOS committee thought that it might be best to leave stock assessment to FAO and other bodies with existing responsibilities in this area.

51 Concern was expressed by several members of the J-GOOS Committee regarding the value of business-as-usual sampling of the coastal ocean for the purpose of understanding controls on recruitment and abundance of coastal species of commercial interest. The role of routine plankton surveys, such as those deploying the Continuous Plankton Recorder was discussed. While this information had value, it alone, even if deployed far more extensively than at present, is unlikely to provide sufficient insight into factors that give rise to fluctuations in the abundance of adults in species to which society attaches

particular value. Given inherent time scales of biological processes in the plankton, and time and space scales of the relevant physics, the density of sampling in both time and space could probably never be sufficient to seriously avoid aliasing of the data.

52 The widespread failure in management of commercially valuable marine species has resulted in part from the inadequacy of methodology needed by decision makers responsible for protecting living marine resources. Hence it is improbable that recommendations for an operational development of these traditional methods under the aegis of GOOS will enhance sustainability of living marine resources.

53 J-GOOS recommendations relating to the maintenance of living marine resources must rest on a solid scientific underpinning, and quite clearly, current approaches have serious shortcomings. However, developments of the last decade in continuous *in situ* sampling methods and remote sensing of key environmental variables, and successes in the modeling of plankton ecosystem dynamics and data assimilation techniques offer sound reason to be optimistic that emerging capabilities may have widespread applicability in the management of living marine resources.

54 J-GOOS has received offers from both SCOR and the IOC to assist through the planning structure of GLOBEC in assessing prospects for GOOS contributions to the LMR module. Recognizing that the community promoting the science of GLOBEC includes biologists and physicists who have given serious consideration to the development and integration of the new approaches mentioned above, the J-GOOS Committee will invite GLOBEC to join it in organizing a workshop to further examine direction for an LMR GOOS module. The anticipated product of this meeting is a document that assesses the potential of present and anticipated future research to bring a new level of sophistication to the study of marine ecosystem dynamics with potential of operational capability relating to living marine resources.

55 The Committee produced a set of guidelines and specific tasks for a four-day workshop of approximately 25 invited experts to be held in the spring of 1996. These guidelines are given in Annex XII. McCarthy, Holland, and Woods agreed to be the responsible J-GOOS individuals for organization of this workshop.

#### 7.4 COASTAL MODULE

56 The coastal module should have a high if not the highest priority. The most immediate and pressing marine problems of nations are coastal. The Coastal Module is likely to share many of the scientific objectives of the IGBP LOICZ programme. Moreover implementation of this module is also likely to follow the LOICZ plan involving Regional Seas for which co-ordination frameworks are often already in existence (e.g., EUROGOOS, NEARGOOS ). Note, however, that the LOICZ group recognizes the existence of serious gaps in coverage in tropical regions. The tropical region will need to receive special attention if global budgets are to be obtained.

57 The Committee discussion focussed on several of the unique aspects of coastal monitoring, modelling and user needs. It was pointed out that a coastal module could be justified on the basis of the different monitoring technologies (e.g., remote sensing aircraft, coastal radars, etc.) employed in the coastal seas as opposed to the open ocean. Further, coastal seas have boundary currents that are not resolved in global coupled models. The variability of these boundary currents critically affect many biological, chemical and physical processes important to coastal nations. The boundaries of the coastal module must extend beyond the shelf edge to resolve these processes - LOICZ also extends to this limit.

Considering that there will be a HOTO Panel and an LMR Panel focussing on chemistry and biology, the Coastal Module could emphasize physics and sedimentology while providing a means for integrating the overarching coastal issues shared with the other modules. However, since much of the in-situ and remote sensing instrumentation is specifically designed for multi-disciplinary applications these foci must accommodate overlapping interests.

58 The Committee had two sets of terms of reference before it for a Coastal Module, one drafted by a J-GOOS subgroup and one offered by I-GOOS. After extended discussion on the implications of the many interactions of this module with the others, the Committee decided to establish an *ad hoc* Panel, with a duration of two years, to define the scientific and technical components of a Coastal Module. The terms of reference adopted by J-GOOS for this Panel (see Annex XIII) take into account the interests of I-GOOS. **The Committee further decided** to organize a workshop in early 1997 (to precede J-GOOS IV ) to examine issues to be considered in developing the coastal aspects of GOOS. The meeting would be structured around a number of commissioned papers which would address generic questions identified by J-GOOS. The draft outline for this workshop is included as Annex XIV. Membership of the ad-hoc group to organize this workshop is: D. Prandle, Jilan Su, P. Holligan (LOICZ).

## 7.5 OCEAN AND MARINE METEOROLOGICAL SERVICES MODULE

59 The Services module was considered by the J-GOOS as a support component to all the modules. It was noted that modeling advancements (e.g., data assimilation in near real time) being developed by the existing services activities can be profitably used in models to be developed for the other modules. After debating the mechanisms through which J-GOOS could best provide guidance and advice for the enhancement of GOOS services, the Committee decided to establish an *ad hoc* panel to assist it in identifying scientific problems ranging from data acquisition to product delivery that are common to all the GOOS models. Annex XV contains the terms of reference for this *ad hoc* Services Module Panel. **The Committee noted** that I-GOOS was appointing a rapporteur on services, to review and summarize existing metocean services and identify requirements, deficiencies and trends. It was agreed that the *ad hoc* Panel should liaise closely with this rapporteur in its work.

## 7.6 POTENTIAL NEED FOR OTHER CROSS-CUTTING MODULES

### 7.6.1 Modelling Issues

60 GOOS modeling development was seen as one cross-cutting activity where J-GOOS would be expected to play a role. Though there are many numerical modelling groups, it is not clear that major GOOS problems such as how to work out the coupling between the regional/coastal and global perspectives are being adequately addressed. **The Committee decided** to commission a paper that would define the landscape of GOOS modelling needs and serve as the basis for a study conference to be scheduled later. A specification will be written for this paper that will serve as a model for other cross-cutting issues. McCarthy, Woods and Brown agreed to develop this specification.

### 7.6.2 Satellite Issues

61 Satellite remote sensing was also considered as an important cross-cutting topic. Lefebvre informed the Committee about actions underway in the space agencies. He cautioned that while the OOSDP report assumes that the ocean observing system will depend on satellites for global coverage, it cannot be taken as a given that they will in fact eventuate. The continual weeding out process that space agencies employ in setting launch priorities demands that the ocean community assert itself in the process and be a constant and strong advocate for the spaceborne systems that will be required.

62 At this stage it is necessary to address some major issues. Currently, one plan under consideration is the development of a series of satellites that will satisfy some initial GOOS requirements. The space part of GOOS cannot rely only on satellites of opportunity to meet operational requirements. Dedicated platforms must be planned and scheduled and J-GOOS has to clearly specify scientific requirements in terms of continuity, sampling, accuracy and intercomparability of measurements, data access, etc. This information has to be provided now for systems expected to be operational several years downstream. Indeed, there is a usual delay between decision and launching of a satellite of 5 to 10 years. The decision process is an ongoing one at the space agencies.



63 As one example of urgency, the decision will be taken this year on the TOPEX/POSEIDON follow-on, an important component to GOOS. The European Space Agency (ESA) have ongoing procedures for decisions on the METOP project and on follow-on ERS and ENVISAT satellites. Also under discussion is reconfiguration of the USA's EOS Programme. Other satellite projects are undergoing the approval process in Japan.

64 An important design matter needing to be addressed in greater depth is the real complementarity of space observations and *in situ* measurements. **The Committee agreed** this subject should be put on the agenda for the planned meeting of the review of the OOSDP Report (see Section 7.1.3 (i)). A major effort is needed to assimilate, through appropriate models, classical data and satellite data in order to quantify their real impact and then to define the systems to be implemented for operational observations.

65 It was agreed that J-GOOS should liaise closely with the GCOS task group on space-based observations (see section 5.3) and with the space agencies' Committee on Earth Observation Satellites (CEOS). In this regard, J-GOOS mandated Lefevbre to monitor satellite developments on behalf of J-GOOS, represent J-GOOS at various satellite planning meetings and propose a course of action for J-GOOS at its next meeting.

## 7.7 REPORTING CHANNELS FOR MODULE PANELS

66 The matter of optimum reporting channels and official parentage for the Panels being established was briefly discussed. It was concluded this could best be explored and sorted out intersessionally by Marton-Lefevre in discussions with representatives from IGBP, GCOS, WCRP, I-GOOS, etc., as appropriate.

## 8. J-GOOS ADMINISTRATIVE CONSIDERATIONS

67 **The Committee agreed** it would meet routinely at least once a year and provide for an executive council to conduct intersessional business. It was further agreed that replacement of members on the Committee would be accomplished via a rotational scheme that retired and replaced one-third of the membership each year after the initial terms of the present members expired. Replacement selections should aim to achieve balanced representation of disciplines. It was recognized that biologists, chemists, and modelers were underrepresented at present.

## 9. SUMMARY OF ASSIGNMENTS

68 The chairman reviewed the action items that the Committee had decided on and reminded the individuals who were tapped for taking the lead on them. These are recapitulated below.

Action Item	Responsible Person(s)
(i) Workshop to Examine Direction for LMR Module (with GLOBEC)	McCarthy (lead) assisted by Holland and Woods
(ii) HOTO Follow-on	Neil Andersen
(iii) Ocean Services Module Definition	Flemming, CMM Nominee by Dexter, IODE/IGOSS person, I-GOOS Rapporteur
(iv) Coastal Module Definition	Prandle

	<b>Action Item</b>	<b>Responsible Person(s)</b>
(v)	OOSDP Workshop	Woods (lead) assisted by Smith
(vi)	Recommendations to I-GOOS	Glass
(vii)	Strategy Document	McEwan
(viii)	GOOS Office Support	Kullenberg, Alexiou
(ix)	Report to Sponsors	Brown
(x)	Establish OOPC	Marton-Lefevre assisted by Smith
(xi)	Organize a Workshop to Formulate Implementation Plan for the Coastal Module	Prandle (lead) Su, Holligan (LOICZ)
(xii)	Represent J-GOOS at various satellite planning fora	Lefevbre
(xiii)	Integration of Existing Observing Systems into GOOS	Flemming (lead) McEwan and Rebert
(xiv)	Draft spec for commissioning paper on GOOS modelling needs	Woods (lead) Brown and McCarthy

#### **10. DATE AND PLACE FOR NEXT MEETING**

69           The Committee agreed to set the date for a three-day JGOOS-III meeting during the week of 21 April, tentatively in Paris.

## ANNEX I

### AGENDA

1. OPENING
2. REVIEW AND ADOPTION OF THE AGENDA
3. APPROVAL OF THE REPORT OF J-GOOS-I
4. REVIEW OF CURRENT GOOS STRUCTURE AND SUPPORT
5. RELATIONSHIPS WITH OTHER ACTIVITIES
  - 5.1 Relationships with the Sponsors
  - 5.2 Relationships with I-GOOS
  - 5.3 Relationships with GCOS
  - 5.4 Relationships with Other Programs
6. J-GOOS SCIENTIFIC STRATEGY
7. REVIEW OF STATUS OF GOOS PANELS
  - 7.1 Ocean Observing System Development Panel (OOSDP)
  - 7.2 Health of the Ocean (HOTO) ad hoc Panel
  - 7.3 Marine Living Resources (LMR) Module
  - 7.4 Coastal Module
  - 7.5 Ocean and Marine Meteorological Services Module
  - 7.6 Potential Need for Other Cross-Cutting Modules
  - 7.7 Reporting Channels for Modules
8. J-GOOS ADMINISTRATIVE CONSIDERATIONS
9. SUMMARY OF ASSIGNMENTS
10. DATE AND PLACE FOR NEXT MEETING

ANNEX II

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ANNEX III

**MEMORANDUM OF UNDERSTANDING BETWEEN THE  
INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION,  
THE WORLD METEOROLOGICAL ORGANIZATION AND THE  
INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS  
ON THE CO-SPONSORSHIP OF THE  
JOINT GOOS SCIENTIFIC AND TECHNICAL COMMITTEE**

The Intergovernmental Oceanographic Commission (IOC), the World Meteorological Organization (WMO) and the International Council of Scientific Unions (ICSU),

Recognizing the initiative of the IOC to create an operational Global Ocean Observing System (GOOS) for the purpose of collecting comprehensive information on the properties and variability of the Earth's ocean system; for assisting in the detection of climate change and assessing its impact; to provide a basis for the development of national and international policies for resource management, coastal development and management; for assessing and preserving the health of the ocean; and for promoting related capacity building and ocean science and its application,

Considering that the required information and interpretation will involve data from activities designed specifically for GOOS, as well as from existing operational oceanographic and meteorological programmes, and data, observations and understanding from a variety of research programmes, and that the GOOS will collaborate with the Global Climate Observing System (GCOS) in the definition and the implementation of the ocean-related component of the GCOS, as provided for in the Memorandum of Understanding which set up the GCOS, signed by WMO, IOC, ICSU and UNEP,

Recalling that the mandate of ICSU is to foster international co-operation in scientific research and the application of scientific knowledge to improving our understanding and stewardship of the global environment, and that the special responsibilities of IOC and WMO include encouraging the co-operative action of governments in all matters dealing with the ocean and atmosphere,

Agree to co-operate in the scientifically based design and planning phase of the Global Ocean Observing System for the following reasons:

- (i) the planning effort requires the full involvement of the scientific community as represented by both intergovernmental and non-governmental organizations, such as the IOC, WMO and ICSU,
- (ii) the design and testing process will result in broadly applicable scientific and technical advances,
- (iii) the prospect that when GOOS becomes operational it will provide data that will also advance our scientific understanding of the ocean and enhance the data sets being acquired by the on-going and planned research programmes such as those of IOC, IGBP, WCRP and SCOR,
- (iv) the ocean data set to be provided by GOOS is a valuable component of that required for the GCOS,
- (v) there will be important benefits from GOOS for a wide range of marine activities including fisheries, coastal seas management, shipping, off-shore mining and waste disposal.

Agree, therefore, that the proposal to establish a GOOS Technical and Scientific Advisory Panel (Resolution IOC XXV.3) shall be implemented jointly by IOC, WMO and ICSU by establishing a Joint GOOS Scientific and Technical Committee (J-GOOS) which shall operate in accordance with the following principles:

- (i) The IOC-WMO Intergovernmental Committee for GOOS (I-GOOS) is the recognized forum for discussion between governments of the nations participating in GOOS, for the commitment of resources for GOOS implementation and related oversight.
- (ii) The J-GOOS will be recognized as the primary international body responsible for the scientifically based design and planning phases and testing of GOOS, and related oversight.
- (iii) The initial sponsors of J-GOOS should be IOC, WMO and ICSU. The Scientific Committee on Oceanic Research of ICSU, being the principal ICSU body responsible for matters relating to ocean research, and, at the same time, the principal Scientific Advisory Body to the IOC, shall be involved in the scientifically based design and planning for GOOS.
- (iv) The Executive Heads of IOC, WMO and ICSU after consultation with the appropriate Members of their organizations and in accordance with the procedures outlined in the Annex to this Memorandum, shall jointly:
  - (a) Appoint the Chairman and members of J-GOOS,
  - (b) Arrange for the expansion of the existing GOOS Support Office located within the IOC Secretariat to include a J-GOOS Director and staff,
  - (c) Arrange for the necessary financial support for J-GOOS and its support staff in accordance with the provisions of Section 7 of the Annex to this Memorandum,
  - (d) Ensure the development of an appropriate mechanism for the co-ordination of I-GOOS and J-GOOS activities, and taking into account the financial support, staff, etc. made available by the sponsoring organizations of the two bodies.

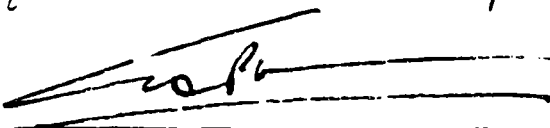
This Memorandum of Understanding shall come into effect on the **First day of September, 1993** and may be reviewed at any time at the request of one of the parties. Otherwise, it shall continue for a period of five years or until all parties agree that it should be terminated.

Other international partners in GOOS may become co-sponsors of J-GOOS with the agreement of the initial parties to this Memorandum.

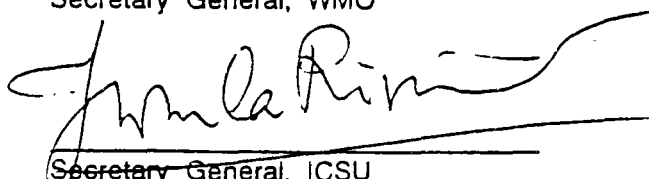
Signed:

 19/8/93  
Secretary, IOC

Signed:

 3/9/93  
Secretary General, WMO

Signed:

 15/9/93  
Secretary General, ICSU



ANNEX A

TERMS OF REFERENCE, STRUCTURE, FUNCTIONS AND FINANCIAL ARRANGEMENTS  
FOR THE JOINT SCIENTIFIC AND TECHNICAL COMMITTEE FOR THE GLOBAL OCEAN  
OBSERVING SYSTEM AND ITS SUPPORT STAFF

1. TERMS OF REFERENCE

1.1 The Joint GOOS Scientific and Technical Committee (J-GOOS) shall:

- (a) be responsible for all the scientific and technical aspects of GOOS design, and undertake appropriate activities to support the design process,
- (b) instruct the Director of J-GOOS support staff in the duties to be performed by the J-GOOS support staff,
- (c) report to the sponsoring organizations at least once a year.

1.2 Specifically, the J-GOOS will:

- (a) establish, after consultation with its sponsoring organizations, required subordinate bodies,
- (b) identify observational requirements ("user needs") and products in co-operation with I-GOOS; define design objectives; and recommend co-ordinated actions by the sponsoring organizations and other relevant organizations and agencies,
- (c) advise the Intergovernmental Committee for GOOS (I-GOOS) on all scientific and technical aspects of GOOS, and take into account the proposals of I-GOOS as they have implications for scientific and technical planning for GOOS,
- (d) collaborate with the Joint WMO-IOC-ICSU-UNEP Scientific and Technical Committee for GCOS, and its Joint Planning Office, and other appropriate bodies,
- (e) review and assess the progressive development and implementation of components of GOOS,
- (f) identify and encourage research efforts, in close co-operation with the on-going research programmes (IGBP and WCRP) in order to promote studies of importance for the development of GOOS,
- (g) encourage the development of new technologies needed for GOOS.

2. MEMBERSHIP

2.1 J-GOOS should contain up to twelve Ordinary Members who will be scientific and technical experts, selected on the basis of their personal expertise, so as to provide a balanced representation of the major scientific and technical disciplines and of the major operational and research programmes contributing to GOOS.

2.2 The Ordinary Members of J-GOOS will be appointed jointly by the heads of its sponsoring organizations.

2.3 Each of the sponsoring organizations shall appoint two representative members to the J-GOOS. The Chairmen of the subordinate bodies set up by J-GOOS shall also be members of J-GOOS. The Chairman of the JSTC for GCOS will be invited to appoint a member of J-GOOS.

2.4 The members of J-GOOS will be appointed for an initial period of three years and may be invited to serve an additional term of two years, but shall not normally serve for more than five successive years. The membership will be reviewed by the sponsors of J-GOOS after every two years. Membership shall be rotated in a manner which will ensure continuity as well as an influx of new members.

### 3. OFFICERS

3.1 The Officers of J-GOOS shall be its Chairman and a Vice-Chairman, selected by the sponsoring organizations after consultation with relevant bodies and appointed for an initial period of three years and may be invited to serve an additional two years.

3.2 The duties of the Chairman of J-GOOS, in close consultation with the Vice-Chairman, shall be:

- (a) to preside over sessions of J-GOOS,
- (b) to conduct the business of the J-GOOS between its sessions, in consultation with its Vice-Chairman, other members of J-GOOS as needed, the J-GOOS support staff Director (see below) and with its sponsors and other international organizations as appropriate,
- (c) to ensure regular communication and co-ordination with the Chairman and support staff Director of the I-GOOS,
- (d) to be responsible for the editorial control of all scientific and technical reports prepared on behalf of J-GOOS,
- (e) to prepare an annual report on GOOS planning activities including the recommendations of J-GOOS for presentation to the sponsoring organizations, to I-GOOS and to the JSTC for GCOS.

3.3 The Vice-Chairman shall assist the Chairman as needed and shall assume the responsibilities of the Chairman should the need arise.

### 4. MEETINGS

4.1 The J-GOOS shall meet at least annually, the venue and dates to be established by the Committee.

4.2 The Director of J-GOOS support staff shall make the necessary practical arrangements for the meetings of the Committee and of its subordinate bodies and shall inform the Committee members, the sponsoring organizations and other participating organizations and agencies accordingly.

4.3 The attendance of representatives of sponsoring organizations at J-GOOS meetings shall be charged to the organizations concerned. Representatives of other relevant organizations and agencies may be invited by the Chairman, in consultation with the sponsoring organizations, to attend J-GOOS meetings as observers at the expense of the organizations concerned.

4.4 Individual experts may be invited by the Chairman to participate in meetings of J-GOOS as needed. The sponsoring organizations should be informed of such decisions which should be of an occasional nature.

### 5. SUBSIDIARY BODIES

5.1 The J-GOOS shall be authorized to establish panels, working groups and to engage consultants, etc. within the scope of its responsibilities. It should do this in consultation with its sponsoring organizations, taking into account the existing technical and scientific groups established by these organizations and the budget available for the work of the Committee.

5.2 Such groups should normally be appointed for a period not to exceed four years and the progress of each J-GOOS subsidiary body should be carefully reviewed by the Committee every two years.

## 6. J-GOOS SUPPORT STAFF

6.1 The existing GOOS Support Office located at the IOC Secretariat shall be expanded to assist in the development of the scientifically and technically-based plans for GOOS, to provide staff support to the Committee and its Officers and to facilitate co-ordination with the I-GOOS, the I-GOOS staff, and with the GCOS Planning Staff.

6.2 A Director of J-GOOS shall be appointed by the sponsoring organizations in agreement with the Officers of J-GOOS.

6.3 The Director and staff of the J-GOOS shall not be assigned duties outside the objectives of J-GOOS without the specific approval of the co-sponsoring organizations.

6.4 The Director will be responsible to the Officers of J-GOOS, acting on behalf of the sponsoring organizations.

6.5 The J-GOOS support staff, under the responsibility of its Director, shall be charged with:

- (a) assisting the J-GOOS in preparing scientifically and technically-based plans for the development of GOOS,
- (b) providing staff support to the J-GOOS and its Officers and to the subsidiary bodies established by the Committee,
- (c) maintaining liaison with the sponsoring organizations and other relevant bodies,
- (d) maintaining liaison with the I-GOOS and its support staff,
- (e) making arrangements for scientifically and technically-based planning and related co-ordination activities,
- (f) the preparation of annual budgets for J-GOOS activities for approval by the Officers of J-GOOS and the sponsoring organizations and for regular reporting on the use of funds made available to the J-GOOS in accordance with the provisions of section 7 of this Annex.

6.6 The continuity of these arrangements and of the necessary financial support for the J-GOOS support staff and planning activities shall be reviewed periodically by the sponsoring organizations and the Officers of J-GOOS.

## 7. FINANCIAL AND OTHER ARRANGEMENTS FOR J-GOOS SUPPORT

7.1 The planning activities of, and support staff for, J-GOOS will be financed through earmarked budgetary allocations to the IOC Trust Fund from the sponsoring organizations, supporting nations and participating organizations and agencies.

7.2 These entities may also make contributions in kind to J-GOOS, such as secondment of staff, provision of facilities and support for meetings, publications, etc.

7.3 Should the activities of J-GOOS be terminated, the balance of the related contributions to the IOC Trust Fund, after all financial commitments are settled, shall be shared between the sponsoring organizations and other donors to the Fund in proportion to their respective contributions to it, for the last accounting period.

Excerpts from Notes of Clarification agreed to on MOU among sponsors (July 1994)

**GOOS Reporting**

It was agreed that the reports from I-GOOS and J-GOOS would be bound together in a single annual volume with an introductory section giving a summary of overall GOOS development, as well as interactions between the two bodies. This could be prepared by the Director of the GOOS Support Office.

**GOOS Sponsors**

It was agreed that all of the organizations presently sponsoring either I-GOOS or J-GOOS could be deemed to be sponsors of GOOS. The intergovernmental bodies (IOC, WMO and UNEP) would be more particularly involved in the preparations for I-GOOS, and UNEP would be invited to join in the sponsorship of J-GOOS.

**MOU**

It was agreed that no amendment to the Memorandum of Understanding signed by IOC, ICSU and WMO for the J-GOOS needs to be made. However, the following clarifications were agreed to:

- under Terms of Reference, paragraph 1.2 (c) the term "take into account" shall be interpreted to mean consider and act upon";
- add to the Membership (Annex A, Section 2.3): the Chairman of I-GOOS shall be an ex officio member.

**Relationship between I-GOOS and J-GOOS**

It was agreed that Figure 1 on the Conceptual GOOS Internal Structure found on page 3 of the Executive Summary of the First Planning Session of the I-GOOS (IOC/EC-XXVII/12, 16 May), before being used again, will be corrected to accurately reflect the MOU in the following respects:

- the word Policy to be replaced by "Science and policy proposals";
- the position of the I-GOOS and J-GOOS boxes should be aligned horizontally and linked by a two-directional arrow.

**Secretariat**

It was agreed that all the GOOS sponsors would request the Director-General of UNESCO to provide a D-1 post for the Director of the GOOS Support Office.

In addition, the IOC Secretary was asked to ensure that the staff of the GOOS Support Office could be dedicated solely to GOOS with no commitment to serve other IOC or UNESCO objectives.

It was further agreed that for the time being, two other professional posts would be required for the GOOS Support Office at P-4 level, one to service I-GOOS and the other for J-GOOS. These may be filled by staff seconded from Member States. The need for supporting staff (GS) was also noted.

All staff appointments (including secondments) in the dedicated GOOS Support Office shall be approved by the sponsors.

**Interim arrangements**

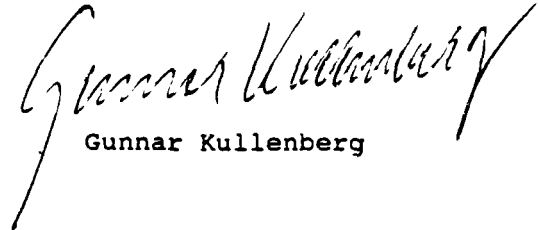
Until the recruitment of a UNESCO-funded GOOS Support Staff Director takes place, a secondment for this position should be considered and the French offer pursued, in consultation with the sponsors.

Until the full GOOS Support staff is appointed, the present staff is expected to carry on with the routine work related to GOOS.

ICSU will provide support for the organization of the second J-GOOS meeting which will take place at the ICSU Secretariat in February 1995.

WMO will provide organizational help for the second I-GOOS meeting to take place at UNESCO in June 1995.

Yours sincerely,

A handwritten signature in cursive script, reading "Gunnar Kullenberg". The signature is written in dark ink and is positioned above the printed name.

Gunnar Kullenberg

## ANNEX IV

### LINKS BETWEEN I-GOOS and J-GOOS

(Presentation by N.C. Flemming)

I-GOOS and J-GOOS have reciprocal and complementary responsibilities and contributions to make to GOOS. With little care there is no risk of duplication, and all the tasks allocated so far to the two bodies are necessary. The principal dangers are:

- Excessive complexity. Quoting Angus McEwan in 2/7.1: "The multi-faceted maze".
- Delays, postponements and multiple buck-passing, arising from this: "Hall of Mirrors"
- Concentration on political level discussion, not executive action and management
- Lack of recognition of the serious load of management and co-ordination in GOOS
- Lack of mechanisms for that management and co-ordination, which should probably be at national or multi-national delegated or regional levels.
- Loss of credibility through delay and failure to support apparent and inevitable trends.

#### OHP 1.

**Comments:** This graphic is fine, in that the actions and responsibilities are all important, and need doing. However, if the subsidiary bodies only meet once or twice per year, or work slowly by correspondence and e-mail, or even worse, cannot be funded at all, then this is a recipe for inaction. We identify serious actions which need to be taken: create a subsidiary body to do it; and then do not provide the body with resources. This is a formula for complete indecision. If we recognise this, we either have to take key decisions in the main body meetings, or delegate to bodies which are not under the direct control of the Sponsor Agencies. I will discuss these options later.

I have added some major activities at the bottom of the OHP. . It is frequently said that GOOS will be implemented by Member States, but we are tending to ignore that this itself will need organisations and mechanisms. These mechanisms will probably be worked out at national and regional level by the most active oceanographic states, and the Sponsor Agencies should recognise this, and wrk out how to relate to that part of the system which is not directly controlled by the Sponsors.

I am raising this point first, because I think that some of the problems of managing the roles of I-GOOS and J-GOOS, and identifying what needs to be done by each of them, is because we have tended to try and do everything within the two Committees, and over-loaded ourselves with activities which we know cannot be funded or carried out.

I will consider the strong points for action of each Committee, and the actions which probably cannot be carried out.

OHP.2.Actions suitable for I-GOOS.

OHP.3.More actions suitable for I-GOOS

OHP.4.Things which I-GOOS cannot do.

OHP. 5.Things which J-GOOS can do

OHP 6.More things which J-GOOS can do.

OHP.7. Things which J-GOOS cannot do.

OHP.8. Comparison of responsibilities and abilities.

There must be an agreed schedule of what is going to be done first, multiple tasks in parallel, and some benchmarks or time deadlines. If we need extra funds to be able to do the work, then at least having the deadline is an aid to getting funds. It is not credible to seek for funds for a job to be done at a totally unspecified date., or not at all

## PROPOSALS/ CONCLUSIONS

### a) Genereal relations: I-GOOS to J-GOOS.

There should be a mechanism for I-GOOS and J-GOOS to agree on parallel priorities, so that J-GOOS can proceed with its key tasks, knowing that I-GOOS is proceeding with a relevant set of complementary tasks. Between major meetings this might be achieved by correspondence between the Chairmen of I-GOOS and J-GOOS, with the Director of the Support Office.

If the progress of I-GOOS and J-GOOS can be completely de-coupled, so that they do not depend upon each others' progress, then that needs to be established. It is very unlikely. If they are connected, then J-GOOS and I-GOOS should confirm what they expect each other to do, and by when. If possible.

### b) Take more decisions in plenary

This sounds impossible, but I think there is a way out. The approach must be to prepare documents much more fully in advance, and present major meetings with yes-or-no choices between well-developed actions. The preparation of such documents is perhaps what subsidiary bodies would normally do, but in the present circumstances it should be carried out by the Support Office, or by volunteer sub-contractors. That is to say, a mechanism must be found to allow very small numbers of specialists to work on these problems without incurring the massive overhead of fully balanced international meetings of workshops, groups of experts etc. The democratic control required by the Members is achieved when the documents are vetted, discussed, and approved at meetings of I-GOOS, or J-GOOS. Large research institutions, or bodies such as OECD, the CEC, etc, might take on or fund some of the work.

### c) Avoid complexity

Stick with the structure we have got. Don't create too many permanent subsidiary bodies. Work with ad hoc panels and self-destruct WGs. Delegate and sub-contract as much as possible, task by task. Use the existing system. Plunder the existing UN Agency committees and sub-committees for material and expertise. Or learn from commercial contractors and existing operational services like Met Offices.

### d) Delegate or sub-contract.

The options for delegating or sub-contracting the preparation of decisions and actions:

Delegate drafting of documents for decisions to:

Other existing UN agency or ICSU bodies. *+ secondment*

National or regional agencies as sub-contractors, unpaid.

Specialist bodies such as OECD, NASA, ESA, CEC-DGs, etc., *NASA, WOCE, TOGA, CLIVAR*

Commercial consultants and contractors, if finance is available.

Delegation of actions and implementation of GOOS.

National operational agencies

Regional operational agencies

Subsidiary regions of GOOS

Commercial operators who are gathering the data for other reasons

Major global or regional science programmes

**d) Learn from what is happening at the national, regional, and commercial level**

Sources: Commercial contractors, survey companies, etc.

National agencies

Regional agencies

Space agencies

Military agencies

Regional components of GOOS

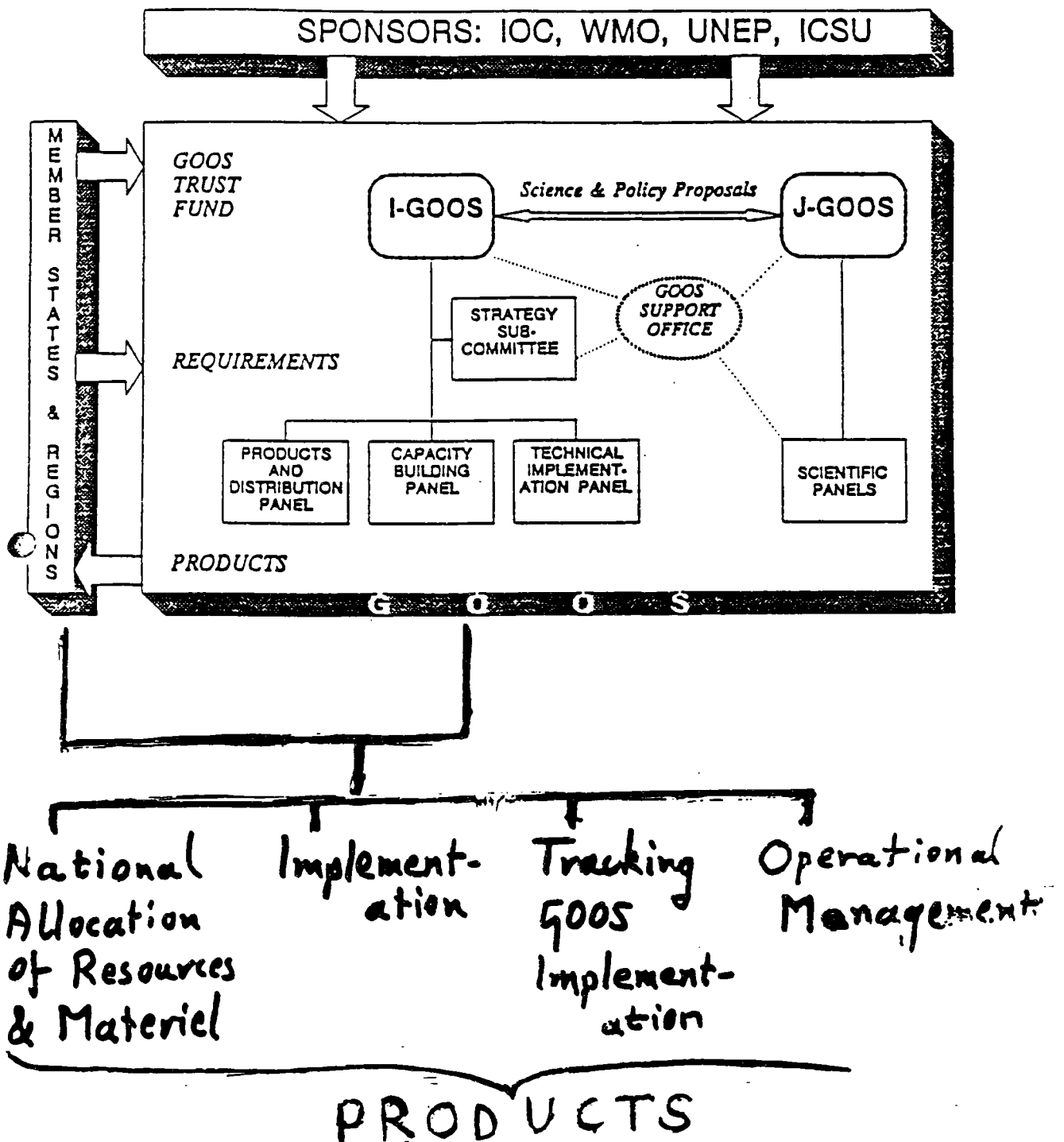
Draw information and expertise from these organisations. Use them as sub-contractors. Don't reinvent the wheel.

There MUST be a timeline. If both committees proceed on a random responsive course, they will keep throwing up random problems and lobbying them to the other Committee, where the request will cause a surprise, delay, and "not invented here" reaction.

There must be a common and agreed agenda.



## 1- GOOS STRUCTURAL DIAGRAM



# 2- I-GOOS & J-GOOS

## I-GOOS Responsibilities

### I-GOOS CAN.....

- Represent the collective will, requirements, and priorities of Member States of IOC/WMO/UNEP/ICSU
  - Represent the needs of developing countries, and promote their participation in GOOS
  - Represent the collective willingness to pay for the international component of GOOS
  - Define the political, legal and treaty elements of GOOS
  - Ensure that GOOS actually happens
- 

### 3 - I-GOOS CAN.....

- Devise a management and control system for implementing GOOS efficiently
- Ensure that GOOS delivers the goods to specification and on time
- Negotiate on data acquisition rights for GOOS in EEZ's
- Promote co-operation amongst UN bodies to support GOOS
- Promote economic studies of the benefits and costs of GOOS

#### **4 - I-GOOS CANNOT.....**

- Establish the scientific basis of GOOS
- Design GOOS
- Detect scientific or engineering faults or inadequacies in GOOS
- Manage the technicalities of the implementation of GOOS
- Implement GOOS
- Fund GOOS

---

#### **5 - J-GOOS CAN.....**

- Establish scientific criteria for GOOS, standards required, sampling strategy
- Design & specify the scientific requirements of GOOS
- Suggest the technology which would satisfy the scientific requirements
- Recommend scientific experiments needed to support GOOS
- Establish a strategy for modelling & sensitivity trials in GOOS

## **6 - J-GOOS CAN.....**

- «Blow the whistle» if GOOS implementation is becoming scientifically unsound
  - Evaluate the validity of GOOS products
  - Indicate a sequence of priorities which could be achieved
- 

## **7 - J-GOOS CANNOT.....**

- Implement GOOS
- Analyse costs and benefits of different options in implementing GOOS
- Manage GOOS on a day-to-day basis
- Co-ordinate formal agreements on treaties on GOOS
- Make mandatory or binding recommendations
- Track or monitor the progressive implementation of GOOS

## **8 - Comparison of Responsibilities & Abilities**

- Complementary in I-GOOS & J-GOOS
  - Non-overlapping
  - All needed
  - Some gaps & missing elements
  - Too much scope for multiple buck-passing and delays
  - Many actions must proceed in parallel
  - Some obvious decisions should be taken quickly
  - A long-term strategy with time bench-marks is needed, even if it has to be revised
- 

## **9 - Missing Elements**

- Formula for agreements to commit resources and implement components of GOOS
- Monitoring of progress in implementation
- Analysis of costs, benefits, and practical sequence of priorities
- Management of implementation

## ANNEX V

### OUTLINE OF A STRATEGIC PLAN FOR GOOS

#### I SCOPE OF GOOS

##### A Define GOOS

**I A 1** Action For the present, the revised document **Towards Operational Oceanography: The Global Ocean Observing System (GOOS)** is accepted as a first description of GOOS, although it insufficiently defines the system. Other defining/descriptive documents will be prepared as needed. Colour brochures will be required periodically. All such documents should stress deliverables as the basis/rationale for GOOS.

Responsible body I-GOOS with advice from its Strategy Sub-Committee.

Time frame Submit revised document to I-GOOS following the first session of the Strategy Sub-Committee for I-GOOS (March 1995). Additional documents will be prepared as deemed necessary.

**I A 2** Action Design and produce a GOOS Handbook.

Responsible body GOOS Support Office.

Time frame Design by SSC-II. Implement as directed by the SSC.

##### B Develop Strategic Plan

**I B 1** Action A Strategic Plan for GOOS, including regional programmes must be developed and refined.

Responsible body Strategy Sub-Committee reporting to I-GOOS.

Time frame Outline by June 1995; first draft by September 1995; review/approval at SSC-II in early 1996; first revision by September 1996; iterate as needed.

#### II DEVELOP SUPPORT

##### A Assess needs for GOOS

**II A 1** Action Obtain a global assessment of observations/products needed by users. This may best be done on a regional basis. It is suggested that the United Kingdom/ESA/EuroGOOS approach be adopted and applied regionally.

Responsible body I-GOOS with assistance from OECD.

Time frame Completion by I-GOOS-PS-II.

## **B GOOS Staff support**

**II B 1**     **Action** Establish an adequate GOOS Support Office. IOC has a wonderful opportunity to strengthen its essential role as an international ocean organization by providing strong, continuing support (including resources) for the GOOS Office. The Office is seen as central and essential to GOOS.

A permanent director is needed for the GOOS Office. The director should have an UNESCO/IOC staff position.

I-GOOS will convey to GOOS sponsors (UNEP, IOC, WMO, ICSU) the requirement to secure financial support for the GOOS Office and other needed infrastructure. Member states must provide this support. I-GOOS ought not be timid in demanding such support.

Responsible body I-GOOS.

Time frame Immediate action is required.

## **C Resource development**

**II C 1**     **Action** Establish a series of regular meetings between heads of major operational ocean agencies, or their designated high-level representatives. Rotate the meeting location.

Responsible body I-GOOS.

Time frame The first such meeting during 1995, probably hosted by the USA. Subsequent meetings to be held approximately at 18-month intervals.

**II C 2**     **Action** Start a dialogue with members of selected major industries beginning with the insurance and reinsurance industry, regarding common interests with GOOS. Note recommended actions in Appendix VII of report SSC-I.

Responsible body GOOS Support Office.

Time frame Working with members of the SSC, the Support Office should make initial contacts with insurance industry representative before SSC-II.

## **III THE DESIGN OF GOOS**

### **A Developing plans for modules**

**III A 1**     **Action** J-GOOS should appoint panels to develop/refine designs for the Health of the Oceans, Living Marine Resources, Coastal and Climate Modules. The Climate Module panel should be appointed in concert with GCOS-JSTC; draft terms of reference have been suggested by JSTC. Each panel should prominently include user representatives as well as scientists and engineers. Observing elements must be recommended and priorities assigned among these elements.

Responsible body J-GOOS.

Time frame J-GOOS should recommend the appointment of panels at its April 1995 meeting.

**III A 2** Action The first design for the Climate Module is complete; that plan will be revisited and subsequent revisions prepared.

Responsible body Ocean Observation Panel for Climate.

Time frame Reports should be made at meetings of JSTC-GCOS and J-GOOS.

**III A 3** Action A first design for HOTO, prepared by an *ad hoc* panel, is nearly complete. The HOTO Panel should be formalized and be encouraged to complete the initial effort within six months. Report to J-GOOS.

Responsible body Health of the Ocean Panel.

Time frame Complete the first design within six months after J-GOOS-II.

**III A 4** Action Appoint one person to perform a survey of users and recommend priority needs for the Oceanographic and Meteorological Services module. Report to J-GOOS.

Responsible body A person will be selected by and provided from WMO.

Time frame A first survey for the Services module should be completed prior to SSC-II.

**III A 5** Action Prepare a design for the Coastal Module as an urgent action. This design should cover aspects of identification of location-specific issues, open-ocean boundary conditions, land-derived inputs, data commonalities, long-term observation requirements, and prioritization.

Responsible body Coastal Module Panel.

Time frame A preliminary design is requested by J-GOOS-III.

**III A 6** Action Prepare a plan for the Living Marine Resources Module. Report to J-GOOS.

Responsible body The Living Marine Resources Panel.

Time frame The panel should be encouraged to complete a preliminary design by J-GOOS III and a first plan by J-GOOS IV.

**III A 7** Action Publish plans for each module and maintain them in current status.

Responsible body GOOS Support Office.



Time frame On approval of module plans.

### **B Integration and priorities**

**III B 1** Action GOOS will not be implemented by module, but rather as an integrated system. Assess the commonality of observing elements among the modules. Establish priorities among the elements, based on feasibility, needed deliverables, and costs. Develop a plan for integration and priorities.

Responsible body J-GOOS recommends to I-GOOS. I-GOOS approves for implementation.

Time frame Although this action cannot be completed until plans for all modules are complete, some assessment can begin now based on the knowledge that some elements will be critical to one or more modules and are already underway at some level.

**III B 2** Action Invite regional consortia to establish regional priorities for GOOS; reconcile regional priorities with the overall GOOS framework.

Responsible body Regional GOOS consortia and J-GOOS.

Time frame As feasible.

**III B 3** Action Develop a GOOS Space Plan. The GCOS Space Plan should be considered as a model and as the first articulation of GOOS needs for the Climate Module. The plan should consider the use of satellites for platform location and communications as well as remote sensing. Begin with assembly of existing ocean space plans from various sources; use an I-GOOS inter-sessional task team to begin drafting a plan.

Responsible body I-GOOS via J-GOOS.

Time frame First report of the task team is expected by SSC II.

**III B 4** Action Publish GOOS Space and Integration plans and maintain them up to date.

Responsible body GOOS Support Office.

Time frame On approval of plans.

### **C Data and information management**

**III C 1** Action Document GOOS observational elements with indications of needed standards and accuracies. Suggest specific codes and protocols, data transfer media, responsible data processing centers, and other information to assist nations interested in participating. Assemble listing of required products and organizations committed to provide those products.

Responsible body Technical Implementation Panel with occasional assistance from specialists supported by the WMO or GOOS Support Office, and in consultation with regional GOOS programmes.

Time frame Needed on a continuing basis.

III C 2 Action Develop a GOOS Data Management Plan. Consideration should be given to the draft GCOS Data Management Plan, as well as plans of GOOS-related research and operational activities.

Responsible body I-GOOS in the absence of the Technical Implementation Panel. A rapporteur or consultant should be found to begin work on a draft plan.

Time frame Draft data policy statement was approved at SSC-I and formulated to I-GOOS-II. Prepare an outline of the Data Management Plan by SSC-II.

#### D Regional Development

III D 1 Action Establish linkages and provide guidance to regional organizations and programmes willing and with a capacity to participate in GOOS, *e.g.* ICES, PICES, SOPAC or IOMAC.

Responsible body GOOS Support Office.

Time frame Immediately.

### IV COST ESTIMATES

#### A Costs of infrastructure

IV A 1 Action Estimate the costs for the GOOS Support Office, I-GOOS, J-GOOS and the needed sub-committees and panels.

Responsible body GOOS Support Office.

Time frame Estimates should be prepared before I-GOOS II and revised annually, or as requested thereafter.

#### B Costs of implementation

IV B 1 Action Estimates of the costs of implementing GOOS must be made and refined.

Responsible body I-GOOS with assistance from OECD (perhaps for consultants) using inputs from nations.

Time frame First estimate by SSC II. Annual refinement.

**IV B 2**     **Action** Compare the estimated costs with actual costs. Nations are requested to report annually their incremental costs required to implement GOOS.

Responsible body GOOS Support Office.

Time frame Comparison should be included in the annual report on implementation.

## **V           IMPLEMENTATION**

### **A    Oversight**

**V A 1**     **Action** Monitor, evaluate and recommend regarding GOOS implementation.

Responsible body GOOS Technical Implementation Panel in consultation with J-GOOS.

Time frame This must be a continuing activity. In the absence of a Technical Implementation Panel, request that nations and regional consortia report at I-GOOS meetings on GOOS elements implemented.

**V A 2**     **Action** There is the need for a Technical Implementation Panel. Appoint and find support for this panel. The TOGA Board should be taken as a model for the international participation in and financing of this panel.

Responsible body I-GOOS.

Time frame By I-GOOS II.

**V A 3**     **Action** A number of other bodies, such as IGOSS, DBCP, CMM or GLOSS, implement and manage ocean observing system elements relevant to GOOS. Their actual contributions to GOOS must be considered, and their systems and practices incorporated into GOOS, where appropriate.

Responsible body The Technical Implementation Panel I-GOOS with inputs from ocean observing system implementation groups. In the absence of this panel, I-GOOS and the Support Office must take this responsibility.

Time frame Reporting at each I-GOOS session.

### **B    Training and capacity building**

**V B 1**     **Action** Establish a Capacity Building Panel. This requires gaining approval and finding support for the panel. TEMA support should be sought.

Responsible body I-GOOS in consultation with TEMA programme.

Time frame Establish during I-GOOS II.

**C Distribution of products**

**V C 1**     Action Appoint a Data Products and Distribution Panel.

Responsible body I-GOOS.

Time frame To be determined.

**D Reporting**

**V D 1**     Action Report national and regional implementation on a regular basis. Some nations prepare regular GOOS reports useful for this purpose. All participating nations and regional consortia should be invited to report annually on progress in GOOS implementation at I-GOOS meetings. GOOS Support Office will suggest key items that might be included in annual reports.

Responsible body GOOS Support Office with inputs from Nations and regional organizations and programmes.

Time frame Annual report.

**VI REVIEW AND REFINEMENT**

**A Monitoring strategic plan implementation**

**VI A 1**     Action Track schedule of implementation.

Responsible body GOOS Support Office.

Time frame Continuing activity beginning now.

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## ANNEX VI

### **Preliminary Guidelines for** **Integration of Observing Systems and Programs as Part of GOOS**

#### I. Background

GOOS is to be built to the greatest extent possible upon existing national, regional and international observing systems. Bearing in mind that these systems have mostly been established for purposes other than global observing, it is both necessary and desirable that encouragement is given for these systems to be adapted, modified and refined to incorporate GOOS-defined observations as well as meeting their primary purposes.

A foreseeable difficulty is that the existing systems have widely differing standards of collection, management and usage, while an essential principle of GOOS is that the data be acquired according to rigorously defined standards and highly coordinated development, distribution and application. Already there is a tendency to assume that existing or planned networks and activities will be embraced into GOOS or regarded as GOOS contributions without critical evaluation or modification.

A consistent and acceptable means has to be found to reconcile this difficulty without compromise to GOOS, and to introduce new programmes and sub-systems.

#### II. The GOOS Criteria

Criteria for GOOS observation in pursuit of GOOS objectives and plans have been broadly defined (The Approach to GOOS...). Such observations include the following characteristics, though this list will be further refined:

- long term
- systematic
- relevant to GOOS
- measurements are cost effective
- measurements are routine
- timely and open delivery and exchange of data

As plans develop, it is expected that requirements will be generated for spatial and temporal resolution, accuracy, geographical coverage and quality control.

Implementation will be on an incremental basis as observational networks are adapted, enhancements occur and technological capability is advanced.

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### III. Incorporation of existing and planned systems

Incorporation will involve adaptation, enhancement and certification.

#### 3.1 Adaptation

The agencies and management bodies for existing observation systems should be encouraged through the I-GOOS implementational mechanisms to evaluate their activities according to the GOOS requirements and criteria with a view to the greatest commonality and lack of duplication.

#### 3.2 Enhancement

Agencies and management bodies will need possible additions and enhancement to their observations for GOOS to be specified through interaction with the appropriate GOOS implementation body. Substitution of existing observations and rationalization may provide important incentives.

#### 3.3 Certification

A mechanism needs to be established to ensure that national, regional and internationally coordinated contributions to GOOS, whether existing or new, are indeed scientifically sound, appropriate, and relevant to the plans of GOOS and the GOOS criteria. It is proposed that a "recognition" process be designed for implementation, giving a graded "certification", that takes into account gradations in standards of control or compliance with technical criteria as one dimension, and geographical or topical relevance in another dimension, as represented by the matrix below:

Criteria matching

	type	core	provisional	potential
	global			
Topics	regional			
	local			
	technical			

Definitions:

Core }  
Provisional }  
Potential }  
Global }  
Local }  
Technical }

To be developed as part of the Action

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#### IV. Action

Actions should be carried out in co-ordination with I-GOOS.

A working paper be developed for J-GOOS III which defines an implementation procedure for the certification process, identifying

1. Validation mechanisms;
2. Definition of certification grades;
3. Process of interaction between GOOS and programmes systems and individual activities appropriate for certification;
4. Initial candidates among existing systems for certification;
5. A recommended schedule for development and introduction of the certification system.

#### V. Contact Persons

Nic Flemming  
Angus McEwan  
Jean-Paul Rebert

## ANNEX VII

### **GOOS RELATIONSHIPS WITH OTHER RELEVANT INTERNATIONAL PROGRAMMES/ACTIVITIES**

#### **INTRODUCTION**

The purpose of this paper is to document in a shorthand way GOOS relationships with existing and planned ocean observing and data management programmes, including those of relevant research programmes.

"The Approach to GOOS" (doc.IOC-XVII/8 Annex 2) adopted by I-GOOS-1 (Rec.GOOS-I.5) and endorsed by the 17th IOC Assembly (Res.XVII-5) as a strategy document for GOOS planning and development, states that "GOOS will be developed on a sound scientific basis using the findings of existing, on-going research programmes including WOCE, TOGA and JGOFS. Operational programmes including IGOSS, IODE and GLOSS form a foundation." It further states that "GOOS planning and development on an international level requires the establishment of links and dialogues with the international bodies dealing with ocean observing and data management systems of IOC and WMO (CBS, IGOSS, DBCP, GLOSS, IODE and CMM), as well as research programmes, particularly WCRP, IGBP, OSLR and GIPME. This approach was strongly advocated by the IOC Assembly (Res.XVI-8) and the WMO Congress (Res 21 (Cg-XI)).

The GOOS planning framework is headed by an intergovernmental component: I-GOOS, and a non-governmental scientific component: J-GOOS. It was agreed subsequent to the formation of these bodies that all the organizations sponsoring I-GOOS or J-GOOS (IOC, WMO, UNEP, ICSU) could be deemed to be sponsors of GOOS. Implementation issues are considered in the domain of I-GOOS, with scientific design issues under J-GOOS. The intergovernmental bodies (IOC, WMO, and UNEP) are more particularly involved with the I-GOOS, and UNEP is to be invited to join in the sponsorship of J-GOOS.

The functions, sponsors and relationships to GOOS of on-going ocean observing and data management systems are briefly summarized herein. A more detailed description is provided in the GOOS Status Report on Existing Ocean Elements and Related Systems issued periodically, the most recent being in December 1993.

#### **EXISTING SYSTEMS TO BUILD ON**

The following on-going activities predate the establishment of GOOS and are considered essential components upon which GOOS should be built.

**Integrated Global Ocean Services System (IGOSS).** IGOSS is a long standing operational system created by IOC and WMO for the exchange of real-time oceanographic data acquired from ships of opportunity, volunteer observing ships, and buoys (e.g., temperature, salinity, currents). There is also an operational sea-level element for the Pacific. The IOC provides a full-time coordinator for IGOSS.

**International Oceanographic Data and Information Exchange (IODIE).** The IOC coordinates this global programme for international exchange of non-operational (delayed-mode) oceanographic data through a system of national, regional and world data centers.



**Global Level of the Sea Surface (GLOSS).** An IOC/GOOS programme, for the acquisition of delayed-mode, sea-level data from a global network of 308 stations, GLOSS is overseen by a non-governmental Panel of Experts that reports to I-GOOS and is coordinated by the IOC. The IOC Technical Secretary for GLOSS is part of the GOOS Support Office.

**Data Buoy Cooperation Panel (DBCP).** This is a joint WMO-IOC activity for administering the collection via satellite relay (ARGOS) of marine meteorological and oceanographic observations from moored and drifting buoys deployed by a variety of investigators. Time-positioning of properly drogued drifting buoys provides surface current data. Data from about 1/2 of the drifting buoys are circulated on the GTS in real time.

**World Weather Watch (WWW).** WWW is a WMO programme for operational collection and exchange of meteorological and related environmental data, including routine marine weather data as well as SST and waves (from ships). Most data are circulated on the GTS in real time.

**Marine Pollution Monitoring (MARPOLMON).** This programme provides systematic observations of contaminants (sources, types and levels) mainly through regional marine pollution monitoring projects (e.g., Mussel Watch) sponsored by UNEP and IOC. The thrusts of this observation programme intersect with those of the GOOS Coastal Zone and Health of the Oceans modules.

## **RELEVANT SCIENTIFIC PROGRAMMES**

**Ocean Science in Relation to Living Resources (OSLR).** OSLR is a programme of IOC and FAO, aimed at identifying fields of ocean science that could lead to a better understanding of the relationship between fish stocks and ocean environmental variability, to provide the scientific basis for fishery development and management. It includes the **Harmful Algal Bloom (HAB) project** and the SCOR-IOC Programme on **Global Ocean Ecosystem Dynamics (GLOBEC)**. (See section on IGBP, below).

OSLR is a resource for scientific and technical advice for the design and development of the GOOS Marine Living Resources Module. In cooperation with OSLR and GLOBEC, an *ad hoc* **Living Marine Resources (LMR) Panel** was established to define the scope and develop a draft plan for the design of this module, including criteria on global and broad-scale monitoring, climate change concerns and biodiversity issues. A draft plan is currently undergoing review.

**Coastal Pilot Monitoring Activities.** This is a collection of pilot activities established within the framework of the UNEP-IOC-WMO Long-Term Global Monitoring System of Coastal and Near Shore Phenomena related to climate change. They include an IOC-UNEP-WMO-IUCN pilot project on monitoring coral reef ecosystems, an IOC-UNEP-WMO pilot activity on monitoring of sea level changes and associated coastal impacts in the Indian Ocean, a pilot activity on monitoring plankton community structure (jointly with OSLR), and a pilot activity on monitoring of mangrove communities (UNEP-UNESCO).

**Global Investigation of Pollution in the Marine Environment (GIPME)** Programme of IOC and UNEP, includes marine pollution research, baseline studies, development of methods, standards and intercalibration, and the development of a marine pollution monitoring system. It includes the **International Mussel Watch Project** - a method for monitoring coastal contaminants using bivalves.

The GIPME Panel is cooperating with GOOS in designing and developing the GOOS Health of the Ocean (HOTO) module. Jointly with GIPME, an *ad hoc* HOTO panel was established to formulate proposals on the design of this module. The Panel will complete a

draft strategic plan for the HOTO module in March 1995 and intends to deliver it for review by J-GOOS at its April 1995 meeting.

**Group of Experts on Scientific Aspects of Marine Pollution (GESAMP).** UNEP is the main sponsor but GESAMP is also cosponsored by IMO, FAO, UNESCO, WMO, WHO, IAEA and the UN. Its work is accomplished through working groups with a large number of experts selected by the sponsoring organizations. Present work is focussed on the assessment of harmful man-produced substances entering the oceans. GESAMP has produced a number of scientific reports on various aspects of marine pollution and plans to issue a concise statement annually on the state of the marine environment. GIPME maintains close relationships with GESAMP.

**UNEP Regional Seas Programme.** The Oceans and Coastal Areas Programme Activity Centre of UNEP in 1974 established this as a global programme implemented through regional components. It currently embraces 12 regions. For each region a Regional Action Plan has been prepared and endorsed by participating countries. The Regional Action Plan is designed to link assessment of the quality of the marine environment and the causes of its deterioration (including climate change) with efforts directed toward management and development of the coastal environment. The action plans promote the parallel development of regional legal agreements and action-oriented programme activities. UNEP in collaboration with other organizations provide "seed money" to finance the early stages of these regional programmes.

Collaboration with these regional activities is essential for the development and implementation of GOOS on a regional basis, particularly with respect to its Coastal Zone and HOTO modules and its capacity-building activities.

## **RESEARCH PROGRAMMES**

Research programmes whose results will have a direct bearing on the scientific design of GOOS are described below.

**World Climate Research Programme (WCRP).** WCRP is sponsored by WMO, ICSU and IOC. The following WCRP research programmes have been or are developing prototype ocean observing systems and deriving information on climate variability both of which are critical to the design of the operational climate module:

- Tropical Oceans and Global Atmosphere (TOGA) Programme,
- World Ocean Circulation Experiment (WOCE), and
- Climate Variability and Predictability (CLIVAR).

The WCRP programmes routinely make use of data sets obtained for operational purposes. Except for some wrap-up of data-related issues, TOGA was completed at the end of 1994. It is anticipated that the research observing system established by TOGA will metamorphose into an operational system as soon as support for the system can be transferred from research budgets to operational program budgets of participating nations and become part of GOOS. WOCE is expected to recommend, and CLIVAR is expected to develop long-term monitoring requirements that may be satisfied in part by GOOS and GCOS.

**International Geosphere-Biosphere Programme (IGBP).** This is an ICSU programme for the study of global change. Two "core projects" and a third "potential core project" of the IGBP are directly linked to GOOS in that they are developing knowledge essential for the design of components of GOOS. Their relationships are described below:

*Land-Ocean Interactions in the Coastal Zone (LOICZ).* IGBP Core Project LOICZ is concerned with a specific domain of the Earth system, the coastal zone; its role in the functioning of the Earth System; and the likely responses of that compartment to changes in the total Earth System. It is aimed at developing a sound scientific basis for management of the coastal zone. In accordance with the Memorandum of Understanding between IOC and LOICZ (1994) IOC and LOICZ agreed to collaborate in "the further development and implementation of the emerging global observing systems and in particular the coastal components of GOOS".

*Joint Global Ocean Flux Study (JGOFS).* The SCOR-IGBP Core Project JGOFS is aimed at improving our understanding of the ocean biogeochemical cycles in climate change. IOC and JGOFS jointly support an ocean CO<sub>2</sub> Panel for quantifying the ocean carbon budget and overseeing the acquisition of CO<sub>2</sub> measurements made on board WOCE cruises. That Panel also is concerned with developing suitable standards, reference materials and portable and robust pCO<sub>2</sub> measuring equipment that can be used on ships of opportunity and on moored buoys to obtain global pCO<sub>2</sub> data sets in conjunction with satellite ocean color sensors when they become available. JGOFS provides data on the biogeochemical dimension of climate variability that the WCRP does not. The design of GOOS systems to observe key biogeochemical variables will rely heavily on JGOFS results.

*The Global Ocean Ecosystem Dynamics (GLOBEC)* programme of SCOR and IOC is cooperating in the development of the scientific plan for the Living Marine Resources Module of GOOS. In particular, GLOBEC Working Groups on Numerical Modelling and Sampling and Observation Systems will develop a system combining new sensors, dynamic models and data assimilation. Pilot studies for the implementation of this "Advanced Modelling and Observation System" are under consideration. GLOBEC has recently been accepted as a potential core project of IGBP.

**Acoustic Thermometry of Ocean Climate (ATOC).** The use of the special characteristics of the propagation of sound in sea water over very long distances to monitor small changes in the temperature of the ocean holds great potential for GOOS. A feasibility study (the Heard Island Experiment) was conducted in 1991. Plans are now underway to implement ATOC on an international basis; this cooperation is being fostered through SCOR Working Group 96.

## **GLOBAL OBSERVING SYSTEMS UNDER DEVELOPMENT**

There are a number of global observing systems under development, some with incidental and others with direct relevance to GOOS. Two in the latter category are described below.

**Global Climate Observing System (GCOS).** GCOS is jointly sponsored by WMO, ICSU, IOC and UNEP. Planning has proceeded via task groups established by the GCOS Joint Scientific and Technical Committee (JSTC) for atmospheric and terrestrial observations, for space based observations, and for data system considerations. Oceanic observation issues relevant to climate have thus far been left to the Ocean Observing System Development Panel (OOSDP). A separate working group expects to complete a report in early 1995 on socio-economic benefits of climate forecasts.

GOOS and GCOS have one common component: the ocean component of GCOS and the climate module of GOOS. At the third session in November 1993 of the JSTC, it was agreed that the I-GOOS should have primary responsibility for the implementation of that shared ocean component. The formulation of the conceptual, scientific design has been the responsibility of OOSDP. That panel has submitted its final report. The JSTC has proposed that a follow-on design panel be appointed jointly by the JSTC and the J-GOOS.

As with GOOS, GCOS will build on existing programmes (e.g., WWW, GAW: Global Atmosphere Watch,, IGOSS, GEMS: Global Environmental Monitoring System, GLOSS) and others that will be developed in association with GTOS.

**Global Terrestrial Observing System (GTOS).** Sponsored by FAO, ICSU, UNESCO, UNEP and WMO, GTOS is still in its initial phase of design and determining the shape and scope its plan. The CZ and HOTO modules of GOOS will require close interaction with GTOS, particularly with regard to observations for assessment and prediction of anthropogenic and natural impacts on coastal ecosystems and coastal natural resources. These shared concerns will likely require the eventual development of a common or comparable data management system and coordination in selecting monitoring sites in the coastal zone and establishing regional centers.

### **CROSS-CUTTING ORGANIZATIONS**

There are a number of cross-cutting organizations whose spheres of responsibility touch upon GOOS activities. Among those with more direct relevancy is the **Committee on Earth Observation Satellites (CEOS)**. CEOS consists of governmental organizations (e.g., NASA, NOAA, ESA, NASDA, etc.) that have a specific responsibility for some part of the Earth Observations programme. GOOS, GCOS, IGBP, WCRP, IOC, ICSU, WMO and UNEP are affiliate members. CEOS has three objectives:

- to optimise mission planning and development of products,
- to serve as a focal point for international coordination, and
- to exchange policy and technical information and encourage complementarity and compatibility of space borne systems.

CEOS also has a Working Group on Data, an *ad hoc* group on Data Policy and a Working Group on Sensor Calibration and Geophysical Validation.

## ANNEX VIII

### The Context of GOOS and J-GOOS

#### 1. GOOS

GOOS has been proposed by its intergovernmental sponsors as the prime focus of internationally coordinated oceanographic activity into the 21st Century. It is intended to build upon the success of two major oceanographic research experiments, TOGA and WOCE, which have demonstrated the feasibility of high levels of international coordination in ocean observation. It seeks to optimise the use of technology and organisational structures that are now becoming available in satellite remote sensing, automated observation, computing, data management and information transfer through electronic networks, for the common benefit of mankind in the use, protection and exploitation of the oceans.

While GOOS will have to be built through the participation, contribution and enhancement of national observing systems and networks, and will to use existing bodies and structures to the greatest extent possible, it is a new departure. Nothing of such comprehensive scale has been implemented, and it involves national commitment unlike that which research organisations have previously made to international experiments. Operational resources on an ongoing, indefinite basis will be needed, and these will require the involvement of governments, supported by national policy and fiscal allocation.

No such support is likely without the promise of clear economic and social benefit, backed up by convincing evidence that this justifies the cost. GOOS is not a research program although science will be a user and beneficiary. Its benefits will have to be visible and transferable to a complete range of maritime and industrial users, environmental managers and economists at a national level for whom science is at best only a means to an end. It is the divergent interests of these users and the aspirations of individual nations that will drive national commitment to GOOS. GOOS has been likened to the World Weather Watch but the benefits of systematic 'operational' ocean observation are less obvious (although probably of greater ultimate benefit to mankind) than global meteorology.

GOOS has to be developed in the context of a range of global and regional observing initiatives which also involve the ocean to a greater or lesser degree, including GCOS and GTOS, and also in relation to some systems and organizational frameworks already in operation with responsibilities for specific ocean observing elements.

The creation of GOOS presents some serious paradoxes, for example

- a) it is motivated by end use or purpose, and its sponsorship by governments will depend upon benefit/cost analysis of those purposes, yet most of these purposes are either not known, not demonstrated or poorly quantified,

- b) existing scientific knowledge may be adequate for the design of GOOS, but demonstration of its value requires considerable scientific development and indeed is dependent on GOOS having been implemented,
- c) GOOS involves an integration of national ocean observations (or a subset of them) to a common plan and management framework yet (apart from the climate module) their application is primarily to territorial purposes. Where can the line be drawn between collective interest and national interests on such matters as biological resources and coastal pollution?

## 2. J-GOOS

J-GOOS is the scientific advisory body for GOOS and carries no implementational responsibility. The above issues are obviously the concern also of the I-GOOS Strategy Subcommittee, but J-GOOS has strongly expressed its need for independence on scientific issues and therefore needs to define for itself the scientific tasks, the structures needed to address them and the order in which they are undertaken.

## 3. A UNIFYING THEME FOR J-GOOS

GOOS is not directly comparable with large scale scientific experiments, being in the nature of an ongoing "operational system", meaning a framework of interrelated elements, approaches or methodologies maintained on a continuing basis according to defined plans. Nevertheless GOOS will be built on principles recognised by scientists, which might include the following:

- a) It is possible to construct accurate and comprehensive dynamical numerical models of the ocean with sufficient detail to permit their use for a wide range of practical purposes.
- b) The accuracy and practical usefulness of such models is critically dependent on the availability of a stream of observational data of appropriate coverage and accuracy.
- c) Observational data are also essential for a wide variety of purposes not necessarily involving models including the identification of trends and events requiring coordinated response, statistical analysis, and baselines for the assessment of environmental quality and resource status.
- d) For many applications, the amount, quality and continuity of data requires global coordination and enhancement over that available from existing national efforts. Regional and nation-specific applications would also benefit from a globally coordinated observing system.
- e) To make such a system feasible scientific participation is necessary in the development of observing technology, standards, sampling design, data management and numerical modelling. Science is also needed in the development of national capability to contribute to a global system, and in the development and application of

products derived from the system. Scientific commitment to GOOS is essential in gaining the involvement of national observing agencies.

These principles are closest to realisation in the physical description of the ocean. However some of the most serious problems besetting mankind relate to marine biological status and the environmental state of the coastal regions, which GOOS has also undertaken an obligation to address. Here the observable variables are more diverse, more difficult to measure and interpret and less amenable to generalised modelling and description.

In view of their importance, J-GOOS strategy must ensure continual incorporation of biological and environmental issues along with the development of capacity for description of the physical environment.

#### 4. GOOS SCIENTIFIC STRATEGY STATEMENT

From the foregoing principles a scientific strategy statement was adopted at J-GOOS-II, as follows:

- a) The translation of the identifiable needs of humanity in the use and protection of the oceans and the evaluation of its role within the global environment, into a set of ocean observations, methodologies and associated scientific products that are appropriate for implementation on an operational basis.
- b) The identification and continual reassessment of the best scientific practice for operational ocean observations including technology, standards, sampling design, data management and numerical modelling, suitable for implementation in the present and foreseeable future by regional and national ocean service organisations.
- c) The definition of the scientific framework within which national services can be developed to contribute to a coordinated and fully integrated global ocean observing system.
- d) The promotion of the development and application of those scientific products of a global ocean observing system which will maximise social, environmental and economic benefit for the nations of the world.

## ANNEX IX

### AN INTRODUCTION TO THE OOSDP REPORT ON THE CONCEPTUAL DESIGN FOR THE OCEAN CLIMATE MODULE

Neville Smith  
BMRC

#### 1. Introduction

The Ocean Observing System Development Panel (OOSDP) recently published its final report on the conceptual design for an observing system for ocean climate (OOSDP 1995), the so-called Climate Module of the Global Ocean Observing System (GOOS), and the ocean component of the Global Climate Observing System (GCOS). This talk to the 2nd meeting of the Joint Scientific and Technical Committee for GOOS concentrated on the conceptual approach of the OOSDP, rather than the scientific detail, and introduced some of the recommendations of the report, though again not in detail.

#### 2. The conceptual approach

Smith et al. (1995) elaborate on the approach taken by the OOSDP in its task. The terms of reference for the panel asked for, among other things, the formulation of a

"conceptual design of a long-term systematic observing system to monitor, describe and understand the physical and biogeochemical processes that determine ocean circulation and the effects of the ocean on seasonal to decadal climate changes in the ocean and to provide the observations needed for climate predictions."

Several important key words appear in this term of reference:

- long-term
- monitor
- understand
- systematic
- describe
- prediction

Long-term and systematic imply that the design is not another experimental or *ad hoc* measurement network for short-term goals but is a permanent, methodical observing system. The last four key words indicate that it is a multi-purpose system, ranging from routine interpretation of data (monitoring) through to the exciting potential of climate forecasting.

The foundations of the design are provided by breaking down the overall objectives into a set of goals and sub-goals (Fig. 1). These will be discussed in more detail later but for now we note that this breaks the very large overall task into a set of smaller, more manageable tasks. The sub-goals are not all independent since the measurement elements of some are common, and the processing is not independent. The choice made by the OOSDP is not unique; they chose time for the initial stratification (short surface, intermediate upper ocean, long deep), and then phenomena or fields. They also chose somewhat arbitrarily to limit the time scales of interest to longer than a month and the space scales to greater than the Rossby radius; for GOOS this choice is important since it excludes western boundary currents and the coastal zone and ignores, for example, mesoscale eddies and waves. Fig. 1 also shows the different levels of information associated with each task, starting at the integrated measurement platforms (Level 1), progressing through stages of quality control and elementary processing to get oceanographic variables (Level 2), and ending with analyses and data assimilation to produce gridded fields and forecasts. This processing chain in effect overlays the goals. There is an important final step which is not shown in either part of the diagram. The outcome from the system (here referred to as the Ocean Observing System for Climate, OOSC) must be a suite of products which offer practical benefits to the customers and users of the system. This "applications" stage effectively overlays and connects all the sub-goals. Alternatively, we add a further level (Level 4) which represents the added-value processing which is required to turn the scientific products (Level 3) into products which are useful to the customers. This application level provides the coherency in the design.



### 3. Applications

The effectiveness of the observing system is inextricably linked to its ability to deliver real, practical benefits to those nations and users who support the system. This is a different measure of success to that used in research. OOSDP (1995) identified four principal applications for the system (again, this break-out is not unique).

(1) Numerical weather prediction The observing system is both a provider of information to, and a customer for, numerical weather prediction products. Surface marine data are ingested in data assimilation systems and, in turn, these systems give new estimates of the surface fluxes of momentum, heat and moisture, based partly on the ingested data and partly on non-surface information.

(2) Numerical ocean prediction The title is chosen specifically to draw an analogy with weather prediction. For certain problems and regions it is now possible to operate routine ocean data analysis, assimilation and model initialisation procedures to produce ocean and coupled ocean-atmosphere forecasts. For example, several centres are running quasi-operational seasonal to interannual prediction systems, based in part on measurements of subsurface ocean temperature.

(3) Climate assessment The present concern with long-term climate change and climate variability, perhaps as a result of an enhanced greenhouse effect, has placed increased emphasis on the adequacy of the ocean data base. There is a recurring and continuing need for state-of-the-ocean assessments, such as those sought by the Intergovernmental Panel on Climate Change, and OOSDP (1995) recommended that consideration should be given to establishing one or more centres which would continue to assess and analyse the oceanic data base in order to refine and maximise the useful information content (the climate signal).

(4) Model validation Models are not a substitute for measurement but rather add value to data sets by interpreting and exporting unevenly distributed information into regions of space and time for which direct sampling is either not available or not possible, subject to dynamical and physical constraints. It is important that the models faithfully represent, as far as is practical, the actual dynamical, physical, chemical and biological processes of the actual ocean. Only by testing models against actual data can we ensure that the methods used to provide products are continually improving. The design and information management practices of the observing system must facilitate the use of ocean data for model validation.

It is the collective operation of the various measurement platforms, processing centres and applications which provides the true strength of the observing system. Data sets used for one goal or application can be used for other goals and applications; measurement platforms are multi-purpose; and so on. Somewhat paradoxically, the cross-utilisation of platforms, processing, data and applications makes clinical design of the system near impossible, yet it also provides the fundamental strength.

### 4. System goals and priority areas

Figure 2 shows a summary of the system goals and sub-goals. OOSDP (1995) discusses in some detail the reasons for choosing these particular goals. The point to note here is that, with this particular choice, an implicit decision has already been made in regard to priorities; these foci were chosen because, in the view of the OOSDP at least, they represented the principal user areas for climate applications. As an example, the El Niño-Southern Oscillation prediction problem was singled out because of the demonstrated ability and applications as a result of the Tropical Ocean Global Atmosphere experiment (TOGA). Sea level is singled out because it is accepted as one of the possible consequences of an enhanced greenhouse effect - it has a high "user profile" if you like.

OOSDP (1995) ranked SST, wind stress, ENSO prediction and global sea level change highest in terms of priority; that is, initial focus should be given to these goals because they will have short-term impact/outcomes. The second level of ranking was given to the remaining surface fields and to upper ocean relentless, but mindful monitoring; the latter goal is directed at improving the global baseline database for thermal measurements and, wherever possible, salinity. Global interior inventories were ranked next followed by global circulation and global seasonal to interannual prediction. this ranking factors in the feasibility and impact of fulfilling each sub-goal as well as our present understanding; the lower ranked sub-goals all await results from current or planned climate research experiments.

Note that the goal dealing with models, information management and climatologies has been treated separately. Each of these activities are relevant for all of the other sub-goals; conceptually, goal 4 overlays and intersects each of the observational goals. These elements are an integral part of the observing system design.

#### 5. Measurement elements

For each sub-goal a list of the relevant measurement elements was constructed (see OOSDP 1995). OOSDP (1995) recognised that there were many factors that need to be considered before any prioritisation could be attached to a particular element; these included (a) the relative influence of different data contributing to the same product, (b) different platforms/instruments contributing like information on variables, (c) some platforms having multiple uses, and (d) possible efficiencies from new technology versus the reliability and familiarity of existing/old technology.

OOSDP (1995) looked at the design from several view points. One of the more useful views (originally proposed by the *ad hoc* Health of the Oceans panel) was to assign, for each element of each sub-goal, a relative impact and feasibility. The scientific impact takes into account the precision and accuracy of the data; the volume; the quality; the complexity of processing required; and the ultimate application of the information. The feasibility introduces the difficulty of collecting the data, including all those factors which are required for operational usage (routine, systematic, long-term, timely, etc.) and the cost. The assigning of feasibility and impact is necessarily subjective and is open to some debate but it does permit a first-order stratification of what we believe might be most important and what we believe might be less important (higher priority would be attached to elements with high impact and high feasibility). OOSDP (1995) presented impact-feasibility diagrams for each of the sub-goals, the details of which will not be discussed here.

The key point is that decisions in regard to priority cannot be avoided, so some attempt must be made to provide guidance for implementors. They will never be straightforward and will always involve rationalisation and trade-offs and depend on the importance that is attached to particular outcomes (e.g., are imperfect predictions of the NINO3 index more or less important than high-quality, global measurements of SST change?). The aim of the design is to provide a substantive and reliable guide, based on available scientific knowledge, of the relative importance and impact of particular measurements for particular scientific objectives. The impact and feasibility assessments are subjective; other factors influence priority; rationalisation and trade-offs between sub-goals, and between this module and other operational services, are difficult to assess; the costs attached to some elements (e.g., satellites) may be "easier" to meet than other elements (e.g. in situ temperature); and so on. It should also be remembered that the system will, and must, continue to evolve, so the impact, feasibility and priorities attached now may not be appropriate in a few years time. The OOSDP (1995) also builds an implicit boundary at the level of applications and impacts; its views are for the most part based on scientific, rather than practical, considerations (scientific impact rather than actual benefits), though its choice of applications (Section 3 above) does represent an interpretation of the benefits that might be obtained from such an observing

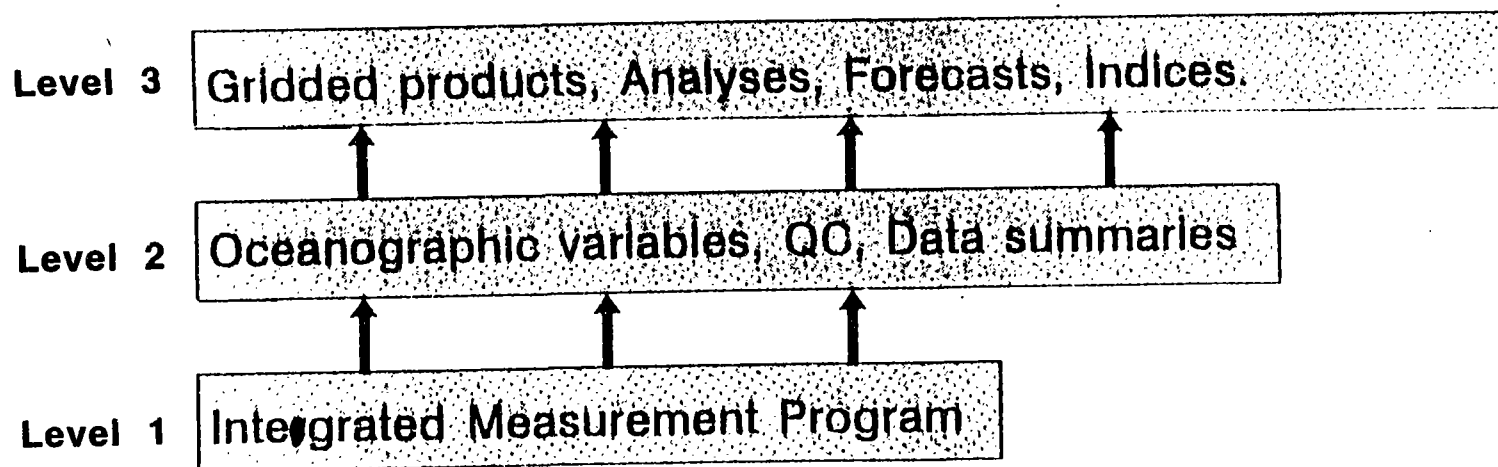
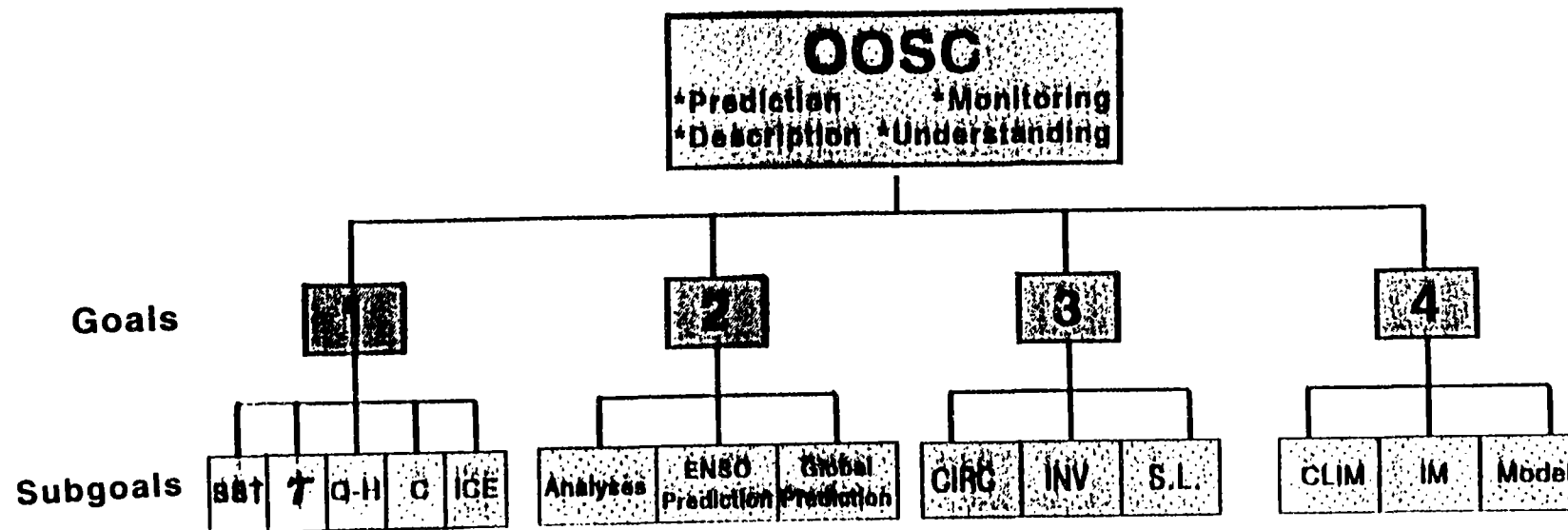
system. The design, recommendations and prioritisation will need to be continually revisited as better knowledge of the actual benefits and practical applications accrues.

#### 6. Conclusions

The conceptual design provided by OOSDP (1995) provides the basis for implementation of a permanent ocean observing system for climate, including a prioritisation and schedule (add now; add as soon as possible; enhance when feasible) and the framework for the evolution of the design. The design is built on knowledge of the variability (i.e., science), a subjective assessment of the user requirements (the applications), appreciation of the available and emerging technology (instrumentation, telemetry/communication, data management, computing, satellites) and the wide application of models (for design, validation, data assimilation and prediction). It exploits trade-offs where possible and acknowledges the importance of models and processing of information for optimising the benefit derived from individual measurements.

#### References

- Ocean Observing System Development Panel (OOSDP) 1995: The Scientific Design for the Common Module of the Global Ocean Observing System and the Global Climate Observing System. Published by the U.S. WOCE Office, Texas A&M University, Texas, USA.
- Smith, N.R., G. Needler and the OOSDP 1995: An ocean climate observing system: the conceptual design. *Climate Change*, to appear.



## **GOALS**

**monitoring, description,  
understanding, prediction**

- (1) Surface fields & Surface fluxes**  
**(a) SST, SSS (b) wind stress (c) heat, E-P (d) C flux (e) sea ice**

- (2) The Upper Ocean**  
**(a) relentless observation (b) ENSO prediction (c) global prediction**

- (3) Ocean interior - long time scales**  
**(a) Q, H<sub>2</sub>O, C inventories (b) ocean circulation (c) sea level**

- (4) Processing and Synthesis**  
**(a) new climatologies (b) information m'ment (c) modelling**

ANNEX X

**Proposal for a meeting on current plans on  
THE CLIMATE MODULE  
as developed by GOOS, GCOS and OOSDP**

Aims of the meeting

1. Scientist peer debate on contents of OOSDP report “Scientific design for the Common Module of the Global Ocean Observing System and the Global Climate Observing System: An Ocean Observing System for Climate”.
2. Inform potential customers (managers of operational services in the public and private sectors) about future opportunities for ocean observation and modelling relevant to climate monitoring and prediction, and consult them about their needs.
3. Review observing priorities identified in the OOSDP report.

Participants

Up to 50 participants drawn from members of, and experts nominated by:  
J-GOOS, I-GOOS, JSTC for GCOS, JSC for WCRP, ICSU, UNEP, WMO, IOC.

Meeting arrangements

3 or 4 days in [location] during 1996

Organisation, sponsors, funding  
?

## ANNEX XI

### Recommendations for I-GOOS

#### Regarding

#### Health of the Oceans (HOTO)

While accepting the need for further development of the HOTO design, J-GOOS II also recognized that immediate actions were not only possible but were indeed necessary to assist with the finalization of the Implementation Plan. The following are recommended to be brought to the attention of I-GOOS II for immediate consideration and action:

- Have conducted, through relevant bodies (e.g., GIPME) a global inventory of measurement capabilities and existing national, regional and international programmes and data bases, relevant to HOTO;
- Initiate quality assurance procedures, through appropriate channels (e.g., contracts) for those measurements the Panel considers to be of the highest priority;
- Request relevant bodies (e.g., GIPME) to reevaluate those methods for Category 3 parameters in Figure 4 of this report, with a view toward stimulating their inclusion in national and regional plans;
- Request relevant bodies (e.g., GEEP) and urge the scientific community at large to define reliable measures of biological response, which can be applied world-wide, and develop techniques for their widespread measurement;
- Urge completion of the current IOC/UNEP International Mussel Watch Program. The evaluation of its results should be facilitated and urgent consideration should be given of its extension to other matrices (e.g., sediments) and to the inclusion of histopathology;
- Take steps to strengthen existing national and regional analytical centres, and where appropriate to create new ones, in order to provide technical focal points for training, data evaluation, capacity building and the introduction of new techniques. The capacity building needs to be developed nationally and, in the long term, become self sustaining. It also needs to be based in the short term on international, regional and bi-lateral collaboration to ensure accelerated development, technology transfer and economies of scales;
- Identify a mechanism to provide a CD-ROM based ocean color interpretation acquired by satellite remotely sensed data and requisite training;
- Develop a mechanism for the delivery of regional assessments to the GESAMP "State of the Marine Environment" reporting system; and
- Initiate efforts, in close collaboration with the IOC/TEMA Programme, to create regional self-sustaining capacity as appropriate for the implementation of pilot studies in the HOTO Module of GOOS.

ANNEX XII

**DRAFT WORKSHOP OUTLINE**

**for**

**GOOS Living Marine Resources**

During J-GOOS2 discussions on the status of the Living Marine Resources, it was determined that further development of this module could be facilitated by the development of an over arching design that specifically considers current and emerging capabilities relating to observations and models. To this end a workshop was proposed to assess options for a design philosophy for GOOS Living Marine Resources based on observations designed: (1) to assess the state of the plankton, fish, coral reef population, etc...(2) to verify ecosystem models, or (3) to provide a combination of (1) and (2).

Specifically the workshop will:

- (a) assess customer needs for management of living marine resources;
- (b) review current and anticipated capability achieved by the following methods:
  - (i) direct monitoring of the plankton by such tools as ocean colour, continuous plankton recorder
  - (ii) simulation of plankton dynamics by mathematical models that are constrained by observations
- c) assess the potential of the observation and modelling technology expected to become available early in the 21st century in meeting customer needs;
- (d) consider the hypothesis that ocean ecosystem simulation models will, within twenty years, be capable of addressing explicitly the classical fisheries problem of recruitment/mortality and the design implication for the GOOS Living Marine Resources Module.

The J-GOOS committee determined that the organization of the GOOS Living Marine Resources workshop would be most effective if conducted in concert with GLOBEC. J-GOOS appreciates the offers of SCOR and the Secretary of IOC to involve the GLOBEC community in this endeavour. The conclusions and recommendations of this workshop will be reported to the J-GOOS3 meeting in Spring 1996.

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**Arrangements**

A four-day meeting to be held before Spring 1996

**Participants**

Circa 25 invited experts drawn from the following communities:

- Fisheries oceanography
- Biological oceanography
- Ecological modelling

**J-GOOS Committee Representatives**

J. McCarthy, G. Holland, J. Woods



## ANNEX XIII

### **Terms of Reference for Coastal Module**

#### **1. Definition**

J-GOOS establishes for a duration of 2 years an *ad hoc* group to define the scientific and technical components of a coastal module. This coastal module will provide infrastructure for integrated coastal area management, including, *inter alia*, living resources questions (e.g. recruitment of fish stocks), health of the ocean issues (e.g. fluxes of land-derived contaminants, their transport distribution, fate and effects, and service module functions (e.g. storm surge and wave prediction, evolution of coastal circulation).

#### **2. Preamble**

In pursuing its charge the *ad hoc* group should consider:

- a) measurement, monitoring and modelling (including hindcasting and operational prediction) within and at the oceanic boundaries of regional seas;
- b) the interfaces of the regional seas with the land, the atmosphere, the sea floor and the deep sea;
- c) the quantification of land-derived inputs for oceanic-scale biogeochemical systems;
- d) assessment of regional systems in a global context and definition of aspects which are generic.

#### **3. Tasks**

The *ad hoc* group will:

1. review scientific issues important to dealing with coastal issues and needed services;
2. assess the capacity for and requirements of global observing systems (e.g. satellites and other systems) to deliver appropriate data ;
3. review and evaluate relevant science and modelling plans for other groups and programmes (e.g., LOICZ and GLOBEC) that might contribute to the development of a coastal module ;
4. propose scientific initiatives that advance the goals of GOOS ;
5. identify coastal observation elements for which continued long-term observation is particularly important;
6. propose a conceptual design of the coastal module and provide recommendations for priorities associated with coastal observational tasks in terms of deliverable benefits, feasibility and cost ;
7. prepare an extended outline for the report before March, 1996; and
8. prepare a first draft report before March, 1997.

## ANNEX XIV

### **Draft Outline for Study Conference on Coastal Seas Modelling and Observations in GOOS (1997)**

The goal of the meeting is to establish a baseline review of the state of the art in coupled, high resolution ocean models, and issues to be considered in developing coastal aspects of GOOS. The meeting will be structured around a number of commissioned review papers, each of which will address generic questions identified by J-GOOS. The commissioned review papers will cover the following themes:

<b>Topic</b>	<b>Author</b>
<b>1. GOOS Modules</b>	
a. Coastal (including coastal protection)	consult Prandle
b. Health of the Ocean	consult Andersen
c. Living Marine Resources (with JGOFS/GLOBEC/LOICZ)	consult P.Holligan
d. Climate (focusing on coastal boundary conditions)	Hasselmann?
e. Services Module	?
<b>3. Regional case studies</b>	
a. EuroGOOS (with the PROMISE group)	consult Prandle
b. Pacific Ocean (NEAR GOOS group)	consult Su Jilan
c. Australia (East coast study)	?
d. North America (Florida Straits)	?
e. Others	

[The meeting programme might be structured to start with Case Studies and follow up with the modules.]

#### **Generic issues to be addressed by the Authors**

1. Coupling global/basin models to regional models
2. Data assimilation
3. Observing System Simulation Experiments
4. Interaction between the physics, chemistry, biology, sedimentology
5. Overarching issues

#### **Conference arrangements**

Location (.....?), Dates (summer 1997), 50 invited participants.

ANNEX XV

**Terms of Reference  
*Ad Hoc* Group for  
GOOS Ocean & Marine Meteorological Services Module**

**1. Definition**

The Services Module concentrates on the common components of other GOOS Modules at the level of the technical and scientific issues of products and applications. It addresses the functions of communications, data transmission, modelling and dissemination of products required to produce services. It analyses common scientific problems related to product delivery in GOOS.

**2. Preamble**

In pursuing its charge the *ad hoc* group should consider:

- (i) the needs expressed by I-GOOS and end-user groups for improved ocean and coastal information and data services for nowcasts, short-term and medium-term forecasts;
- (ii) that there are many existing operational marine services provided by international agencies, national agencies, and by commercial organisations; and
- (iii) that I-GOOS has appointed a Rapporteur on Services to review existing metocean services, trends in existing services, and to identify weaknesses and requirements in such services.

**3. Tasks**

J-GOOS decides to appoint an *ad hoc* Group to support the Services Module to conduct the following tasks:

- (i) Identify common design requirements and best practice for GOOS regarding data and information management necessary for the timely provision of services and products, for the timely delivery of data to data processing centres, quality assurance, and data archival;
- (ii) Examine the common requirements of GOOS Modules in regard to product generation, and the possible rationalisation of the technical aspects of services, where appropriate;
- (iii) Identify common design requirements and best practice for modelling and product preparation, including timely data assimilation and model enhancements;
- (iv) Provide advice and feedback to scientific programmes and components of GOOS to ensure that the design and schedule of GOOS with regard to services and information management is consistent and efficient;
- (v) Consider, investigate and report on the possible need for specialized centres within GOOS at the level of applications, products, and services;
- (vi) Establish a sequence of priorities and a schedule for actions regarding products and services on a 5 to 10 year timescale; and
- (vii) Report to J-GOOS-III. ..../..

**4.     Contact names**

N.C. Flemming

CMM: Nominated by P. Dexter

IODE/IGOSS: to be contacted by NCF

I-GOOS Rapporteur

82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO<sub>2</sub> Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System