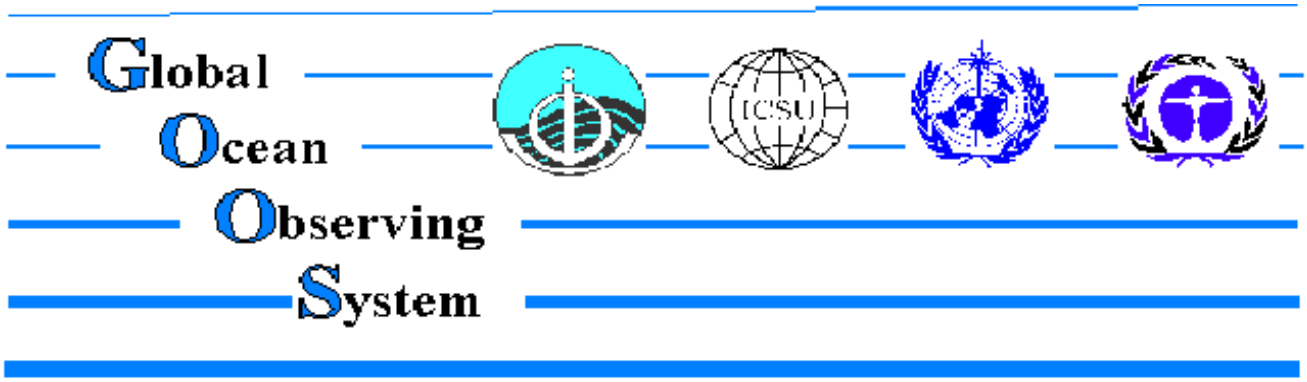

Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies

IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS)

Fourth Session
14 - 16 March 2001
Vina del Mar, Chile

GOOS Report No. 102 **UNESCO**

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Paris, June 2001
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ABSTRACT

The fourth session of the GOOS Steering Committee (GSC) took place on March 14-16, 2001, in Vina del Mar, Chile. Progress was reported on the merger of the Coastal GOOS, Health of the Ocean (HOTO), and Living Marine Resources (LMR) Panels to form the Coastal Ocean Observations Panel (COOP), which first met in October, and will produce an integrated design plan for coastal seas. A change has been approved in the Terms of Reference of the Ocean Observations Panel for Climate (OOPC) to reflect the expansion of its role to include ocean physical and biogeochemical processes as well as climate. The GSC endorsed the plans of COOP and the OOPC. The GSC welcomed the positive results of the First GOOS Users' Forum, and encouraged continuation of this new consultative mechanism. The GSC approved expansion of the GOOS Initial Observing System (GOOS-IOS) to include the California Co-operative Fisheries Investigations (CalCOFI), and the Global Observing Systems Information Centre (GOSIC). In addition, it identified the satellite missions that contribute to the GOOS-IOS. The Committee endorsed the progress in and plans for the Global Ocean Data Assimilation Experiment (GODAE), which has now formed a pilot project to develop high-resolution SST data sets and products. The GSC noted that several countries have made financial commitments to the *Argo* profiling float project, including funds to support the recruitment of an *Argo* Technical Co-ordinator, who started work in February 2001 at the *Argo* Information Centre in Toulouse. Around 1500 *Argo* floats are expected to be in the water by the beginning of GODAE (2003), though difficulties are foreseen in obtaining full global coverage. The GSC was pleased with the growing regional development of GOOS. Development of an Indian Ocean GOOS had begun at meetings in Perth, Western Australia. Meetings had been held between GOOS and both ICES (North Atlantic) and PICES (North Pacific) to see how their ecosystem requirements could be met by GOOS developments. Contacts had been strengthened between GOOS and UNEP's Regional Seas Programme. Regional meetings had been held to take forward the development of PacificGOOS, IOCARIBE-GOOS, and Black Sea GOOS. MedGOOS had been successful in attracting major funding from the EC to expand development in the Mediterranean. EuroGOOS had begun working towards operational ecosystems models and forecasts. NEAR-GOOS had begun moving towards operational forecasting. The GSC approved plans to inaugurate a new Tropical Moored Buoy Implementation Panel (TIP) under the auspices of CLIVAR, GOOS and GCOS to cover buoy array requirements in all the tropical oceans. The GSC approved the hiring of a consultant to collect information on national activities, so as to improve the national GOOS database on the GOOS web site. The Committee also approved strengthening relationships with the partnership for an Integrated Global Observing Strategy (IGOS) (focusing on space-based observations), and with the Partnership for Observations of the Global Ocean (POGO) (focusing on education and training), and recommended dissolution of the Global Observing Systems Space Panel (GOSSP). An Implementation Strategy for Capacity Building was approved. The GSC was pleased with the first issue of the GOOS Products and Services Bulletin, which had been published on the GOOS web site. Progress with and plans for communication and information about GOOS were approved, as was the GOOS work programme and budget. The Committee proposed that in 2002 there should be a major international review of progress in GOOS.

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ANNEXES

1. ORGANIZATION OF THE SESSION

1.1 OPENING OF THE SESSION

The fourth session of the Global Ocean Observing System (GOOS) Steering Committee (GSC) was called to order by its chairman, Prof. W. Nowlin, on Wednesday March 14th 2000, at 09.00, at the Alcazar Hotel, Vina del Mar, Chile. The Chairman welcomed the new member of the core committee, S. Vallerga, along with E. Lindstrom, representing the Committee on Earth Observation Satellites (CEOS), S. Sathyendranath, representing the Partnership for Observations of the Global Ocean (POGO), B. Searle, Chairman of the International Oceanographic Data and Information Exchange Programme (IODE), D. Arcos, past Co-Chair of the Living Marine Resources (LMR) Panel of GOOS, B. Thompson, GOOS Data Co-ordinator, from the University of Delaware, and Y. Tamura, an observer from the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), as well as the Local Organizing Committee members and associates. Apologies were presented from committee members, R. Rayner and D. Wallace, from Ron Wilson and from the representatives of the International Council for Science (ICSU) and the United Nations Environment Programme (UNEP). The list of participants is presented in Annex II.

1.2 WELCOMING REMARKS

The Director of the hosting organization, the Servicio Hidrografico y Oceanografico de la Armada de Chile (SHOA), and President of the National Oceanographic Committee of Chile, Captain Fernando Mingram, welcomed the Committee to Chile. He remarked that Chile is highly honoured to be the host of such an important meeting, not just because Chile has a very considerable dependence on the sea and its resources, but also because this is the first time that such an important meeting has been held in the southern hemisphere and in a developing country. Chile takes very seriously the many serious problems affecting the ocean, as is reflected in the national oceanographic plan, the master document that guides and orients the marine scientific investigation in Chile, prepared by the National Oceanographic Committee. GOOS is important to Chile because it addresses and interprets local concerns regarding the great global phenomena which have local impact, such as El Nino. In closing Captain Mingram called the attention of the Committee to the importance of training, technological transfer and capacity building, especially in regions where there are developing countries, such as Latin America, that have the will and the potential to become active elements in GOOS, and to contribute to resolve the problems that involve us all. He wished the Committee a successful meeting, and a happy stay in Chile.

1.3 REMARKS BY SPONSORS REPRESENTATIVES

On behalf of the Intergovernmental Oceanographic Commission (IOC), Colin Summerhayes (Director of the GOOS Project Office, GPO) thanked participants for sparing their valuable time to attend this meeting, thanked Chile for kindly offering to host the meeting, thanked the Local Organizing Committee and SHOA for making all the necessary arrangements, and thanked ICSU and WMO for providing financial support. He passed on a message from Patricio Bernal, Executive Secretary of the IOC, to the effect that GOOS is the flagship project of the IOC and is making good progress. It is hoped that the work of the new Coastal Ocean Observations Panel (COOP) will lead to the development of a Handbook for the application of GOOS particularly by developing countries. The development of COOP is seen as a necessary simplification of the structure, as was the abolition of the Joint Data and Information Management Panel (J-DIMP). IOC governing bodies have called for a factual statement of the structure, mandates and modus operandi of GOOS, which is currently being prepared by Angus McEwan for the next meeting of the Intergovernmental Committee for GOOS (I-GOOS) in June 2001. The structure should not be reviewed in isolation by the IOC Assembly at its next meeting in July, but in the context of the wide-ranging review of GOOS progress that would be discussed during this session. The IOC welcomes the participation of CEOS in the meetings of the GSC, to help implement the Oceans Theme of the Partnership for the Integrated Global Observing Strategy (IGOS), and the involvement of GOOS in the development of a Carbon Theme for the IGOS Partners (IGOS-P). The IOC also welcomes the involvement of POGO in this meeting, to explore the potential for the involvement of POGO institutions in capacity building. Now that GOOS is being implemented, IOC's Member States are keen to see the capacity building element grow so that they can all participate in and benefit from GOOS. IOC is helping the Argo project along by employing an Argo Technical Co-ordinator who will work out of Toulouse.

On behalf of the World Meteorological Organization (WMO), Peter Dexter indicated the continued support of the WMO for GOOS. He noted that the new Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) holds its first formal meeting in June of this year. He expected that this would lead to further integration of present observing subsystems in support of GOOS implementation, as well as to improved interaction at the national level between meteorological and ocean agencies. JCOMM will enable the implementation of much of GOOS.

1.4 ADOPTION OF THE AGENDA

The provisional agenda (document GSC-IV/1) was adopted as published in Annex I.

1.5 WORKING ARRANGEMENTS

Dr. Summerhayes, Director of the GPO, set out the meeting timetable (document GSC-IV/2), presented the list of participants (document GSC-IV/3) (see Annex II), and introduced the list of documents (document GSC-IV/4; see Annex III). He noted that all meeting documents had been made available (and would stay) on the GOOS web site (http://ioc.unesco.org/goos/GSC-IV_doclst.html).

2. REPORT FROM THE CHAIRMAN OF I-GOOS

Dr. A. McEwan, Chairman of the Intergovernmental IOC-WMO-UNEP Committee for GOOS (I-GOOS) addressed the Committee, offering an I-GOOS perspective on the future of GOOS (document GSC-IV/7).

He noted that the activities listed in document GSC-IV/B28 (The Status Report for GOOS, 2000) attest to an extremely active year for ocean observing in general and GOOS in particular. Credit must go to the leadership of Dr. Summerhayes and the energy of his staff for the way these have been conducted and the dialogue and strengthened networking that has been achieved between the main groups involved. The merging of three advisory panels into COOP is a welcome simplification of the GOOS structure, a review of which by the IOC-Assembly is likely. Argo is gaining strong national endorsements. Territorial rights issues of this new technology are being explored and terms of a Resolution by the IOC Assembly (Resolution XX-9) have, despite their intention, the potential to encumber global implementation of the system. This was tested during a trial deployment in the vicinity of Indonesian waters in early 2000. The declaration of the GOOS Initial Observing System (IOS) in 1998 has met with general approval, as has the creation of JCOMM.

Five emerging issues that will impact the ongoing development and implementation of GOOS were highlighted: (i) oceanographic data exchange policy; (ii) regional implementation; (iii) widening the recruitment to GOOS; (iv) the visibility of GOOS, and external perceptions; and (v) intergovernmental resourcing and the future of GOOS.

(i) Data exchange: There is an ongoing debate at the intergovernmental level on the need for a definitive IOC policy on the exchange of oceanographic data.

(ii) Regional implementation: It is very likely that much of GOOS will be implemented through 'Regional GOOS' alliances. We now need some defining policies to guide their development. Acting on the discussions of GSC-III, a GOOS Regional Policy document (GSC-IV/11) has been drafted for consideration by I-GOOS V for endorsement by the IOC Assembly (see section 6.1, below). The policy should help to reduce or eliminate the potential for duplication of function, competition for resources and perceptions of poor co-ordination.

(iii) Recruitment to GOOS: Although the GOOS community has been successfully widened to embrace many existing and new subsystems, including new initiatives like GOSIC, Argo, GODAE and PIRATA, the GOOS paradigm has yet to be tested in the more sensitive contexts of coastal regions, biological resources and environmental health. As these contexts are of more immediate concern to many coastal Member States of IOC than is climate, the value of GOOS is less easily recognizable. Much work is still needed to allay concerns that GOOS is not relevant to developing coastal countries.

Although there has been a gratifying increase in the level of involvement of actively participating countries in GOOS, the number of those countries is relatively static. Nevertheless, in the past two years many previously non-involved countries have joined new regional groupings like MedGOOS, PacificGOOS and IOCARIBE-GOOS. Although they have yet to become very actively involved, at least they have signed up to the GOOS Principles, at the agency level if not at the country level. Other countries seem to be awaiting more evidence of the relevance of GOOS to their own needs.

(iv) Visibility of GOOS: The external comprehension of the GOOS mission and its visibility within a host of competing demands for national interest and support is an ongoing concern. Part of the problem is that ocean observation takes a minor place relative to global change and environmental degradation, instead of being seen as part of the solution. There is no particular focus for public interest and government investment, apart from that which the national ocean, atmospheric and environmental agencies are willing to promote. Even the specialized potential user industries and professions are poor champions for the system, due to the selectivity of their interest. In many countries the marine lobby is weak, and likely to remain so for some time. Regional development of GOOS may help to capture community and government interest, provided it involves the creation of GOOS-labeled activities like pilot projects, Observing System Simulation Experiments (OSSEs) and global system components whose value can be demonstrated. The GOOS Newsletter, the GOOS homepage, the GOOS Products and Services Bulletin and the creation of GOSIC are excellent initiatives to capture the interest of professionals in the field. Links from other sites to the GOOS homepage could be improved, especially those to popular directories and encyclopedias, as well as to kindred organizations like IOC and IODE. Specialist publicity services might provide new approaches to the promotion of GOOS and open new doors to support and sponsorship.

(v) Intergovernmental Resources: An increasing challenge for the future will be how to organize and implement GOOS without depending on intergovernmental resources. Resourcing through UNESCO remains difficult, partly because of the financial problems of the host organization, and partly because of the 'double governance' to which IOC is subjected by first the IOC Assembly, and then the UNESCO General Conference, a body made up of people who are commonly not from the same ministries as those who attend the IOC governing bodies, and who therefore have different agendas even though from the same Member States. The situation reflects the poor communications that exist in many countries between the sectors of government responsible for different parts of the UN system. Attempts are being made to give IOC more independence. Like it or not, the intergovernmental process is indispensable to the implementation of such a global and highly networked undertaking as GOOS, for it provides the mandates, agreements and endorsements that justify national co-operation.

The Committee held an extended discussion on policies and practices regarding national and regional GOOS mechanisms, and the problem of 'double governance'. Since the foundation of GOOS, IOC Member States have been encouraged to form national GOOS Committees. The intention was that the co-ordination between national agencies that took place in such committees would provide the basis for effective briefings of delegates to I-GOOS, and facilitate the co-ordination of multi-national GOOS regional activities, as well as improving the utilisation of GOOS products. While many countries have set up formal or informal national GOOS co-ordinating groups, the real value of such co-ordination may not be widely recognized and establishment of new national committees has been slow.

The GSC thanked Dr. McEwan for his thoughtful and comprehensive review of the wider issues, as well as for his wise advice through his membership of the GSC Executive Committee.

In discussion on this presentation, **the Committee understood that** the 'double governance' system might cause decisions to be taken, or recommendations ignored, to the disadvantage of GOOS, because delegates to UNESCO are usually appointed by their national Foreign Affairs (or equivalent) ministry, may often be from Educational or Cultural Agencies, and may be completely oblivious of either IOC or I-GOOS or their own national operational agencies' interests. **The Committee also appreciated** that similar problems might arise between I-GOOS and the governing bodies of the IOC, when the national delegates to I-GOOS differed from those attending IOC governing bodies. To ensure that national delegates to both I-GOOS and the IOC governing bodies were in concert**, the GSC recommended** that National GOOS Co-ordinating Committees be formed to bring together the views of the multiple national government agencies, industries, and NGOs that

benefit from GOOS (Fisheries, Public Health, Offshore Energy, Navy, Coastal Protection/Flooding, Navigation/Charts, Coastguard/Rescue, Tourism, Environment, Wildlife/Conservation, Climate, Meteorology, Space Agency, Science, and Foreign Affairs), to co-ordinate internal activities, exchange and provide access to data and products, and to brief delegations to I-GOOS, IOC, and UNESCO, with consistent policies and objectives.

The Committee agreed that regions should aim to be self-governing, and that as this developed over time it would take pressure off the GPO in Paris.

Action 1: The IOC should encourage Member States and national operational agencies to form National GOOS Co-ordinating Committees. The same national committees may also assist briefing delegates to the other GOOS sponsors: WMO, UNEP, FAO and ICSU.

Action 2: The GPO should strongly encourage Member States to send to I-GOOS meetings delegates who truly represent a broad range of operational agencies; Dr. Flemming offered to provide suggestions on how the GSC and GPO might achieve this for Europe.

3. REPORT BY THE DIRECTOR OF THE GPO

Colin Summerhayes reported on the progress and plans of the GOOS Project Office (GPO) (document GSC-IV/8). The IOC Regional (GOOS) Programme Office in Perth, Australia, has been very active (see document GSC-IV/B12, and section 6.1.8, below). The WESTPAC Secretariat in Bangkok continues to actively support the development of NEAR-GOOS (GSC-IV/B7), and is trying to spin up SEA-GOOS. The IOC through its GPO has provided funds to support the MedGOOS Secretariat in Malta (GSC-IV/B8), and to provide a part time Secretariat for IOCARIBE-GOOS in Miami (GSC-IV/B10), to assist the development of these two regional activities. The Perth Office is working with the South Pacific Applied Geoscience Commission (SOPAC) to provide a Secretariat for PacificGOOS. In the near future, Brazil may provide a regional office in Rio for the southwest Atlantic and PIRATA.

Staff support increased by 14% (from 8.7 to 10.1 man-years per year) compared with 1999/2000. New professional staff include: (i) Tsuyoshi Shiota, seconded from MONBUSHO, Tokyo, in July 2000 as an Associate Expert to replace Rimi Nakano, who returned to Tokyo in June; (ii) Bert Thompson, who started working part-time on GOOS data and information management in relation to GOOS commitments, through the University of Delaware; and (iii) Matthieu Belbeoch, who joined as Argo Technical Co-ordinator, in Toulouse, on March 1st 2001. The GPO lost Janice Trotte, who returned to Brazil's Directorate of Hydrography and Navigation at the end of May 2000, and Ned Cyr, the Technical Secretary of the LMR Panel, who returned to NOAA in March 2001. In addition, both Maria Hood and Art Alexiou spent less time on GOOS work. The GPO needs a staff member to work on capacity building for remote sensing (document GSC-IV/B24). The IOC is maintaining secretarial support for the GPO at an adequate level.

The GPO continues to maintain a high level of co-ordination with the sponsors, with GCOS, GTOS, CEOS, CLIVAR, GLOBEC, LOICZ, WOCE and JGOFS, with regional GOOS bodies, and with major national organizations especially in Europe, Japan and the USA. Connections have been strengthened with ICES, and PICES, notably through the formalization of the new ICES-IOC Steering Group for GOOS. Links with UNEP's Regional Seas Programme have been strengthened. IOC has asked FAO to consider co-sponsoring GOOS.

Promotion of and communication about GOOS remain at a high level, with several papers on GOOS being delivered at conferences and/or published, with continuation of the GOOS News, and with continued improvement of the Web page. A GOOS brochure and poster are being developed. The IGOS Ocean Theme report was published by NASA. Some GOOS reports are now available on the GOOS Web site in other languages than English (French, Spanish, Russian).

Many GOOS meetings have taken place to facilitate international co-ordination and implementation, including a First GOOS Users' Forum.

The IOC continues to provide about 36% of the funds to support GPO activities (document GSC-IV/22). Considerable efforts were made to bring in the external funds needed to maintain the work programme at the desired level.

The Committee congratulated the GPO on its efficiency and effectiveness.

4. VIEWS FROM THE CHAIR

Prof Nowlin listed some key developments of GOOS from the intersessional period. These included the completion of the Strategic Design Plans of the C-GOOS, LMR and HOTO Module Panels; the formation of COOP to guide development of coastal theme, and the successful first meeting of COOP; the continued forward progress of GODAE and Argo; progress with the development of JCOMM; the scheduled review of GOSIC; the increasing emphasis being given to data and information management; the hiring of Bert Thompson to solicit and access commitments for the GOOS-IOS; the energetic and successful beginning of the Perth Office; the advance of regional implementation; the appointment of a new chair to the Capacity Building Panel (Geoff Brundrit).

Professor Nowlin reported that the First GOOS Users' Forum, held in Costa Rica in November 2000 (document GSC-IV/B1), was well attended and had been a useful meeting. The Forum concept is seen as directly useful to the development of COOP's plans, where a major challenge is to involve user groups outside the scientific community as early a possible in the formulation of the design and implementation plan. It is unrealistic to expect COOP to meet with all users in all regions on a regular basis. Since national and regional GOOS programmes are the primary vehicles by which coastal GOOS will be implemented and are in direct contact with user groups in their country or region, advice and guidance from representatives of these programmes are vital to the design of a successful implementation plan. Recognizing this, GOOS Users' *Fora* should be designed (i) to ensure that the design and implementation of the coastal component of GOOS reflects the priorities of national and regional GOOS programmes and the needs of user groups represented by these programmes, and (ii) to strengthen national and regional GOOS programmes by facilitating the exchange of information on new technologies, approaches and knowledge among participating nations; and promoting the global scale implementation of all components of GOOS.

The first GOOS Users' Forum began the development of the GOOS Network by bringing together representatives of several national and regional GOOS groups to exchange ideas, learn about best practices from one another, explore common difficulties, learn about new GOOS developments, and influence COOP thinking. Although it had been hoped that the attendees would represent the views of a broad user community, this hope was not fully realized. It would be advisable to narrow the scope somewhat in future. The Forum concept should be continued in association with COOP meetings, with one meeting per year devoted to user requirements in a relatively narrow geographical field, and one devoted to continuing development of the GOOS Network at a broad regional or even global scale. COOP-II, in Trieste, in June, would follow the former model, bringing together users interested in the Adriatic in particular. COOP-III, later in the year, would follow the latter model. These meetings might be focused on a variety of user needs in the region considered, or on one or more selected needs or products.

The Committee endorsed this approach to engaging the user community.

Prof. Nowlin showed members the latest version of the GOOS activity diagram from the GOOS web page, in which hot links have been made to most of the activity boxes.

The Committee approved the modifications made to the activity diagram.

Prof Nowlin concluded by listing some key issues for GSC-IV. These included:

- Approval of the reports, schedules, actions and budgets for COOP and OOPC, and of the Terms of Reference for COOP;

- Endorsement of the regional policy document; of the mechanism suggested for obtaining commitments; of the ocean carbon observing programme; of the latest version of the data and information management strategy; of the implementation strategy for capacity building; of the plans for a review of GOOS in 2002; and of the work programme and budget;

- Decisions on the follow-up to GOSSP; on the long-term objectives for capacity building; on the GOOS brochure; on user scenarios for the Products and Services Bulletin; and on future members, including a potential replacement for the chairman;

- Agreement on the way forward in ocean data management.

5. GOOS PLANNING

Prof. Nowlin introduced this item, reminding the Committee about the merger of the C-GOOS, LMR and HOTO advisory panels into a new integrated advisory panel, the Coastal Ocean Observations Panel (COOP). Following the presentations (below) by the chairs of OOPC and COOP, he invited the Committee to consider what more needs to be done to aid in the development of plans for GOOS.

5.1 OCEAN OBSERVATIONS PANEL FOR CLIMATE (OOPC)

Dr. Neville Smith reported on progress with OOPC activities (see highlights in Annex IV; and full report in document GSC-IV/9). GODAE and Argo are dealt with separately in item 6.2.2 below. The Panel held it fifth meeting in Bergen (20-23 June, 2000), and will hold its sixth meeting at the Bureau of Meteorology, Melbourne, 2-5 April 2001. The new Terms of Reference, have been approved by the GSC (at GSC-III) and by the World Climate Research Programme (WCRP) but not yet by GCOS.

In situ sampling for climate is still a problem in the Arctic and the Southern Ocean, in the south-western Pacific, much of the Indian Ocean, and South Atlantic. There were setbacks in the surface drifter and ship-of-opportunity programmes, but action has been taken to address the issues.

Among the highlights for the year was the Workshop on Sustained Observations for the Climate of the Indian Ocean, in Perth last year (see item 6.1.8). This proved a very effective mechanism for regional participation, and Bill Erb (of the Perth Office) and Gary Meyers (Convenor) deserve much credit for setting up the workshop. In the Indian Ocean the diurnal cycle is critical to weather and monsoon forecasting, so the measurement focus tends to be more on the near-surface and upper ocean than on the deep waters. Among other highlights, good progress has been made with the Working Group on Numerical Experimentation (WGNE) on surface reference sites (the Surface Flux Analysis, or SURFA, Project). Discussions on Arctic observations and wind waves at OOPC-V have led to an improved strategy for the Arctic. There has been good progress in the follow-up to the OceanObs '99 Conference; the associated publication should appear in the third quarter of 2001. M. Hood et al. have done good work in producing a carbon cycle paper (GSC-IV/B20). Links with JGOFS have been improved with the nomination of P. Haugan to co-ordinate with OOPC. Close collaboration has continued with CLIVAR and its Ocean Observations Panel (CLIVAR-OOP), and with the Working Group on Air Sea Fluxes (WGASF). A strategy has been agreed for co-ordination with the CLIVAR-OOP. The actions on OOPC from GSC-III have largely been met.

Looking forward, the major OOPC action items for 2001-2002 include (i) a review of the tropical mooring arrays, (ii) the development of the SURFA Project, (iii) the first meeting of the Time-Series Stations Science group, (iv) action on data management issues, (v) follow-up actions for the Indian Ocean, (vi) review of the carbon background paper (GSC-IV/B20) and (vii) completion of the OceanObs monograph. He noted that the Indian Ocean Workshop in Perth, plus GODAE and the SURFA project all enjoyed partial support from IOC over the last year and this is appreciated, as is the strength and energy of the Secretariat support. It is hoped the majority of the tasks for the coming year will be largely self-sustaining and have little call for IOC resources; data management issues might provide an exception. Dr. Smith noted the considerable work on SST products by the OOPC/AOPC SST Working Group, and through the GODAE SST Working Group, and stressed the importance of continued progress in this area.

Dr. Smith noted the intention of the Panel to develop a longer-term strategy for its work as many of the networks start to mature, and as the emphasis shifts to evaluation and assessment. He also pointed to the process initiated by GCOS and the UNFCCC for reporting of national observing activities, and the intention to follow this with a synthesis and assessment phase. The latter will be a critical activity of the Panel in 2002 and 2003.

The GSC commended Dr. Smith on the extensive accomplishments of the Panel, **approved the work plan, and noted** that there were no major action items for the GSC directly arising from his report. **The Committee considered** that the OOPC had made good progress over the last year and could not identify any areas where activity is unsatisfactory, inappropriate or requires improved co-ordination with other areas of GOOS. **The Committee noted** that interactions of OOPC are extensive and include the other co-sponsors (GCOS, WCRP), CLIVAR, JCOMM, POGO and the satellite agencies through the IGOS Partners. These interactions, which require significant effort, were regarded as appropriate and effective. **The Committee noted** that three new members have been nominated for OOPC (T. Dickey, E. Campos, and P. Taylor), and **endorsed the nominations**.

5.2 COASTAL OCEAN OBSERVATIONS PANEL (COOP)

Dr. Tom Malone, chair of the former Coastal GOOS (C-GOOS) Panel and co-chair of COOP, reported on progress with Coastal GOOS, then, supported by COOP co-chair Dr. Tony Knap, on progress with COOP activities (working document GSC-IV/10).

5.2.1 Coastal Panel of GOOS (C-GOOS), Health of the Oceans (HOTO) and Living Marine Resources (LMR) Design Plans

Following its fifth and last meeting in May 2000, C-GOOS completed the "Strategic Design Plan for the Coastal Component of the Global Ocean Observing System" (GOOS Report No. 90) (document GSC-IV/B2). The LMR Panel produced its design plan following its fourth and last meeting in May 2000 (document GSC-IV/B3), and the HOTO Panel produced its design plan following its fifth and last meeting in September 2000 (document GSC-IV/B4).

The C-GOOS Design Plan provides the framework for integrating the HOTO and LMR plans into a common framework. Highlights of the plan are given in Annex V. The successful development of C-GOOS depends on broad-based international support and ongoing sponsorship by nations and private institutions. The first step is to co-ordinate with national and regional GOOS programmes to incorporate and link existing efforts to ensure continuity and to achieve larger scale regional and global perspectives, minimize redundancy, improve access to data, and produce timely analyses that benefit a broader spectrum of user groups. By building on existing capabilities and infrastructure, and by using a phased implementation approach, work can start immediately to achieve the vision. New technologies, past investments, evolving scientific understanding, advances in data communications and processing, and the will to address pressing societal needs combine to provide the opportunity to initiate an integrated observing system for coastal ecosystems. The major pieces sought are an internationally accepted global design; national and international commitments of assets and funds; and an unprecedented level of collaboration among nations, institutions, data providers and users.

5.2.2 Coastal Ocean Observations Panel (COOP)

COOP was formed by the merger of C-GOOS with the Health Of The Oceans (HOTO) and Living Marine Resources (LMR) module Panels. COOP's main task is to formulate a unified, comprehensive design that integrates the design plans for the coastal, HOTO and LMR modules. Consistent with the broad range of issues that are to be addressed, COOP is a large panel (21 members) with a broad range of expertise. This panel has a core of members from the previous panels plus experts to address selected topics. The Terms of Reference for COOP are as follows:

(i) integrate and refine the design plans drafted by the Health Of The Oceans (HOTO), the Living Marine Resources (LMR), and the Coastal GOOS (C-GOOS) panels to develop a unified plan that is consistent with the GOOS Design Principles and addresses issues related to the following themes:
- coastal marine services (e.g., safe and efficient marine operations, coastal hazards);

- the health of marine and estuarine ecosystems and its relation to human health; and
- living marine resources;

(ii) develop mechanisms for more effective and sustained involvement of user groups in the design and implementation of the coastal module of GOOS;

(iii) develop mechanisms that enable effective synergy between research and the development of a sustained observing system for coastal marine and estuarine ecosystems;

(iv) formulate an implementation plan that is co-ordinated with the OOPC plan for climate services, research and marine services with due emphasis on:
- integrated observations;
- data and information management;
- data assimilation and modelling for the purposes of prediction and product development;
- capacity building; and
- national, regional, and global promotion of objectives and benefits of the observing system;

(v) establish criteria and procedures for selecting observing system elements on global and regional scales, and recommend the elements that will constitute the initial observing system;

(vi) define procedures for ongoing evaluation of system components, reliability of data streams, access to data, and applications.

At its first meeting in November 2000, COOP drafted an action plan to complete the design phase at its second meeting in June 2001. This will set the stage for the timely completion of the implementation plan by the end of 2003. This is an optimistic schedule, but achievable with two meetings per year. Dr. Knap outlined the contents of the unified design plan, details of which will be published in the report of COOP-I.

Reporting on progress against actions from GSC-III, Dr. Malone noted that co-ordination between COOP and OOPC would be ensured by having an OOPC member attend COOP meetings. COOP would be considering proposals made by the LMR and HOTO Panels for pilot projects. FAO and the IGBP (for LOICZ) have been asked to co-sponsor COOP. Although no progress was made with the suggestion (at GSC-III) that GTOS might wish to co-sponsor COOP in the same way that GCOS co-sponsors OOPC, the link with GTOS would be continued with participation of a GTOS representative on COOP.

5.2.3 Interaction with Users

Dr. Malone concluded by stressing the importance of continuing interaction with users in the development of COOP's plans. These interactions had begun at the second meeting of the Coastal GOOS Panel in Curitiba, Brazil, since when all meetings of the C-GOOS Panel were preceded by a one-day meeting with stakeholders. The LMR Panel had followed a similar process. The local organizing committee identified the groups to be represented and invited the appropriate individuals. The purpose of these meetings was: (i) to familiarize the panel with local and regional requirements for environmental information and (ii) to familiarize stakeholders from the region with GOOS. The C-GOOS Panel was sufficiently encouraged by the input it received to recommend to the GSC that this process be continued and improved on as a precursor to each meeting of the COOP (as approved in section 4, above).

T**he GSC congratulated** the C-GOOS, LMR and HOTO Chairs on the impressive progress made, **endorsed** the new COOP Terms of Reference, and **approved** publication of the strategic design plans for the C-GOOS and LMR Modules. Approval for publication of the strategic design plan for HOTO will follow its circulation to members by the GPO.

Action 3: Tony Knap to provide the GPO with the final version of the HOTO Strategic Design Plan, and GPO to circulate it to Committee members for comment and approval.

The Committee approved the proposed schedule of two meetings per year, up until GSC-V, at which point progress will be reviewed before deciding on a future schedule.

In discussion, **the Committee recognized** that at this point in time it is not evident how implementation of COOP's plans would be undertaken. The physical elements would largely be undertaken by JCOMM. More consideration will have to be given in future to the implementation of the chemical and biological elements. **The Committee acknowledged** that the COOP design will be tested through the development of a range of potential pilot projects. **The Committee wondered** if some of these tests could not take place through existing projects with COOP-like characteristics, such as growing number of Large Marine Ecosystem (LME) projects, the regional research projects of LOICZ (the Land-Ocean Interactions in the Coastal Zone Project of the IGBP), coastal developments in GTOS, and so on. The COOP co-chairs responded that COOP would be considering a wide range of possible mechanisms and pilot projects for testing its design plans, and would be working as actively as possible with regional users to engage them in the process. Much of the interaction with users has taken place through the Coastal GOOS stakeholders meetings, and it would continue through the two different types of Users' Fora (see section 4, above). Tom Malone reminded the Committee that the Coastal GOOS design started from users' requirements, and worked back from them to the design of the observation system. **The Committee endorsed this process, and agreed** that to further stimulate engagement with users in the Mediterranean and Adriatic, it would be useful for the COOP co-chairs to be on the advisory board of the MedGOOS Pilot Project, MAMA (*"Mediterranean network to Assess and Upgrade Monitoring and Forecasting Activity in the basin".)* (see section 6.1.3, below).

Action 4: MedGOOS Chair to invite COOP co-chairs to serve on the Advisory Board of MAMA.

The Committee agreed that there was considerable potential for the COOP and OOPC approaches to be linked, especially through the development and application of models, with GODAE (which will cover shelf seas as well as the open ocean) providing the basis for nesting more local models. In this context, the CAOS (Co-ordinated Adriatic Observing System) pilot project offers the potential for a miniature application of the combined COOP and OOPC approaches to forecasting.

Action 5: Strong linkage between COOP and OOPC needs to be maintained at least at the level of the chairmen.

To publicize the COOP approach, **the Committee suggested** that COOP consider developing a set of articles for a special issue of the journal Estuarine and Coastal Marine Science.

6. IMPLEMENTATION OVERSIGHT

6.1 REGIONAL IMPLEMENTATION

Prof. Nowlin reminded the Committee that the GSC Discussion Paper on GOOS Regional Groups (document GSC-IV/B5), produced with the assistance of the Director of EuroGOOS, is now available on the GOOS web site. That document led to the formulation of a draft GOOS Regional Policy paper (document GSC-IV/11) that will be considered by I-GOOS in June 2001. Regional development is natural and desirable. To avoid overlap with other existing regional organizations, duplication of effort, inefficient use of resources, and conflicts, there must be a policy to cover regional GOOS development. Recognition of groups claiming or intending to develop a regional GOOS must be carefully considered, both as regards boundaries and the technical capabilities of the proposing, parent organization. Failure to do so will lead to boundary disputes and inefficient or ineffective use of resources. The new policy, when fully agreed, will be promulgated by the GSC, I-GOOS and the GPO.

In discussion, Dr. McEwan noted that the draft Regional Policy document will need an annex to apply to GOOS systems that are already in place, like EuroGOOS, or NEAR-GOOS. The Committee made several suggestions for Dr. McEwan to consider in improving the policy document. The Director of EuroGOOS is assisting Dr. McEwan with the Policy paper. **The Committee endorsed** transmission of the policy paper to I-GOOS, with the amendments noted.

Action 6: GPO and chair of I-GOOS, with assistance from Director EuroGOOS, to make suggested improvements to the regional policy document for presentation to I-GOOS-V.

Prof. Nowlin then invited presentations and discussion on progress with, and requirements for, building GOOS on a regional basis.

6.1.1 European GOOS (EuroGOOS)

The Director of EuroGOOS, Dr. Nic Flemming, reviewed progress and plans in EuroGOOS, especially noting developments in EuroGOOS that can be applied more widely (see highlights in Annex VI, and details in document GSC-IV/B6 and on the EuroGOOS Home Page: HTTP://www.EuroGOOS.org). EuroGOOS is now an association of member agencies that is funded by a subscription that pays for the EuroGOOS Office and administration. It has 30 members from 16 countries.

In January 2000 EuroGOOS published its Forward Look policy document, which included a set of benchmark objectives. The objectives in the time frame 1999-2002 are almost achieved now, in the sense that the foundations have been laid and EuroGOOS projects in every sea area are progressing well. Work has already started on some of the objectives for the 2003-2008 time frame, especially in connection with observations from space. These include:

- Operational real-time services with substantially less than 1-km grid resolution in coastal seas, and 1- to 5-km in the Mediterranean;
- Expanded list of forecast variables, including nutrients, water quality, and ecosystem parameters;
- Fully operational ocean basin and shelf edge models;
- Strong regional seas operational systems, such as BOOS, MSF, NOOS, etc.;
- Expanded network of deployed ocean profiling floats and time-series fixed stations (Argo, GODAE etc.);
- Greatly increased computer modelling capacity and high data rate real-time network;
- Operational ocean satellite missions scheduled on an agreed programme at European level;
- Fully functional real-time data sharing agreement (the Data Policy);
- Agreements to deliver products to non-research directorates and European agencies.

EuroGOOS has become an operational organization supported by an infrastructure of crosscutting components and services, rather than an exploratory and planning body. It has a substantial number of operational services now running. Many data products are accessible on agency and Task Team home pages in real time. The internal structure has been re-organized to give greater responsibility to the Regional Seas Task Teams and their representatives. Implementation of observing systems is developed at the Regional Seas level, the pan-European level, and the Atlantic-Global level. EuroGOOS has held a major workshop with ICES on bio-ecological operational modelling (EuroGOOS Publication 15), and Members are working towards operational ecosystems models and forecasts, in conjunction with ICES, HELCOM, and OSPAR. EuroGOOS has regular working contacts with MedGOOS, Black Sea GOOS, and ISOOS in the USA, and is interested to further the collaboration between GOOS Regions. An economic evaluation of operational oceanography in Europe is being conducted, with a view to standardizing methodology on time-scales from hours to decades. A 2-day conference with space agencies at Darmstadt on 'Operational Oceanographic Observations from Space' (October 2000) led to a joint agreement published as a Conference Statement (Annex VI). Members of EuroGOOS have also been active in preparing for the Argo float deployment in the Atlantic. French and British Agencies have launched profiling floats as part of the build up of Argo. EuroGOOS is participating as a member of the new ICES-IOC Steering Group for GOOS, and is working with ICES and the GOOS Project Office to plan a workshop on operational oceanography for support of ecosystem management and fisheries, which will be held in Bergen in September 2001 (see section 6.1.7, below).

Dr. Flemming reported that he will retire as Director of the EuroGOOS Office at the end of 2001. A search committee is responsible for recruiting and appointing his successor.

The Committee noted the significant transformation of EuroGOOS into an operational entity providing operational data services to an expanding range of user groups, and with data products accessible through a suite of homepages, **and congratulated** the Director on excellent progress.

In discussion, Dr. Flemming made it clear that the EuroGOOS data policy does not preclude the exchange of data with non-EuroGOOS bodies; such exchange will be free, barring costs of reproduction, if

required for research purposes. While noting that some of the EuroGOOS members were meteorological agencies, **the Committee suggested** that more collaboration with meteorological agencies might be considered, so as to fully engage WMO Members in EuroGOOS activities. Professor Yu expressed the view that regional activities could learn a lot from each other and asked if the GPO could stimulate such interaction.

Action 7: Directors GPO and EuroGOOS to consider mechanisms to facilitate visits between EuroGOOS representatives and other regional GOOS bodies.

6.1.2 North-East Asian Regional GOOS (NEAR-GOOS)

The immediate past Chairman of NEAR-GOOS, Professor Yu Zhouwen, reported on progress in NEAR-GOOS, referring to document GSC-IV/B7 (for more information see the NEAR-GOOS website at: http://ioc.unesco.org/goos/neargoos.htm). His remarks were supported by additional comments from Mr. Hasegawa, a former chairman of NEAR-GOOS. Prof. Yu referred to three significant achievements. First was establishment of an operational data sharing system. Data contribution to and retrieval from the regional and national NEAR-GOOS databases has increased considerably in the past year. Sealevel data is now reported on line. The databases are all currently accessible via Internet. Users can access the system free of charge, and the high level of interest is reflected in the 2000 hits per month on the central database. Second was the NEAR-GOOS data and information management training course, held annually for half a dozen people from inside and outside the NEAR-GOOS region. Third was the development of several substantial GOOS-related research projects, especially in Japan and Korea.

For the future, plans are in hand for a NEAR-GOOS ocean environmental forecasting workshop that will be held in August 2000. The idea is to broaden NEAR-GOOS beyond just data exchange. There are also plans to broaden NEAR-GOOS's remit and membership to incorporate issues relating to living resources and environmental quality. In that context links are being developed with PICES (see section 6.1.7, below), and PICES will co-sponsor the forecasting workshop. In addition environmental links are being strengthened with the UNEP Regional Seas programme NOWPAP (Northwest Pacific Action Plan). NEAR-GOOS could evolve to provide the infrastructure for exchange of data by PICES and NOWPAP. The next step is to obtain their requirements. To put all these development in context, NEAR-GOOS is developing a medium-term strategy for the next 5 years, so as to capitalize on the production of the design plans of C-GOOS, LMR and HOTO.

The Committee was much encouraged by these developments**. It was pleased** to see the development of a strategic approach **and looked forward** to seeing the strategic plan in due course. **It was also pleased to see** the growing emphasis on forecasting, the intention to broaden the types of data distributed, and the developing links with PICES and UNEP.

6.1.3 Mediterranean GOOS (MedGOOS)

Dr. Silvana Vallerga, Chairperson of MedGOOS, reported on progress and plans in the development of MedGOOS, which now has agencies from 21 countries as members. The MedGOOS strategy involves ascertaining what is going on nationally and regionally, incorporating existing systems, and developing appropriate multi-national and bilateral projects. To facilitate development of the programme, the IOC has provided funds to support a part-time assistant in the MedGOOS Secretariat in Malta.

A major activity during the past year has been continuation of the Mediterranean Forecasting System Pilot Project (MFSPP), and development of proposals for MFS phase 2. MedGOOS also includes the MEDAR-MEDATLAS (Mediterranean Data Archaeology) project.

Considerable effort has gone into developing the MAMA proposal for submission to the EC early in 2001. MAMA is a pilot project for *a "Mediterranean network to Assess and Upgrade Monitoring and Forecasting Activity in the basin"*. The first stages of MAMA were developed at the MedGOOS meeting in Rabat (November 1999; document GSC-IV/B8). MAMA involves: building a basin-wide network for modelling and forecasting; identifying significant gaps in the basin; building capacities, through exchange of personnel; designing an initial forecasting system; and raising awareness. MAMA provides full geographical coverage, involving 26 research and government agencies from 19 countries in the region.

The Committee was pleased to see the progress being made in developing pilot projects and in implementing the MedGOOS strategic plan, and **complimented** its chairperson.

6.1.4 PacificGOOS

Dr. Summerhayes reported on progress and plans in the development of PacificGOOS, based on documents GSC-IV/B9 and B12, submitted by Bill Erb of the Perth Office. A Pacific Coastal GOOS Workshop was convened in Apia Western Samoa in August, co-organized with SOPAC. Some forty participants attended. Attendees identified a set of potential coastal pilot projects, and SOPAC was given the task of working with the interested parties to further develop the project proposals, which included:

(i) monitoring coastal water quality at selected regional sites;
(ii) monitoring pearl culture and seaweed farming in Kiribati and the Marshall Islands;
(iii) monitoring reef health at Pacific island dive tourism sites.

The meeting also provided a forum to discuss Argo in the Pacific and led to an arrangement for processing clearances from island nations to deploy Argo floats in their EEZ's.

The practicalities of implementing the PacificGOOS programme were further discussed at a PacificGOOS Steering Committee meeting in the margins of the GODAE meeting in Noumea. A key requirement is the development of a strategic plan that will provide context for the pilot projects.

The Committee was pleased to see the focus on pilot projects as a method of implementing PacificGOOS, **and looked forward** to seeing a strategic plan for the implementation of the pilot projects.

6.1.5 IOCARIBE-GOOS

Dr. Summerhayes reported on progress and plans in the development of IOCARIBE-GOOS (document GSC-IV/B10). The second meeting of the *ad hoc* Advisory Group for IOCARIBE-GOOS took place in Havana on November 27 to December 1, 2000, to consider a set of draft chapters for the IOCARIBE-GOOS strategic plan. The IOC has funded the appointment of a part-time assistant to function as the IOCARIBE-GOOS Secretariat in Miami. The Secretariat will develop inventories of existing operational systems and programmes relevant to IOCARIBE-GOOS, of organizations with a potential interest in IOCARIBE-GOOS, of existing and proposed scientific programmes of interest to IOCARIBE-GOOS, and of commercial interests related to IOCARIBE-GOOS. The inventories and the revised chapters of the strategic plan will be used at the third meeting of the Advisory Group (Miami, April 1-5, 2001) to finalize the strategic plan and to define selected pilot projects. The strategic plan will then be presented to attendees at Oceanology International (April 4-6) as part of an IOCARIBE-GOOS workshop that will address the potential for development of GOOS in the wider Caribbean region.

The Committee welcomed these developments **and looked forward** to seeing the strategic plan and the list of potential pilot projects.

6.1.6 GOOS-AFRICA

Dr. Geoff Brundrit, Chairman of the GOOS-AFRICA Co-ordinating Committee, reported on the progress with and plans for GOOS-AFRICA. He reminded the Committee that the immediate priorities for GOOS Africa are (i) to form an Africa wide network of National Ocean Data Centres; (ii) to upgrade the African network of GLOSS sea level stations; (iii) to encourage access to and capability in Ocean Remote Sensing in Africa; and (iv) to facilitate Internet access and data transfer mechanisms. These priorities were defined at the Pan African Conference on Sustainable Integrated Coastal Management (PACSICOM) in Maputo, July 1998, and are supported at the Ministerial level by African coastal countries. The PACSICOM follow-up, now referred to as the African Process, is underway. It should provide a unique opportunity for GOOS-AFRICA to put forward, for endorsement, projects proposals relating to observational infrastructure and capacity building for coastal and marine management in sub-Saharan Africa. The holding of Rio+10 in South Africa in 2002 should provide a further boost for the African Process, for GOOS-AFRICA, and for GOOS as a whole.

Progress is already being made in that priorities (i) and (iv) that are currently being funded by IOC in partnership with donor governments through the ODINAFRICA Project of the IODE.

As far as objective (ii) is concerned, the tide gauge/sea-level network in eastern and southern Africa and in the island states of the western Indian Ocean is in a relatively healthy state, with over 12 stations reporting to the Permanent Service for Mean Sea Level (PSMSL). The situation on the Atlantic seaboard of west Africa, from Morocco to Angola, is unsatisfactory, with scarcely an operational station reporting to the PSMSL. The needs of the north African region are being addressed through the expansion of the sea-level network of MedGOOS. A GLOSS training course for the countries of the Red Sea region was held in Jeddah, Saudi Arabia in 2000, and one for African countries was held in Cape Town in 1999.

For objective (iii) there is a need to increase both real-time access to satellite imagery and the ability to add value to this imagery in the form of planning products and forecasts. For GOOS-AFRICA, there must be an emphasis on improving access to receiving stations for ocean satellites. At the moment, such access is limited and there is little trained capacity available to meet expanding local demands.

Under the GOOS-AFRICA umbrella there are several regional initiatives. Those for North Africa were discussed under MedGOOS (section 6.1.3, above), and include MedGLOSS. A proposal to establish the Western Indian Ocean Marine Applications Project (WIOMAP) has been written, and ways of taking it forward are now being examined with the aide of WMO and IOC. LMR interests are being addressed through the Benguela Current Large Marine Ecosystem (BCLME), and the Gulf Of Guinea Large Marine Ecosystem (GOGLME), and the BENguela Environment for Fisheries Information and Training project (BENEFIT). The Pilot Research Array in the Tropical Atlantic (PIRATA) project is well underway.

For the future, Prof. Brundrit saw a number of additional possibilities, including:

(i) A GOOS-AFRICA workshop to be held in east Africa later this year, hopefully in conjunction with CEOS or its agencies, to explore the needs for and development of proposals and plans for remote sensing to meet the demands of objective (iii);
(ii) A pilot research array for the tropical Western Indian Ocean;
(iii) A Somali Current Large Marine Ecosystem project;
(iv) An Agulhas Current Large Marine Ecosystem project;
(v) A Canary Current Large Marine Ecosystem project;
(vi) A SeaWatch Southern Africa coastal moored buoy system;
(vii) PIRATA SE (Angola) and NE (Senegal) extensions;
(viii) A west African/eastern Atlantic GLOSS improvement.

The Committee encouraged initiatives to meet GOOS-AFRICA's immediate priorities. **The Committee recognized** that remote sensing and sea level are needed for climate as well as for coastal issues, and GCOS offered to relay the PACSICOM message about remote sensing to the UNFCCC and donor agencies. Silvana Vallerga noted that CNR, Italy, has a SeaWIFS receiving station through which GOOS-AFRICA scientists could be trained. **The Committee recommended** that modelling be treated as an important part of the proposals coming out of the East Africa meeting. **The Committee accepted** that LME projects are demonstration projects that could form part of GOOS-AFRICA, and be recognized as GOOS-related activities.

Action 8: Director GPO and Chair GOOS-AFRICA were asked to capitalize on the GOOS-Africa meeting in E. Africa later in 2001 to formulate for the African Process proposals on ocean remote sensing for GOOS-AFRICA and (in conjunction with GLOSS) on an effective GLOSS network for West Africa, and to explore the possibility of liaison with CEOS in relation to the remote sensing requirements;

Action 9: GOOS-AFRICA Committee to seek an assessment of regional priorities from its members (including IOC bodies such as IOCEA and IOCINCWIO), and to encourage the development of key proposals, which match the four priorities, for submission to the African Process, within the time frame of the African process;

Action 10: Director GCOS to work with GPO to get details from EUMETSAT of the PUMA proposal funded by the EC for receiving stations in Africa;

Action 11: Director GCOS to bring the PACSICOM requirements for remote sensing and sea level to the attention of the UNFCCC in the context of their use for climate observations;

Action 12: Chairs of OOPC and COOP were asked to work with their panels to consider whether or not to accept some of the listed GOOS-AFRICA regional pilot projects as GOOS Pilot Projects, and/or as elements of the GOOS Initial Observing System;

Action 13: I-GOOS-V should be asked to consider how GOOS should be presented within the meeting in 2002 on Rio+10.

6.1.7 International Council for the Exploration of the Sea/North Pacific Marine Science Organization (ICES/PICES)

Dr. Summerhayes reported on progress and plans in the development of linkages between the two main international fisheries organizations, ICES, and PICES. The ICES-IOC Steering Group for GOOS, of which both the GPO and EuroGOOS are members, held its first meeting in Southampton (October 2000), hosted by EuroGOOS. To preserve and stress the link with the LMR element of GOOS, Mike Sinclair of the LMR Panel is co-chair of the new Group. The Group's main interests lie in seeing how the observations of ICES Member States, and the ICES database, can be of use to GOOS, and how GOOS principles and approaches, especially those of LMR GOOS and EuroGOOS, can be applied in the ICES context. The Group is particularly interested in seeing developed an ecosystem approach to fisheries management. To this end it is planning a workshop on operational oceanography for support of an ecosystem approach to the management of fisheries, focusing on the North Sea, where it is intended that a pilot project on this topic should be developed, building on and in association with EuroGOOS North-west shelf Operational Oceanographic System (NOOS). The workshop, jointly sponsored by ICES, IOC, EuroGOOS and OSPARCOM, will be held in Bergen in September 2001.

ICES agencies also collect large amounts of hydrographic and chemical data (nutrients, oxygen) that could be of considerable use and interest to other communities should they become available through GOOS. Much of the open ocean hydrographic data might be useful for climate studies and should be brought to the attention of the OOPC.

PICES also has become interested in GOOS. Ned Cyr (Technical Secretary of the LMR Panel) and Maarten Kuijper (Technical Secretary of NEAR-GOOS) attended the PICES Annual meeting in summer 2000, where they explored the possibility of setting up a joint GOOS PICES North Pacific pilot project. PICES is interested in considering the implications of setting up a Regional Analysis Centre (RAC) for the North Pacific, along the lines recommended by the LMR Panel, and has set up a working group to consider this. Mike Laurs and Warren Wooster of the former LMR Panel are on the working group and will attend a workshop in Honolulu in March 2000 to consider these various possibilities. Maarten Kuiper will work with NEAR-GOOS and PICES to consider the development of a PICES type of GOOS pilot project in the NEAR-GOOS area, where PICES is co-sponsoring a Forecasting Workshop in August 2000.

The Committee was pleased to see that GOOS has captured the attention of the major fisheries bodies. **The Committee was pleased to see** the strong relationship developing between the GOOS Project Office, EuroGOOS and ICES, and **looked forward to seeing** the results of the Bergen workshop. **The Committee asked** OOPC to advise on how ICES hydrographic data might be used in climate studies of the North Atlantic.

Action 14: OOPC to consider how ICES Hydrographic data might be used in climate studies of the North Atlantic.

Action 15: GPO to assess the availability of data from the ICES database, and to report back to GSC-V.

The Committee was pleased to see the strong relationship developing between PICES, GOOS and NEAR-GOOS, and **looked forward to seeing** project proposals emerge.

Action 16: Julie Hall to provide the GPO with details about the new SCOR working group on an ecosystem approach to fisheries, for the GPO to use in links with ICES and PICES.

6.1.8 Other Regional Activities

The representative of the WMO, Dr. Peter Dexter, reported on progress and plans in the development of the South-East Asia Centre for Marine Prediction (SEACAMP). SEACAMP is a project concept involving the ASEAN countries through the ASEAN Subcommittee on Meteorology and Geophysics. To make it easier to fund, the proposal now has four modules: (i) the observing system; (ii) communications; (iii) capacity building; and (iv) setting up the prediction centre (in Singapore). The proposal was approved by the sub-committee and is now with the ASEAN Secretariat. The prediction centre will also be a training centre contributing to capacity building. If it is funded it will make a major contribution to a South-East Asia GOOS (SEAGOOS).

The Committee endorsed SEACAMP as a potential building block for SEAGOOS, contingent on its acceptance by the Capacity Building Panel and its agreement with GOOS Principles.

Action 17: GPO to determine whether SEACAMP meets with GOOS Principles, and, if so, to request the Capacity Building Panel to consider acceptance of SEACAMP as an element of the GOOS Capacity Building programme.

Colin Summerhayes reported briefly on progress and plans in the development of SEAGOOS. Maarten Kuijper of IOC's Bangkok Office has organized a SEAGOOS workshop as part of the WESTPAC Scientific Symposium in Seoul in August 2001. It is hoped this will lead to the development of one or more GOOS Pilot Projects in the area. **The Committee noted** that the Gulf of Thailand Project overseen by the IOC's WESTPAC Office in Bangkok is a potential SEAGOOS building block, as is SEACAMP.

Peter Dexter also reported on progress in developing the Western Indian Ocean Marine Applications Project (WIOMAP), which aims at the co-ordinated enhancement of marine observing systems, modelling capabilities and services, based on co-operation among interested agencies and institutions in the western Indian Ocean. A draft project proposal for WIOMAP has been prepared, and it is hoped that this will be finalized and submitted for funding before the end of 2001. As for SEACAMP, the proposal is modular, providing the opportunity to get sections of it funded if there is not money available for all.

Action 18: Capacity Building Panel to review the WIOMAP proposal, check compliance with GOOS Principles, and consider acceptance of aspects of WIOMAP as elements of the GOOS Capacity Building programme.

Angus McEwan reported on progress with the Perth Office (document GSC-IV/B12), leaving aside the involvement of the Office (i) in PacificGOOS that is mentioned in 6.1.4, above, and (ii) in capacity building that is mentioned in 8.1, below. The Office, in the person of Bill Erb, has been very active, and is succeeding in establishing an awareness and appreciation about GOOS and the IOC throughout the region. As a result of its activities, there are on the horizon several possible Indian Ocean projects that will contribute to the global system. The activities of the Office are overseen by a Steering Committee comprising representatives of the three funding entities concerned: the IOC through its GPO, the Australian Bureau of Meteorology, and the Government of Western Australia, plus the Australian delegate to the IOC. At the request of the Steering Committee, Bill Erb has drafted an Indian Ocean Observing Strategy Paper to make the case for an Indian Ocean observing system.

During November eight meetings took place in Perth, with Bill Erb of the Perth Office taking the responsibility for local organization The meetings included: Sustained Observations for Climate of the Indian Ocean (SOCIO), an Oceans and Climate 2000 seminar, a Southern Ocean observing meeting, a TAO Implementation Panel meeting, the Indian Ocean Climate Initiative meeting and the Cockburn Sound Groundwater Discharge Workshop. Over eight hundred participants attended this series of meetings, making them the largest marine science gathering ever convened in Western Australia. Extensive TV, radio and press coverage greatly enhanced the status of the Perth Office, IOC and UNESCO, and the Western Australian government's role in marine science.

Under development is a Western Australia initiative for GOOS that might include support for the observational network and modelling and value-adding activities related to climate and coastal management and industry. The Office is exploring the possible role of the Western Australia Regional Remote Sensing and Applications and Technology Centre in providing GOOS products for the Indian Ocean and South Pacific.

The Committee noted with appreciation the energy that Bill Erb was bringing to his task and the progress being made in bringing people together and in raising the profile of GOOS throughout the region. **The Committee would like to see** some capacity building programmes developing during 2001.

Action 19: GPO to invite Bill Erb to attend GSC-V and to ensure Perth reports are circulated to the Committee.

Action 20: (i) GPO to invite Bill Erb to join the Capacity Building Panel; (ii) Perth Office to aim to get some specific capacity building activities funded, in consultation with the GPO and the Capacity Building Panel.

Dr Summerhayes noted that the IOC Regional Committee for the Black Sea had for some years been discussing the setting up of a Black Sea GOOS. There were plans to create a Black Sea GOOS steering committee, and to hold a Black Sea GOOS meeting during 2001.

6.1.9 National GOOS Developments

Dr. Summerhayes reported that the GPO had begun to create a database of national GOOS contact points (document GSC-IV/B13). A template has been developed to guide national reporting to I-GOOS, and is now with Member States to enable all to submit reports to I-GOOS-V in the same format. These reports will be available on the GOOS web site. The information they contain will enable the table of national contacts (GSC-IV/B13) to be updated.

The Committee noted progress, and looked forward to seeing the revised database and national inputs after I-GOOS-V.

Action 21: GPO to ensure that heads of National GOOS Co-ordinating Committees are listed on the national contacts list.

6.2 GLOBAL IMPLEMENTATION

6.2.1 Joint IOC-WMO Technical Commission for Oceanography and Marine Meteoroloy (JCOMM) [including Drifting Buoy Co-operation Panel (DBCP), Ship-of-Opportunity Programme (SOOP), Tropical Atmosphere Ocean Array (TAO), Global Sea-Level Observing System (GLOSS)]

Peter Dexter reported on progress with the development of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), the formation of which was ratified in 1999 by the governing bodies of the WMO (13th Congress) and the IOC (20th Assembly) (documents GSC-IV/25, and GSC-IV/B14). A major initial priority will be the implementation of an operational ocean observing system for climate, and to be successful JCOMM will require an equal engagement and commitment from meteorologists and oceanographers alike.

6.2.1.1 Background

Establishment of JCOMM is the first step in a long and delicate process. The essential requirement for JCOMM to be truly interdisciplinary may pose problems in many countries, where meteorology and oceanography are dealt with by different organizations. The need for co-operation and co-ordination in the nomination of a balanced membership for JCOMM and in the support of its work programme will hopefully lead to greatly enhanced integration of operational oceanography and marine meteorology at the national level, including institutionally.

The Committee was informed about the actions underway to launch JCOMM, and to ensure that it provides much-needed infrastructure for GOOS and GCOS, including the preparations for and expected outcomes of JCOMM-I (Akureyri, Iceland, 19-29 June 2001). To guide the dissolution and merging into JCOMM of the WMO's Commission for Marine Meteorology (CMM) and the Joint WMO/IOC Integrated Global Ocean Services System (IGOSS), and to plan a coherent structure and work plan for the new Commission, two transition planning meetings took place. The first was in St. Petersburg in July 1999 and the second in Paris in June 2000. These meetings essentially constituted sessions of an interim JCOMM Management Committee. The meetings developed an integrated work plan for JCOMM, to encompass the ongoing CMM/IGOSS work, as well as the urgent new tasks to be addressed, in particular in relation to GOOS and GCOS implementation. Additional issues included the future sub-structure for the Commission, capacity building, membership, and preparations for JCOMM-I. The proposed structure of JCOMM is based on a set of Programme Areas to allow clear responsibilities and reporting procedures. Until these are approved at JCOMM-1, existing working groups and other CMM and IGOSS activities continue to address major on-going issues.

6.2.1.2 Intersessional Highlights

A report on intersessional highlights is given in Annex VII. These cover the activities of the Volunteer Observing Ship (VOS) programme, the Data Buoy Co-operation Panel (DBCP), the Ship-Of-Opportunity programme (SOOP), the Automated Shipboard Aerological Programme (ASAP), the Marine Climatological Summaries Scheme (MCSS), the Global Temperature and Salinity Profile Programme (GTSPP), the Global Digital Sea Ice Data Bank (GDSIDB), the Global Maritime Distress and Safety System (GMDSS), the Marine Pollution Emergency Response Support System (MPERSS), and the Capacity Building strategy. They are supplemented with reports from Dr. Summerhayes on GLOSS (document GSC-IV/B15), and TAO-IP (the Tropical Atmosphere Ocean Implementation Panel) (Annex VII).

6.2.1.3 Future priorities

JCOMM is the primary implementation mechanism for the GOOS/GCOS ocean climate module and other physical parts of GOOS. The vision of JCOMM is of a dynamic, forward looking body, which co-ordinates a fully integrated marine observing, data management and services system, responsive to the evolving needs of all users of marine data and products as well as the development of new technologies and capabilities. The vision also includes close co-ordination with the World Weather Watch (WWW), as well as an outreach programme to enhance the capacity of all maritime countries to contribute to JCOMM activities and to benefit from the outcome of these activities.

Climate

The primary priority within the JCOMM Observations Programme Area for the next four years will be the implementation of an integrated operational ocean observing system for climate, to address the requirements expressed in the GOOS/GCOS Implementation Action Plan. There will be a number of specific themes to this implementation:

(i) Maintenance of existing operational system components at, as a minimum, present levels of activity. SOOP will evolve in accordance with the recommendations of the Upper Ocean Thermal Review;

(ii) Development of an integrated approach to ship-based observations, with co-ordination of the VOS, SOOP and ASAP under the Ship Observations Team;

(iii) Implementation of a JCOMM Observing Platform Support Centre (JCOMMOPS), based on the existing DBCP, SOOP and Argo co-ordinators, to act as a focal point for *in situ* operational observing systems and provide a range of support information, products and services;

(iv) Evolution of the VOSClim Project to full operational status;

(v) Transformation of Argo to an operational programme and its integration with other system elements;

(vi) Continued interaction with satellite operators to ensure the long-term maintenance of oceanographic satellites supporting identified requirements, and the blending of their data with *in situ* observations;

(vii) Review and evaluation of new instrumentation and techniques and their integration into operational systems, including automated shipboard systems and surface-based radars;

(viii) Expansion of participation in the WRAP project, and the development of new ASAP projects in other ocean regions.

Integrated data management

The priority for the JCOMM Data Management Programme Area will be integration of observational data streams, focussed on:

(i) Implementation, jointly with IODE, of an End-to-End Ocean Data Management System, based on the concepts and structure of the GTSPP. This will be initially for physical ocean data, but with the flexibility to address chemical and biological variables, and will address the expressed needs of GOOS and GCOS;

(ii) Further enhancements to the MCSS and its gradual integration with the ocean data management system;

(iii) Convening of a second CLIMAR Workshop, with the general theme of integrated atmosphere/ocean climate data and products for applications;

(iv) Further development and expansion of the Global Digital Sea Ice Data Bank, and its gradual integration also with other elements of the JCOMM data management system.

New services

JCOMM will continue to maintain and enhance maritime safety services, in particular those delivered under of the GMDSS. Efforts will be made to encourage and support the implementation of new marine services, in particular those for waves and storm surges; those based on climate products; enhanced sea ice services; those involving integrated meteorological and oceanographic variables, especially in coastal areas; and those for co-ordinated disaster reduction initiatives. JCOMM will help Members to apply new technologies to enhance service delivery, and to interact with and educate maritime clients in the use of new services. Internet use will be emphasized, including maintenance and development of the JCOMM Products Bulletin and its wider application. Full implementation of the Marine Pollution Emergency Response Support System (MPERSS) will be emphasized.

Non-physical oceanography

Requirements are gradually emerging within GOOS for the operational collection, processing and delivery to users of a range of ocean chemical and biological variables, as well as of products and services based on these. It is not yet obvious that JCOMM should be the mechanism for dealing with these. Moreover, for the present the first JCOMM priority must remain, physical ocean variables required for climate and operational marine services. It is nevertheless essential that a dialogue be maintained with GOOS regarding these non-physical requirements, and JCOMM systems must be made flexible enough to deal with them, if and when the need arises.

Co-ordinated capacity building

The new JCOMM Capacity Building Strategy provides a blueprint for future JCOMM capacity building activities, in co-ordination with GOOS and GCOS. For the coming intersessional period, these will be concentrated in the following areas:

(i) On-going specialized workshops in fields such as wave and storm surge forecasting; support for ship-based observing systems, including PMO training; the applications of remotely-sensed ocean data;

(ii) Training to support integrated coastal area management;

(iii) Implementation of existing regional co-operative projects and the development of new ones in other regions;

(iv) A continuing dialogue with potential funding agencies and bodies, including private industry, to develop innovative ways to enhance the capacity of all maritime countries to participate in JCOMM work and make use of the data and products which result;

(v) Support of institutional partnerships.

The Committee noted with pleasure the progress being made in the establishment of JCOMM and the integration of activities, **and approved** the proposed attendance of the GSC Chair at JCOMM-I.

6.2.1.4 Global Sea-Level Observing System (GLOSS), Tropical Atmosphere Ocean Array (TAO), Pilot Research Moored Array in the Tropical Atlantic (PIRATA)

Dr. Summerhayes noted that the 7th session of the GLOSS Group of Experts (GLOSS-GE) will be held in Hawaii in April 2001. A Scientific Steering Group (SSG) has been created as a joint group with other GLOSS-related programmes (e.g. OOPC, CLIVAR-UOP, IAPSO CMSLT). Chaired by Dr. Gary Mitchum the group will advise the GLOSS-GE as scientific priorities develop in future. A web-based GLOSS Handbook (http://www.bodc.ac.uk/services/glosshb/), updated in 1999, is now being further updated. A data archaeology project for historical sea level records has been proposed, with the aim of extending existing time series and gaining access to observations that are not in digital form. The project will be co-ordinated by GLOSS, with the Global Ocean Data Archaeology and Rescue (GODAR) Project Leader acting as advisor to the project.

The PIRATA array in the tropical Atlantic will evolve to a 5–year consolidation phase intended to run from 2001-2006, to allow time to demonstrate its utility for climate forecasting and applications, before considering it as a permanent feature of GOOS. An extension was funded in the northwest.

The TAO Implementation Panel dissolved itself at the conclusion of its last meeting (November 2000). A new Tropical Moored Buoy Implementation Panel (TIP) will be inaugurated under the auspices of CLIVAR, GOOS and GCOS to cover buoy array requirements in all the tropical oceans, with an emphasis on technical and logistical issues related to implementing and sustaining buoy programmes in support of climate studies. The Panel emphasized the importance of having a moored buoy programme for climate in the equatorial Indian Ocean, and recommended that a working group be formed to develop provisional plans for an array there.

The Committee expressed satisfaction with the past work of the TAO-IP, **asked** that its thanks be passed to the chair, Mike McPhaden, and **looked forward to seeing** results from the new TIP with its focus on implementation.

Action 22: Chair GSC to write to Mike McPhaden to express satisfaction with the past work of the TAO-IP and to offer thanks for his efforts.

6.2.1.5 SeaKeepers

Prof. Nowlin briefly described the SeaKeepers programme, which will most probably become a component of the WMO's Voluntary Observing Ship (VOS) programme. SeaKeepers is a private association that has 50 Founding Member's yachts, four large cruise lines and their 48 cruise ships, cargo vessels, coastal ferries and cable laying ships, and that is in discussion with oil tankering companies. A fleet of some 200 + ships is expected by 2004. All are or will be equipped with the SeaKeepers ocean and weather monitoring module. The same technology has been converted for use on coastal piers, and 15 piers are now scheduled for installation. The technology will be converted for installation on three-meter weather buoys all over the world thus converting current weather buoys to comprehensive GOOS ocean monitors. Private funds for the pier and buoys are being raised through a special "Adopt a Buoy" or "Adopt A Pier" programme! 100 buoys and piers should be equipped by 2004.

The standard suite of sensors measures all weather conditions (true wind speed and direction, air temperature, barometric pressure, humidity) as well as GPS, SST, Salinity, pH, oxygen, and Eh (redox). Other sensors are being tested for CDOM, turbidity, chlorophyll, seven heavy metals, pCO_2 and TCO_2, and PAR. Data is gathered and recorded every few seconds while the vessel is underway. Every three hours, a 10-minute average is taken and these data are transmitted in real time via COMSAT to RSMAS, and in future by RSMAS to NOAA.

Ultimately all SeaKeepers information will be shared worldwide over the net.

SeaKeepers have raised over US$3.7 million and spent about US$2.8 in developing, field testing and deploying its modules. It has pledges for another US$2.6 million for expansion.

The Committee noted the activities of the SeaKeepers programme as an eventual contribution to both GOOS and JCOMM. **There was some concern** about the quality of the data from sensors yet under development. Future monitoring of data released for real-time use will assess the utility of this programme to GOOS.

6.2.2 The Global Ocean Data Assimilation Experiment (GODAE) and the Global Array of Profiling Floats (Argo)

Dr. Smith reported on progress with GODAE and Argo (document GSC-IV/12). For details see: http://www.bom.gov.au/bmrc/ocean/GODAE/. The International GODAE Steering Team (IGST) has met twice over the last year (GODAE-IV, Southampton, May 2000, and GODAE-V, Noumea, February 2001). A review of specific GODAE activities is given in Annex VIII. Highlights are as follows:

- The GODAE Strategic Plan is published and a draft of the Implementation Plan is available. The Implementation Plan should be published by February 2002;
- A new Pilot Project has been initiated to develop high quality, high-resolution SST data sets and products;
- The *Argo* Pilot Project is progressing well with the most significant unresolved issue being long-term subscription to remote areas needed for a global array;
- Significant activities in data set development, data and product servers, prototype model assimilation systems and applications have been reported;
- While progress has not been strong on all fronts, the evidence from GODAE V is that developments are on track for the intensive phase 2003-2005.

6.2.2.1 The GODAE Strategic and Implementation Plans

The GODAE Strategic Plan (http://www.bom.gov.au/bmrc/ocean/GODAE/Strategic_Plan.pdf) presents the approach GODAE is taking to the development of needed components. The Plan discusses the rationale and scope for GODAE including the vision and objectives. The reasons for acting now are presented. Perceived benefits and prospective users are noted and a list of specific outcomes given. The legacies of GODAE will include a better, integrated sustained ocean observing system and global operational oceanographic systems maintained by several nations.

GODAE is guided by a set of principles and guidelines. It is structured as shown in Figure 1 of Annex VIII. The concept of a GODAE Common is being used to foster free and open exchange among the GODAE Partners. The Common comprises data, products, servers, and the accumulated knowledge base. The essential elements of GODAE are observational networks, models and estimation tools. The generation of globally consistent fields of the ocean state through the synthesis of satellite and *in situ* data streams with models is an identifying characteristic of GODAE. The unique nature of GODAE includes:

- The development of coherent, organized data sets;
- Synoptic ocean analyses and hind casts;
- Short-range ocean forecasts;
- Reanalyses and initial conditions for climate forecasts;
- Characterization of products;
- A dedicated improvement cycle.

The Strategic Plan discusses implementation concepts, the GODAE functional components (servers, centres, etc.) and GODAE phases. A transition phase (2006-2007) has been added to accommodate the transition of GODAE systems to operational support. The Plan recognizes the importance of developing metrics to measure the success or otherwise of GODAE.

The Implementation Plan is being constructed around the functional components diagram shown in Figure 1 of Annex VIII (from the Strategic Plan). The Implementation Plan will discuss each of the elements (inputs, servers, assimilation centres, users/application centres) and the interfaces between them. Substantial plans have been provided as the basis for the GODAE Common. Considerable progress has already been made toward implementation. It is hoped that the first full draft will be available by around November and will be reviewed at GODAE-VI (Navy Oceanographic Office, Stennis, USA, December 4 – 7, 2001).

6.2.2.2 GODAE High-Resolution SST Project

An initial workshop for the GODAE High-Resolution SST Project (http://www.bom.gov.au/bmrc/ocean/GODAE/HiResSST/) took place in Ispra, Italy, 30 October – 2 November 2000. This GODAE Pilot Project aims to develop high-resolution SST data sets and products using all available remote and *in situ* measurements and scientifically defensible definitions of SST. A strategic plan will be developed focussed around 4 themes: (i) Testing, proving and refining the data sources; (ii) Integration and assimilation: the data providers; (iii) Users and application: the data users; and (iv) Research and Development. A project Science Team has been approved to oversee the Project. Project development will follow the method used for *Argo*, and Terms-of-Reference follow the guidelines developed by GODAE (and the GSC) for Pilot Projects. The Strategic Plan will be reviewed with a tentative date for the first draft of mid-2001. The international GODAE Science Team believes this Project will make a valuable contribution in several areas (e.g., it will exploit synergy with the SURFA project, and the assembly and data serving will be used for other parts of GODAE).

6.2.2.3 Argo

The international *Argo* Science Team has not met since GSC III (it is due to meet 20-22 March 2001). An Implementation Planning Meeting for Argo in the Atlantic Ocean was held in Paris on July 10 and 11, 2000 (http://www.argo.ucsd.edu/rapport-final.html). A similar meeting for the Indian Ocean has been postponed until mid-2001. The first meeting of the *ad hoc* committee addressing Argo data management issues (http://www.argo.ucsd.edu/report1.html), was held in Brest from 3 to 5 October 2000. A full-time employee, Mathieu Belbéoch, has been hired to be Argo Technical Co-ordinator at the Argo Information Centre (http://argo.jcommops.org/).

The existing commitments to *Argo* are good as is the multi-national spread of interest (Table 1 of Annex VIII). The Argo Science Team anticipates around 1,500 floats in the water by the beginning of GODAE in 2003, and a reasonable prospect of near full implementation by the end of 2005. There is considerable uncertainty in some of the numbers, and efforts are being made to encourage more investment. The principal issue concerns global coverage. This will require nations to free some of their resources for use in remote regions, and the Science Team continues to work on this issue. A second issue concerns deployment of floats in national EEZs. *Argo* took advantage of the GOOS/GCOS Regional Workshop for the Pacific Islands in August of 2000 to develop an approach with the Pacific Island Nations to address this issue, which is particularly important and difficult given the desire to adequately cover the ENSO 'warm pool' and the fact that the area is included within the EEZs of many island nations. SOPAC is making progress working with its member nations to secure permission to deploy floats within their collective EEZ. Deployment within EEZs will continue to be an issue until such time as Argo and various nations are able to come to an adequate resolution.

The initial Argo deployments are in the Atlantic and eastern Pacific. A strategy for assembling, quality controlling and distributing *Argo* data has been developed. Data are distributed in real-time via the GTS for the benefit of operational users who demand immediate access. A second, high-quality near-real-time stream also is distributed. There is a plan to produce high-quality delayed-mode data sets that will be available via the Internet within 90 days. France and the US have agreed to establish international *Argo* Data Centres through which all *Argo* data will be available.

Julie Hall gave a short presentation on SEREAD (Scientific Educational Resources and Experience Associated with the Deployment of Argo Drifting Floats in the South Pacific Ocean). The Pacific Coastal Workshop in Apia suggested to Bill Erb the need for a capacity building project related to Argo. Subsequent discussions led to the development of the SEREAD project, the proposal for which is now supported by The International Ocean Institute (IOI), the Argo Science Team, POGO, NOAA, UNESCO's Apia office, NIWA, SOPAC and the IOC Perth Office. The project relates the tracking of floats with educational materials delivered via the Internet. The IOI office at the University of the South Pacific will manage the project, which should start-up early in 2001. A meeting to develop the project plan and budget took place in Auckland on January 23-24, 2000.

The Committee recognized the good progress being made with GODAE and Argo, **and considered** the various developments to be entirely appropriate. **The Committee recognized** that GODAE is emerging as a leader in innovative real-time data and product handling and serving, **and asked** the OOPC and COOP (within the context of Action 5) to consider how this capability may be best deployed for the wider benefit of GOOS.

The Committee considered SEREAD to be a splendid idea. There was some concern about the extent to which the educational materials developed would fit into accepted science curriculum in the region. **The Committee also had concern** as to how sustained funding could be ensured, but perhaps the project will be sustainable because it relies on a large number of sponsors each contributing relatively small amounts. SEREAD could be taken as a model for other regions, and adapted as required.

6.2.3 GOOS Initial Observing System (GOOS-IOS)

Colin Summerhayes provided an update on the GOOS-IOS (document GSC-IV/13). The GOOS Initial Observing System (GOOS-IOS) is the nucleus on which GOOS will grow. It unites the main global observing sub-systems supported by the IOC, WMO and (in the case of coral reefs) the IUCN, and includes measurements from ships, buoys, coastal stations and satellites (see below). In addition to these international elements, as of July 1999 many nations have agreed to contribute substantial parts of their national observing systems to GOOS. These remain to be evaluated (document GSC-IV/14). Although the implementation of GOOS through the GOOS-IOS has begun by exploiting existing systems, it is expected that the existing systems will be adapted to meet the design requirements. New components will be added as appropriate and in accordance with GOOS designs.

6.2.3.1 Level 1 Contributions

These are those for which statements from operators exist to the effect that, whatever else they may contribute to, they are expressly contributions to GOOS:

- The operational ENSO Observing System in the tropical Pacific, including the Tropical Atmosphere Ocean (TAO) array of buoys [http://www.ogp.noaa.gov/enso/] [http://www.pmel.noaa.gov/toga-tao/]
- Meteorological measurements from the Voluntary Observing Ship (VOS) network of the WMO
- Upper ocean measurements of the Ship-of-Opportunity Programme (SOOP) [http://www.ifremer.fr/ird/soopip/]
- Fixed and drifting buoys co-ordinated by the Data Buoy Co-operation Panel (DBCP) [http://dbcp.nos.noaa.gov/dbcp/]
- The Global Sea Level Observing System (GLOSS) network of tide gauges [http://www.pol.ac.uk/psmsl/programmes/gloss.info.html]
- The Global Temperature and Salinity Profile Programme (GTSPP) [http://www.nodc.noaa.gov/GTSPP/gtspp-home.html]
- The Global Coral Reef Monitoring Network (GCRMN) [http://coral.aoml.noaa.gov/gcrmn/index.html]

- The Global Telecommunications System (GTS) of the WMO

- The GOOS Data Centre of the Atlantic Oceanographic and Meteorological Laboratory (AOML) of the US National Oceanic and Atmospheric Administration (NOAA)
[http://www.aoml.noaa.gov/]

- Ocean observations from the operational satellites of NOAA and other entities
[http://www.oso.noaa.gov/]

- The Continuous Plankton Recorder (CPR) programme of the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) (added 1999)
[http://www.npm.ac.uk/sahfos/introduction.html]

- The ICES International Bottom Trawl Survey (IBTS) of the North Sea

- Time Series Station 'S' off Bermuda

- Time Series Station Bravo in the Labrador Sea

- The JCOMM Electronic Products Bulletin
[http://iri.ldeo.columbia.edu/climate/monitoring/ipb/introduction.html]

- The Global Observing Systems Information Centre (GOSIC)
[http://www.gos.udel.edu/]

- California Co-operative Oceanic Fisheries Investigations (CalCOFI)
[http://www.mlrg.ucsd.edu/calcofi.html.]

In discussion, **the Committee noted** that GCOS is involved in a rolling evaluation of the observing system for climate. **The Committee agreed** that some of these elements should also be listed as part of the GCOS Initial Operational System.

Action 23: GPO to work with Chair OOPC and Director GCOS to agree on which elements of the GOOS-IOS should be listed as elements of the GCOS-IOS.

The Committee noted that most of the components of the GOOS-IOS are the sub-components that produce the data. Thus it is not in fact the complete end-to-end system of GOOS. However, it does include observing system elements, elements dealing with data transfer and archiving (e.g., via GTSPP), and directories to data and products (e.g., JCOMM Electronic Products Bulletin and GOSIC).

Action 24: Chairman GSC to appoint a working group (W. Nowlin, N. Flemming, A. Knap, and N. Hasegawa) to work inter-sessionally on a definition of the GOOS-IOS, which might include a name change, and to report back by the end of May.

Although GSC-III (Action 38) had suggested adding selected National Operational Centres to Level 1, **the Committee decided** not to proceed with this suggestion. **It was agreed** that the number of groups who will produce products from GOOS observations and the diversity of such products should grow to be very large and that such growth is encouraged. Such groups and products will range from operational meteorological/ oceanographic centres to the private sector. The **Committee felt it unnecessary** to attempt to accredit and track such groups; rather, broad use of observations by all should be encouraged and as many products as feasible listed in directories such as the GOOS Products and Services Bulletin or the JCOMM electronic products bulletin.

The LMR Panel had recommended that several national and international biological monitoring programmes be adopted as components of the GOOS-IOS. **The Committee decided** that aside from the Southern Ocean monitoring element (discussed next) these must be evaluated first by COOP.

GSC-III (action 39) had asked Angus McEwan to evaluate the possible role in GOOS of CCAMLR (Commission for Conservation of Antarctic Marine Living Resources) in Southern Ocean Ecosystem Monitoring. Dr. McEwan reported on his visit to CCAMLR. The Commission was founded in 1982. It collects various biological data from the CCAMLR Convention Area defined as the area south of 60°S and the area between that latitude and the Antarctic Convergence. There are three main sources of data: regular programmes (e.g., CCAMLR's Ecosystem Monitoring Programme, CEMP); fisheries related activities; and surveys (e.g., Synoptic Krill Survey CCAMLR-2000).

CEMP was set up in 1985 to detect and record significant changes in critical components of the ecosystem, to serve as a basis for the conservation of Antarctic Marine Living Resources, and to distinguish between changes due to the harvesting of commercial species and changes due to environmental variability, both physical and biological. It uses indices derived from data on indicator species and the environment collected by standard methods within the three Integrated Study Regions of the CCAMLR Convention Area. Species were chosen based on their potential to respond to changes in prey availability or environmental factors (e.g., penguins, flying birds, seals), or because their potential harvest (e.g., krill) would have a major effect on other components of the ecosystem. The environmental data (e.g., regional sea-ice distribution and SST) are from the U.S. National Snow and Ice Data Centre and the Climate Modelling Branch of the U.S. National Centre for Environmental Prediction. Environmental indices are reviewed and updated each year by the CCAMLR Secretariat, and an annual report is presented to CCAMLR's Working Group on Ecosystem Monitoring and Management (WG-EMM) for analysis. Time series for each index are produced, and trends and anomalies are identified.

The CCAMLR Data Centre also holds extensive sets of fishery, observer and survey data for Antarctic fisheries on target species such as krill, icefish, toothfish, as well as by-catch. These data are analysed by CCAMLR's Working Group on Fish Stock Assessment (WG-FSA) as well as WG-EMM, and form the basis for many of CCAMLR's Conservation Measures.

All data held by CCAMLR are subject to strict rules for access and use (Annex IX). The Rules stipulate that "*when data are requested for purposes other than consideration by future meetings of CCAMLR bodies, the Secretariat will, in response to a detailed request [approved in writing by the Representative of the Member to the CCAMLR Scientific Committee], supply the data only after permission has been given by the originators/owners of the data... [who] retain control over any use of their unpublished data outside of CCAMLR.*"

The CCAMLR Data Manager and the Science Officer consider that one option for collaboration between GOOS and CCAMLR could be in the development of environmental indices, which could be used by CCAMLR's Ecosystem Monitoring Programme. In addition, some form of GOOS-CCAMLR collaboration may be set up following the presentation of a discussion paper by GOOS at WG-EMM (the next meeting is in Sweden in July), and further discussion by CCAMLR's Scientific Committee (next meeting is in Hobart in October). If so desired, GOOS could participate as observer to one, or both, of these meetings.

The Committee thanked McEwan for his thorough and informative report.

Action 25: Angus McEwan to draft a letter to CCAMLR, for approval by the GSC Executive Committee, regarding possible collaboration between GOOS and CCAMLR.

6.2.3.2 Level 2 Contributions

These are those for which specific commitments remain to be negotiated:

- Selected ocean observing satellite missions;
- Appropriate parts of JCOMM (Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology);
- Appropriate parts of IODE (International Ocean Data and Information Exchange programme of IOC);

- Appropriate components of national observing systems (like the US Sea Ice Centre; the US PORTS programme);

- Appropriate commercial observing systems (like long-lived oil platforms);

- The international Mussel Watch programme (recognizing that it measures contaminants but does not provide direct information on the health of the organism or the environment);

- Appropriate parts of the IOC's Harmful Algal Blooms (HAB) programme.

GSC-II Action 26 called for the GPO to work with OOPC to determine which satellite programmes could/should be added to the GOOS-IOS. Since then, the GSC had endorsed the IGOS Oceans Theme report (document GSC-IV/B19), Appendix I of which contains a listing of the satellite missions in support of the IGOS Oceans Theme. Eric Lindstrom provided Table 1 (below) to indicate which of the satellite missions in Appendix 1 of the Oceans Theme report should be considered as contributions to Level 1 of the GOOS-IOS.

Table 1: Remote Sensing Satellite Missions Contributing to the GOOS Initial Observing System. Note: (i) SST is covered by AVHRR on NOAA satellites (already in the GOOS-IOS), or is to be determined; (ii) the trend is for research missions to graduate into operational missions.

Status	**Ocean Surface Topography**	**Ocean Vector Winds**	**Ocean Colour**
In orbit	Topex-Poseidon (1992)	Seawinds on QuikSCAT (1999); operational data stream	SeaWIFS (1997); MODIS on TERRA (1999)
Awaiting launch	Jason-1 (summer 2001); operational data stream	Seawinds on ADEOS-II (end 2002); ASCAT on METOP (2003); operational	MODIS on AQUA (end 2001)
Planned follow-on	Jason-2 (summer 2001); operational partners (NOAA/EUMETSAT)	ALPHA.SCAT on GCOM-B1 (2006)	VIIRS on NPP (2005)
Goal	Jason-3 (completed on 2009); operational	Decision to be determined: active or passive microwave on NPOESS	VIIRS on NPOESS (completed on 2009); operational

The Committee agreed that operational elements from Appendix I of the Oceans Theme report (i.e., those listed in Table 1, above) should be listed as Level 1 contributions to the GOOS-IOS.

6.2.3.3 Major Pilot Projects

These are those specifically acknowledged as parts of GOOS:

- Baltic Operational Oceanographic System (BOOS), a EuroGOOS regional project [http://www.soc.soton.ac.uk/OTHERS/EUROGOOS/]

- The Mediterranean Forecasting System Pilot Project (MFSPP), contributing to both EuroGOOS and MedGOOS [http://www.cineca.it/~mfspp000/; or via EuroGOOS web site]

- The Pilot Research Array in the Tropical Atlantic (PIRATA) [http://www.ifremer.fr/orstom/pirata/pirataus.html]

- The Global Ocean Data Assimilation Experiment (GODAE) [http://www.bom.gov.au/bmrc/ocean/GODAE/]

- The Argo float programme of GODAE [http://www.bom.gov.au/bmrc/ocean/GODAE/Argo_Design.html/]

- The RAMP (Rapid Assessment of Marine Pollution) pilot project of the HOTO Panel.

Potential Additions include the Western Indian Ocean Marine Applications Project (WIOMAP), once it is past the proposal stage. In addition, the LMR Panel proposed some additions, which still await review by COOP in accordance with Action 14 of GSC-III. These include: (i) A Northeast Pacific CPR Network; (ii) the BENEFIT Programme/Benguela Current Large Marine Ecosystem Programme; and (iii) Biological Action Centres (BACs).

Action 26: COOP to consider the LMR proposals for elements of the GOOS-IOS, including pilot projects.

6.2.3.4 GOOS Commitments

In accordance with action 40 from GSC-III, Prof. Nowlin reported on progress in and plans for obtaining details of commitments to GOOS made by individual countries at the July 1999 Initial Commitments Meeting. Specific proposals were presented for a mechanism for assessing and accepting new contributions to the GOOS-IOS (document GSC-IV/14) (see below):

(i) a suitable individual will be supported to contact entities offering potential GOOS contributions with the purpose of understanding and evaluating such contributions; and

(ii) the IOC Secretary will write to representatives of Member States notifying them that future contacts will be made to solicit and evaluate contributions to GOOS, and asking for co-operation in this process.

To obtain support for (a) above, Prof. Nowlin reported that he had obtained support from NESDIS/NOAA for two years for Bert Thompson, a former employee of the IOC and long-time expert in soliciting data sets and tracking their delivery to the WOCE Data Information Unit. Mr. Thompson will be supported on a part-time basis to carry out three tasks:

(i) Task 1 (Contacting). This involves making contact with nations and agencies that have offered activities to be labeled as GOOS, for example at the First GOOS Commitments Meeting in July 1999. The appropriateness of the activities to GOOS will be assessed. For example: do the observing system elements meet GOOS principles and are they appropriate?

(ii) Task 2 (Tracking). This involves contacting providers of data and products in cases when the delivery of such data or products are found to have ceased or changed, as monitored by the Global Observing System Information Centre (GOSIC) at the University of Delaware. Such contacts must be timely to remedy gaps in the delivery system, and are best made by a designated individual who has established personal contact. Thus, the same person who makes initial contacts when observing system elements are offered best does this task. Moreover, this task should begin when system elements are entered into the GOSIC for tracking.

(iii) Task 3 (Assessment). This involves assessing ongoing observing system elements that might be of good value for GOOS. Many potential observing system elements exist. We cannot solicit their inclusion into GOOS and assist with their integration into the system if we do not have information regarding them. The design/scientific panels need this information. It is a natural adjunct to the evaluation of observing system elements offered (part of task one). This task can begin well into the first year of effort, since tasks 1 and 2 are more urgent.

In association with Dr. Ferris Webster, Professor at the University of Delaware, Thompson will work directly with and report to the GOOS Project Office (GPO) through the Chair of the GOOS Steering Committee. This will help to populate GOSIC with information on new GOOS data sets and products.

In response to (b) (above), the Chairs of the GSC and I-GOOS, and the Director of the GPO, had drafted a letter for the IOC Secretary to send to IOC representatives and other selected foci in Member States asking them to provide assistance to Bert Thompson and the GPO in detailing commitments.

The Committee approved the mechanism proposed, provided a minor modification to the draft letter, and asked for NOAA-NESDIS to be thanked formally for its support of the Data Co-ordinator position.

Action 27: GPO and Chair I-GOOS to arrange (i) for the revised version of the letter to be sent to relevant IOC contact points and to the agency representatives who attended the Initial GOOS Commitments Meeting in July 1999; and (ii) for Executive Secretary IOC to thank NESDIS formally for support of the Data Co-ordinator's position.

6.2.3.5 Cost Benefit Analysis

Nic Flemming reported that there had been little progress in the development of a cost-benefit regional analysis workshop involving eastern central and South America (possibly including the Caribbean).

He also reported on steps taken to produce specific examples of the development costs of a range of observing system elements. He noted that analysis of socio-economic evaluations of GOOS identifies four categories in which different criteria may be used. These are:

(i) commercial, economic and social value – representing benefits that can be measured in cash sales of data and cash benefits to the user, or notional benefits in terms of public good and benefits to government agencies or proxies for public health, safety, etc.;

(ii) true environmental value – representing total natural capital concepts, where economic and social value is attributed to the services performed by the natural environment;

(iii) sustainable development value – representing environmental benefits through improved management of sustainable development, compliance with international conventions, etc.;

(iv) 'saving the planet' values – representing the value of forecasting, mitigating impact, or avoiding the global climate change over decades to centuries.

He pointed out that for short-term benefits, as in commercial operations over periods of one day to one month, the costs and benefits can be estimated quite accurately, and individual sectors have quantifiable benefits in millions to tens of millions of dollars. As time-scales are extended, to weeks or seasonal/inter-annual, the sectoral benefits are measured in hundreds of millions of dollars, but are more difficult to evaluate accurately, and are related to additional input costs. On time-scales of decades, the risks and dangers are measured in many billions of dollars per year, but the logical connection to the benefits of GOOS are more diffuse, and have large margins of uncertainty. Strict Cost Benefit Analysis (CBA) can only be applied to category (i) above.

Dr. Flemming announced that a consultant is being hired by EuroGOOS to synthesize various types of benefits analyses related to GOOS.

6.2.4 Data and Information Management

Prof Nowlin reminded the Committee of the decision to dissolve J-DIMP, and reported that the members of J-DIMP had been formally thanked for their efforts over the years.

6.2.4.1 Global Observing Systems Information Centre (GOSIC)

Using overheads provided by Dr. Ron Wilson, Prof Nowlin briefed the committee on progress with and plans for the G3OS Information Centre (GOSIC), including the proposed review of GOSIC to meet the needs of GOOS, GCOS and GTOS. He reminded the Committee that GOSIC provides information on observing requirements, as defined by the science panels; and on operational data systems that are implemented as parts of the GOOS-IOS or are pilot projects. It also provides on-line access for finding, assessing and obtaining data and products, through web links. GOSIC's dataset registry is based on NASA's Global Change Master Directory. GOSIC contains data flow diagrams representing the system components in each element of the GOOS-IOS. Data flow monitoring procedures are under development, and observing system documentation is on-line.

GOSIC is located at the University of Delaware (http://www.gos.udel.edu). It began as a three-year pilot project to December 2000, and is currently on a 6-month unfunded extension. The least few months have been devoted to developing a joint data set registry with NASA and IODE; preparing pages, data flow diagrams, and links for the GOOS-IOS; and preparing pages and links for the GCOS-IOS. The University is now seeking an additional three years of support from NASA and NOAA to continue centre development. This to be followed by a two-year period during which the system can be transitioned to an operational agency.

As agreed at GSC-III, a review of GOSIC has been planned. It will take place at Lewes, Delaware, on April 23-24. The review team comprises two representatives each from GOOS, GCOS and GTOA. The two GOOS representatives are Yves Tourre (Chairman) for OOPC, and Matthew Howard, for COOP. The Terms of Reference for the review are:

- To review and evaluate the overall plans of GOSIC for designing and implementing a web-based information Centre for the G3OS;
- To periodically review the implementation by the University of Delaware of a prototype information system that meets the needs of the G3OS, and identify potential improvements (with prioritization);
- To review and discuss with GOPSIC representatives their plans to further develop the system, and top prepare a critique of those plans;
- To discuss with GOSIC representatives the approaches to and potential problems involved with the future transfer of GOSIC to an operational agency. Possible timing and candidate agencies should be included in discussions;
- To report to the chairs of the G3OS Steering Committees summarizing the reviews, including evaluation and recommendations.

The Committee expressed satisfaction with developments, **and looked forward** to seeing the results of the review.

6.2.4.2 GOOS Data and Information Management (DIM) Plan

Using overheads provided by Dr. Wilson, Colin Summerhayes reminded the Committee of the revisions that Dr. Wilson had made to the draft data and information management plan for GOOS (document GSC-IV/15). The plan is to be used:

(i) to form the basis for a review of the GOOS observing system elements, to bring the existing applications up to the standards established for GOOS end-to-end systems;
(ii) to guide the development and implementation of new end-to-end systems, as pilot projects are implemented and evolve into operational systems; and
(iii) to be a source of information on all aspects of GOOS data and information management both for developers of new systems and for users requiring access to GOOS data and information management.

The plan had been revised in accordance with advice from GSC-III. New sections included those on: fisheries productivity, biodiversity, regional integrated systems, data archaeology, and the way forward. Sections on J-DIMP and GOSSP have been modified to reflect the dissolution of those committees, and COOP has been added. Next steps in production of the document involve adding a list of acronyms, including comments from this meeting, undertaking final editing, and adding an executive summary or abstract if such is required by the Committee. The Plan will appear on the GOSIC web site with appropriate hyperlinks.

The Committee was asked to note that once the plan was approved it would then be necessary to implement it. Implementation would require IODE and JCOMM to create appropriate substructures to support the GOOS-IOS and its associated pilot projects. He noted that it would also be necessary to take full advantage of opportunities that may develop as a result of the ocean data management initiative (see 6.2.4.4, below).

The Committee expressed satisfaction with the revised draft, **gave** members 30 days to provide comments to the GPO, **required** the GPO to develop an Executive Summary summarising the contents, **and asked** the GPO to thank Ron Wilson for the hard work he had put in to the first and second drafts of the plan. Recognizing the difficulty of some countries in accessing the Internet, **the Committee agreed** that a paper publication would also be needed.

Action 28: (i) Members to provide comments on version 4 to GPO by end April; (ii) GPO to develop Executive Summary and publish final draft in hard copy and on the web; (iii) GPO to thank Dr. Wilson for his efforts.

Professor Yu asked how the Committee could encourage different countries to make available subsets of their data for GOOS, suggesting that a high level international meeting might be needed to achieve this.

Action 29: GPO to bring this question to the attention of I-GOOS-V.

6.2.4.3 International Oceanographic Data and Information Exchange (IODE) Linkage [Marine Environmental Data and Information Exchange (MEDI, etc.)]

Dr. Ben Searle, Chairman of IODE, reported on the new developments taking place within IODE (document GSC-IV/B16). In March 2000, an IODE-GOOS meeting was held to discuss the metadata requirements of the GOOS programme, and to plan the necessary collaboration to meet these needs. It had been agreed that GOSIC and NASA would consider using the MEDI software tool for their off-line metadata input into the NASA Global Change Master Directory.

IODE started implementing the 'Ocean Data and Information Network for Africa' (ODINAFRICA) project, in which 20 African coastal States participate. Between 2000 and 2004, ODINAFRICA will assist in the development and operation of oceanographic data centres. The centres will emphasize user services, and provide them to scientists, the private sector, decision makers and the general public. The data centres will establish close links with the communities involved in Integrated Coastal Area Management (ICAM) and GOOS. As such ODINAFRICA will support GOOS-AFRICA.

GOOS links with IODE were further strengthened at the 16th Session of the IODE, in Lisbon, Portugal, from October 31 to November 8, 2000. The GOOS Project Office Director outlined GOOS' activities in the area of data and information management, and Dr. R. Wilson presented the draft GOOS Data and Information Management Strategy and Plan. The session noted the importance of increasing the participation of the existing and new IODE centres in managing GOOS data. The session established a Steering Group to establish, maintain and strengthen IODE's participation in co-operative marine research and monitoring programmes; this Group can help to strengthen co-operation between IODE and GOOS. One particular area of potential co-operation is in data standards and exchange protocols, where IODE has considerable expertise. Another area is in Capacity Building, where the NODCs can be helpful to GOOS. IODE recognized GOOS' needs to access biological and chemical data, and established an IODE Group of Experts on Biological and Chemical Data Management and Exchange Practises to take this issue forward. In response to a recommendation by OOPC, IODE has established an Underway Sea Surface Salinity Data Archiving Pilot Project.

IODE continues to participate in the Marine XML (extensible mark-up language) Consortium. The benefits of a marine XML will be (i) improved data discovery and access; (ii) automatic database population; (iii) automatic aspects of data quality control and dataset integration; (iv) simplified data exchange; (v) simplified data retrieval; (vi) simplified processing of data; (vii) provision of a common platform to support marine data management system developers; (viii) supporting the automatic entry of data into analysis and visualization applications; and (ix) support of different 'versions of data'.

The Committee recommended that IODE move rapidly to the incorporation of non-physical data types, so as to be more useful to GOOS, **and was pleased to see** that a working group had been formed to consider this issue. **The Committee noted** that several national ocean data centres may have difficulty in taking on these additional data because of a shortage of resources.

Dr. Searle also reported on progress in making the Marine Environmental Data Inventory (MEDI) system available as a tool for use by GOOS, and gave a demonstration on MEDI. Using an example from the North Sea, he shows that the IODE MEDI system is a potential mechanism for describing both the details of monitoring activities and the actual data sets collected. The information was obtained from the SeaNET web site as an illustration of the functionality of the system. The demonstration application consisted of a Java based 'stand-alone' programme, but the Committee was told that a network and Internet version of MEDI, requested

by GOOS, would be available before mid 2001. MEDI is fully compatible with the Global Change Master Director and therefore with GOSIC.

Using MEDI, information could be collected and retrieved in a standard structured manner, compliant with evolving ISO standards for geophysical metadata data, enabling use of the information in other compatible systems. In the context of GOSIC, MEDI would provide a detailed description of individual monitoring stations, adding to GOSIC's information (in the same structure) of the monitoring network as a whole. For example, MEDI would show the location of each tide station in a country's sea level network, and GOSIC would describe the national network (comprising all the individual stations as a single metadata entry).

The Committee discussed the importance of using accepted standards for metadata (such as the ISO metadata draft standard) and **expressed concern** that other related metadata systems were not following these standards. **The Committee considered** it important to have interoperability between metadata directories. **The Committee proposed** that a letter be written to GTOS to indicate the benefits of complying with the developing metadata standards, rather than using specifically developed (and therefore unique) metadata structures, as appears to be the case with the GTOS system, TEMS.

Action 30: Dr. Searle to write to GTOS to seek compatibility between TEMS and MEDI.

The Committee found the MEDI demonstration very informative and **was pleased to see** the new developments. **The Committee noted** that MEDI will work closely with GOSIC to meet their needs and avoid duplication, **and expressed a concern** about whether MEDI would be able to deal with real-time data.

6.2.4.4 Ocean Data Management

An extended discussion on GOOS data and information management was stimulated by Neville Smith's presentation of his ideas on the way forward (document GSC-IV/16). He explained that in his view the key issues are as follows:

- Telemetry - too little capacity and too restrictive modes.
- Data Assembly - imperfect practices at the specialist level, no broad agreement on how we ensure coherent, integrated data holdings.
- Inadequate investment, in terms of resources (amount and direction) and intellectual engagement.
- Dislocation and/or poor communication between the scientific community and data management experts.
- Poor or inappropriate uptake of modern information technology.
- Lack of agreement on common standards, formats and practices, or imperfect application of those we do have.
- A data archiving strategy and infrastructure that is not satisfying modern needs.
- Generally poor modes of data exchange, both routinely for operational requirements and occasionally for science.
- No proper scoping and assessment of the existing problem, let alone that emerging in the future.
- Lack of an agreed strategy and implementation plan in climate and physical oceanography.
- No agreed strategy for coastal and biological observations and non-conventional ocean observations.

When we look at the foundations for a future data and information management system we find many good examples of data and information management at work but, they tend to be poorly integrated: there are many realizations of the same function/form (reflecting the operation of the "not invented here" syndrome), there is no generally accepted approach, we see too much in-house technology and too little out-sourced functionality, there is too little fusion or cross-sector adoption, there is little or no engagement from the scientific community, and there is a lack of innovation.

Dealing with Information Technology seems to require an approach that is not within our "normal" mechanisms, a method that will have to be bold and path-finding. He suggested that the way around the problem was to do some work, and set a target. First we should agree to tackle the issues on a broad front and initiate a suite of studies to evaluate the capability and functionality of existing systems as well as potential 3rd

party systems. We should properly scope the needs, looking at the total requirements, for all aspects of data and information management. And we should evaluate available technologies and methodologies. The studies should then be reviewed in a working Conference (similar to OceanObs'99) which would seek consensus on an action plan for implementing a new approach to data and information management.

He had received many positive responses to his open letter (document GSC-IV/16). There was general consensus that our ability to effectively and efficiently manage, exchange and process marine data is very poor, and that developing a data and information management system is of the highest priority. Many respondents welcomed the sort of conference proposed, but cautioned that it should not be the primary focus. The suggestion of an Ocean Information Technology Project was appreciated, as it suggested a new, more sophisticated approach that might attract the attention of funding agencies. Beneficiaries would include projects like CLIVAR as well as GOOS.

Respondents recognized that there were some hurdles in the way, not the least of which are the culture of data exchange and the key role played by the Principal Investigator as the data holder in many programmes. A new paradigm and a new data exchange policy are required for the requirements of the new millennium, which are driven by the arrival of massive amounts of real-time data. Initiatives like GODAE are carrying data management issues far beyond the boundaries of traditional data and information management. In this context, Argo is a path-finder, breaking new ground.

To some extent the massive duplication of effort relates to the lack of standards in marine science, which has the 'knock-on' effect of discouraging external information technology developers becoming involved in our problems. The lack of standards inhibits straightforward interoperability. Extensible Mark-up Language (XML) seems to provide an opportunity for providing a standard [at the metadata level] that will enhance inter-sector and intra-sector operability (see also item 6.2.4.3).

It is all too easy for investment in data and information management to be minimized in research grants when they are squeezed by the funding agencies. This approach fails to recognize that we need both architects (designers, concept builders, scientists) and engineers (data managers) to construct a data and information management system of lasting value.

Respondents found attractive the idea of a Conference / Workshop formula as the basis for reaching consensus on the way forward, provided the end result was some form of commitment or agreement on mechanisms which would actually lead to investment and design and construction of the system. The Conference would have to draw on all kinds of data and information management, including those from the commercial world, where there has been much greater investment (e.g., offshore geophysical surveys, travel agencies, banks, airlines).

The Ocean Information Technology System (OITS for short) which does everything we want, and has none of the disadvantages, would have the following characteristics:

- OITS would be globally accessible by data originators, automated systems, floats, satellites, ships, and all kinds of machine or institution wishing to put data sets into it.
- The overheads, learning curve, costs, of putting data into OITS would be minimal.
- Any specialist software needed could be downloaded from the net, or directly from OITS, and specifications of formats, codes, etc., which the data originator had to use would create minimal inputting work or costs.
- OITS would interface with all commercial database formats and presentation formats.
- OITS would have the bandwidth to handle all incoming data, and the carrying capacity to manage exchanges of large raw data sets, or model outputs, between modelling centres and large users.
- The daily/monthly management of OITS would be controlled by an expert/professional team, probably with extensive background experience in commercial data management.
- Strategic direction of OITS would be through a series of panels and committees bringing together the needs of the different scientific and operational communities, and the relevant UN and governmental bodies and agencies.
- Funding for OITS should be 'new money'.

- Most of the present acronym bodies (JCOMM, DBCP, DIMP, DIS, IODE, GLOSS, GOOS, etc.) could all survive and co-exist with OITS.

This begs the question of how OITS would interface with the huge GCOS, IGOS and CEOS systems. Is OITS the marine/science/GOOS input to something bigger? How compatible would OITS be with development of terrestrial data management, etc.?

Neville suggested three stages for development:

Stage 1: Bring in the "architects", start building scale models for particular components (thinking, planning, prototypes); agree on the model/design;
Stage 2: Bring on the engineers and craftsmen: the expertise and experience of data management specialists;
Stage 3: Move in (adoption): A major renovation versus new accommodation.

Papers for the conference could address such topics as: what do we need to keep that ensures the data are useful 50 years from now? what do existing systems give us? what technologies, if broadly adopted, will make dramatic improvements? what are the broad requirements of programmes, with the commonalities presented in a framework that data managers and scientists relate to? What is the impact of diversity of data? How do we integrate data from multiple sources?

As a rough structure one might envisage:

(i) A set of real-time data centres and affiliates arranging for real-time and near-real-time data and information management, with JCOMM providing the over all co-ordination. The GODAE Monterey data server is typical of what is planned.

(ii) Another set of non-real-time data centres and servers, focussed on the high-quality, scientific streams, and ultimately more distributed (many different scientists).

(i) and (ii) MUST be linked and there must be an international organization that provides co-ordination of such activities. For both (i) and (ii) there will also be many products served as well. We need to think how this part can be managed and it would have to have a very close relationship with science. Its mission would have to be the development of data sets of high-quality and lasting value, and it would have to be the facilitator of access to the definitive data sets.

In summary, from the personal perspective, Neville saw the following requirements:

- A "great leap forward" is required. Loosely connected, incremental steps are not working.
- We should be bold and visionary.
- We need to embrace technologies beyond our community and "deregulate" to encourage external investment in our problems.
- We need a system that is "open" - the OIT approach - so that it is equally accessible to the non-specialist and scientist, and is user driven.
- It must be balanced and integrated, both real-time and climate/science.
- It must have the capacity to handle all data, of many different types, and to handle the volumes in real-time.
- The responsibilities should be distributed but co-ordinated and integrated - the problem is bigger than any single agency or nation.
- There must be an enabling policy framework.
- We have many useful foundations but we should not let our history constrain the search for innovation.

An Ocean Data and Information Technology Project is called for to create an efficient and effective data and information management system for the ocean and marine environment, based on leading-edge [ocean] information technology, and serving the oceanographic community and beyond. Next steps involve developing a comprehensive and visionary rationale for the system; setting specific objectives; building a work programme around them; setting a target for phase 1 of the Project; developing a schedule for implementation.

This will require a Work Programme involving (i) developing a Prospectus for the Project, and an overview paper; and (ii) deciding on and carrying out a series of studies/reviews/work on such topics as:

- telemetry and communications;
- information standards (the XML project);
- solutions developed beyond oceanography;
- an assessment of technologies and relevant IT;
- the overall rationale for the system - the technical, scientific and societal drivers;
- *datum* and data set integrity;
- unique "tags" for every original *datum*;
- a rational scheme for tracking value added (or removed); accreditation;
- data and product servers (the GODAE project for R/T);
- scientific requirements;
- operational requirements;
- non-specialist requirements;
- developing an effective User Interface;
- an analysis of the complexity of the Level 2 data stream;
- the virtual ocean data system approach;
- data assembly and quality control;
- innovation and archives.

In discussion, **the Committee accepted** that data and information management is now one of the highest priority issues for GOOS, **noting** that it has endorsed document GSC-IV/15 as the data and information management strategy. **The Committee urged** that concrete steps be encouraged to implement the GOOS data and information management strategy, consistent with the implementation steps being fostered by the GOOS advisory Panels.

Following a broad-ranging discussion, **the Committee commended** Dr. Smith on the vision and insights in his presentation, **and accepted** the thrust of his argument. **The Committee decided** that the "Ocean Data and Information Technology Project" approach, based on document GSC-IV/16, provides an appropriate, innovative potential way forward for GOOS data and information management, consistent with the GOOS end-to-end, user-driven approach in which the focus must be on meeting the needs of a broad user community. **The Committee recommended** that funding agencies and users must be entrained from the start. The message for the funding agencies should be that probably some 15% of GOOS observational budgets should be allocated to data and information management on a permanent basis, recognizing that if this is not spent then much of the other 85% is wasted.

The Committee recommended the following actions:

Action 31: Neville Smith to convene a small meeting (April 24th), just before the National Virtual Ocean Data Hub meeting in Washington, D.C., to develop agreement on the content of the Prospectus.

Action 32: The Washington Group (above) to prepare a paper setting out the vision, rationale, objectives and prospective implementation pathway for the project. This Prospectus should be available as a background paper for JCOMM-I. It should list the possible architects and set out the financial implications.

The Committee recommended that construction of the Prospectus should start from the Work Programme listed above, **and recognized** that some initial steps had already been or were soon to be taken through (i) the XML project, (ii) a PICES Workshop, (iii) a data integrity paper by Bob Keeley, and (iv) the GODAE server projects. **The Committee emphasized** that, consistent with the objectives of the proposal, involvement in the Project should be GOOS-wide and involve groups like IODE and JCOMM. Subject to the development of an appropriate plan, schedule, and budget etc., **the GSC agreed** that this might be suitable as a GOOS Pilot Project.

Ben Searle made a brief presentation on the need for a marine data directory and for a single specification for a marine XML to be considered in the development of these ideas (see also item 6.2.4.3,

above). **The Committee agreed** that it was desirable to develop a single specification for XML. Nic Flemming agreed to promote the discussion on XML in Europe.

Action 33: IODE is encouraged to contact US Navy and others interested in XML with the objective of obtaining agreement on a single specification for XML.

6.2.5 Ocean Theme for the IGOS Partnership [including Integrated Global Observing Strategy (IGOS), Global Observing Systems Space Panel (GOSSP), Committee on Earth Observation Satellites CEOS)]

6.2.5.1 Oceans Theme

Colin Summerhayes briefed the committee on interactions with the IGOS Partners (documents GSC-IV/B17 and B18), and on progress with and plans for the Oceans Theme of the Integrated Global Observing Strategy (IGOS) Partners (document GSC-IV/B19). He reminded the Committee that the IGOS Partners had asked GOOS to accept responsibility for working with CEOS to implement the Oceans Theme, that the GSC has the oversight of this responsibility, and that CEOS has nominated a technical expert, Dr. Eric Lindstrom, of NASA, to attend the GSC meetings to assist in the implementation of the IGOS Oceans Theme.

In discussion, **the Committee praised** the production of the Oceans Theme document by NASA. **The Committee recognized** that the IGOS Partners would like the GSC to take responsibility for oversight of implementation of the Oceans Theme, **and thanked** CEOS for sending Eric Lindstrom to assist in this process. However, the Committee expressed some concern about the lack of information regarding the follow-on roles for the Theme Teams, and of GOOS, in terms of having oversight of the implementation process. The **Committee considered** that the Ocean Theme Team should be a continuing activity with oversight responsibility for implementation of the satellite observations and with responsibility for refining Ocean Theme requirements with appropriate inputs from the GOOS Steering Committee. The **Committee considered** that the GSC has responsibility for oversight of the *in situ* observational elements of the Ocean Theme, that will be implemented/co-ordinated largely through the JCOMM. **The Committee considered** that emphasis should be to report on products and on product development, because, as in all of GOOS, the products should drive the development of the system. **The Committee was informed** that the product-based approach has been taken in conjunction with EuroGOOS by EUMETSAT.

Action 34: The GPO was asked to write a letter to the IGOS Partners with the following text (copied to the WMO's CBS via Peter Dexter):

[This text and its eventual recipients are now under further consideration.]

The Ocean Theme and its Team have successfully developed a path-finder approach for the Integrated Global Observing Strategy and, in particular, an integrated strategy for the satellite measurements.

The GOOS Steering Committee recommends the IGOS Partners consider consolidation of this activity into a sustained action, involving:

- *Implementation and oversight of the remote sensing strategy,*
- *Ongoing review and consideration of the role of the ocean theme within the IGOS, including consideration of any new requirements, and*
- *Keeping the IGOS-P informed on the products of the Theme.*

The GOOS Steering Committee will appoint a rapporteur to provide connectivity from the GOOS design and planning process to the Ocean Theme.

Further, the GSC suggests the IGOS-P consider formalizing such transitions for other Themes.

Action 35: Dr. Flemming to supply Director GPO and Chair GSC with the EuroGOOS-EUMETSAT meeting papers.

6.2.5.2 Carbon Theme

Because Doug Wallace was unable to attend the meeting, Colin Summerhayes reported on progress with the development of the Integrated Carbon Theme of the IGOS Partners, outlining the plans for an ocean carbon observing system (document GSC-IV/17; document GSC-IV/B20), which have been developed with the aid of the OOPC and others.

Dr. Wallace had provided Committee members with an e-mail note (8 March 2001) to assist their deliberations on the way forward. In it he described document GSC-IV/B20 as an excellent background paper giving a very thorough exposition of the justification for, background to, and possibilities for, a global ocean carbon observing system. He noted that this is a work in progress, that several modifications remain to be made, and that it represents a valuable first step towards the development of an integrated global carbon theme report for the IGOS Partners. The document has had the input, support and recognition of the international scientific community (including the IOC-CO_2 Panel). He recommended that the GSC support this activity for the IGOS-P, and build on this opportunity for developing the initial strategies and plans for ocean carbon observations that are needed within GOOS. He also recommended that the finished document, which will form the basis for the ocean carbon component of the IGOS Integrated Global Carbon Observation theme, be published as a GOOS report.

In discussion, **the Committee endorsed** document GCS-IV/B20 as a valuable first step towards the development of an integrated global carbon theme report for the IGOS Partners; **agreed** to support this activity for the IGOS-P; and **agreed** to use this document as a working document to inform the development of plans for and implementation of ocean carbon observations that are needed within GOOS. **The Committee also agreed** that when the document was completed it should be published as a GOOS report, but not until the Integrated Global Carbon Observation theme report was produced.

Action 36: (i) Members to provide feedback on the Ocean Carbon Theme document to the GPO to pass to Maria Hood by end April; (ii) GPO to publish the finalized ocean carbon observing system document as a GOOS report once the Integrated Global Carbon Observation theme report is produced.

Dr. Summerhayes tabled an additional paper, submitted at short notice by Dr. Wallace for the consideration of the Committee, on *Observing Systems for Biogeochemistry: the Importance of Volunteer Observing Ships*. The intent of the paper was to draw to the attention of the Committee the fact that although there is great progress being made in establishing a global observing system suited to examining the role of the ocean in the climate system, our ability to observe the biological and biogeochemical state of the ocean lags very far behind. This means that major political and legal issues of great consequence for mankind are being addressed in the absence of meaningful observations to assess the global effectiveness of any remediative measures proposed.

Dr. Wallace's paper pointed out that the potential of making biogeochemical measurements from surface vessels has been drastically underutilized and underappreciated. He pointed as a long-term success story to the Continuous Plankton Recorder (CPR) surveys operated by the Sir Alister Hardy Foundation for the Ocean Sciences, which is part of the GOOS-IOS. He recommended that a major effort should be made to utilize the commercial shipping fleet as a platform for making a suite of biogeochemical measurements of the surface ocean and also the atmosphere, using existing measurement technologies

The Committee recommended that Dr. Wallace's paper should be considered by the OOPC and at the COOP-II meeting in Trieste (April 2000).

Action 37: (i) OOPC and COOP to consider the development of a biological/biogeochemical observing system using voluntary observing ships, as suggested in Dr. Wallaces's paper, and to provide a co-ordinated response to him through the GPO; (ii) the JCOMM Ship Observations Team to consider this matter at its next meeting, using the advice from OOPC and COOP.

6.2.5.3 Global Observing Systems Space Panel (GOSSP)

Prof Nowlin briefed the committee on progress with and plans for GOSSP. He noted that there has been no full meeting of GOSSP since October 1998. Reflecting some dissatisfaction with the operation of GOSSP, possible modifications to its structure and Terms of Reference had been discussed at the 5th session of the G3OS Sponsors Group (6 June 2000) (document GSC-IV/B21) and at the 9th session of the GCOS Steering Committee (12-14 September 2000) (document GSC-IV/B22).

In the remote sensing area, there are three issues facing GOOS, and perhaps the other observing systems too: (i) do the advisory panels have the scientific and technical expertise needed to design and provide implementation oversight for their areas of responsibility? (ii) how best can we assemble and co-ordinate the requirements from the various aspects of GOOS? and (iii) how can we keep the co-ordinated requirements before CEOS?

The first of these issues is a matter of having access to scientific and technical advice. What are the best ways to meet the need? One approach is to have appropriate members on, or invite experts to meetings of, GOOS panels. Another mechanism is to gain advice via projects, especially those that cross boundaries – like the HiResSST project. For particularly messy issues, there one can consult specialist groups related to each satellite system, and it is always possible to commission a special study. This is the recommended approach.

The second of these issues is best tackled by one person. The Committee could consider appointing a rapporteur for GOOS, possibly jointly with JCOMM, who is knowledgeable across the field and who has enough self-interest to ensure he/she will remain active. This is essentially the approach used in the past by GOSSP with Ian Robinson and Francis Bretherton as rapporteurs.

The third issue requires clear definitions of the responsibilities of the major parties involved. Potential conflicts can be avoided by clarification of the roles of the IGOS Partnership and CEOS. Here we need several things:

(i) from the GSC, the GCOS-SC, and JSC and other executive groups of the IGOS Partners we need a clear and concise statement of what IGOS is, what the body calling itself the IGOS Partners is, and what role that body is to play or not to play. This would include a clear definition of the role for Themes, and generic guidelines for Theme Teams. Lacking such clear guidelines, continuing clashes and confusions are likely.

(ii) from CEOS we need a clear statement on its preferred strategy for implementation. The Ocean Theme is viewed by most as a strategy for implementation of remote sensing for the sustained observing system. The Oceans Theme does not deal with the full implications of integrating remote and *in situ* observations (e.g. the integration of requirements for numerical weather prediction and ocean climate for the Tropical Atmosphere Ocean array; temperature and salinity stations for climate change and coastal applications; and so on). Is it understood by the Theme Teams that such integration is not the responsibility of the Theme Teams? If not, GOOS must reconsider its role.

(iii) assuming that (i) and (ii) are resolved, then a Rapporteur for GOOS (perhaps also covering JCOMM), could bring our satellite requirements to the 'Implementation Mechanism' (which might equal Theme Team), to provide interpretation and adjustment as necessary, and then bring that response back to the GSC and its Panels. Assisting connectivity between the Panels in this way might be a secondary function of the rapporteur.

[Action 34 under item 6.2.5.1 (above) should go far towards resolving the third issue.]

Action 38: (i) The GPO and GCOS to take these ideas to GTOS; (ii) if all agree, then GOSSP should be dissolved with letters being written to thank participants for their efforts; then (iii) the GSC Executive and GPO to work together to seek the assistance of a Rapporteur, to be paid for services rendered based on a clear job description to be drafted by the end of May.

7. LIAISON/INTEGRATION

7.1 GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)

Alan Thomas described briefly the latest developments in GCOS, with particular reference to the linkages with GOOS through the OOPC, through the Sixth Conference of the Parties (COP) to the UN Framework Convention on Climate Change (UNFCCC), and through the development of regional workshops for capacity building (document GSC-IV/B22).

The strategic framework of GCOS has four main elements: (i) building on existing operational and research observing and data systems; (ii) obtaining commitments from governments to implement GCOS (by engaging the governing bodies of the sponsors, and through national reporting to the COP of the UNFCCC); (iii) addressing deficiencies in the initial operational system at the regional level; and (iv) keeping the initial operational systems relevant to users' needs.

Specific actions include the following:

- Reporting to the governing bodies of the sponsors to raise visibility and importance;
- Using the COP decisions and the SBSTA (Subsidiary Body for Scientific and Technical Advice) process to address deficiencies in observing systems (e.g., through synthesis and analysis of national reports, and through regional workshops and proposals for funding);
- Connecting with the network of national co-ordinators for GCOS;
- Using the Steering Committee as a focus for implementation, with scientific leadership through the advisory panels;
- Paying attention to the carbon and water cycles, e.g., through the IGOS Themes;
- Providing the second report to the COP on the Adequacy of the global climate observing systems.

In response to the decisions of the 5th COP, GCOS has developed a series of 10 regional workshops, the goals of which are: (i) to promulgate understanding of the guidelines for reporting on systematic observation to the UNFCCC: (ii) to assess the contribution of the region to the GCOS baseline networks; (iii) to identify national and regional needs and deficiencies in climate data; and (iv) to initiate development of a regional Action Plan for improving the observing systems. The workshops form the basis for identifying regional needs for capacity building. The first one took place with regional meteorological officers in Apia, Samoa, in August 2000. A second one is being planned for eastern and southern Africa in October 2001 with funding from the Global Environmental Facility (GEF) of the World Bank. The total project of 10 workshops and regional action plans is estimated to cost US$3 million over 6 years. A full proposal will be sent to the GEF for about half of the required funds.

Dr. Thomas noted that the GCOS-SC called for some actions involving input from GOOS and/or the OOPC, in particular (document GSC-IV/B22):

GCOS-SC action 27: to define which components of the GOOS-IOS constitute also a part of the GCOS initial operational system (see action 23, above);

GCOS-SC action 28: OOPC, GOOS and GCOS to agree on a set of performance metrics for ocean measurements for climate;

GCOS-SC action 29 GCOS to review the new Terms of Reference for OOPC.

The Committee noted progress with the development and implementation of GCOS.

7.2 INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME (IGBP) [LAND-OCEAN INTERACTION IN THE COASTAL ZONE (LOICZ); GLOBAL OCEAN ECOSYSTEMS DYNAMICS (GLOBEC)]

Julie Hall reported briefly on progress with LOICZ and its relation to COOP. Links between LOICZ and Coastal GOOS were strong, but there is nobody from the LOICZ Steering Committee or Project Office on COOP. It looks as if LOICZ will progress into a second phase within IGBP.

Action 39: (i) Julie Hall to ask LOICZ to involve COOP in its planning activities, perhaps by inviting a COOP member to its steering committee meetings; (ii) Worth Nowlin to contact the IGBP chair to ask if COOP can be formally represented in the IGBP Annual Meetings; (iii) COOP co-chairs to invite LOICZ representation at COOP meetings.

Dagoberto Arcos reported briefly on progress with GLOBEC and its relations to GOOS. Links between the two bodies are good. Mike Fogarty of COOP is a member of the GLOBEC Steering Committee, and Colleen Maloney of COOP is a member of a GLOBEC working group.

Roger Harris of GLOBEC attended COOP-I and will be invited to attend future COOP meetings.

5.1 PARTNERSHIP FOR OBSERVATION OF THE GLOBAL OCEANS (POGO)

Shubha Sathyendranath, Executive Director of POGO, reported on the development of POGO and its relevance to and interaction with GOOS (http://www.oceanpartners.org). POGO held its last meeting at the end of November in Sao Paulo, Brazil. Tony Knap attended for COOP, and Neville Smith for OOPC. The meeting focused on the role that POGO can play in improving the co-ordination, implementation and promotion of major programmes. POGO is actively promoting the Argo project. The regional focus of the recent meeting was on the southern hemisphere; participants adopted a declaration to promote observations in the southern hemisphere, to identify gaps in coverage, and to identify the means to fill those gaps. Capacity building was also a focus for attention. POGO decided to institute a Visiting Fellowship Scheme in collaboration with SCOR and the IOC, to provide training to scientists and technicians from developing countries on topics related to global ocean observations. POGO also agreed to co-sponsor SEREAD (see 6.2.2, above). POGO would appreciate receiving suggestions related to activities that it might take up in support of GOOS.

Action 40: Director POGO to send POGO details to Silvana Vallerga.

8. OUTREACH/ INFRASTRUCTURE

8.1 CAPACITY BUILDING

Prof. Nowlin welcomed the new chairman of the Capacity Building Panel, Geoff Brundrit, who had only recently agreed to replace Geoff Holland. Prof. Brundrit reported on the GOOS capacity building (CB) programme. He reviewed progress against actions since GSC-III (document GSC-IV/19A), presented a revised draft of the implementation plan (document GSC-IV/19B), and touched on current plans for capacity building (document GSC-IV/19). He noted that the various plans and actions were to be seen in the context of the final version of the Capacity Building Principles (document GSC-IV/B23), which had been revised in accordance with the wishes of GSC-III, and which was now available on the GOOS web site.

He explained that the draft GOOS Capacity Building Programme Implementation Plan (document GSC-IV/19B) was a revision made by himself, Worth Nowlin and Colin Summerhayes from the draft presented by Geoff Holland at GSC-III, and incorporating suggestions made by Members at that time and since. Principal elements of the strategy were:

(i) The GSC must decide on the long-term objectives for the CB Programme. These goals should be achieved within the framework of the GOOS Principles of Capacity Building, and will be adopted and used to maintain a consistent programme;

(ii) With advice from I-GOOS, the GOOS-Capacity Building (CB) Panel and the GPO, the GSC must decide on the short- to medium-term objectives for the CB Programme, which should be designed to meet national and regional users' needs, within the framework of the GOOS CB Principles;

(iii) Within the framework of the objectives provided by the GSC in (i) and (ii) above, the GPO should work to obtain the support of both donor and recipient countries for the proposed programme;

(iv) I-GOOS should be encouraged to develop arguments for an intergovernmental mechanism to provide the resource base needed for capacity building;

(v) The GOOS CB Programme should exploit the potential benefits of working through partnerships;

(vi) The GOOS CB Programme should possess certain attributes: (a) it should be flexible; (b) projects in the programme should be evaluated; (c) the CB programme must be capable of accepting all scales of assistance programmes that are seen to contribute to the long term goals for GOOS, whilst being firm in refusing to accept, as GOOS programmes, activities that are not consistent with those goals; (d) the programme must be creative;

(vii) The CB Panel, I-GOOS and the GSC must suggest to the GPO ways of levering expertise, equipment, facilities, capital and funding sources to increase the scope and impact of the CB programme.

The Committee considered the Implementation Strategy document section-by-section, **endorsed** the suite of long-term goals for GOOS capacity building contained in the document, made suggestions for improvements, **congratulated Prof Brundrit** on his revision of the original document, **and endorsed** production of the document, **recognizing** that some improvements needed to be made to it before it was published in hard copy and on-line by the GPO. **The Committee decided** that data and information management should be high on the list of short- to medium-term priorities, as should training in modelling and remote sensing. I-GOOS should be asked to help find resources for implementing the programme.

Action 41: (i) Members to provide suggestions to Prof Brundrit for improvements to the Implementation Strategy within 30 days; (ii) CB Panel to consider short term objectives; (iii) GPO to publish the revised Implementation Strategy on-line and in hard copy; (iv) GPO to submit the finalized document to I-GOOS-V, asking for help in finding resources.

Prof Brundrit explained that in response to GSC-III Action 47 Ilana Wainer had developed a GOOS Capacity Building web page at the University of Sao Paulo (USP), which was reachable through the GOOS homepage. The only document on the USP site at present is the GOOS Capacity Building Principles. The Committee asked the Capacity Building Panel to work with the GPO to populate this new site with appropriate materials.

Action 42: GPO to work with Capacity Building Panel (including Ilana Wainer) to populate the Capacity Building web site at the University of Sao Paulo with appropriate material.

Prof Brundrit noted that aside from his substitution for Geoff Holland, there had been one other slight change to membership of the CB Panel. A. Dahl (UNEP) had retired, and a replacement would be sought from UNEP. **The Committee decided** that some other changes in membership were necessary, given the development of COOP. In particular Eduardo Marone (ex C-GOOS) would be replaced by a COOP representative. Bill Erb should be added, as agreed under item 6.1.8. Panel membership would then be as follows:

A. Botello (COOP, ex-HOTO) (Mexico)
G. Brundrit (GOOS-AFRICA) (S. Africa) (Chair)
E. Desa (developing country rep.) (India)
W. Erb (Perth Office)
K. Koranteng (COOP, ex-LMR) (Ghana)
M. C. Piccolo (ICSU rep.) (Argentina)
R. Rayner (industry rep.) (UK)

J. Stel (Donor rep.) (Netherlands)
C. Summerhayes (Tech. Sec.) (IOC) (France)
I. Wainer (ex-GSC) (Brazil)
R. Weller (OOPC) (USA)
A. N. Other (UNEP rep.)
A. N. Other (COOP)

Action 43: GPO to discuss with UNEP a replacement for A. Dahl on the CB Panel; COOP to recommend a replacement for E. Marone.

The Committee endorsed the Capacity Building programme for the year 2000 (document GSC-IV/19). The programme includes (i) training courses for GLOSS and in NEAR-GOOS Data and Information Management; (ii) GLOSS web-based training; (iii) installation of GLOSS tide gauges in Ghana; (iv) a GLOSS regional demonstration project; (v) a GOOS-ARICA workshop on remote-sensing; (vi) a SEA-GOOS exploratory meeting; (vii) a NEAR-GOOS ocean forecasting workshop; (viii) a Black Sea GOOS start-up meeting; (ix) an Argo capacity building project meeting; and (x) a meeting of the IOCARIBE-GOOS Advisory Group.

The Committee called for the CB Panel to work with OOPC, COOP and the GPO to develop a GOOS-CB programme for the year 2002, including the possibility that there should be a meeting of the CB Panel itself.

Action 44: In consultation with GOOS Panels and with the GPO, Capacity Building Panel to develop a Capacity Building programme and budget for 2002, by end September 2001.

8.2 COMMUNICATION AND INFORMATION

It was reported that since GSC-III, there have been two issues of the GOOS Newsletter (Issues 9, in April 2000, and 10, in December 2000) (documents GSC-IV/B25 and GSC-IV/B26). Both are available on the GOOS web site. A number of GOOS reports have been published or are in press (document GSC-IV/B27); published reports are available on the GOOS web site. The GPO has contributed several articles or papers to journals and annual reports (Annex III of document GSC-IV/8). The GOOS web site has been improved, and is averaging about 260 hits per week, a two-fold increase on two years ago.

A revised draft GOOS brochure, prepared by Maria Hood of the GPO, was presented for the consideration of the Committee (document GSC-IV/23). The brochure was reviewed in the margins of the meeting by a working party chaired by Tony Knap, and including Silvana Vallerga, Dr. Swamy, Julie Hall, and Johannes Guddal. The working party liked the overall format proposed, and made numerous constructive suggestions for improvements to the text and layout, as well as for illustrations. **The Committee liked** the draft provided by Maria Hood, but recognized that the working party had come up with some good suggestions for improvements. **It agreed** that the working party should stay in being as an advisory group to assist Maria Hood in completing the brochure. **The Committee also agreed** that the brochure must make it plain that GOOS is NOT a programme; it is a system to deliver products. In that context it adds value to and is not in competition with research programmes.

Action 45: Tony Knap will thank Maria Hood for her efforts, and communicate the suggestions of the working party to Maria Hood. The working Party (joined by Nic Flemming) will stay in being as an advisory group to Maria Hood.

Julie Hall reported that she had drafted a Coastal GOOS poster, focusing on COOP, for use at scientific meetings. Copies of the poster were circulated at the meeting for comment. It was noted that Cindy Clark at Scripps has a lot of images available.

Action 46: Members were asked to provide Julie Hall with feedback on the Coastal GOOS poster within 30 days, and with high quality graphics if available.

Johannes Guddal reported that the prototype version of the GOOS Services and Products Bulletin, which was posted on the GOOS web site (http://ioc.unesco.org/goos) last year, had been improved by the addition of an article on offshore industry, and has recently been finalized as Bulletin Number 1. **The Committee asked** the Director GPO to pass on its thanks to Maria Hood for her excellent work on developing the Bulletin to its present professional level.

Action 47: GPO to pass on the Committee's thanks to Maria Hood for her work on the Bulletin.

Mr Guddal discussed the list of possible User Scenarios that were tabled in document GSC-IV/24, noting that the first eight had already been published in the Bulletin, and that an additional two had been received recently, on (a) local and regional occurrence of harmful algal blooms, and (b) eutrophication. **The Committee decided** that for each scenario (i) a new text should be provided where one was lacking, (ii) that the presently existing texts should be examined to see if they could be improved, and (iii) that authors should be found by Committee members to write articles relating to each scenario. The present issue of the Bulletin has one such article, on offshore industry. Members of the Committee and others were identified for Johannes Guddal to work with to fulfil these requirements, as follows:

	Scenario	Committee Member or Other
1.	Flood defenses	??
2.	Energy supplies	Tony Knap
3.	Water supplies	Tony Knap
4.	Ocean routes	Nic Flemming
5.	Oil and gas	done
6.	ENSO	??
7.	Monsoon	??
8.	Ports	??
9.	Marginal ice zone	Stein Sandven
10.	Pollution	Peter Dexter
11.	Biodiversity	Tom Malone
12.	Algal blooms	Tom Malone
13.	Eutrophication	Tom Malone
14.	Invasive species etc	Tony Knap
15.	Climate	??

Action 48: Members to provide to Johannes Guddal by end May text for new scenarios, suggested revisions to text for existing scenarios, and names of potential authors for articles relating to scenarios.

9. PLANS FOR GOOS REVIEW

Prof Nowlin presented a plan for a review of progress in GOOS by an external review group made up of representatives of operational agencies and users (document GSC-IV/21). The review had been proposed by past sessions of the Committee, and would take place in the year 2002. It will be the first in a 5-yearly cycle of such reviews by an independent group of experts. The plan will have to be agreed by I-GOOS and the GOOS sponsors.

The Committee recommended that the review should follow the precedent of the recent review of the IOC's Ocean Sciences Programme, and that the 21st IOC Assembly be asked to commission the review of GOOS, using a text along the following lines:

*'**The Assembly requested** the Executive Secretary IOC to initiate a review of the Global Ocean Observing System (GOOS) and to form an ad hoc group of appropriate experts, including mainly representatives of operational agencies and of different parts of the user community, to undertake the task with the following Terms of Reference: (i) review the development and implementation of GOOS, paying particular attention to its structure, mandates and modus operandi, to the activities of its advisory panels, to the development of the GOOS Initial Observing System including its pilot projects, to the regional development of GOOS, to the national development of GOOS; (ii) review the capacity building activities in support of GOOS, in*

the context of bringing benefits to the Member States; (iii) review the impacts of GOOS and its capacity building activities; and (iv) report to the Member States by the Thirty-fifth Session of the IOC Executive Council in 2003. ***The Assembly recognized*** *that this decision would have a financial implication of US$15,000 from the Regular Budget allocation, supplemented by the IOC Trust Fund and/or extra-budgetary sources if required.* ***The Assembly further requested*** *the Executive Secretary IOC to ask the co-sponsors of GOOS, the IGOS Partners, and other relevant partners to assist the review group.'*

The Committee recommended that:

(i) once approved by GSC-IV, and modified as appropriate, this text be submitted for further consideration and approval by I-GOOS-V;

(ii) once approved by I-GOOS-V, and modified as appropriate, this text be submitted for endorsement by the Assembly;

(iii) the review group (like that of Ocean Sciences) should comprise 4 people, who should be experts drawn from operational agencies and different parts of the user community;

(iv) nominations of potential members for the review group should be made to the Executive Secretary IOC by IOC Member States and by other GOOS sponsors (WMO, UNEP, ICSU), and should be chosen by the IOC Executive Secretary in consultation with the other sponsors;

(v) the review group should interview (a) the GPO staff; (b) the Chairmen of the GSC and I-GOOS (including the immediate past chairman of I-GOOS if the present chairman is replaced at I-GOOS-V); (c) the chairmen of key advisory panels (OOPC, COOP and the GOOS Capacity Building Panel); (d) the supervisor of GOSIC; (e) the chairpersons of selected regional GOOS bodies (such as EuroGOOS etc); (f) the Directors of the GCOS and GTOS Secretariats; and (g) representatives of the following groups:

- national implementation agencies;
- user communities from various parts of the developed and developing world;
- GODAE and Argo;
- SCOR;
- CEOS (from the IGOS Partnership);
- the academic community (chosen from the membership of POGO);
- co-sponsors of GOOS (WMO, UNEP, FAO and ICSU);
- IODE;

(vi) much of the information should be gained through use of a questionnaire, and much of the correspondence should be done by e-mail;

(vii) meetings thought necessary to gain information, or for clarification, could coincide with one or more of the scheduled meetings that would bring such representatives together;

(viii) meetings could be conducted in different regions if the review group felt this was necessary (for instance (a) at a Mediterranean location for EuroGOOS, MedGOOS and GOOS-AFRICA; (b) at a central American/Caribbean location for the Americas; (c) at IOC offices in Bangkok or Perth for the Asian, Pacific, and Indian ocean sector);

(ix) the review should be written up by the review group independently of the IOC.

The Committee recommended that the evaluation by the IOC Assembly of the report being drafted by Dr. McEwan on the structure, mandates and modus operandi of GOOS, be done in the context of the proposed review, and not in isolation.

Action 49: GPO to document the GSC's recommendations for the GOOS review, and take them to I-GOOS-V for further consideration, prior to approval by the IOC Assembly.

10. WORK PROGRAMME AND BUDGET

A working party chaired by Julie Hall, and comprising herself, Mr. Hasegawa and Dr. McEwan, reported on the work programme and budget for the next biennium (document GSC-IV/22). She noted that there was an increase in expenditure on implementation and a decrease in expenditure on planning. The proposals for 2001 were more or less fixed, but a few of the liaison meetings proposed in the work programme had been eliminated. The proposals for 2002 were less certain, but were soundly based on the prospect of continuation of more or less the same programme as in 2001. Dr. Summerhayes noted that the work programme and budget for capacity building activities for 2002 might be expected to change once the Capacity Building Panel had decided on what was needed for the future. Tony Knap noted that he had US $25,000 for a RAMP training workshop for the Black Sea, and Nic Flemming reported that he may be able to identify donors for support of Black Sea GOOS. Peter Dexter noted that JCOMM may approve substantial capacity building activity in 2002, for which funds will be needed.

The committee endorsed the work programme and budget, with minor modifications, **noting** that the Capacity Building Panel has an action against it to develop a work programme and budget for 2002.

Action 50: GPO to work with Tony Knap and Nic Flemming to exploit funding opportunities in support of the development of GOOS in the Black Sea.

11. OTHER BUSINESS

11.1 GSC MEMBERSHIP AND ROTATION OF MEMBERS

Prof. Nowlin noted that the core membership of the GSC should reflect a balance between user groups, operational experts, and scientific researchers. It was important that it consist of experts in global observing systems, which made it difficult to achieve complete geographic balance. He noted that at present there were two places currently vacant, that with the rotation of Ilana Wainer (physics) off the Committee this year the number of places vacant would increase to three, and that the Committee is weak in expertise concerning large-scale ecosystems and fisheries. Recognizing this weakness, he recommended that Julie Hall be invited to stay on the Committee for a further year.

The Committee thanked Ilana Wainer for her services, **endorsed** the suggestion that Julie Hall continue as a Member, **and suggested** the names of several other biologists who were experts in either large-scale ecosystems and/or fisheries.

Action 51: GPO and GSC Chair to work with GOOS Sponsors to identify three potential members for the Committee to fill the spaces available, with a preference for biological experts in large-scale ecosystems and/or fisheries.

Prof Nowlin explained that he had been invited to stay on for two more years as chair, and that the sponsors had decided to appoint a chair-elect to shadow him for a year before he stands down at the end of GSC-V, after which he will stay on the Committee for a further year as past-chair. He asked the Committee to suggest possible candidates for his replacement, noting that the past chairs of both J-GOOS and its successor, the GSC, had been physical oceanographers from the USA.

Action 52: GPO and GSC Chair to work with GOOS Sponsors to identify a potential new chairperson, who should be other than a physical oceanographer and from outside the USA, and who should preferably have experience of GOOS panels.

11.2 DATE AND PLACE OF NEXT MEETING

Prof Nowlin noted that following the plan that the GSC should alternate its meetings between the regions and UNESCO HQ (Paris), GSC-V will be held in Paris in May 2002. **The Committee decided** to hold GSC-VI in Africa in 2003, possibly in conjunction with a meeting of ODINAFRICA (IODE).

Action 53: (i) G. Brundrit to see if an invitation to host the meeting in Cape Town in 2003 could be obtained; (ii) GPO to work with IODE to see if a back-to-back meeting with ODINAFRICA is feasible then.

12. CLOSURE

The Chairman commended the GPO for its efforts in preparing the documentation and logistics for the meeting, thanked the local organizing committee for its smooth and efficient support behind the scenes, thanked Servicio Hidrográfico y Oceanográfico de la Armada de Chile for its excellent treatment of the participants, thanked all participants for attending, and closed the meeting at 17.30 on Friday March 16th 2001.

13. LIST OF ACTIONS

Action 1: The IOC should encourage Member States and national operational agencies to form National GOOS Co-ordinating Committees. The same national committees may also assist briefing delegates to the other GOOS sponsors: WMO, UNEP, FAO and ICSU.

Action 2: The GPO should strongly encourage Member States to send to I-GOOS meetings representatives who truly represent a broad range of operational agencies; Dr.Flemming offered to provide suggestions on how the GSC and GPO might achieve this for Europe.

Action 3: Tony Knap to provide the GPO with the final version of the HOTO Strategic Design Plan, and GPO to circulate it to Committee members for comment and approval.

Action 4: MedGOOS Chair to invite COOP co-chairs to serve on the Advisory Board of MAMA.

Action 5: Strong linkage between COOP and OOPC needs to be maintained at least at the level of the chairmen.

Action 6: GPO and chair of I-GOOS, with assistance from Director EuroGOOS, to make suggested improvements to the Regional Policy document for presentation to I-GOOS-V.

Action 7: Directors GPO and EuroGOOS to consider mechanisms to facilitate visits between EuroGOOS representatives and other regional GOOS bodies.

Action 8: Director GPO and Chair GOOS-AFRICA were asked to capitalize on the GOOS-Africa meeting in E. Africa later in 2001 to formulate for the African Process proposals on ocean remote sensing for GOOS-AFRICA and (in conjunction with GLOSS) on an effective GLOSS network for West Africa, and to explore the possibility of liaison with CEOS in relation to the remote sensing requirements.

Action 9: GOOS-AFRICA Committee to seek an assessment of regional priorities from its members (including IOC bodies such as IOCEA and IOCINCWIO), and to encourage the development of key proposals, which match the four priorities, for submission to the African Process, within the time frame of the African process.

Action 10: Director GCOS to work with GPO to get details from EUMETSAT of the PUMA proposal funded by the EC for receiving stations in Africa.

Action 11: Director GCOS to bring the PACSICOM requirements for remote sensing and sea level to the attention of the UNFCCC in the context of their use for climate observations.

Action 12: Chairs of OOPC and COOP were asked to work with their panels to consider whether or not to accept some of the listed GOOS-AFRICA regional pilot projects as GOOS Pilot Projects, and/or as elements of the GOOS Initial Observing System.

Action 13: I-GOOS-V should be asked to consider how GOOS should be presented within the meeting in 2002 on Rio+10.

Action 14: OOPC to consider how ICES Hydrographic data might be used in climate studies of the North Atlantic.

Action 15: GPO to assess the availability of data from the ICES database, and to report back to GSC-V.

Action 16: Julie Hall to provide the GPO with details about the new SCOR working group on an ecosystem approach to fisheries, for the GPO to use in links with ICES and PICES.

Action 17: GPO to determine whether SEACAMP meets with GOOS Principles, and, if so, to request the Capacity Building Panel to consider acceptance of SEACAMP as an element of the GOOS Capacity Building programme.

Action 18: Capacity Building Panel to review the WIOMAP proposal, check compliance with GOOS Principles, and consider acceptance of aspects of WIOMAP as elements of the GOOS Capacity Building programme.

Action 19: GPO to invite Bill Erb to attend GSC-V and to ensure Perth reports are circulated to the Committee.

Action 20: (i) GPO to invite Bill Erb to join the Capacity Building Panel; (ii) Perth Office to aim to get some specific capacity building activities funded, in consultation with the GPO and the Capacity Building Panel.

Action 21: GPO to ensure that heads of National GOOS Co-ordinating Committees are listed on the national contacts list.

Action 22: Chair GSC to write to Mike McPhaden to express satisfaction with the past work of the TAO-IP and to offer thanks for his efforts.

Action 23: GPO to work with Chair OOPC and Director GCOS to agree on which elements of the GOOS-IOS should be listed as elements of the GCOS-IOS.

Action 24: Chairman GSC to appoint a working group (W. Nowlin, N. Flemming, A. Knap, and N. Hasegawa) to work inter-sessionally on a definition of the GOOS-IOS, which might include a name change, and to report back by the end of May.

Action 25: Angus McEwan to draft a letter to CCAMLR, for approval by the GSC Executive Committee, regarding possible collaboration between GOOS and CCAMLR.

Action 26: COOP to consider the LMR proposals for elements of the GOOS-IOS, including pilot projects.

Action 27: GPO and Chair I-GOOS to arrange (i) for the revised version of the letter to be sent to relevant IOC contact points and to the agency representatives who attended the Initial GOOS Commitments Meeting in July 1999; and (ii) for Executive Secretary IOC to thank NESDIS formally for support of the Data Co-ordinator's position.

Action 28: (i) Members to provide comments on version 4 to GPO by end April; (ii) GPO to develop Executive Summary and publish final draft in hard copy and on the web; (iii) GPO to thank Dr. Wilson for his efforts.

Action 29: GPO to bring this question to the attention of I-GOOS-V.

Action 30: Dr. Searle to write to GTOS to seek compatibility between TEMS and MEDI.

Action 31: Neville Smith to convene a small meeting (April 24th), just before the National Virtual Ocean Data Hub meeting in Washington, D.C., to develop agreement on the content of the Prospectus.

Action 32: The Washington Group (above) to prepare a paper setting out the vision, rationale, objectives and prospective implementation pathway for the project. This Prospectus should be available as a background paper for JCOMM-I. It should list the possible architects and set out the financial implications.

Action 33: IODE is encouraged to contact US Navy and others interested in XML with the objective of obtaining agreement on a single specification for XML.

Action 34: The GPO was asked to write a letter to the IGOS Partners with the following text (copied to the WMO's CBS via Peter Dexter).

Action 35: Dr. Flemming to supply Director GPO and Chair GSC with the EuroGOOS-EUMETSAT meeting papers.

Action 36: (i) Members to provide feedback on the Ocean Carbon Theme document to the GPO to pass to Maria Hood by end April; (ii) GPO to publish the finalized ocean carbon observing system document as a GOOS report once the Integrated Global Carbon Observation theme report is produced.

Action 37: (i) OOPC and COOP to consider the development of a biological/biogeoehcmial observing system using voluntary observing ships, as suggested in Dr. Wallaces's paper, and to provide a co-ordinated respose to him through the GPO; (ii) the JCOMM Ship Observations Team to consider this matter at its next meeting, using the advice from OOPC and COOP.

Action 38: (i) The GPO and GCOS to take these ideas to GTOS; (ii) if all agree, then GOSSP should be dissolved with letters being written to thank participants for their efforts; then (iii) the GSC Executive and GPO to work together to seek the assistance of a Rapporteur, to be paid for services rendered based on a clear job description to be drafted by the end of May.

Action 39: (i) Julie Hall to ask LOICZ to involve COOP in its planning activities, perhaps by inviting a COOP member to its steering committee meetings; (ii) Worth Nowlin to contact the IGBP chair to ask if COOP can be formally represented in the IGBP Annual Meetings; (iii) COOP co-chairs to invite LOICZ representation at COOP meetings.

Action 40: Director POGO to send POGO details to Silvana Vallerga.

Action 41: (i) Members to provide suggestions to Prof Brundrit for improvements to the Implementation Strategy within 30 days; (ii) CB Panel to consider short term objectives; (iii) GPO to publish the revised Implementation Strategy on-line and in hard copy; (iv) GPO to submit the finalized document to I-GOOS-V, asking for help in finding resources.

Action 42: GPO to work with Capacity Building Panel (including Ilana Wainer) to populate the Capacity Building web site at the University of Sao Paulo with appropriate material.

Action 43: GPO to discuss with UNEP a replacement for A. Dahl on the CB Panel; COOP to recommend a replacement for E. Marone

Action 44: In consultation with GOOS Panels and with the GPO, Capacity Building Panel to develop a Capacity Building programme and budget for 2002, by end September 2001.

Action 45: Tony Knap will thank Maria Hood for her efforts, and communicate the suggestions of the working party to Maria Hood. The working Party (joined by Nic Flemming) will stay in being as an advisory group to Maria Hood.

Action 46: Members were asked to provide Julie Hall with feedback on the Coastal GOOS poster within 30 days, and with high quality graphics if available.

Action 47: GPO to pass on the Committee's thanks to Maria Hood for her work on the Bulletin.

Action 48: Members to provide to Johannes Guddal by end May text for new scenarios, suggested revisions to text for existing scenarios, and names of potential authors for articles relating to scenarios.

Action 49: GPO to document the GSC's recommendations for the GOOS review, and take them to I-GOOS-V for further consideration, prior to approval by the IOC Assembly.

Action 50: GPO to work with Tony Knap and Nic Flemming to exploit funding opportunities in support of the development of GOOS in the Black Sea.

Action 51: GPO and GSC Chair to work with GOOS Sponsors to identify three potential members for the Committee to fill the spaces available, with a preference for biological experts in large-scale ecosystems and/or fisheries.

Action 52: GPO and GSC Chair to work with GOOS Sponsors to identify a potential new chairperson, who should be other than a physical oceanographer and from outside the USA, and who should preferably have experience of GOOS panels.

Action 53: (i) G. Brundrit to see if an invitation to host the meeting in Cape Town in 2003 could be obtained; (ii) GPO to work with IODE to see if a back-to-back meeting with ODINAFRICA is feasible then.

ANNEX I

AGENDA

1. ORGANIZATION OF THE SESSION
1.1 OPENING OF THE SESSION
1.2 WELCOMING REMARKS
1.3 REMARKS BY SPONSORS REPRESENTATIVES
1.4 ADOPTION OF THE AGENDA
1.5 WORKING ARRANGEMENTS

2. REPORT FROM THE CHAIRMAN OF I-GOOS

3. REPORT BY THE DIRECTOR OF THE GPO

4. VIEWS FROM THE CHAIR

5. GOOS PLANNING
5.1 OOPC
5.2 COOP

6. IMPLEMENTATION OVERSIGHT
6.1 REGIONAL IMPLEMENTATION
- **6.1.1 EuroGOOS**
- **6.1.2 NEAR-GOOS**
- **6.1.3 MedGOOS**
- **6.1.4 PacificGOOS**
- **6.1.5 IOCARIBE-GOOS**
- **6.1.6 GOOS-AFRICA**
- **6.1.7 ICES/PICES**
- **6.1.8 Others (e. g. SEACAMP, SEAGOOS, WIOMAP, Indian Ocean)**

6.2 GLOBAL IMPLEMENTATION
- **6.2.1 JCOMM (inc DBCP, SOOP, TAO, GLOSS)**
- **6.2.2 GODAE & Argo**
- **6.2.3 GOOS Initial Observing System (GOOS-IOS)**
- **6.2.4 Data and Information Management**
  - 6.2.4.1 GOSIC
  - 6.2.4.2 GOOS DIM Plan
  - 6.2.4.3 IODE Linkage (MEDI, etc)
  - 6.2.4.4 Ocean Data Management
  - 6.2.4.5 The Ocean Theme for the IGOS Partnership (including IGOS, GOSSP, CEOS)

7. LIAISON/INTEGRATION
7.1 GCOS
7.2 GTOS
7.3 WCRP (CLIVAR)
7.4 IGBP (LOICZ; GLOBEC)
7.5 OTHER

8. OUTREACH/ INFRASTRUCTURE
8.1 CAPACITY BUILDING
8.2 COMMUNICATION AND INFORMATION
8.2.1 Newsletter
8.2.2 Report
8.2.3 Papers
8.2.4 Brochures, CDs, Display, etc.
8.2.5 Web-Site
8.2.6 Products and Services Bulletin

9. PLANS FOR GOOS REVIEW

10. WORK PROGRAMME AND BUDGET

11. OTHER BUSINESS
11.1 GSC MEMBERSHIP AND ROTATION OF MEMBERS
11.2 DATE AND PLACE OF NEXT MEETING

12. CLOSURE

ANNEX II

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ANNEX III

LIST OF DOCUMENTS*

Document Code	Title	Agenda Items	Lang.
WORKING DOCUMENTS			
GSC-IV/1	Provisional Agenda	1.4	E only
GSC-IV/1B	Annotated Provisional Agenda	1.4	E only
GSC-IV/2	Provisional Timetable	1.5	E only
GSC-IV/3	List of Participants	1.5	E only
GSC-IV/4	Provisional list of Documents (this document)	1.5	E only
GSC-IV/5	Report of GSC-III	1.5	E only
GSC-IV/5A	Progress against the actions of GSC-III	1.5	E only
GSC-IV/6	Report of the Session (to be prepared during the meeting)	1.5	E only
GSC-IV/7	An I-GOOS Perspective on the Future of GOOS	2	E only
GSC-IV/8	GPO Director's Report	3	E only
GSC-IV/9	Report of OOPC activities and plans	5.1	E only
GSC-IV/10	Report of COOP activities and plans	5.2	E only
GSC-IV/11	A Regional Policy for GOOS	6.1	E only
GSC-IV/12	Report of GODAE and Argo (also refer to web sites: http://WWW.BoM.GOV.AU/bmrc/mrlr/nrs/oopc/godae/homepage.html; and http://WWW.BoM.GOV.AU/bmrc/mrlr/nrs/oopc/godae/Argo_Design.html)	6.2.2	E only
GSC-IV/13	An update on the GOOS Initial Operational System	6.2.3	E only
GSC-IV/14	A Draft Mechanism for Acceptance of GOOS Commitments	6.2.3	E only
GSC-IV/15	GOOS Data and Information Management Plan, Version 4	6.2.4.1	E only
GSC-IV/16	Ocean Data Management Paper	6.2.3.4	E only
GSC-IV/17	Summary of an Ocean Carbon Observing System	6.2.5	E only
GSC-IV/18	(not presented)	6.2.5	E only
GSC-IV/19	Plans for GOOS Capacity Building	8.1	E only
GSC-IV/19A	Report on Progress against Capacity Building Actions	8.1	E only
GSC-IV/19B	Capacity Building Implementation Plan		
GSC-IV/20	(not presented; see GSC-IV/8, Annex III)	8.2.3	E only
GSC-IV/21	Plans for the 2002 review of GOOS	9	E only
GSC-IV/22	GOOS Project Office Work Programme and Budget	10	E only
GSC-IV/23	Draft GOOS Brochure	8.2.4	E only
GSC-IV/24	New User's Scenarios	--	E only
GSC-IV/25	JCOMM Status Report	--	E only
BACKGROUND DOCUMENTS			
GSC-IV/B1	Report of 1st GOOS Users' Forum]	4	E only
GSC-IV/B2	C-GOOS design plan]	5.2	E only
GSC-IV/B3	LMR design plan	5.2	E only
GSC-IV/B4	HOTO design plan	5.2	E only
GSC-IV/B5	GOOS Regional discussion document	6.1	E only
GSC-IV/B6	EuroGOOS Status Report (http://www.soc.soton.ac.uk/OTHERS/EUROGOOS/)	6.1.1	E only
GSC-IV/B7	Report of 5th meeting of NEAR-GOOS	6.1.2	E only
GSC-IV/B8	Report of MedGOOS meeting, Rabat, November 1999	6.1.3	E only
GSC-IV/B9	Report of PacificGOOS meeting, Apia, August 2000	6.1.4	E only
GSC-IV/B10	Report of the IOCARIBE-GOOS Meeting, Havana	6.1.5	E only
GSC-IV/B11	(not available)	6.1.7	E only

* This list is for reference only. No stocks of these documents are maintained.

Document Code	Title	Agenda Items	Lang.
BACKGROUND DOCUMENTS (cont'd)			
GSC-IV/B12	Report on Status of Perth Office and programmes	6.1.8	E only
GSC-IV/B13	Database of National Contacts	6.1.9	E only
GSC-IV/B14	Report of the 2nd JCOMM Transition Meeting (Paris)	6.2.1	E only
GSC-IV/B15	Report on progress with GLOSS	6.2.1	E only
GSC-IV/B16	IODE events relevant to GOOS in 2000	6.2.3.3	E only
GSC-IV/B17	Report of the 5th IGOS Partners Meeting]	6.2.5	E only
GSC-IV/B18	Report of the 6th IGOS Partners Meeting	6.2.5	E only
GSC-IV/B19	The IGOS Oceans Theme Document	6.2.5	E only
GSC-IV/B20	The Ocean Contribution to the IGOS Carbon Theme	6.2.5	E only
GSC-IV/B21	Report of G3OS Sponsors Meeting, June, 2000	7	E only
GSC-IV/B22	Report of the GCOS Steering Committee, Beijing, 2000	7.1	E only
GSC-IV/B23	Principles for GOOS Capacity Building	8.1	E only
GSC-IV/B24	Case for Remote Sensing Post in Support of GOOS at IOC	8.1	E only
GSC-IV/B25	GOOS News No. 9	8.2.1	E only
GSC-IV/B26	GOOS News No. 10	8.2.1	E only
GSC-IV/B27	GOOS Reports List	8.2.2	E only
GSC-IV/B28	GOOS Status Report for 2000	5.2.2	E only

ANNEX IV

OOPC ACTIVITIES IN THE INTER-SESSIONAL PERIOD

Sea Surface Temperature Observations

Further progress has been made by the SST group in defining *in situ* requirements and in analyzing differences between various SST climate products. A product server was created to facilitate intercomparisons. Differences in bias correction prior to 1910 have identified. Issues concerned bulk and skin temperatures have also been raised (since taken up by the GODAE SST group).

Surface Reference Sites

The Surface Flux Analysis Project (SURFA, joint with WGNE) has outlined a strategy for involving meteorological agencies and ocean observers in routine and regular validation of model surface flux estimates. OOPC convened a small workshop (December 2000) to develop recommendations on the preferred surface reference sites. An initial set of sites was agreed. Methods for exchanging information in real-time have also been discussed. The enthusiasm from both sides augurs well for the project.

Tropical Moored Buoy Arrays

The OOPC was briefed on some problems with mooring arrays, notably the problem of fish aggregation around the buoys and vandalism / destruction of the buoys by fishing operations. OOPC was also briefed on increasing financial and logistical pressures facing TAO and TRITON. In view of the high priority attached to tropical mooring array data, OOPC agreed to lead an International Review (probably 10-12 September, in Seattle) covering (a) the status of the array, (b) the use of the data by both operational and research interests, and (c) guidance on the future of the array. The ToR of the present TAO Implementation Panel have been revised (section 6.2.1).

Time Series Stations

The OOPC considers that a co-ordinated, major effort is now warranted and feasible. A science team has been established under the joint sponsorship of GOOS / GCOS (OOPC) and CLIVAR, with support from POGO. A Workshop is scheduled for late May 2001. Links will be established to the COOP, DEOS and JGOFS.

GODAE and *Argo*

A report on GODAE is given under a separate item. However, OOPC noted that GODAE provided considerable opportunity for developing guidance on aspects of the observing system and that perhaps OOPC should be more pro-active in the area of observing system experiments. Several areas were discussed (e.g., sensitivity of various climate products to elements of the subsurface observing system) and it was agreed that a more detailed set of recommended studies should be presented to OOPC VI.

Ship-of-Opportunity Programme

Due to significant increases in the price of XBTs ($\sim$ 60%), implementation of the revised plan for high-density and frequently repeated lines has been difficult. The SOOP Implementation Panel is working to address XBT shortfalls and to get international commitments to the revised plan. OOPC reaffirmed their support for SOOP and noted that the revised strategy provided for unique, complementary information for the global observing system.

Indian Ocean Workshop

A workshop was held in Perth on Sustained Observations for Countries of the Indian Ocean (convened by Gary Meyers, with significant support from the Perth Office of the IOC/GOOS) to follow up on recommendations from OceanObs. The Workshop embraced both research and applications and attempted to

bring together individuals and agencies with the potential to jointly implement a sustained ocean observing system for the Indian Ocean. The Workshop was well attended and successfully addressed all of its prime objectives. The rationale for such a system was developed in detail and an observational strategy agreed. The OOPC will examine the conclusions of the Workshop at its next meeting and develop a strategy for implementation.

The GLOSS/OOPC Sea Level Science Panel

This group led the preparation of the OceanObs paper but has been otherwise quiet. OOPC has not identified any major areas for action at this moment.

SPECIFIC AREAS FOR ACTION

Ocean Observations for the carbon cycle

OOPC will remain in contact with the many initiatives related to carbon cycle measurements planned for 2000/2001. OOPC will review the latest version of GSC-IV/B20 at its next meeting.

Deep Ocean Observations

OOPC recognizes the need for repeated hydrographic sections, but is uncomfortable taking a leading position. For both time-series stations and hydrography, it is clear the carbon cycle is providing the major rationale for action, as suggested by OceanObs'99.

Ice-Covered Ocean

OOPC V provided an excellent opportunity to review and refine the observational strategy for the ice-covered ocean. Major points were: (i) evidence of Arctic ice volume changes; (ii) the SSM/I is essential for sea ice extent, and overlap for intercalibration is essential; (iii) ice thickness can now be measured from space (CRYOSAT and NASA IceSAT) and should be supported by a range of *in situ* sonar measurements from submarines and upward-looking sensors; (iv) the strategy for the Antarctic must be different for ice thickness.

Boundary Currents

OOPC has suggested that CLIVAR take the lead through its Ocean Observations Panel to define the most promising and useful techniques for boundary layers, based on the discussions from OceanObs.

Wind Waves

The recommendations from OceanObs have been reviewed. The need to predict and monitor conditions for extreme waves is an issue since measurements from space are not reliable. OOPC can make some contribution in the area of *in situ* observations. A pilot-project to put bow-mounted sensors on VOS ships over the high-density XBT tracks has been suggested.

Data Servers And Data Management

The OOPC has discussed the GOOS Data and Information Management Plan and options for addressing some of the many pressing issues (see also section 6.2.4). OOPC VI will receive a paper on the following issues (prepared by R. Keeley), and may initiate a small project in collaboration with JCOMM to develop a solution: (i) a mechanism for maintaining the integrity of data and data sets; (ii) an improved method for auditing value-adding (and value-depreciating) actions; (iii) methods for recording such actions and for recognizing excellence; and (iv) a more robust system for archiving key data.

Liaison and Collaboration

OOPC continues to liaise and collaborate with other panels and groups in areas where its own expertise is limited. These include the GCOS/WCRP Atmospheric Observations Panel for Climate (AOPC), the CLIVAR Ocean Observations Panel, the IOC/SCOR CO2 Panel, the SCOR/WCRP WG on Air-Sea Fluxes (WGASF), JCOMM and its various programme areas, POGO and WGNE. OOPC is pursuing several initiatives with co-sponsorship (see Table).

Co-Sponsored Activities	
Activity / Group	**Co-sponsor**
SST WG	GCOS/WCRP AOPC
Sea Level WG	GLOSS/JCOMM, CLIVAR OOP
SURFA Project	CAS/WCRP WGNE
Carbon cycle issues	JGOFS, CO_2 Panel, IOCCG
Air-sea fluxes	With WCRP WGASF
OceanObs monograph	CLIVAR OOP
SOOP	SOOPIP/JCOMM
TAO review	CLIVAR OOP, NOAA, JCOMM
T/S Pilot Project	CLIVAR OOP, POGO, ...
GODAE	National Patrons
Argo	CLIVAR OOP

To ensure good linkage to the GOOS COOP, the OOPC will be represented at COOP meetings. The IOC Perth Office has been very active over its first year and has provided OOPC with a strong presence in the Indian Ocean region. This work is greatly appreciated.

GCOS and the UNFCCC Observations Reporting Process

Many nations have now begun gathering information on their contributions to the climate observing system. The Chair of OOPC participated in a workshop that provided guidelines for this reporting. GCOS has recommended that a formal assessment process be initiated to analyse the responses. While this assessment would presumably be restricted to climate and climate change observations, the National Reporting is also likely to include much information relevant to other aspects of the global observing system and OOPC will consider how best to take advantage of this information. The Chair participated in the first GCOS Regional Workshop, in Samoa, for the Pacific Island states. Workshop participants came mainly from regional meteorological services; there is little promise of any significant outcome for oceanography.

ANNEX V

MAIN FEATURES OF COASTAL GOOS DESIGN PLAN

Design Considerations

The knowledge gained from oceanographic and ecological research is the foundation for coastal GOOS. Four important generalizations will guide the design of the system: (i) most of the changes occurring in coastal ecosystems are local in scale and are globally ubiquitous; (ii) such changes are often local expressions of larger scale changes in coastal drainage basins, watersheds, basin scale oceanic regimes, or some combination thereof; (iii) physical processes structure the pelagic environment and are of fundamental importance to changes in the biological and chemical characteristics of coastal ecosystems; and (iv) changes in these characteristics are related through a hierarchy of interactions that can be represented by robust models of ecosystems dynamics (e.g., numerical models of physical processes and coupled physical-biological models). Thus, it is likely that there is a relatively small set of core variables that, if measured with sufficient resolution, for extended periods over large scales, will provide the data and information required to detect and predict changes in coastal ecosystems that benefit a broad spectrum of user groups.

Design Framework

The observing system is conceived as a global network for the measurement and analysis of a common set of key variables that is regionally and locally customized (e.g., more variables, greater resolution, additional products) to address those issues that are of greatest concern to participating countries. The global network is the focus of the C-GOOS design strategy. Linking user needs to measurements to form an end-to-end, user-driven system requires a managed, two-way flow of data and information among three essential subsystems: (i) the observing subsystem (detection); (ii) the communications network and data management subsystem (integration); and (iii) the modelling (prediction) and applications subsystem.

(i) The **observing subsystem** consists of the global infrastructure required to measure the common variables and transmit data to the communications network and data management subsystem. Recommended common variables are surface winds, air pressure and temperature, precipitation, sea level, bathymetry, temperature, salinity, surface currents and waves, turbidity, sediment type, dissolved nutrients, phytoplankton pigments, and water clarity. The infrastructure must incorporate the mix of platforms, samplers, and sensors required to measure the common variables with sufficient spatial and temporal resolution to capture important scales of variability in 4 dimensions. This will require the assimilation of data from remote sensing and *in situ* measurements involving six interrelated categories of observing elements: (1) coastal observing networks for the near shore (CONNS); (2) global network of coastal tide gauges (GLOSS); (3) fixed platforms, moorings and drifters; (4) ships of opportunity (SOOP) and voluntary observing ships (VOS); (5) remote sensing from satellites and aircraft; and (6) remote sensing from land-based platforms (e.g., high frequency radar).

(ii) **Data communications and management** link measurements to applications. The objective is to develop a system for both real-time and delayed mode data transmission that allows users to exploit multiple data sets from disparate sources in a timely fashion. A hierarchical system of local, national and supra-national organizations is envisioned to provide data, information, and access to users at each level. Some national and supranational organizations will also become synthesis centres that will provide highly processed products (e.g., assimilating data from remote and *in situ* sources for numerical model predictions requiring substantial computing power). High priority should be placed on the design and implementation of this subsystem.

(iii) **Data assimilation and modelling** are critical components of the observing system. Real-time data from remote and *in situ* sensors will be particularly valuable in that data telemetered from these sources can be assimilated to (1) produce more accurate estimates of the distributions of state variables (for both validation and assimilation), (2) develop, test and validate models, and (3) initialize and update models for improved forecasts of coastal environmental conditions and, ultimately, changes in measures of ecosystem health and living resources. A variety of modelling approaches (statistical, empirical,

theoretical) will be required. The challenge of developing a cost-effective observing system underscores the importance of the interaction between measurements and modelling. Due to the complexity of coastal ecosystems and the cost of observing them, Observation System Simulation Experiments (OSSEs) will become increasing valuable as tool for assessing the efficacy of different sampling schemes and the value of measuring different variables.

Building C-GOOS

C-GOOS will come into being in step-by-step fashion by selectively incorporating, networking, enhancing, and supplementing existing programmes. It is recognized that many of the elements required for a comprehensive, fully integrated, multi-disciplinary observing system are not operational, that much work is needed to develop and determine those products that are most useful, and that capabilities and resources vary enormously among nations. In these regards, **the importance of National and Regional GOOS Programmes cannot be overemphasized**. These programmes are the vehicles for implementation. They provide an important means for facilitating the user input required to implement and enhance the core programme and for institutionalizing mechanisms for sustainable funding.

ANNEX VI

EUROGOOS ACTIVITIES AND SPACE CONFERENCE STATEMENT

EuroGOOS is organized into 5 Regional Task Teams to develop the necessary operational oceanographic systems in each Region, as determined by the environmental conditions and socio-economic requirements.

The Arctic Task Team aims to develop an operational monitoring and forecasting system for the Arctic and adjoining Nordic Seas. Arctic observations and models show a reduction of the ice coverage as well of the ice thickness over several decades. Up to now the activities of the Arctic TT have been mostly collaborative research projects. During 2001 the Arctic Task Team will start to develop a formal Arctic TT Plan for operational oceanographic services.

The Baltic Task Team published the plan for the Baltic Operational Oceanographic System (BOOS) (EuroGOOS Publication No. 14) and launched a BOOS homepage. BOOS is now engaged in long-term co-operation with HELCOM. Products from BOOS which are already available deliver information on: Sea level, Waves (real-time), SST-data, Harmful algal blooms, and Currents. The aim is to update this information daily on the web, or to establish a continuous presentation system.

The North West Shelf Task Team has drafted a plan for a Northwest shelf Operational Oceanographic System (NOOS); a final draft will be available in summer 2001, for discussion with the partner institutes. The European Shelf Ocean Data Assimilation Experiment (ESODAE), which links to GODAE, is going very well. An exchange of storm surge warning predictions between the predicting agencies has been achieved. The ecological North Sea GOOS component suggested by the ICES-IOC Steering Group for GOOS is a valuable contribution to NOOS, and should be fully integrated with the other parts of the Plan.

The Mediterranean Task Team has been responsible for the Mediterranean Forecasting System (MFS). Phase 1, the MFS Pilot Project (MFSPP), lasted from 1998-2000. Oceanographic nowcasts and forecasts can be obtained on-line from the MFSPP (Web page: http://www.cineca.it/~mfspp000/) or EuroGOOS web sites. During 2000 preparation began for a new EuroGOOS Mediterranean Task team Strategy Document, which will support Phase 2 of MFS (Integration and extension of observing system: 2001-2003). This will be followed by Phase 3 (2003-2005) - Coastal primary producers forecast. The pilot project includes: (i) an observing system; (ii) a forecasting system; (iii) coupled physical and biochemical numerical models. The MFSPP includes 7 VOS tracks and the POSEIDON network of 11 Seawatch buoys and publishes forecasts for weather, waves, and circulation. (http://www.poseidon.ncmr.gr). Future developments include: (a) a large-scale system (models and observations); (b) integrated shelf scaled systems nested in the large-scale system; and (c) local coastal systems. Linkages need to be made to GODAE and Argo.

The Atlantic Task Team is involved in a number of observational programmes, including e.g., (i) observations, through GYROSCOPE, an EU-funded project which aims to deploy an array of 80 profiling buoys to provide real time data, and CORIOLIS, a French programme, aiming at improvement of existing observing systems as VOS XBT lines, drifters, PIRATA Array; and (ii) forecasting systems, like MERCATOR (under development in France) and FOAM, operated by the UK Met Office, and run daily since 1997. Plans are being made for the European contribution to GODAE.

EuroGOOS now has an approved Data Policy. The Data Policy will have no effect on the existing scientific conventions and standards for oceanographic data management, and is designed to enable operational agencies to contribute data to GOOS in operational mode for the first time. It is therefore an addition to the data stream available to GOOS, not a restraint. Most data sets will be classified as having no restriction, and those which do have terms or conditions attached will still be freely available for research.

A European Directory of Initial Observing Systems (EDIOS) has been designed as a EuroGOOS project and approved for funding by the EU. EDIOS will be a contribution to the GOOS catalogue of the Initial Observing System. We estimate that there will be between 5,000- and 10,000 entries in the EDIOS Directory. EDIOS aims to: (i) build a computerized directory that includes information on all European ocean-observing

sites/devices in routine and repeated operation; and (ii) use this directory to define the Initial European Ocean Observing System.

The regular electronic messages and up-dates of EuroGOOS progress have been replaced with a more formal electronic Newsletter, transmitted 3-4 times per year. The EuroGOOS website (www.EuroGOOS.org) has been up-dated and expanded during the year. The real-time data displays of different agencies, and further information on their data holdings, can be accessed via the EuroGOOS home page. EuroGOOS projects and operational data products can also be obtained, including forecasts of sea surface characteristics, altimetry, sub-surface conditions, currents, and transport through straits, together with animations of the ten-day forecasts for some regions.

A two-day conference with space agencies, at Darmstadt, Germany, on 'Operational Oceanographic Observations from Space' (October 2000) led to a joint agreement published as a Conference Statement, reprinted below:

The EuroGOOS Conference on Operational Ocean Observations from Space,

Hereby states and recommends, in the context of the European capabilities and heritage, and the existing international space agency plans,

A. For the identification of priority operational missions

1. The continuation of European participation in the provision of precision altimetry through the JASON-2 Mission should have highest priority in the initial implementation of an operational oceanographic satellite system for Europe, capitalizing on JASON-1, ENVISAT, and the approved ERS programme. As the recognized operational agency for European environmental missions it is recommended that EUMETSAT adopt the European part of the mission.

2. The need to continue to fly satellites to ensure long-term, continuous measurements of sea surface temperature, wind speed and direction from the existing research and operational satellites. The existing EUMETSAT meteorological programmes will with other international programmes provide the basic requirement for SST and wind. There is also a need to continue the operations of ERS-2 beyond its currently agreed end date to provide continuity of data until ENVISAT and METOP-1.

3. Support the concept of Earth Watch missions proposed by ESA to promote transition to operational missions, and recommends that continuation of relevant ENVISAT services be considered in the plans of on-going Earth Watch discussions, in close connection with EuroGOOS and EUMETSAT. In this context ocean colour could be considered as a candidate for subsequent EUMETSAT optional programmes.

4. Support for the initiatives taken by ESA in funding the Earth Explorer missions on the cryosphere, salinity and geoid.

5. Further recommends that studies be conducted to identify the mechanism for transitioning some of these ESA Explorer research missions to fully operational systems. In future R&D the development of new concepts such as, for example, wide swath altimetry, the use of reflected GPS signals, constellations of relatively cheap altimeters, and of new sensors for providing wave spectra needs to be given high priority.

6. In addition to the usual cal/val activities organized by space agencies special efforts be made by Europe to intercalibrate appropriate missions to enable long-term consistent datasets to be derived for operational purposes and climate studies.

B. On International Collaboration, Representation and Communication

7. EuroGOOS, EUMETSAT, ESA and national agencies should work together to ensure that long-term plans for operational ocean observing missions developed in consultation with international partners, reflect the needs of European users.

8. In the short term EuroGOOS, EUMETSAT, ESA and national agencies should collaborate to establish a regular procedure for communication and discussion to maintain progress in European operational ocean observing systems from space.

9. There should be consultation with the relevant committees of WMO and the IOC of UNESCO, including the Joint Committee for Oceanography and Marine Meteorology (JCOMM). Additional consultation should take place with the relevant committees of GCOS and GOOS.

C. On Funding

10. Member Agencies of EuroGOOS and Member States of EUMETSAT should seek to identify sources and procedures for funding ocean observing missions which are dedicated to the measurement of variables additional to those established products for meteorological purposes, and to support the collaboration referred to in (7) and (8).

ANNEX VII

INTERSESSIONAL HIGHLIGHTS OF JCOMM

Observing networks

Ships of the Voluntary Observing Ships (VOS) network are a cornerstone of an integrated ocean observing network to support operational meteorology, maritime safety services and, increasingly, global climate studies. Although the total numbers of ships in the VOS scheme continued to decline slightly, data return in terms of both quality and quantity has improved, due to enhanced automation of observations, satellite communications and the operation of the UK Met Office of real-time data quality monitoring. A new project, called VOSClim, has now been implemented to enhance data quality and metadata availability for a subset of the VOS, to provide a reference set of high quality VOS data and metadata in particular to support global climate studies.

Unmanned drifting and moored ocean data buoys form a very cost-effective platform for obtaining essential meteorological and oceanographic data from remote ocean areas. The WMO/IOC Data Buoy Co-operation Panel (DBCP) is the primary international co-ordination and technical support mechanism for buoy programmes globally, and is now the primary component of the Data Buoy Observations Team under JCOMM. Buoy deployments are managed through a number of regional and programme Action Groups, and technical and logistic support is provided through a full time technical co-ordinator, who is funded through voluntary contributions by panel Member Countries. During the past four years, the quality and quantity of buoy data on the GTS has been substantially enhanced; tropical moored buoy arrays strengthened and extended in the Pacific, Atlantic and Indian Oceans; and a technical workshop has been held with the annual DBCP sessions, which regularly attracts more than 50 scientists, engineers and manufacturers interested in buoy technology and applications. The Argos system continues to be the primary mechanism for the collection of buoy data, although tests have been undertaken of alternative systems such as Orbcomm. Overall, the DBCP has proven to be a very successful format for international co-ordination and co-operation in environmental observations, which is now being emulated for other types of observations and platforms.

The operational Ship-of-Opportunity Programme (SOOP), co-ordinated through a SOOP Implementation Panel (SOOPIP) maintains the operational SOOP network established under TOGA to provide upper ocean thermal data essential for coupled ocean/atmosphere modelling and climate prediction. Despite some degradation of the network, this objective has been largely achieved during the intersessional period. With the advent of the Argo Project of profiling floats, the SOOPIP is now redesigning the XBT network from the previous “broadcast” mode to concentrate on high density and frequently repeated lines.

The Automated Shipboard Aerological Programme (ASAP) Panel, formerly the ASAP Co-ordinating Committee, now also reports to JCOMM, in the context of a fully co-ordinated marine observing system. The panel addresses issues relating to technical aspects of ASAP, network maintenance, communications, data quality and data applications. ASAP data support both operational meteorology and global climate studies, and the panel has successfully maintained a network of around 22 sounding units for more than a decade, with data being concentrated mainly over the North Atlantic and North Pacific Oceans. Recently, the network has begun expanding, in particular with a EUMETNET ASAP Project, and a new Worldwide Recurring ASAP Project, WRAP. The latter, implemented in early 2001, is an important co-operative effort, involving several countries, to provide in particular much needed sounding data over southern hemisphere oceans. The panel also successfully co-ordinated the transition from OMEGA-based sondes to GPS sondes for ASAP.

The Global Sea Level Observing System (GLOSS) constitutes a co-ordinated global network of tide gauge stations contributing sea level measurements in support of a variety of operational applications and global climate studies. GLOSS is co-ordinated by a GLOSS Group of Experts, which now also formally reports to JCOMM. GLOSS data and products are made available to users through centres such as the Permanent Service for Mean Sea Level (UK) and the Hawaii Sea Level Centre (USA). Substantial progress has been made in the development of the GLOSS core network; the use of tide gauges for on-going altimeter calibration; the provision of data and information to international scientific study groups such as the Intergovernmental Panel on

Climate Change (IPCC); and enhancement of materials for training, outreach and research. Enhanced investment is required worldwide to respond to increasing requirements for real time sea level data, as well as the use of tide gauge data transmission platforms for other oceanographic variables.

All sea level centres (PSMSL, BODC, UHSLC, NTF) now have good web pages which serve to spread information to the public as well as the science community. The PSMSL summary of the status of the GLOSS Core Network (GCN) serves as a reflection of the status of the programme overall:
http://www.pol.ac.uk/psmsl/programmes/gloss.info.html.

It is about two-thirds operational. An updated version of the third volume of the IOC Manuals and Guides No. 14 on sea level measurement and interpretation has been completed and can be down-loaded from the PSMSL training web page: http://www.pol.ac.uk/psmsl/training/training.html.

A GLOSS training course took place during 15-19 April at Jeddah, Saudi Arabia funded by the Programme for the Environment of the Red Sea and Gulf of Aden (PERSGA) and IOC. Several sets of tidal analysis software continue to be widely distributed and play a major role in improving data quality and timely delivery. Two page brochures advertising GLOSS are now available in English, Portuguese, Spanish and (soon) French and can be downloaded from the PSMSL training web page. GLOSS was involved in providing reviews on sea level to Chapter 11 of the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC). GLOSS is being developed in the Mediterranean through MedGLOSS, which held a Co-ordination Meeting at Haifa, Israel to plan installation and co-ordination of a network of gauges for the Mediterranean and Black Seas. Four second-hand Ott R20 gauges (chart recorders) were donated to GLOSS by Singapore and eventually two were provided to Romanian authorities as a contribution to MedGLOSS development. The two others remain at POL in a part-serviceable state and could be made available if required.

The TAO Implementation Panel met in Perth, Australia, in November 2000. It reviewed the status of the TAO/TRITON array of buoys (formerly the TAO array) in the equatorial Pacific; addressed technical and logistic issues related to maintenance of the array; and provided a *forum* for discussion of enhancements and expansions of the array for climate studies. Data are available at http://www.pmel.noaa.gov/tao/, and at a mirror site in Japan (http://www.jamstec.go.jp/jamstec/TRITON). Vandalism continues to plague the TAO/TRITON array in the Pacific and the PIRATA array in the Atlantic, especially in regions of high tuna catch. Efforts to combat vandalism continue.

Ocean remote sensing, both satellite and ground-based, will be an essential component of a future operational ocean observing system. In addition to SST, satellites can now be used to provide a reliable global coverage for sea surface winds, sea state, ocean topography, sea ice and ocean colour, and development work is underway for other important variables such as surface salinity. The main preoccupation now for oceanographers, and for JCOMM, will be to work with other interested programmes, organizations and the satellite operators to ensure long-term continuity in the relevant satellite missions. In this context, the interim Management Committee has agreed that JCOMM must work closely with the WMO's Commission on Basic Systems (CBS), both in the development of the requirements database and in negotiations with satellite operators. Much work has been done on developing ocean satellite data requirements for climate and their input into the WMO database. JCOMM has also participated actively in the CBS Rolling Requirements Review process and in work on the redesign of the WMO Global Observing System (GOS). It has also provided input to CGMS and participated in the High Level Consultative Meeting on Satellites, specifically with regard to ocean satellite data requirements. IOC has been invited to become a member of CGMS, JCOMM is to develop a Statement of Guidance with regard to ocean data requirements, and JCOMM is also identified as having a major role in implementing the Ocean Theme Report of the IGOS Partners.

Major developments have taken place in ground-based radar ocean sensing. In particular, the EuroROSE project, financed by the European Commission, has clearly demonstrated the value of both HF and X-band radars in providing real time ocean data for assimilation into various ocean models to generate operational products and services in support of Vessel Traffic Services in operationally sensitive waters. Similar work is taking place in other parts of the world.

Data management

The Marine Climatological Summaries Scheme (MCSS) has been in operation since the mid-1960s. It represents a unique and highly successful, globally co-ordinated system for the delayed mode collection of observations from the VOS and some fixed platforms, their quality control and archival and, as appropriate, the preparation of products based on the data. A realization of expanding requirements for these data, in support of various marine services and particularly global climate studies, led to a substantial upgrading of the scheme in the 1990s, including streamlined data collection and processing and enhanced quality control procedures. Further system enhancements have been implemented during the past intersessional period. Both the Global Collecting Centres and Responsible Members under the MCSS are now taking leading roles in the new VOSClim Project A major international workshop on the applications of marine climatology (CLIMAR99) was hosted by Canada in September 1999. A selection of papers from this workshop will form a new "dynamic" section to the Guide to the Applications of Marine Climatology.

The Global Temperature and Salinity Profile Programme (GTSPP) is a joint programme of the IOC's IODE programme and the former IGOSS, and is now co-sponsored by JCOMM. The GTSPP has developed and implemented an end-to-end data management system for temperature and salinity profile data, which serves as a model for ocean data management systems. It provides a timely and complete data and information base of ocean temperature and salinity data of known and documented quality in support of users, and has been adopted by WOCE and SOOPIP. Data management within the Argo project will be heavily influenced by the GTSPP concept and operations. The GTSPP concept has led to a proposal for a similar end-to-end system for surface salinity data, in which JCOMM should be directly involved.

Data from ocean data buoys are collected, quality controlled and archived by a number of individual programmes and centres, including in particular the Global Drifter Programme. In addition, all buoy data on the GTS are collected and archived by the Marine Environmental Data Service of Canada, acting as a designated IODE centre for this purpose. The DBCP operates a set of quality control guidelines for buoy data on the GTS, which has resulted in measurable improvements in data quality over the past four years. The work of the RSMC Bracknell (UK Met. Office), as the CBS lead centre for monitoring the quality of real time surface marine data, is also gratefully acknowledged. This work, and follow-up by Port Meteorological Officers (PMOs), has again resulted in measurable enhancements in data quality.

The Global Digital Sea Ice Data Bank (GDSIDB) project provides a mechanism for the systematic digitization of ice charts and the archival of these data in support of global climate studies. The two international archival centres for the GDSIDB, in Boulder, USA and St Petersburg, Russia, now hold comprehensive digital sea ice data sets from the 1960s to the present. These data sets are available both on CD-ROM and via the Internet. Work continues to extend the data sets both backward and forward in time.

Services

The development and implementation of a new, globally co-ordinated, marine broadcast system for meteorological forecasts and warnings for shipping under the Global Maritime Distress and Safety System (GMDSS) of IMO represents a major achievement by the former CMM and Members concerned. JCOMM continues to monitor the operation of the system as well as the reactions of users, and will enhance both the quality and timeliness of GMDSS broadcasts, as a contribution to maritime safety.

The analysis and forecasting of ocean waves and storm surges also remains a high priority under JCOMM. A revised edition of the Guide to Wave Analysis and Forecasting has recently been published, along with a supplement on extreme waves. A wave model intercomparison project has been implemented; an information and support service has been initiated, to assist Members in their wave forecasting work. Close interactions have been developed with the Tropical Cyclone Programme, on storm surge modelling and forecasting. A Handbook on Offshore Weather Forecasting was published on behalf of the Offshore Weather Panel.

The Marine Pollution Emergency Response Support System, MPERSS, has continued to develop and can now be classified as fully operational in several parts of the world, including in particular the Mediterranean, with both simulations and real emergencies having been dealt with.

Sea ice continues to provide a major hazard to shipping in high latitudes. The operational sea ice services provided by WMO Members are essential to maritime safety. Work continues under JCOMM to enhance these services, including through monitoring and documenting their availability, and the preparation and publication of guidance on sea ice forecasting and on navigation in ice covered waters.

The electronic JCOMM Products Bulletin, developed and maintained by Professor Yves Tourre, former chairman of IGOSS, continues to provide an interactive, web-based, set of operational ocean analysis and forecast products. The products are in standardized formats and provide a valuable source of data and information for operational and research users alike. All products in the bulletin are based on data available on the GTS, and are updated at least monthly.

Capacity building

Capacity building under JCOMM is an essential, high priority activity, designed to assist Members and Member States both to contribute to operational ocean observations and services and also to gain maximum benefit from the data and products available through the system. At present, capacity building work is concentrated in two areas: specialized training and regional co-operative development projects.

The international network of PMOs links national meteorological services (NMSs) and shipping, which is both a source of marine meteorological data and also a user of marine services. To maintain and enhance the PMO network, regional workshops took place in Valparaiso, Melbourne and Cape Town. JCOMM has also sponsored training workshops on wave analysis and forecasting, storm surge forecasting, sea ice remote sensing and the MPERSS.

Recognizing the importance of capacity building and of the need to enhance co-ordination and co-operation in capacity building activities, the Management Committee produced a JCOMM Capacity Building Strategy.

ANNEX VIII

GODAE AND Argo

Figure 1: A schema showing the functional components of GODAE. The shaded components are within the GODAE Common and their development is primarily the responsibility of GODAE

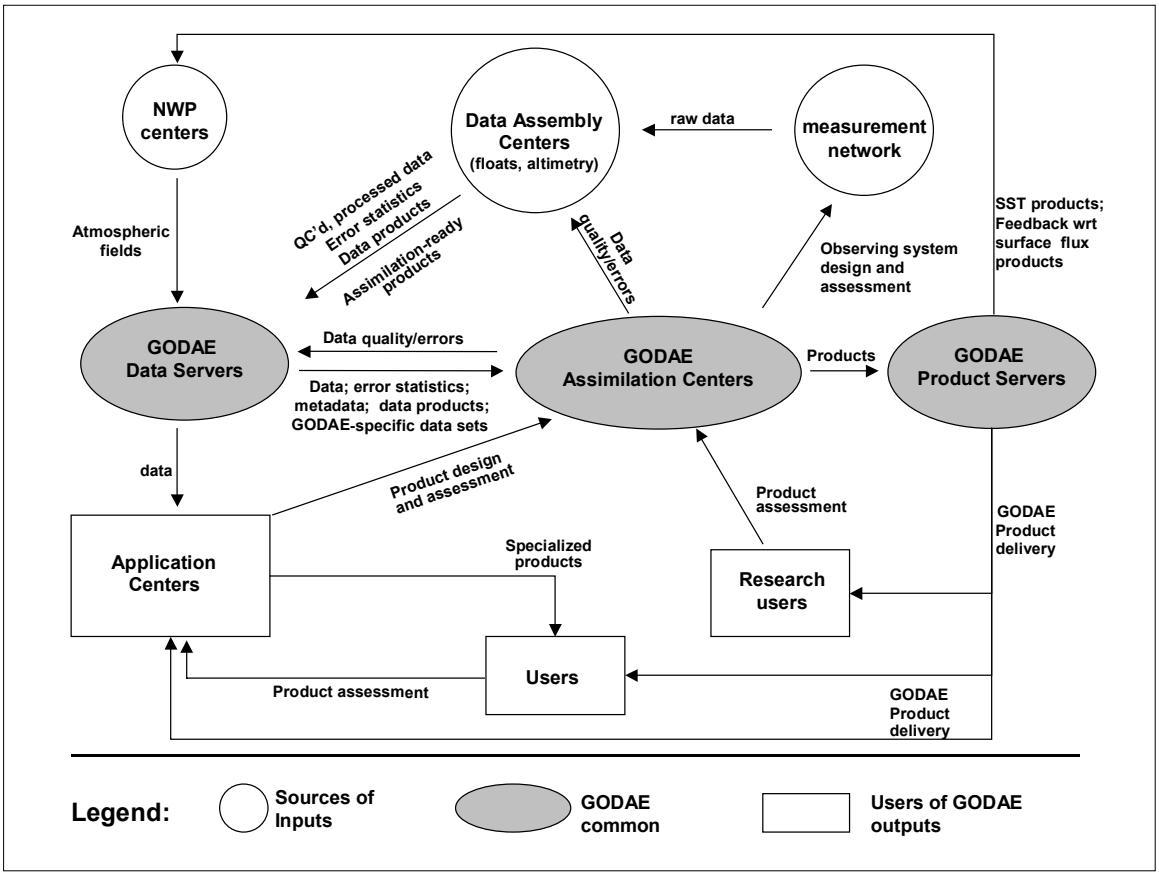

Table 1: A summary of the present status of international commitments for Argo Floats (15 Feb 2001)

Nation	Already Funded	Proposed Over Next 3 Years
Australia	20	90
Canada	56	90+
EuropeanCommission	80	
France	140	210
Germany		100+
India		150
Japan	20	300
NewZealand	2	10
South Korea	20	90
Spain		24
U.K.	17	150
U.S.A.	428	980
Totals	**783**	**2194**

Table 2: List of GODAE Product/Activity Sites

GODAE Home Page	http://www.bom.gov.au/bmrc/mrlr/nrs/oopc/godae/homepage.html or http://www.bom.gov.au/GODAE/
MERCATOR Ocean Bulletin	http://www.mercator.com.fr/
Argo Home	http://www.argo.ucsd.edu/
HiResSST Project	http://www.bom.gov.au/bmrc/mrlr/nrs/oopc/godae/HiResSST/
HICOM	http://hycom.rsmas.miami.edu/
DIADEM	http://www.theyr.is/diadem/rtweb.html
TOPAZ	http://www.halo.is/
NAVOCEANO	http://www.navo.navy.mil/
FNMOC	http://www.fnmoc.navy.mil/
NRL Modelling	http://www7320.nrlssc.navy.mil/global_nlom/
US GODAE	http://www.usgodae.fnmoc.navy.mil/
Bathymetry - BODC	
Met Office	http://www.met-office.gov.uk/sec5/FOAM/FOAMHOME.HTML
ESODAE	http://www.met-office.gov.uk/sec5/ESODAE/ESOHOME.HTML
Met Office FOAM	http://www.metoffice.gov.uk/research/ocean/operational/dpds/dpds_foam.html

Details of Specific GODAE Activities

The Measurement Network. The *Argo* and SST Pilot Projects (above) are the important elements in the IP. Both address identified deficiencies. The IGST foreshadowed some actions to ensure adequate and appropriate real-time are available (e.g., from GLOSS). The delay in METOP is unfortunate but sufficient data should be available from other direct and indirect sources. The link to coastal networks will be explored through COOP.

National Contributions. Descriptions of national activities have been received from Australia, Japan, France, Norway, the U.K. and the U.S.A. While in most cases there is no specific budget line for GODAE, commitments have been built on existing activities and, in some cases, enhanced operational centre activity. A list of existing related sites is given in Table 2 of Annex VIII. Several prototype systems are now available though many are in the early stages of development. High-quality, interesting and potentially valuable products are now emerging. Further investment is required, but based on the existing and potential contributions it would seem GODAE is not greatly off schedule.

NWP Products and fluxes. To some extent, GODAE must work with what is available. However, because of the relationship between several of the national activities and existing operational entities, it is hoped some actions can be taken to enhance products (e.g., through the SURFA project). A letter has been drafted for the attention of ECMWF requesting access to operational surface products, in real-time, for GODAE Partners.

Data Assembly Centres. The SST and *Argo* projects provide good examples of the demands being placed for good data set assembly. Specific actions are taking place for altimetry, SST and surface winds (also *Argo*). It remains unclear whether adequate radiation products will be available. New bathymetric data should be available mid-year from GEBCO. GODAE is recommending the establishment of an ocean current data assembly centre, operating in real-time. No such entity exists now.

Data and Product Servers. The establishment of the US GODAE Monterey Server is the most significant recent development. This site will provide access to all GODAE data (either directly or via distributed access) as well as providing a range of products. A similar facility is being established in France. It is likely a project will be established around this theme, as there are many interesting new developments that GODAE wishes to promulgate through its community. There are significant issues concerning co-ordination of the sites and ordered arrangements and access to information. The likely establishment of a further site at the IPRC (Honolulu) may provide an orderly procedure for migrating data from the Monterey site to climate servers. NAVO has also announced that many of its formerly non-public models will now be made public through a

server established at Stennis. The openness of the US Navy data and product systems has set a high "standard" for other GODAE partners.

Product Characterization. This will be an important aspect of GODAE activities. In effect, it is the quality assurance process for GODAE products. Two projects were approved by the IGST at GODAE-V.

(i) A GODAE Atlantic Prototype Project. The objective is to use the Atlantic as a prototype to test and evaluate functionality needed for and appropriate to the global experiment (data access, assimilation and forecasting, products).

(ii) A Pacific Model and Product Intercomparison. This project will compare products in the North Pacific, principally for the mesoscale fields, and in the tropical Pacific for climate prediction. A Workshop is to be held at the IPRC in July to develop details. This workshop will also discuss applications, data assimilation and the potential implementation of the IPRC data server.

Applications. Several exciting applications are now emerging or proposed: e.g., the Norway-led DIADEM and TOPAZ projects are providing experimental analyses and forecasts to the oil and gas industry, at resolutions of around 2 km. Most national plans include significant applications and user involvement.

GODAE Conference. GODAE-V accepted a French proposal to hold a 3-day Conference, probably in Biarritz, March 2002. The Conference would present scientific and technical advances relevant to GODAE and provide a *forum* for displaying prototype products and applications. The Conference will be held in conjunction with the first Jason SWT meeting.

ANNEX IX

RULES FOR ACCESS AND USE OF CCAMLR DATA

The following Rules for Access and Use of CCAMLR Data were adopted by the Eleventh Meeting of the Commission (CCAMLR-XI, paragraph 4.35[*]):

(a) All data submitted to the CCAMLR Data Centre should be freely available to Members for analysis and preparation of papers for use within the Commission, the Scientific Committee and their subsidiary bodies.

(b) The originators/owners of the data should retain control over any use of their unpublished data outside of CCAMLR.

(c) Requests to the Secretariat by individual scientists of a Member for access to data in the CCAMLR Data Centre will only be considered if the request has been approved in writing by the Representative to the Scientific Committee (or his nominated deputy) of that Member. The Representative is responsible for informing the individual scientist requesting the data, of the rules governing access to CCAMLR data and for obtaining the requester's agreement to comply with these rules.

(d) When Members request access to data for the purpose of undertaking analyses or preparing papers to be considered by future meetings of CCAMLR bodies, they should indicate the reason for the request and the nature of envisaged data analysis. The Secretariat should supply the data and inform the originators/owners of the data of this action, together with the details of the original request. When data are requested for purposes other than consideration by future meetings of CCAMLR bodies, the Secretariat will, in response to a detailed request, supply the data only after permission has been given by the originators/owners of the data.

(e) Data contained in papers prepared for meetings of the Commission, the Scientific Committee, and their subsidiary bodies should not be cited or used in the preparation of papers to be published outside of CCAMLR without the permission of the originators/owners of the data. Furthermore, because inclusion of papers in the *Selected Scientific Papers* series or any other of the Commission's or Scientific Committee's publications, constitutes formal publication, written permission to publish papers prepared for meetings of the Commission, Scientific Committee and Working Groups should be obtained from the originators/owners of the data and authors of papers.

(f) The following statements should be placed on the cover page of all unpublished working papers and background documents tabled:

This paper is presented for consideration by CCAMLR and may contain unpublished data, analyses, and/or conclusions subject to change. Data contained in this paper should not be cited or used for purposes other than the work of the CCAMLR Commission, Scientific Committee, or their subsidiary bodies without the permission of the originators/owners of the data.

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[*] These rules replace those adopted at the Eighth Meeting of the Commission (CCAMLR-VIII, paragraph 64)

ANNEX X

LIST OF ACRONYMS

ACSYS	Arctic Climate System Study
AOPC	Atmospheric Observing Panel for Climate
Argo	Global Array of Profiling Floats (not an acronym)
ASAP	Automated Shipboard Aerological Programme
ASEAN	Association of South-East Asian Nations
AVHRR	Advanced Very High Resolution Radiometer
BATS	Bermuda Atlantic Time Series Station
BENEFIT	Benguela Environment for Fisheries Information and Training Project
BODC	British Oceanographic Data Centre
BOOS	Baltic Operational Oceanographic System
CARICOM	Caribbean Community
CBS	WMO's Commission on Basic Systems
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCCO	Committee on Climate Change and the Ocean
CEOS	Committee on Earth Observation Satellites
CLIVAR	Climate Variability and Predictability
CMM	Commission for Marine Meteorology
COP	Conference of the Parties (of the UNFCCC)
CPR	Continuous Plankton Recorder
CSIRO	Commonwealth Scientific and Industrial Research Organization
DBCP	Data Buoy Co-operation Panel
EC	European Commission
EDIOS	European Directory of the Initial Observing System
EEZ	Exclusive Economic Zone
ENSO	El Niño-Southern Oscillation
ENVISAT	Environmental Satellite
EPB	Electronic Products Bulletin
ESODAE	European Shelf Seas Data Assimilation and Forecast Experiment
EU	European Union
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EuroGOOS	European GOOS
FAO	Food and Agriculture Organization of the United Nations
FCCC	Framework Convention on Climate Change
FOAM	Forecast Ocean Atmosphere Model
GCOS	Global Climate Observing System
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
GEOHAB	Global Ecology of Harmful Algal Blooms
GIPCO	GOOS Integrated Panel for the Coastal Ocean
GIPME	Global Investigation of Pollution in the Marine Environment
GLOBEC	Global Ocean Ecosystems Dynamics
GLOSS	Global Sea-Level Observing System
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GOOS-IOS	GOOS Initial Observing System
GOSIC	G3OS Information Centre
GOSSP	Global Observing Systems Space Panel
GPO	GOOS Project Office
GSC	GOOS Steering Committee
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunications System (of WMO)

GTSPP	Global Temperature-Salinity Profile Programme
HAB	Harmful Algal Blooms
HOTO	Health of the Oceans
HOTS	Hawaii Ocean Time Series Station
IAEA	International Atomic Energy Agency
IBTS	ICES International Bottom Trawl Survey
ICES	International Council for the Exploration of the Sea
ICSU	International Council of Science
IEPB	IGOSS Electronic Products Bulletin
IFREMER	Institut français de recherche pour l'exploitation de la mer
IGBP	International Geosphere-Biosphere Programme
IGOSS	Integrated Global Ocean Services System
IGOS	Integrated Global Observing Strategy
I-GOOS	Intergovernmental Committee for GOOS
IIAG	Interim Implementation Advisory Group
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOC-EC	Intergovernmental Oceanographic Commission Executive Council
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IOCCG	International Ocean Colour Co-ordination Group
IOCEA	IOC Regional Committee for the Central Eastern Atlantic
IOCINCWIO	IOC Sub-Commission for the Caribbean and Adjacent Regions
IODE	International Oceanographic Data and Information Exchange
IOS	Initial Observing System
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
IUG	International Union of Geographers
JAFOOS	Joint Australian Facility for Ocean Observing Systems
JAMSTEC	Japan Marine Science and Technology Centre
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
J-DIMP	Joint Data and Information Management Panel
JGOFS	Joint Global Ocean Flux Study
LME	Large Marine Ecosystem
LMR	Living Marine Resources
LOC	Local Organizing Committee
LOICZ	Land-Ocean Interactions in the Coastal Zone
LUCC	Land Use and Cover Change Programme
MedGOOS	Mediterranean GOOS
MEDI	Marine Environmental Data Information Referral System
MFSP	Mediterranean Forecasting System Pilot Project
MONBUSHO	Japanese Ministry of Education and Science
NAML	North American Marine Laboratories Network
NAO	North Atlantic Oscillation
NASA	National Aeronautics and Space Administration (USA)
NEARGOOS	N. E. Asian Region GOOS
NESDIS	National Environmental Satellite Data and Information Service (NOAA)
NGCCs	National GOOS Co-ordinating Committees
NGOs	Non-Governmental Organizations
NIO	National Institute of Oceanography (India)
NIWA	National Institute of Water and Atmosphere Research Ltd
NOAA	National Oceanic and Atmospheric Administration (USA)
NODC	National Oceanographic Data Centre
NPOESS	National Polar Orbiting Environmental Satellite (USA)
NSF	National Science Foundation (USA)
NTF	National Tidal Facility (Australia)
ODINAFRICA	Ocean Data and Information for Africa

OECD	Organization for Economic Co-operation and Development
OITS	Ocean Information Technology System
OOPC	Ocean Observations Panel for Climate
OOS	Ocean Observing System
OOSDP	Ocean Observing System Development Panel
OSPARCOM	Oslo-Paris Commission for the Protection of the Marine Environment of the North-East Atlantic
PACSICOM	Pan African Conference on Sustainable Integrated Coastal Management
PICES	North Pacific Marine Science Organization
PIRATA	Pilot Research Array in the Tropical Atlantic
PMOs	Port Meteorological Officers
POGO	Partnership for Observation of the Global Ocean
RAMP	Rapid Assessment of Marine Pollution
SAHFOS	Sir Alister Hardy Foundation for Ocean Sciences (UK)
SAR	Synthetic Aperture Radar
SBSTA	Subsidiary Body for Scientific and Technological Advice
SEA-GOOS	Southeast Asian GOOS
SEAWIFS	Sea-Viewing, Wide-Field-of-View Sensor
SEACAMP	S. E. Asia Centre for Atmospheric and Marine Prediction
SIO	Scripps Institute of Oceanography (University of California, USA)
SOA	State Oceanic Administration (China)
SOC	Southampton Oceanography Centre
SOCIO	Sustained Observations for Climate of the Indian Ocean
SOOP	Ship-of-Opportunity Programme
SST	Sea Surface Temperature
SURFA	Surface Flux Analysis
TAO-IP	Tropical Atmosphere Ocean Array Implementation Panel
TAR	Third Assessment Report
TEMA	Training, Education and Mutual Assistance programme (IOC)
TOGA	Tropical Ocean Global Atmosphere Research Programme
TOPEX	Ocean Topography Experiment
TORs	Terms of Reference
UHSLC	University of Hawaii Sea Level Centre
UNCED	United Nations Conference on Environment and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UNFCC	UN Framework Convention on Climate Change
UNISPACE	United National Conference on Outer Space
VOS	Voluntary Observing Ship
WCRP	World Climate Research Programme
WESTPAC	IOC Sub-Commission for the Western Pacific
WGNE	Working Group on Numerical Experimentation
WHOI	Woods Hole Oceanographic Institution (USA)
WIOMAP	Western Indian Ocean Marine Applications Project
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
WRAP	Worldwide Recurring ASAP Project
XBT	Expendable Bathythermograph