



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

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# **GLOBAL OCEAN OBSERVING SYSTEM (GOOS) CAPACITY BUILDING (CB) PANEL**

**(Including Action Plan, Phase I)**

## **First Session**

Geneva, Switzerland

24 - 26 June 2002

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(GOOS) CAPACITY BUILDING (CB)  
PANEL**

(Including Action Plan, Phase I)

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IOC/GOOS–CB I/3  
Paris, 31 January 2003  
English only

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## 1. OPENING OF THE SESSION

### 1.1 OPENING OF THE MEETING

The Chairman of the GOOS CB Panel, Prof. Geoff Brundrit, opened the meeting in Salle 7J (Jura) of the World Meteorological Organisation (WMO) Secretariat in Geneva, Switzerland, at 0900 on Monday 24 June 2002. He welcomed the participants (listed in Annex I).

At 0930 the Panel joined the first session of the Capacity Building Programme Area Coordination Group (CBCG) of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), for a joint opening ceremony. Ms Andrioli, Chair of the CBCG, welcomed the GOOS and JCOMM participants, recalled the importance of the two meetings, both separately and in the joint sessions, and thanked WMO for hosting both meetings. She then called on the Assistant Secretary-General of WMO, Professor Hong Yan, to address the meeting.

**Recognising that parts of the GOOS CB meeting were held jointly with JCOMM, the texts in this report that relate to those joint sessions have been extracted from the report of the CBCG meeting, and are given in italics below.**

*On behalf of the Secretary-General of WMO, Professor G.O.P. Obasi, and the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC), Dr P. Bernal, Prof. Yan welcomed participants to both meetings, to WMO and to Geneva. He noted that WMO and IOC were now entering into a new era of inter-organizational scientific collaboration, which was at the same time exciting and complicated. It was exciting because, for the first time, there was the opportunity to address important issues, such as the provision of an integrated and stable ocean database for global climate studies and the implementation of operational oceanography, at the intergovernmental level, in a multi-disciplinary and multi-institutional way. At the same time, it was complicated primarily because of this multi-disciplinary approach.*

*Professor Yan stressed that both JCOMM and GOOS would only succeed in this enterprise if all maritime countries were able both to contribute to and benefit from work undertaken to support the two bodies. This had been clearly recognized at JCOMM-I and in many GOOS meetings, and the capacity building strategies for both JCOMM and GOOS recognized the high priority to be given to this integral part of the programmes. At the same time, it was important that the capacity building work of JCOMM and GOOS should be complementary, reflecting the complementarities of the overall programmes and making the most effective use of the resources available. The present concurrent meetings, with some joint sessions, had been planned to this end.*

*Professor Yan then reviewed briefly a number of specific priorities to be addressed during the two meetings. These included, for JCOMM, the need to develop a strategic overview of capacity building requirements to support the Commission, and then to provide advice to other programme areas, and the Secretariat, on specific actions to address these. For GOOS, priorities were to build a global network of regional GOOS organizations, and also to develop capacity building for non-physical, non-climate aspects of ocean observations. Professor Yan concluded by assuring the meeting of the full and ongoing support of the JCOMM and GOOS Secretariats, both during the present meetings and throughout the inter-sessional period.*

### 1.2 ADOPTION OF THE AGENDA

The Panel adopted the Agenda given in Annex II.

### 1.3 WORKING ARRANGEMENTS

The Panel agreed its working hours based on the Provisional Timetable. The Secretariat introduced the documentation noting that the proceedings would be in English.

## 2. BACKGROUND REPORTS

The Chairman presented a report on progress with GOOS Capacity Building, and drew attention to the views of the recent 5th session of the GOOS Steering Committee (GSC) on the priorities suggested for the CB Panel, which included a focus on remote sensing and on data and information management. He reminded members that, in addition to these two items, the Implementation Plan called for an emphasis on modelling and forecasting. Developing countries need assistance in using *in situ* and remotely sensed data, in conjunction with models, to produce products useful to managers and policy makers in support of sustainable development.

The Chairman noted that the GOOS Capacity Building Principles (GOOS Report 69) and the Implementation Strategy for Capacity Building (GOOS Report 106) would form the basis for an initial discussion on the way forward. He emphasised the importance of partnerships in designing and implementing the GOOS CB programme, recognising that a well-integrated and comprehensive programme was beyond the scope of just the IOC or GOOS. The objective was to help countries build the capacity to “DO” GOOS at various levels, depending on their strengths and weaknesses, and to develop and provide services to users.

Colin Summerhayes, Director of the GOOS Project Office (GPO), reported on the existing GOOS CB Programme, which consists of two main elements (aside from other elements mentioned later in this report which involve the activities of partner organisations). First were a small number of training courses, including (i) those on Sea Level Measurements (by the Global Sea Level Observing System (GLOSS), (ii) one (by N.E. Asian Region GOOS, NEAR-GOOS) on data and information management, and (iii) one (by the Perth Office) on remote sensing. It had been suggested by the Global Ocean Data Assimilation Experiment, GODAE, Bureau that the GOOS CB Panel should sponsor a Summer School for training in techniques relevant to GODAE. The second and larger component of the GOOS CB programme was aid for the development of regional GOOS bodies. Regional CB efforts include UNESCO’s cross-cutting project in support of GOOS-AFRICA. In addition UNESCO supports a number of UNESCO Chairs in universities in developing countries. Some of the Chairs (e.g. Maputo in Mozambique, and Concepción in Chile) are in marine science.

**Action 1. GPO to ensure that all regional GOOS bodies know about the full range of GOOS activities, including things like the IGOS Partnership by end 2002.**

Many of the organisations involved in making global observations have CB programmes. The GOOS sponsors, and the Integrated Global Observing Strategy (IGOS) Partners, have recognised that there might be much to be gained by forming collaborative efforts between these complementary activities, and by exchanging experience. Dr Summerhayes had been asked by those two groups to suggest how this might be achieved. As an initial step he had begun compiling an inventory of CB activities carried out by various agencies (document GOOS-CB-1/9). He was expected to report on this topic to the next meeting of the IGOS Partners at the end of May 2003.

**Action 2. Members were asked to assist the GPO in the completion of the inventory of capacity building activities.**

The IGOS Partners' goal is to facilitate the development of global observations, and their support by individual nations and agencies. To this end the Partnership focuses on a limited number of specific high-priority themes, among which are an Ocean Theme, a Carbon Theme, and one on the water cycle. The Ocean Theme is the only one so far published and in the process of implementation.

Bob Weller made a presentation on the Partnership for Observations of the Global Oceans (POGO), which brings together the directors of the major oceanographic institutions and others involved in making global ocean observations. POGO provides a means of strengthening the links between individual partner institutions (e.g. Woods Hole Oceanographic Institution (WHOI) with Concepción in Chile; and Brazil with Kiel in Germany). As a contribution to capacity building in support of GOOS, POGO has established a Fellowship scheme co-sponsored by IOC and the Scientific Committee on Oceanic Research, SCOR. POGO is also keenly supporting the Argo profiling float project and the creation of a global network of time-series observatories.

**Action 3. The GPO will work with POGO to inform national GOOS and IOC contacts about POGO (hard copy and electronic means), and to get regional GOOS contacts to inform their members, by end 2002.**

In discussion, the Panel recalled that different countries were at different stages of development, so that the GOOS CB Plan should not be 'one-size-fits-all'. It was agreed that, in order to persuade governments to sign up to GOOS, the economic and public good benefits had to be clearly identified, with real examples from the regions. The Panel recognised that in many countries the difficulties in building GOOS were exacerbated by the fragmentation of responsibilities for the ocean between different government departments; however, this problem exists in developed and developing countries alike. The Panel saw some common elements that would have to be considered in future plans for GOOS CB: (i) funds would be necessary; (ii) economic and social benefits must be defined, and the public and the user communities must be made aware of them; (iii) the supply of data and information must be valuable (e.g. ODINAFRICA, the Ocean Data and Information Network for Africa, is striving not simply to create data centres in Africa, but to use those centres to provide products and services); (iv) the effort must be sustained over the long term.

### **3. REVIEW OF RELATED CB PROGRAMMES (held jointly with JCOMM CB Panel)**

#### **3.1 JCOMM CAPACITY BUILDING STRATEGY**

The Director of the WMO Marine Programme, Peter Dexter, gave a brief presentation on the JCOMM Capacity Building strategy.

*The two groups recognized that substantial capacity building activities of direct relevance to GOOS and JCOMM are undertaken under a number of other WMO and IOC programmes, including GOOS, GCOS (the Global Climate Observing System), IOC's TEMA (Training, Education and Mutual Assistance) and IODE (International Oceanographic Data and Information Exchange programme) and the WMO Education and Training, Technical Cooperation, Voluntary Cooperation and satellite programmes. Based on reports from these programmes, the meeting reviewed such activities, with a view to identifying specific actions which might be undertaken jointly, as well as general areas where coordination and cooperation would be of direct benefit to JCOMM and GOOS.*



### 3.2 GOOS

*Colin Summerhayes informed the meeting that the objectives of the GOOS CB Panel meeting are to explore the development of a framework for the short-term to medium-term objectives of a capacity building programme, in the context of the long-term goals published in the Implementation Plan for CB, following the Principles of GOOS CB. In this context JCOMM and GOOS are complementary organisations and should develop complementary plans for CB. GOOS is designed to develop a global system that is akin to the World Weather Watch, but for the ocean, while JCOMM is the implementing arm for GOOS and other bodies. JCOMM will, at least initially, focus on the physical aspects of the ocean. GOOS has a broader remit, covering all aspects of ocean science. Thus the eventual plans will differ in some important respects. However, in some areas there is considerable commonality, especially in the areas of (i) in situ measurements, such as sea level from tide gauges, or other measurements from ships and buoys, (ii) remotely sensed measurements from space, and (iii) numerical modelling that will take the in situ and remotely sensed data and integrate them to produce new products and forecasts. In this context JCOMM's efforts will be close to the end products and services, while GOOS's CB training efforts may be focused further upstream. GOOS is building a network of national GOOS bodies to help build GOOS at the national level, and regional GOOS alliances that will build GOOS at the regional level. Much capacity building is needed to raise the level of ability both of individual countries and of whole regions to contribute to and benefit from GOOS. In this context, the regional surveys that JCOMM was undertaking should be of use to the developers of a GOOS CB programme as well as to JCOMM. It will be important, as GOOS and JCOMM progress, to ensure that the activities developed by the two groups are complementary. It will also be evident that in some areas GOOS and JCOMM will need joint working groups to take forward specific developments, for example in remote sensing and modelling.*

### 3.3 GCOS

*William Westermeyer of the Global Climate Observing System (GCOS) Secretariat reviewed the GCOS Regional Workshop Programme. GCOS initiated this 10-workshop programme in response to the invitation of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) to organize regional workshops "to identify the priority capacity-building needs related to participation in systematic observation." GCOS created the Programme as a means to bring attention to needed improvements in observing systems for climate and to facilitate the development of Regional Action Plans to address priority needs. Other objectives include educating workshop participants about the status of observing systems in each region, including: gaps and deficiencies in networks; improving communication between directors of meteorological services and national climate change co-ordinators; and helping participants understand guidelines for reporting to the UNFCCC on systematic observations.*

*Three regional workshops have been held thus far, including those for the Pacific Islands, for eastern and southern Africa, and for Central America and the Caribbean. Action Plans for the first two regions have been completed thus far, with that for Central America and the Caribbean expected by late summer 2002. The next scheduled workshop is for the countries of East and Southeast Asia in September 2002.*

*The GCOS Secretariat receives support from the Global Environment Facility of the World Bank to fund 60 percent of the Regional Workshop Programme. It must raise the remaining funds from individual donor countries and international organizations on a workshop-by-workshop basis. The implementation of Action Plans is beyond the scope of the Programme, but as part of its broader mission GCOS is committed to helping regions identify sources of funding for the priorities*

*identified in the Plans. The Conference of the Parties to the UNFCCC remains very interested in the Regional Workshop Programme and Action Plans, and this high-level interest enhances the possibilities for support for real improvements in observing systems.*

### 3.4 BILKO

*Craig Donlon informed the group that the UNESCO Bilko project (coordinated by UNESCO's Coastal and Small Islands (CSI) programme) provides a comprehensive distance-learning capability for marine remote sensing. The project has over 15 years' experience with a current registered user community of over 1800 students in 500 institutions and 40 countries. Bilko has been used extensively in many hands-on international training workshops and by a large number of Universities as a core component of marine remote sensing training.*

*The Bilko project provides, free of charge, a comprehensive image processing software package (called Bilko2000) that continues to evolve based on coordinated user requests. Bilko2000 is unique in its approach and capability, having been built on extensive user testing and research. The application provides support for many different file formats (including HDF and flat binary 16- and -32 bit data) and functionality ranging from simple image display through to complex mathematical operations handling multiple-image data sets and navigation of image data. Complex geophysical and atmospheric correction algorithms are exposed in easy-to-use text files that explain clearly each operation performed. An extensive introductory tutorial is provided presenting new users with an easy-to-understand review of the functionality offered by Bilko2000.*

*The Bilko2000 software is supported by a suite of distance-learning pedagogical materials that present, at various levels, a broad spectrum of image data sets, image processing tools and techniques, geophysical algorithms and concepts. Lesson topics include sea surface temperature, chlorophyll concentration, mapping of marine habitat, ocean winds, ocean waves, subsurface acoustic Doppler current profiler time-series data, time series analysis of ocean station data, ocean model output data visualisation and fisheries research. A variety of different image data sets are used, including synthetic aperture radar, infrared, microwave and, colour sensors. In addition to a series of structured lessons that consider fundamental remote sensing concepts, collections of lessons provide series of thematic modules that have an application or regional focus.*

*A strict review procedure is used to ensure that all lesson material adopts best practices in terms of distance-learning devices, style and structure as well as assuring the quality of scientific content. In particular, an extensively researched lesson format is strictly adopted by all Bilko lessons, which provides students with a clearly stated lesson aim, a number of objectives, background material and structures self-assessment questions. Each lesson provides a structured learning experience that is very much hands-on as students interact with satellite data using the Bilko2000 software. Many lessons are available in different languages, including Spanish, Russian, and English. All material is available free of charge, on request to the Bilko secretariat, as a CD-ROM and in colour hard-bound workbooks. Full details of the Bilko project may be found at <http://www.unesco.bilko.org>.*

In discussion of remote sensing issues, the GOOS CB Panel decided on the following actions:

**Action 4.** Joint inter-sessional group (Craig Donlon, Colin Summerhayes, Hiroshi Kawamura representing JCOMM, and Don Hinsman) to work with partner organisations (e.g. IGOS Partners) to develop a plan to guide CB in remote sensing (by end January, so as to be available to the Second JCOMM management meeting, February 2003, the 6th Session of the

GSC, February 2003, the 6th Session of the Intergovernmental Committee for GOOS (I-GOOS), March 2003, and the IGOS Partners meeting at the end of May 2003).

**Action 5.** GPO and Peter Pissierssens to find a means to advertise UNESCO BILKO Project as a mechanism for Training for Remote Sensing, on the web sites of IOC, IODE, ODIN, IOI (International Ocean Institute) and GOOS, by year end 2002.

### 3.5 IODE

*Mr Peter Pissierssens, Head of Ocean Services, IOC, informed the meeting on the capacity building activities of the IOC's International Oceanographic Data and Information Exchange (IODE) programme. He explained that, whereas in the past IODE's capacity building programme had focused mainly on advisory missions, internships and training courses, IODE had, since the late 1980s, embarked on a new strategy based on linking equipment, training and operational support. This new concept was put into place through the development of 'Ocean Data and Information Networks' (ODINs) in the African (ODINAFRICA) and the Caribbean and South American regions (ODINCARSA). These networks have the following capacity building elements in common: (i) provide assistance with the development and operation of National Oceanographic Data and Information Centres (NODCs) as well as their networking; (ii) provide training opportunities in ocean data and information management applying standard formats and methodologies as defined by IODE; (iii) assist with the development and maintenance of national and regional metadata, information and data-holding databases; and (iv) assist with the development and dissemination of ocean data and information products responding to the needs of a wide variety of user groups using national and regional networks. Mr Pissierssens pointed out that the ODIN networks should be seen as multi-purpose ocean data and information management platforms of which the scope will gradually expand from mainly delayed-mode data to operational oceanography data focusing on developing services and products as required by a wide variety of users.*

*Mr Pissierssens then gave an overview of the OceanTeacher system. The objective of OceanTeacher is to provide training tools for oceanographic data and information management and exchange. These tools are used during IODE Training Courses but can also be used for self-training and continuous professional development. The OceanTeacher system is composed of three elements: (i) the Resource Kit; (ii) the Training Manual; and (iii) Data CD. The Resource Kit contains a range of ocean data and information management materials, such as software, quality control and analysis strategies, training manuals and other relevant documents. The Training Manual is a collection of outlines, notes, examples and other materials to be used in conjunction with the Resource Kit to organize IODE training courses at the national or regional level. The Data CD is prepared for specific training courses covering data specific for a particular region. Data include data sets obtained from relevant NODCs or World Data Centres (WDCs) in the IODE system. After the training events, participants are urged to start the collection of national metadata, data and information to develop national data holdings. Where possible this is done within the framework of an ODIN project. OceanTeacher is available through the web site <http://www.oceanteacher.org> and on CD-ROM (available upon request from the IOC/IODE Secretariat).*

*Mr Pissierssens invited JCOMM and GOOS to contribute training material to the OceanTeacher to make it a comprehensive training system covering delayed-mode as well as operational oceanography (and possibly marine meteorology, in cooperation with WMO's distance learning system).*

*The group recommended that stocks of the OceanTeacher CD-ROM should be made available at the national level through ODIN or IODE national coordinators. The group welcomed the call for cooperation and recommended that, in particular, collaboration should be established with BILKO. It was further agreed that Mrs Regina Folorunsho would assist with the scoping of JCOMM relevant content that could be considered for inclusion in a joint IODE/GOOS/JCOMM OceanTeacher.*

*The group recommended cooperation between ODINs, GOOS, the Western Indian Ocean Marine Applications Project (WIOMAP) and other relevant IOC and WMO projects and programmes. The group further recommended that ODINs should be established in other regions, if interest in such an endeavour was expressed by Member States in such regions. It was hoped that the success in the existing ODINs would facilitate identifying necessary funding for these networks.*

**Action 6. Recommend to IODE that the ODIN approach be applied to the Indian Ocean, Pacific and S.E. Asia.**

**Action 7. Members of the Panel to supply comments on the scope of Ocean Teacher, to GPO by October 2002.**

### 3.6 OTHER IOC INITIATIVES

Among other IOC CB initiatives that could be considered in future to contribute to the GOOS capacity building programme, Colin Summerhayes reported on the training programmes of the Harmful Algal Bloom Programme. In addition he reminded Panel Members that the IOC and SCOR co-sponsor the work of the International Ocean Colour Coordinating Group (IOCCG), which also offers training courses in the interpretation and use of ocean colour data from satellites. Like POGO, the IOCCG also has a Fellowship programme.

### 3.7 WMO PROGRAMMES

*Peter Dexter informed the group that (i) Education and Training and (ii) Technical Cooperation constitute separate programme areas within the overall WMO programme structure, and that both programmes undertake various activities, which directly support JCOMM or GOOS. They include: the award of short-term and long-term fellowships in marine fields; the publication of guidelines and syllabi for education and training in marine fields; various marine support projects through the voluntary cooperation programme; and expert missions to advise on the development of marine observing systems and marine services in a number of countries.*

*Dr Donald Hinsman, Senior Scientific Officer for the WMO Satellite Activities Office, briefed the joint meeting on WMO's Strategy to Improve the Utilization of Satellite Systems, WMO's Strategy for Education and Training in Satellite Meteorology as well as the Virtual Laboratory for Education and Training in Satellite Meteorology and its associated Focus Group. He described the process whereby WMO Members provided input to the Strategy to Improve the Utilization of Satellite Systems through the use of a biennial questionnaire. An analysis of the questionnaire provided guidance to WMO Members on a regional and national basis on how to exploit better the available satellite systems. He noted that the strategy for education and training approved by WMO's Executive Council followed the principle to "train the trainers". Several "Centres of Excellence" had been identified and co-sponsored by the Coordinating Group on Meteorological Satellites (CGMS) satellite operators (Niamey and Nairobi by EUMETSAT, Barbados and Costa Rica by NOAA/NESDIS, Nanjing by CMA and the BMTC by JMA).*

*Recently the “Centres of Excellence” have been linked through the use of Internet to provide the possibility for near-continuous education and training. The system of linked “Centres” was called the Virtual Laboratory for Education and Training in Satellite Meteorology (VL). Dr Hinsman described some advancement in the VL that allowed for lectures to be given remotely through new capabilities such as VisitVIEW and through the use of Internet. He proposed that the VL could provide similar training opportunities for the oceanographic community. He also informed the joint meeting of the recent decision by WMO to expand the space-based component of the Global Observing System to include Research and Development satellites and that NASA, ESA and the Russian Space Agency had already confirmed their participation.*

*The group noted this information with considerable interest. It specifically requested that the VL programme should be expanded to include ocean satellites and ocean remote sensing, with the possible addition of new centres of excellence, devoted to oceanography.*

**Action 8. Don Hinsman to provide GPO with copies of his presentation on the WMO remote sensing programme and the Virtual Laboratory for training in remote sensing.**

**Action 9. Bill Erb to plan with Don Hinsman a Virtual Laboratory for training in remote sensing applications (Oceans), to be held in summer 2003 in Perth, Australia.**

### 3.8 INTERNATIONAL OCEAN INSTITUTE

*Dr I. Oliounine, IOI Executive Director, presented information on the International Ocean Institute, which was established in 1972 as an international non-governmental organization with the Headquarters in Malta. The mission of the Institute is to promote education, training and research, enhance peaceful and sustainable use of ocean and coastal spaces and their resources, their management and regulation, and facilitate the protection and conservation of the marine environment. This mission is being implemented by 22 IOI Operational Centers (OC) (usually co-located with universities or national research centers) scattered all over the world. Each OC has its own strength, some in law and policy, some in oceanography and coastal management, some in technology, etc.*

*During the past 30 years the Institute gained a worldwide reputation in providing advice, consultancy, evaluation, assessment and information exchange services. Achievements include support to the formulation and realization of the articles of the Convention on the Law of the Sea, organization of Pacem in Maribus conferences, seminars and workshops on ocean governance, socio-economic issues, risk assessment and management, publication of the Ocean Yearbook, development work among coast communities, etc. The IOI plays a role of a think tank which helps generate incentives and contacts between authorities, integrate social, environmental economic and scientific issues and develop projects with involvement of all sectors.*

*The IOI past experience includes projects on eco-villages and biodiversity, sustainable livelihoods and coastal management and protection. Today one of the IOI flagship programmes is the IOI Virtual University (IOIVU), which integrates the IOI experience in long-term training gained during the last two decades. The mission of IOIVU is to enhance the abilities of developing countries to develop and govern their own marine and coastal resources and environments sustainably, in harmony with related international conventions and agreements. IOI will offer this programme as a major contribution to holistic capacity building in the years after WSSD.*

*Dr Oliounine emphasized that, in implementing IOIVU as all other projects, IOI is looking for cooperation and partnership with other governmental and non-governmental organizations and*

*considers IOC and WMO as important potential partners. IOI will be pleased in its turn to provide the teaching and training needed at the level of middle management and decision makers as well as its expertise and experience which will be useful to meet GOOS and JCOMM objectives.*

*Dr Oliounine noted that in capacity building there are areas where the IOI experience can be very useful for JCOMM and GOOS and can complement JCOMM and GOOS activities. IOI may be interested in helping to develop internal/external policies that are best adapted to the real situation regarding local environments in assisting in the dissemination of results of JCOMM and GOOS projects, in promoting JCOMM and GOOS goals, in assisting in fund-raising campaigns and in increasing public awareness and support. The group expressed its appreciation to Dr Oliounine and the IOI for the offer of collaboration, which it accepted.*

#### **4. FUTURE ELEMENTS OF GOOS CB**

The Panel was reminded that much of the GOOS CB effort and financial investment in the recent past had been on building regional GOOS bodies. Several of these had been kicked off by the original ad hoc GOOS CB Panel, led by Jan Stel, and with the assistance of Bill Erb. They had left an excellent legacy behind them, on which the present Panel could build.

The Panel would need to evaluate future requirements at the regional level, and in other areas (e.g. technologies, teaching methods and so on). However, it must be borne in mind that specific regional CB requirements would come from the regional groups themselves. The Panel therefore needed to consider generic requirements that would apply to all regions and areas.

As background to the discussion, the Panel was reminded that the regional GOOS alliances now comprised the following:

**EuroGOOS:** status - well established with funding from 16 national agencies; an active Secretariat (currently in Sweden); a Baltic Operational Oceanographic System (BOOS); a Northwest Shelf Operational Oceanographic System (NOOS); plans for a broad-scale Atlantic programme contributing to GODAE.

**NEAR-GOOS** (North-east Asian Region): status - well established with 4 countries (Russian Federation; Japan; Republic of Korea; China).

**MedGOOS:** status - newly established with a Secretariat in Malta; involves all Mediterranean countries; European Commission funding to start the process.

**Black Sea GOOS:** status - newly established with a Secretariat in Istanbul; involves all Black Sea countries; European Commission funding to start the process.

**PacificGOOS:** status - founded in 1998; little funding; part time Secretariat in Fiji provided by South Pacific Applied Geosciences Commission (SOPAC); Strategic Plan developed; three pilot projects outlined.

**IOCARIBE-GOOS:** status - founded in 1999; Strategic Plan approved; part time Secretariat in Cartagena; no funding yet.

**SEA-GOOS:** status - preliminary meetings held. WMO and IOC have earlier developed a proposal for a South-East Asia Centre for Atmospheric and Marine Prediction (SEACAMP), which may be part-funded by the ASEAN group of countries. If so, this would provide one nucleus for SEA-GOOS. Another would be the ongoing IOC/WESTPAC-sponsored Gulf of Thailand Project.

**Indian Ocean GOOS:** status - developed 2001; Secretariat in Hyderabad provided by India; major kick-off Conference planned for Mauritius (November 2002).

**GOOS-AFRICA:** status - a Coordinating Committee encouraging sub-regional development of GOOS activities; Secretariat provided from IOC headquarters; proposals developed for submission through the African Process in 2002.

## 4.1 REGIONAL NEEDS AND PRIORITIES

### 4.1.1 Western Pacific

The Chairman noted that, in order to raise the capacity of island nations in the Pacific to use oceanographic and meteorological data to guide decision-making, JAMSTEC had developed a capacity building programme. He invited Misaki Ohashi of JAMSTEC to give a presentation on the programme, noting that this type of approach may provide a model for capacity building in other similar areas.

The Training Programme for Asia-Western Pacific Ocean Research Network is designed to establish an operational oceanographic observation network in the Asian and Western Pacific region.

In each 8-week-long course, 5/6 young scientists, engineers or government officers from marine-related organisations in the region are trained and provided with personal computers and software that they can take home, so that they can process their local oceanographic and meteorological data, improve forecasts of their local marine conditions, establish an observing network, and participate in a global network to predict anomalous climate change. Courses are held in Japan. The first took place in January/March 2001, and the second in November/December 2001; the third will be held in October/December 2002. Participants largely use their own data.

El Niño events are prominent throughout the region. Trainees learn that El Niño forecasts are underpinned by the Japanese TRITON buoys that form the western end of the TAO/TRITON array in the equatorial Pacific. They go home with a heightened awareness of the value of the buoy data to the improvement of local forecasts. This has in turn led to a decrease in the vandalism of the buoys.

The Panel agreed that the JAMSTEC approach was a valuable one, and worthy of export to other regions.

**Action 10. GOOS organisations to be encouraged to use the JAMSTEC Pacific training programme as a model for the development of GOOS (and JCOMM) products and services for developing countries.**

### 4.1.2 IOC Perth Regional Programme Office Activities (Pacific and Indian Oceans)

Bill Erb, of the IOC Regional Programme Office in Perth, Western Australia, explained the development of Indian Ocean GOOS, and tabled a draft paper on “Capacity Building in the South Pacific and Indian Oceans”, which had been written by Geoff Holland. The paper provided a rationale for funding for training, a regional data centre, and a programme coordinator in each area.

An Indian Ocean GOOS (IOGOOS) Conference was planned for Mauritius in the first week of November 2002, to take forward the regional development of GOOS, as one step towards building regional capacity. Peter Dexter noted that a proposal for a Western Indian Ocean Marine

Applications Project (WIOMAP) was nearing completion, and would be finalised at the IOGOOS meeting. If successful, it would upgrade the ocean and atmospheric forecasting capabilities of the region.

In Western Australia, Bill Erb has been working with industry and other agencies to develop a Western Australia GOOS (WAGOOS) that would enhance operational oceanography for the benefit of the offshore oil industry and other coastal user communities.

Erb has also worked with Curtin University, in Perth, to provide training in remote sensing interpretation. Using the BILKO approach, the University has provided training in remote sensing in Noumea (2001) and will continue in Fiji (October 2002) and Mauritius (November 2002).

The Perth Office is also responsible for the development of PacificGOOS. Bill Erb explained how the South Pacific Applied Geosciences Commission (SOPAC) had worked with PacificGOOS to provide permissions for the deployment of Argo floats in the Exclusive Economic Zones of the island nations of the region. He talked about the SEREAD project to work with school children to raise regional awareness of the importance of Argo float data to local communities. The key to success is to be able to develop and maintain good communication with the community.

The Panel endorsed in principle the document provided by Bill Erb for development of capacity building for IOGOOS and PacificGOOS, and adopted Actions 11 and 12.

**Action 11.** (i) Members are asked to provide feedback to Bill Erb on the text and ideas in the draft proposal by end July 2002, (ii) the text should clearly link to IODE the data centres mentioned in the proposal, and (iii) Annex III on the clearing-house mechanism should be treated as a completely separate document.

**Action 12.** With the revisions above, Bill Erb to engage the interests and involvement of Member States by sending the (two) documents for review to the chairs of IOCINDIO and IOCINCWIO, and to the Members of IOGOOS and PacificGOOS for comment by end August. The clearing-house proposal should be sent to the Chair of ABE-LOS for comment.

#### **4.1.3 Africa**

The Chairman explained how proposals were being developed for building the capacity of African countries to collect *in situ* ocean data, to access and interpret remotely sensed data from space, and to combine these in numerical models to produce ocean and meteorological and climate forecasts. The proposals will be submitted through the African Process, in Johannesburg in August 2002. There was a close relation between GOOS-AFRICA developments and those of the ODINAFRICA programme (listed under 3.5 above) to create a network of national ocean data centres for Africa.

#### **4.1.4 The S.E. Pacific and S. Atlantic**

An IOC Regional Programme Office has been opened in Rio de Janeiro, with a part time staff member (Janice Trotte). The objective is to help the development of GOOS, particularly in the South Atlantic.

An initial Coastal GOOS Pilot Project named QUIJOTE, led by Eduardo Marone of Brazil, has been developed along the southwest Atlantic coast to improve warnings of marine hazards (storm surges and the like). QUIJOTE is described in the latest issue of the GOOS Products and Services Bulletin on the GOOS web site.



Cintia Piccolo (Argentine) noted that her institution regularly holds a major regional marine scientific meeting, and that the next one will be in 2003. This meeting could well provide a forum for discussions about the regional development of GOOS.

**Action 13. GPO to investigate the possibility of holding a GOOS awareness raising workshop for South America as part of the biennial marine science meeting to be organised by Cintia Piccolo in Argentina in 2003; it is recommended that this be done in conjunction with the Regional GOOS Programme Office in Rio.**

Individual countries along the western coast of S. America, in the S.E. Pacific, have been developing networks of buoys and tide gauges to monitor changes in coastal waters, especially in relation to improving forecasts of the local effects of El Niño and La Niña events. These networks are in place off Peru and Chile. There exists the prospect of uniting these and the observing systems from Ecuador and Colombia into a future S.E. Pacific GOOS. IOC is discussing this possibility with the Permanent Commission for the South Pacific (CPPS). It was noted that five of the Peruvian buoys had already been lost due to vandalism, which means there is a considerable need for raising the awareness of the community to the value of these devices.

#### **4.1.5 The Caribbean**

Alfonso Botello reported on the finalisation of the IOCARIBE-GOOS Strategic Plan. The next step is to develop a pilot project to demonstrate the value of implementing GOOS in the region.

#### **4.2 NEEDS AND PRIORITIES OF THE GOOS ADVISORY PANELS**

The Chairman led a discussion on the capacity building requirements of the Coastal Ocean Observations Panel (COOP), and of the Ocean Observations Panel for Climate (OOPC). The CB Panel agreed that defining precise capacity building activities was the responsibility of these expert panels, working together with the regional GOOS alliances where that was appropriate. The CB Panel could add value to those activities by taking a generic overview, and by identifying possible sources of funding, as well as by promoting application of the GOOS CB Principles and Implementation Strategy. The CB Panel would not be able to provide much advice on CB in the context of COOP until the COOP Design Plan and Implementation Plan had been published.

**Action 14. The Chair of the CB Panel will initiate inter-sessional action to review the implications for capacity building of the publication of the COOP Design Plan, once it is available (late 2002).**

The Panel agreed that it should be promoting the development of complete end-to-end (observation to final product) systems, and the blending of data with numerical models to produce forecasts. In this context it was clear that many developing countries would find it difficult to afford off-the-shelf commercial modelling packages. Access to a wide range of freely available numerical models could perhaps be provided via the Internet to stimulate their use by developing countries. This should be done jointly with JCOMM.

**Action 15. Joint GOOS/JCOMM inter-sessional group, including Worth Nowlin, Geoff Brundrit and Johannes Guddal, to develop a plan for capacity building in modelling and forecasting, including the possible development of a freely available pool of numerical models, by year end 2002.**

In the case of the OOPC the Panel recognised that some consideration needed to be given in future to technologies that might be available in the future and that were not subject to vandalism; for instance submarine gliders or autonomous underwater vehicles. In addition, thought needs to be given to what combinations of technologies might be best for particular areas. For example, a combination of remotely sensed data plus numerical models might be adequate for the predictions that are required for the west coast of South America where buoys are subject to extensive vandalism.

Consideration also needs to be given to how to carry forward the concepts of GODAE, once GODAE has been completed (by 2007). GODAE currently requires the use of highly sophisticated numerical models run on large computers that are outside the financial reach of most developing countries. How will this technology be transferred to developing countries in future? The Panel agreed that one way in which developing countries could benefit from GODAE outputs was through the provision of regional sub-samples of the global fields of state variables that GODAE produced. Some effort will be required to find out what the regions require, and then to develop mechanisms for getting it out of the GODAE producers. Another mechanism for raising awareness about GODAE is to involve scientists from developing countries in the proposed GODAE Summer School.

**Action 16. The Chair of the CB Panel will write to Neville Smith to provide the Panel's endorsement of the plans for a GODAE Summer School, which should be considered as co-sponsored by GOOS in the interests of building up over time a cadre of operational oceanographers. The Summer School should be encouraged to run annually, to draw students from regional GOOS areas, among others, to start with a lecture on GOOS, and to utilise BILKO software and OceanTeacher as appropriate.**

Colin Summerhayes discussed the ideas in the proposal that he had developed with Neville Smith on “Developing Countries, the Oceans, and Climate Change”, for submission to the Canadian International Development Agency. The objective is to develop mechanisms to provide ocean agencies in developing countries with access to and interpretation of complex ocean data and model outputs for use in developing policy and making decisions. These could be GODAE products and Argo data, for example. Under this proposal, leading modelling groups would provide access to their data and products, sub-sampled for the region of interest, and make it available through a dedicated web page. Individuals would be trained in the use and interpretation of the data and products, and in their use to develop more advanced products. A five-year programme was envisaged in the first instance. At its conclusion the regions should be able to carry out the required tasks themselves, in partnership with the data producers. The Panel encouraged the application of this approach.

The Panel agreed that the widespread implementation of GOOS would create a demand for standards and standard approaches. The Panel noted that GOOS was lacking any formally endorsed standards. The World Ocean Circulation Experiment Group (WOCE) standards were the ones being used for the implementation of physical measurements in support of climate and weather predictions through GOOS and GCOS. It was noted that JCOMM had a Task Team for Standards.

The Panel endorsed the plans by the GPO to produce a GOOS handbook as a guide for developing countries.

**Action 17. The GPO, with advice from appropriate GOOS bodies and JCOMM, should develop a GOOS Handbook, to include among other things statements on metadata, quality control, calibration, and standards; the Handbook to be developed during phase I of the GOOS CB Action Plan.**

**Action 18. Chairman to ask JCOMM to accept on its Task Team for Standards nominees from OOPC, COOP and IODE, to ensure that GOOS requirements are considered in standard setting.**

#### 4.3 NEEDS AND PRIORITIES OF OTHER GOOS BODIES

The Panel considered the possible relations between itself and the Intergovernmental Committee for GOOS (I-GOOS). I-GOOS has a mandate to seek out resources for the development and implementation of GOOS.

**Action 19. The outcome of the 1st meeting of the GOOS CB Panel should be reported to I-GOOS-VI so as to guide the development of arguments for improving the resource base needed for sustainable capacity building.**

I-GOOS has begun a process of consultation with the regional GOOS alliances, which will take place through a biennial Regional GOOS Forum, the first of which will be held during the first week of December 2002, in Athens, in association with the 3rd EuroGOOS Conference.

**Action 20. The outcome of the 1st meeting of the GOOS CB Panel should be reported to the 1st Regional GOOS Forum (Athens, December 2002), for information.**

I-GOOS was in one sense a committee of national GOOS bodies. At the national level, countries were encouraged to form National GOOS Coordinating Committees (whose duties are described on the GOOS web page) to stimulate the development of GOOS at the national level and to involve all potential stakeholders in the process; some of this work might be done by National Oceanographic Committees. The I-GOOS Board had recently noted that communication between the GOOS Project Office and the national GOOS contact points was very weak, and had recommended that it be improved. The CB Panel agreed that good communication was an essential aspect of capacity building and therefore approved Action 21.

**Action 21. In order to improve communication between GOOS management bodies, GPO, and national and regional GOOS bodies, the GPO (after consultation with Peter Pissierssens about appropriate methods) should send monthly bulletins on GOOS developments to national and regional GOOS contacts and IOC contact points, and members of GOOS advisory panels before end 2002.**

#### 4.4 NEEDS AND PRIORITIES OF OPERATIONAL AGENCIES AND INDUSTRIAL SECTORS

The IOC has begun working with industries to determine the ‘demand pull’ from different parts of the private sector, starting with Europe. In Western Australia, industry was an important part of the newly formed WAGOOS. Both of these kinds of interactions would help to build an awareness of the benefits of GOOS to industry. Desirable end results might be more widespread investment in observing systems by industry, sharing of industry data from its own observing systems, and increased advocacy from industry to government in favour of the growth of operational oceanographic observing systems.

GOOS is high on the agenda of the biennial Oceanology International meetings, where industry comes together in a combined conference and exhibition on ocean activities. The triennial EuroGOOS Conferences on Operational Oceanography, which are also associated with industry exhibits, provide another occasion for bringing operational oceanographers and industry together.

Several instrument manufacturers have a keen interest in seeing their systems used as GOOS expands.

The Panel agreed that these awareness-raising efforts are another form of national and regional capacity building.

GOOS developments were also helping to develop the capacities of operational agencies, many of which were deeply involved in GOOS pilot projects such as GODAE and Argo. However, this was mainly true of advanced nations where agencies had access to massive computing capability.

Dr Kitazawa noted that in some countries research agencies were active contributors to the development of GOOS and the operation of monitoring systems. Those countries might find it more accurate to refer to the agencies involved in GOOS development and implementation as ‘implementing agencies’, which was more all-embracing, rather than ‘operational agencies’, which carried a much narrower connotation.

Dr Kitazawa noted that JAMSTEC had done much technical work on the problems associated with the development and deployment of Argo floats, but this was published in in-house journals (in English) that had rather limited distribution. He offered to make this information available to the Argo community.

**Action 22. GPO to pass to the JCOMM *In Situ* Observing Platform Support Center (JCOMMOPS) a copy of the JAMSTEC technical bulletin on Argo floats, as a means of technology transfer.**

The Panel agreed that awareness-raising was a key element of capacity building, especially for decision-makers.

**Action 23. Joint GOOS/JCOMM inter-sessional group, including Jan Stel and Colin Summerhayes for GOOS, and Regina Folorunsho and Ruben Aparicio for JCOMM, to develop a plan for awareness-raising for decision makers (involving clear examples of benefits), by year end 2002.**

The Panel also agreed that, to facilitate effective communication, GOOS needed the kind of communication strategy being developed by an inter-sessional working group of the GSC.

**Action 24. Panel Chair and Peter Pissierssens to be nominated as CB Panel representatives to join the GSC's inter-sessional working group on a communication strategy.**

The Panel also agreed that its Members should help to spread the word about GOOS, consistent with GSC-V Action 9, and adopted Action 25.

**Action 25. Members to use opportunities to give papers on GOOS at major scientific meetings and to write short articles on GOOS for appropriate journals and newsletters.**

## **5. FUNDING MECHANISMS TO SUPPORT GOOS CB**

### **5.1 PRESENT ARRANGEMENTS**

Dr Summerhayes provided copies of the GOOS work programme and budget for 2002 and 2003, explaining that 56% of the roughly \$800,000 annual non-salary expenditure on programme

activities came from sponsors and donor organisations (chiefly a few national agencies from developed countries). For the most part, financial support arrived in relatively small amounts earmarked for the support of specific activities attractive to one donor agency or another. Costs of meetings were commonly shared by two or more agencies. Of the total expenditure, 33% went on capacity building, mostly to support the development of regional GOOS alliances.

Dr Summerhayes noted that the CB work programme and budget for 2003 assumes a continuation of more or less the same activities as those planned for 2002, and asked for the Panel's advice in adjusting the programme and budget.

## 5.2 FUTURE OPPORTUNITIES

The Panel was informed that I-GOOS has decided to set up an inter-sessional Resources Working Group to assist with capacity building. This group has not yet met. In addition, JCOMM is setting up a Task Team on Resources. The following discussions and conclusions constitute potential input to those groups.

Panel Members considered a range of possible funding opportunities. SCOR and POGO could be approached for information on foundations that may provide funding outside of the USA. IOC itself has a funding guide that could be used as a source of information on possible donors.

Some industries might be approached for support; for instance, to develop a 'blue' image.

The IOC is making the case to the World Summit on Sustainable Development (WSSD, Johannesburg, August 2002) for support of GOOS as a tool for sustainable development. Acceptance of this concept may help to increase investment in GOOS. Jan Stel noted that he is arranging for a GOOS presentation as part of the Dutch exhibit in the Water Dome at the WSSD. This provides an opportunity for a broader presentation on GOOS.

In the European context, the proposed development of a major programme on Global Monitoring for Environment and Security (GMES) provides several possibilities for future investment that may be available to developing countries outside Europe; for example, in Africa.

**Action 26. Jan Stel and Chair CB Panel to jointly explore with the EC (Brussels) the possibility of developing partnerships in GOOS and JCOMM capacity building, within the context of the proposed GMES (Global Monitoring and Environmental Security) programme.**

The Panel noted the potential for funding by the Global Environment Facility (GEF) of the World Bank that was offered by the development of the Large Marine Ecosystem (LME) programme. Each LME project could be seen as a capacity building pilot project of GOOS. This approach is consistent with the linkage being developed between the LME and GOOS management groups.

**Action 27. Chairman to recommend to regional GOOS bodies that they form strong links to fast-developing Large Marine Ecosystem (LME) projects, where appropriate, to stimulate capacity building.**

The Panel noted the existence of, and attempts to revitalise, UNEP's Regional Seas Programme, and agreed that GOOS potentially provided an excellent tool for the implementation of the requirements of the Programme. This recognition, in the minds of the governments that were signatories to each RSP, might lead to an increased investment in some aspects of the observing system on a region-by-region basis.

The Panel agreed that it might be helpful for GOOS to have a resource person whose time was dedicated to finding funds for GOOS developments. It was recognised that the case for GOOS funding would depend on the preparation of comprehensive proposals that should explain the eventual benefits likely from investment. This was a question for the I-GOOS inter-sessional group on resources.

## **6. THE ROLE OF OPERATIONAL AGENCIES AND TERTIARY EDUCATIONAL INSTITUTIONS IN GOOS CB**

The Panel explored different possible opportunities for assistance from operational agencies and educational establishments. Fellowships like those offered by POGO and IOCCG would be helpful. The SCOR Graduate Centres offered additional possibilities for education and training.

**Action 28. Chair to write to President of SCOR to explore the use of SCOR Graduate Centres for training and education relevant to GOOS.**

The Panel explored the possibility that EuroGOOS might at some point develop a capacity building programme that could benefit neighbouring developing countries. Although the EuroGOOS Plan includes a section on capacity building, currently there does not seem to be any actual support for it.

**Action 29. Jan Stel to provide Chair and GPO with information on the EuroGOOS approach to capacity building, to enable the Chair to write to Chair of EuroGOOS regarding the possible expansion of support by EuroGOOS of the GOOS and JCOMM capacity building programmes.**

The Panel noted that many space agencies (e.g. NASA, ESA, CNES) had useful collections of teaching materials on their web sites. GOOS could advertise these, and they could be made part of a coordinated programme. This would require a new approach to the development of the GOOS CB web page, a better term for which would be the GOOS Resources web page. Such a page could have different sections for remote-sensing data, for *in situ* data, for awareness-raising, and so on. For those countries with limited web access, the contents of the Resources page could be made available annually on a CD. Such a web site should focus on key issues and be product oriented.

Peter Pissierssens noted that IOC's proposed Ocean Portal offers one route for access to these sorts of products. It would be worth considering the development of a GOOS Portal, which could link readers to teaching sites, regional sites, and so on.

The Panel agreed that the general question of the development of the GOOS web site should be part of the considerations of the GSC's inter-sessional working group on communication strategy (see Action 24, above). In addition, they approved Action 30 (below).

**Action 30. Joint inter-sessional working group (Ilana Wainer, Convenor, Craig Donlon, Bill Erb, Bob Weller, Peter Pissierssens, Cintia Piccolo and Ruben Aparicio as JCOMM representative) to consider ways in which the GOOS CB (Resources) web page can be improved by end 2002.**

Finally, the Panel noted that the many oceanographic teaching establishments could perhaps be persuaded to give their courses a more operational flavour.

## 7. DEVELOPING SYNERGIES AND AVOIDING DUPLICATION

### 7.1 JCOMM

In a second joint session with the JCOMM CBCG, the combined group discussed how GOOS and JCOMM can help one another, and where the spheres of influence could/should be separate. To facilitate the building of links between JCOMM and GOOS regional alliances, the group agreed on Action 31.

**Action 31:** At the GOOS Regional Forum (Athens, December 2002), Peter Dexter to discuss with representatives of GOOS regional alliances the need to form links between them and JCOMM.

*The combined group noted that there were a number of existing regional programmes and associated activities outside of WMO and IOC, such as the Regional Seas Conventions of UNEP or regional groupings such as CPPS, which were of potential value to JCOMM capacity building. The group reviewed the status and activities of these, with a view to identifying and establishing appropriate links with these programmes. Group members were requested to investigate the status of the Action Plans in their individual regions, to summarise their activities, to develop appropriate links (including with their secretariats if these existed and, if possible, to propose possible collaboration with JCOMM in capacity building. Eventually, summary reports on these Action Plans, and possible JCOMM interaction, should be submitted to the chair and Secretariat. In this context, the group noted with interest the enhanced collaboration between IOC and UNEP in the Caribbean region, through IOCARIBE and the Caribbean Action Plan, as well as in the Mediterranean and the northwest Pacific.*

*The group recognized that the overall JCOMM Capacity Building Strategy had been developed to be fully compatible with that of GOOS, and it was clear that many of the objectives and activities of the capacity building programmes of JCOMM and GOOS were interrelated and complementary. Based on the discussions under preceding agenda items, which formed part of the joint session with the GOOS Capacity Building Panel or otherwise, the JCOMM CBCG and the GOOS Panel jointly reviewed the requirements and possibilities for enhanced coordination of the two programmes.*

*Resulting from the ensuing extensive discussions, the following specific issues of common interest and/or requiring enhanced coordination, were identified:*

*The continuation and expansion of the storm surge pilot projects currently underway or planned in East Asia and Eastern South America*

- (i) Enhanced coordination of specific training workshops, bearing in mind that the objectives of such workshops for JCOMM and GOOS were often different. The JCOMM workshops are generally to support operational agencies, directed to specific operational services, such as wave forecasting, while GOOS workshops may be more general in nature, covering other disciplines*
- (ii) The development and distribution, as freeware, of software for modelling and forecasting various ocean elements, such as waves, surges, currents, oil spills, etc, (see Action 15, above)*
- (iii) The development and distribution of guidelines relating to user interactions and public awareness. It was recognized that there was much material already available via the web, in particular directed to awareness-raising among school children, which might*

*also be exploited. The importance of the involvement of children as a target audience in the awareness and education process was stressed. It was noted that other organizations such as the IOI were also involved in this process. The IOI would invite JCOMM/GOOS to participate in its programme on Children and the Sea. The group accepted this offer with appreciation, at the same time stressing the need for JCOMM in particular to concentrate on operational ocean issues in its public interactions (see Action 23, above)*

- (iv) Linked web pages to provide information regarding JCOMM and GOOS capacity building resources (training courses and materials, freeware, technical information, etc.) (see Action 30, above)*
- (v) It was recognized that GLOSS supports both JCOMM and GOOS, and that therefore there was a direct interest from both the CBCG and the GOOS Panel to ensure that GLOSS training and technical assistance meet all requirements. It was agreed that JCOMM and GOOS should work with and support the GLOSS Group of Experts in their capacity building work, both to ensure that requirements were adequately addressed, and also that, to the extent possible, adequate resources were available for this work*
- (vi) GOOS was considering the need and possibilities for preparing guidance material relating to observational instrument evaluations, standards, best practices, QC, etc. An evaluation of the way forward in this important area was already underway within JCOMM, through a Task Team on Instrument Testing and Intercalibration established by the Ship Observations Team at its session in Goa, February 2002. It was agreed that GOOS and IODE would nominate experts to join this task team (see Action 18, above)*
- (vii) There may be value for both JCOMM and GOOS capacity building in the establishment of links between JCOMM and the GOOS Regional Alliances. It was agreed that a first step in this regard should be made at the GOOS Regional Alliance Forum in Athens in December 2002 (see Action 31, above)*
- (viii) Both JCOMM and GOOS have a strong interest in greatly enhanced training in satellite ocean remote sensing, in terms of data access, data management, product preparation and applications. It was recognized that JCOMM and GOOS should jointly coordinate with the WMO satellite programme, as well as external activities, such as the Bilko project, to implement facilities and projects for capacity building in ocean remote sensing. To this end, it was agreed that the JCOMM and GOOS CB groups should jointly establish a technical working group on remote sensing, to develop a status overview of existing facilities and projects, and assessment of future expectations and an outline training programme proposal (see Action 4, above).*

*The group agreed that the opportunity for both committees to interact directly, including in particular in the joint sessions, had been very valuable.*

## **8. CAPACITY BUILDING WORK PROGRAMME**

### **8.1 TRAINING REQUIREMENT FOR *IN SITU* OBSERVATIONS**

The Panel held an extended discussion on possible ways forward, including consideration of what was missing from the present CB programme. It was decided that an approach similar to that



used by the Bilko team for education and training in the interpretation of remotely sensed imagery was needed for *in situ* data acquisition methods.

**Action 32. Joint GOOS/JCOMM inter-sessional group, including Bob Weller, Craig Donlon, Alfonso Botello, to develop a plan for an equivalent to the UNESCO BILKO project for training in *in situ* methods of oceanography, by year end 2002.**

## 8.2 ACTION PLAN

The Panel decided that the way forward was to develop an **Action Plan** to complement the Principles (GOOS Report 69) and the Implementation Strategy (GOOS Report 106). The **Action Plan**, with rationale, tasks and time frames is detailed in Annex III.

**Action 33. Chair to take the Action Plan for GOOS capacity building to GSC-VI for endorsement, and GPO to take it to I-GOOS-VI for relevant action.**

The Panel noted that implementing the Action Plan would require a substantial amount of staff time. The Panel accepted that some of the work required would be carried out at the regional level by the regional GOOS Secretariats, and by offices like those in Perth and Rio. Nevertheless, the programme envisaged by the Action Plan was demanding. Making it work would require additional human resources beyond the present limited capabilities of the already stretched GPO in Paris. Recognising that the IOC was intending to recruit a high-level staff member to handle the Training, Education and Mutual Assistance (TEMA) programme, and that the TEMA programme was meant to support the CB activities of other IOC programmes, such as GOOS, the Panel adopted Action 34.

**Action 34. Chairman to write to the Executive Secretary of the IOC to ask that the new IOC TEMA Officer (when appointed) devotes a substantial part of his/her time to implementing the GOOS CB Action Plan.**

The Panel accepted that implementation of the proposed Action Plan would have considerable implications for the work programme and budget for 2003 and beyond, and adopted Action 35.

**Action 35. Inter-sessional working group on budget, including Geoff Brundrit, Colin Summerhayes and Worth Nowlin, to consider the implications of the Action Plan for GOOS capacity building on the proposed GOOS work programme and budget for 2003, before end 2002.**

## 9. OTHER BUSINESS

In order to facilitate business, the Panel decided that it needed to have a Vice-Chair.

**Action 36. Chair to ask the GSC Executive Committee to endorse Craig Donlon as the Vice Chair of the GOOS CB Panel.**

The Panel requested the GPO to complete the report of the meeting and to ensure that it was exchanged with the report of the CBCG.

**Action 37. GPO to ensure the exchange of the reports of the GOOS and JCOMM CB Panels.**

The Panel recommended that its next meeting should be held towards the conclusion of the first phase of the Action Plan in 2004, and that this meeting should be held, if possible, in conjunction with that of the JCOMM CBCG.

## **10. CLOSURE**

The meeting closed around 1700h on Wednesday 26 June. On 27 June the Chair and the Director of the GOOS Project Office presented a summary of the report of the GOOS CB Panel to the final session of the JCOMM CBCG, as a means of ensuring a continuing joint approach to common problems.

## **11. ACTION LIST**

**Action 1.** GPO to ensure that all regional GOOS bodies know about the full range of GOOS activities, including things like the IGOS Partnership by end 2002

**Action 2.** Members were asked to assist the GPO in the completion of the inventory of capacity building activities.

**Action 3.** The GPO will work with POGO to inform national GOOS and IOC contacts about POGO (hard copy and electronic means), and to get regional GOOS contacts to inform their members, by end 2002.

**Action 4.** Joint inter-sessional group (Craig Donlon, Colin Summerhayes, Hiroshi Kawamura representing JCOMM, and Don Hinsman) to work with partner organisations (e.g. IGOS Partners) to develop a plan to guide CB in remote sensing (by end January, so as to be available to the Second JCOMM management meeting, February 2003, the 6th Session of the GSC, February 2003, the 6th Session of the Intergovernmental Committee for GOOS (I-GOOS), March 2003, and the IGOS Partners meeting at the end of May 2003).

**Action 5.** GPO and Peter Pissierssens to find a means to of advertise UNESCO BILKO Project as a mechanism for Training for Remote Sensing, on the web sites of IOC, IODE, ODIN, IOI (International Ocean Institute) and GOOS, by year-end 2002.

**Action 6.** Recommend to IODE that the ODIN approach be applied to the Indian Ocean, Pacific and S.E. Asia.

**Action 7.** Members of the Panel to supply comments on the scope of OceanTeacher, to GPO by October 2002.

**Action 8.** Don Hinsman to provide GPO with copies of his presentation on the WMO remote sensing programme and the Virtual Laboratory for training in remote sensing.

**Action 9.** Bill Erb to plan with Don Hinsman a Virtual Laboratory for training in remote sensing applications (Oceans), to be held in summer 2003 in Perth, Australia.

**Action 10.** GOOS organisations to be encouraged to use the JAMSTEC Pacific training programme as a model for the development of GOOS (and JCOMM) products and services for developing countries.

**Action 11.** (i) Members are asked to provide feedback to Bill Erb on the text and ideas in the draft proposal by end July 2002, (ii) the text should clearly link to IODE the data centres mentioned in the proposal, and (iii) Annex III on the clearing-house mechanism should be treated as a completely separate document.

**Action 12.** With the revisions above, Bill Erb to engage the interests and involvement of Member States by sending the (two) documents for review to the chairs of IOCINDIO and IOCINCWIO, and to the Members of IOGOOS and PacificGOOS for comment by end August. The clearing-house proposal should be sent to the Chair of ABE-LOS for comment.

**Action 13.** GPO to investigate the possibility of holding a GOOS awareness raising workshop for South America as part of the biennial marine science meeting to be organised by Cintia Piccolo in Argentina in 2003; it is recommended that this be done in conjunction with the Regional GOOS Programme Office in Rio.

**Action 14.** The Chair of the CB Panel will initiate inter-sessional action to review the implications for capacity building of the publication of the COOP Design Plan, once it is available (late 2002).

**Action 15.** Joint GOOS-JCOMM inter-sessional group, including Worth Nowlin, Geoff Brundrit and Johannes Guddal, to develop a plan for capacity building in modelling and forecasting, including the possible development of a freely available pool of numerical models, by year end 2002.

**Action 16.** The Chair of the CB Panel will write to Neville Smith to provide the Panel's endorsement of the plans for a GODAE Summer School, which should be considered as co-sponsored by GOOS in the interests of building up over time a cadre of operational oceanographers. The Summer School should be encouraged to run annually, to draw students from regional GOOS areas, among others, to start with a lecture on GOOS, and to utilise BILKO software and Ocean Teacher as appropriate.

**Action 17.** The GPO, with advice from appropriate GOOS bodies and JCOMM, should develop a GOOS Handbook, to include among other things statements on metadata, quality control, calibration, and standards; the Handbook to be developed during phase I of the GOOS CB Action Plan.

**Action 18.** Chairman to ask JCOMM to accept on its Task Team for Standards nominees from OOPC, COOP and IODE, to ensure that GOOS requirements are considered in standard setting.

**Action 19.** The outcome of the 1st meeting of the GOOS CB Panel should be reported to I-GOOS-VI so as to guide the development of arguments for improving the resource base needed for sustainable capacity building.

**Action 20.** The outcome of the 1st meeting of the GOOS CB Panel should be reported to the 1st Regional GOOS Forum (Athens, December 2002), for information.

**Action 21.** In order to improve communication between GOOS management bodies, GPO, and national and regional GOOS bodies, the GPO (after consultation with Peter Pissierssens about appropriate methods) should send monthly bulletins on GOOS developments to national and regional GOOS contacts and IOC contact points, and members of GOOS advisory panels before end 2002.

**Action 22.** GPO to pass to the JCOMM *In situ* Observing Platform Support Center (JCOMMOPS) a copy of the JAMSTEC technical bulletin on Argo floats, as a means of technology transfer.

**Action 23.** Joint GOOS/JCOMM inter-sessional group including Jan Stel and Colin Summerhayes for GOOS, and Regina Folorunsho and Ruben Aparicio for JCOMM, to develop a plan for awareness raising for decision makers (involving clear examples of benefits), by year end 2002.

**Action 24.** Panel Chair and Peter Pissierssens to be nominated as CB Panel representatives to join the GSC's inter-sessional working group on a communication strategy.

**Action 25.** Members to use opportunities to give papers on GOOS at major scientific meetings and to write short articles on GOOS for appropriate journals and newsletters.

**Action 26.** Jan Stel and Chair CB Panel to jointly explore with the EC (Brussels) the possibility of developing partnerships in GOOS and JCOMM capacity building, within the context of the proposed GMES (Global Monitoring and Environmental Security) programme.

**Action 27.** Chairman to recommend to regional GOOS bodies that they form strong links to fast developing Large Marine Ecosystem (LME) projects, where appropriate, to stimulate capacity building.

**Action 28.** Chair to write to President of SCOR to explore the use of SCOR Graduate Centres for training and education relevant to GOOS.

**Action 29.** Jan Stel to provide Chair and GPO with information on the EuroGOOS approach to Capacity Building, to enable the Chair to write to Chair of EuroGOOS regarding the possible expansion of support by EuroGOOS of the GOOS and JCOMM capacity building programmes.

**Action 30.** Joint inter-sessional working group (Ilana Wainer, Convenor, Craig Donlon, Bill Erb, Bob Weller, Peter Pissierssens, Cintia Piccolo and Ruben Aparicio as JCOMM representative) to consider ways in which the GOOS CB (Resources) web page can be improved by end 2002.

**Action 31.** At the GOOS Regional Forum (Athens, December 2002), Peter Dexter to discuss with representatives of GOOS regional alliances the need to form links between them and JCOMM.

**Action 32.** Joint GOOS-JCOMM inter-sessional group, including Bob Weller, Craig Donlon, Alfonso Botello, to develop a plan for an equivalent to the UNESCO BILKO project for training in *in situ* methods of oceanography, by year end 2002.

**Action 33.** Chair to take the Action Plan for GOOS capacity building to GSC-VI for endorsement, and GPO to take it to I-GOOS for relevant action.

**Action 34.** Chairman to write to the Executive Secretary of the IOC to ask that the new IOC TEMA Officer (when appointed) devotes a substantial part of his/her time to implementing the GOOS CB Action Plan.

**Action 35.** Inter-sessional working group on budget, including Geoff Brundrit, Colin Summerhayes and Worth Nowlin, to consider the implications of the Action Plan for GOOS capacity building on the proposed GOOS work programme and budget for 2003, before end 2002.

**Action 36.** Chair to ask the GSC Executive Committee to endorse Craig Donlon as the Vice Chair of the GOOS CB Panel.

**Action 37.** GPO to ensure the exchange of the reports of the GOOS and JCOMM CB Panels.

## ANNEX I

### AGENDA

- 1. OPENING OF THE SESSION**
  - 1.1 OPENING
  - 1.2 ADOPTION OF THE AGENDA
  - 1.3 WORKING ARRANGEMENTS
- 2. BACKGROUND REPORTS**
- 3. REVIEW OF RELATED CB PROGRAMMES (held jointly with JCOMM CB Panel)**
  - 3.1 JCOMM Capacity Building Strategy
  - 3.2 GOOS
  - 3.3 GCOS
  - 3.4 BILKO
  - 3.5 IODE
  - 3.6 OTHER IOC INITIATIVES
  - 3.7 WMO PROGRAMMES
  - 3.8 INTERNATIONAL OCEAN INSTITUTE
- 2. FUTURE ELEMENTS OF GOOS GB**
  - 4.1 REGIONAL NEEDS AND PRIORITIES
    - 4.1.1 Western Pacific
    - 4.1.2 IOC Perth Regional Programme Office Activities (Pacific and Indian Oceans)
    - 4.1.3 Africa
    - 4.1.4 The S.E. Pacific and S. Atlantic
    - 4.1.5 The Caribbean
  - 4.2 NEEDS AND PRIORITIES OF THE GOOS ADVISORY PANELS
  - 4.3 NEEDS AND PRIORITIES OF OTHER GOOS BODIES
  - 4.4 NEEDS AND PRIORITIES OF OPERATIONAL AGENCIES AND INDUSTRIAL SECTORS
- 5. FUNDING MECHANISMS TO SUPPORT GOOS CB**
  - 5.1 PRESENT ARRANGEMENTS
  - 5.2 FUTURE OPPORTUNITIES
- 6. THE ROLE OF OPERATIONAL AGENCIES AND TERTIARY EDUCATIONAL INSTITUTIONS IN GOOS CB**
- 7. DEVELOPING SYNERGIES AND AVOIDING DUPLICATION**
  - 7.1 JCOMM
- 8. CAPACITY BUILDING WORK PROGRAMME**
  - 8.1 TRAINING REQUIREMENT FOR *IN SITU* OBSERVATIONS
  - 8.2 ACTION PLAN
- 9. OTHER BUSINESS**
- 10. CLOSURE**
- 11. ACTION LIST**

ANNEX II

LIST OF PARTICIPANTS

**I. Panel Members Attending**

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## ANNEX III

### **ACTION PLAN** (version 1.3), Phase I, Lifecycle 2002-2004

Global Ocean Observation System (GOOS)

### **CAPACITY BUILDING PROGRAMME**

#### **Reference Documents**

1. GOOS Report 69
2. GOOS Report 106
3. First GOOS Capacity Building Meeting Report

#### **CONTEXT**

Mission Statement:

**“To develop the capacity building needed to ensure the growth, development, sustenance and evolution of GOOS worldwide”**

Long-term Objective:

**“Build a solid foundation for global operational oceanography to ensure the complete development of GOOS by 2008-2010”**

This requires:

- Awareness-raising
- Education and training
- National and regional support structures
- Networks and partnerships
- Broad infrastructure
- Communication
- Mutual assistance

In order to:

- Develop and maintain the scientific capacity required for GOOS
- Raise understanding and awareness of value of observations and their benefits
- Facilitate the creation of baseline networks in critical areas
- Raise abilities to participate in and benefit from GOOS

We already have:

- Statement of Principles (GOOS 69)
- Implementation Strategy (GOOS 106)
- Capacity Building Panel
- Shared responsibility with the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) Capacity Building Programme Area Coordination Group (CBCG)
- Existing capacity building activities (e.g., International Ocean Data and Information Exchange (IODE), UNESCO Bilko project)

- Existing Partnerships (e.g., POGO, IGOS Partners)
- GOOS Project Office staff in Paris, Bangkok, Perth, Rio and Cartagena with part-time responsibilities for CB.
- Regional GOOS Alliance Secretariats with similar part-time responsibilities (e.g. MedGOOS)
- Approximately \$250,000 annually in programme costs in support of GOOS-CB.

## **THE ACTION PLAN**

The Action Plan details the short-to-medium-term objectives, the actions and the timeframes required to realise selected high-priority objectives. We see GOOS Regional Alliances as essential for implementation. Therefore it is suggested that the Action Plan is used as a template by national and regional GOOS bodies and GOOS technical panels. We also see Partnerships being critical to meeting the objectives. The Action Plan builds on existing initiatives and is expected to evolve as targets and priorities change; for this reason this Action Plan is considered to represent phase I of the GOOS capacity building programme.

## **GOOS Capacity Building Actions and Activities**

The following are considered key action areas (Vertical Pillars) of GOOS capacity building:

- Infrastructure
- Remote sensing
- *In situ* observations
- Ocean models and forecasting
- Data and information management exchange and delivery.

The following are seen as key horizontal cross-cutting activities:

- Multidisciplinary oceanographic training and education
- Calibration and standards
- Paying attention to cultural and language diversity
- Outreach and raising awareness including schools and policymakers
- Development of networks
- Communication and liaison
- Fund-raising
- Documentation, including manuals and handbooks (removing language barriers)
- Technology transfer (including software and hardware)
- Regional activity centres
- Regional workshops.

## **Conceptual framework**

GOOS will develop at the ocean basin to global scale, with the implementation and growth of projects like the Global Ocean Data Assimilation Experiment (GODAE), the Argo profiling float programme, the Ship of Opportunity Programme (SOOP), the global distribution of surface drifting floats, equatorial buoy arrays, and ocean surveillance from satellites. GOOS will also develop at the regional level through GOOS Regional Alliances of countries with a common interest in a particular water body, like the Caribbean or the Mediterranean. And GOOS will develop at the national level through the exchange of information collected by parts of national observing systems. Capacity building is needed to improve performance at all three levels, and to enable developing countries in particular to participate in, benefit from, and contribute to GOOS.

## Specific Actions Required to Implement Phase I

1. Create and sustain a capacity building staff position within the IOC to coordinate capacity building activities.
2. Create an information system to avoid duplication of capacity building initiatives of relevance to GOOS (e.g., calendar of activities).
3. Improve the data and information management networks and exchange in support of GOOS by strengthening collaboration with IODE's Ocean Data Information Network (ODIN) and OceanTeacher to make effective use of the experience gained and groundwork done by IODE.
4. Develop a web portal (gateway to internet-based information sources) to provide a comprehensive information resource of ocean activities relevant to GOOS, making use of IODE's dynamic content management system and Ocean Portal.
5. Create a set of "Start-up packs" following the example provided by the IODE Resource Kit and focussing on operational oceanography.
6. In consultation with JCOMM, WMO and CEOS, develop a plan to guide capacity building in remote sensing.
7. Improve knowledge of, and training in the use of, oceanographic remote sensing in support of the development of GOOS data products and services, by capitalising on the UNESCO Bilko project (e.g., to create introductory and regional distance learning modules).
8. In consultation with JCOMM, improve knowledge and training in the use of oceanographic *in situ* methods and data in support of the development of GOOS data products and services, for instance by creating appropriate distance-learning modules (e.g., using netCDF and ncview)
9. In consultation with JCOMM and WMO, develop a plan for CB in ocean modelling and forecasting, including the development of a pool of freely available numerical models.
10. In cooperation with JCOMM and other partners, explore the possibility of an infrastructure-sharing programme to facilitate the exchange of technology, equipment and services between countries (e.g., a Voluntary Cooperation Programme, VCP).
11. Providing alternative mechanisms to the Internet for access to all GOOS materials (e.g., CDs).
12. In association with IOI, assemble educational material to explain the benefits and applications of global observations to students. This would use, for example, games-based learning packages (targeted at schoolchildren) and Argo profile data as in the SEREAD project for high-school students.
13. Provide information about educational materials and initiatives currently available from national and international agencies (Met offices, Space agencies, Navies etc.) for graduate and postgraduate students, and technical staff.
14. In cooperation with I-GOOS and the JCOMM Task Team on Resources, acquire the necessary resources to implement Phase I.

The GOOS Capacity Building Panel and the GOOS Project Office in consultation with the GSC, I-GOOS and relevant partners, will devise precise plans, schedules and costs for implementing each of these specific actions. Mini-proposals will be required for each specific action before end January 2003.

## GOOS Capacity Building Program Evaluation

The programme will be evaluated as follows:

1. Proposal evaluation: see Implementation Plan Annex IV, GOOS Report 106.
2. Project evaluation on completion (see CB Principles, pages 7 and 8, GOOS Report 69)
3. Programme evaluation and review (see CB Principles, pages 7 and 8, GOOS Report 69)

Appropriate parts of the evaluation will be made in association with JCOMM.

## ANNEX IV

### LIST OF ACRONYMS

ABE-LOS	Advisory Body of Experts on the Law of the Sea
ASEAN	Association of South-East Asian Nations
BMTC	Bremen Maritime Training Centre (Germany)
BOOS	Baltic Operational Oceanographic System (Baltic GOOS)
CB	Capacity Building
CBCG	Capacity Building Programme Area Coordination Group (of JCOMM)
CD-ROM	Compact Disk with a Read-Only Memory
CEOS	Committee on Earth Observing Satellites
CGMS	Coordination Group for Meteorological Satellites
CMA	China Meteorological Administration
CNES	Centre National d'Etudes Spatiales (France)
COOP	Coastal Ocean Observations Panel
CPPS	Permanent Commission for the South Pacific
CSI	Coastal and Small Islands Programme (UNESCO)
EC	European Commission
ESA	European Space Agency
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EuroGOOS	European Programme for the Global Ocean Observing System
GCOS	Global Climate Observing System
GEF	Global Environment Facility
GMES	Global Monitoring for Environment and Security
GLOSS	Global Sea-Level Observing System
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GPO	GOOS Project Office
GSC	GOOS Steering Committee
HAB	Harmful Algal Blooms
IGOS	Integrated Global Observing Strategy
I-GOOS	Intergovernmental Committee for the Global Ocean Observing System
IOC	Intergovernmental Oceanographic Commission (UNESCO)
IOCARIBE	IOC Sub-Commission for the Caribbean and Adjacent Regions
IOCCG	International Ocean Colour Coordinating Group
IOCINDIO	IOC Regional Committee for the Central Indian Ocean
IOCINCWIO	IOC Regional Committee for the Cooperative Investigation in the North and Central Western Indian Ocean
IOGOOS	Indian Ocean GOOS
IODE	International Oceanographic Data and Information Exchange
IOI	International Ocean Institute
IOIVU	International Ocean Institute Virtual University
JAMSTEC	Japan Marine Science and Technology Centre
JMA	Japan Meteorological Agency
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM In Situ Observing Platform Support Centre
LME	Large Marine Ecosystem
MedGOOS	Mediterranean GOOS
NASA	National Aeronautics and Space Administration (USA)
NEAR-GOOS	North-East Asian Regional GOOS
NESDIS	National Environmental Satellite, Data and Information Service (of NOAA)
NOAA	National Oceanic and Atmospheric Administration (USA)
NODC	National Ocean Data Centre
NOOS	Northwest Shelf Operational Oceanographic System

OC	Operational Centre
ODIN	Ocean Data and Information Network /IODE
ODINAFRICA	Ocean Data and Information Network for Africa
ODINCARSA	Ocean Data and Information Network for the IOCARIBE and South America regions
OOPC	Ocean Observations Panel for Climate
POGO	Partnership for Observations of the Global Ocean
QC	Quality Control
RSP	Regional Seas Programme
SCOR	Scientific Committee on Ocean Research
SEA-CAMP	South-East Asian Centre for Atmospheric and Marine Prediction
SEA-GOOS	South East Asia regional GOOS
SERREAD	Scientific Educational Resources and Experience Associated with the Deployment of Argo Floats
SOOP	Ship-of-Opportunity Programme
SOPAC	South Pacific Applied Geoscience Commission
TAO	Tropical Atmosphere Ocean Array
TEMA	Training, Education and Mutual Assistance in Marine Sciences
TRITON	Triangle-Trans-Ocean Buoy Network
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VCP	Voluntary Cooperation Programme
VL	Virtual Laboratory
WAGOOS	Western Australia Global Ocean Observing System
WCRP	World Climate Research Programme
WDC	World Data Centre
WESTPAC	IOC Sub-Commission for the Western Pacific
WHOI	Woods Hole Oceanographic Institution (USA)
WIOMAP	Western Indian Ocean Marine Applications Project
WMO	World Meteorological Organization
WSSD	World Summit on Sustainable Development, Johannesburg, 2002
WOCE	World Ocean Circulation Experiment
WWW	World Weather Watch (WMO)
XBT	Expendable Bathythermograph

In this Series, entitled

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

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (**Also printed in Spanish**)
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping (**Also printed in French and Spanish**)
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica (**Spanish only**)
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources (**Also printed in French and Spanish**)
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (**Also printed in French**)
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities (**Also printed in Spanish**)
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (**Also printed in Spanish**)
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic (**Also printed in French**)
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (**Also printed in Spanish**)
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping

59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System
61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Inter-calibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans **(Also printed in French)**
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' **(Spanish only)**
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico **(Also printed in Spanish)**
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO<sub>2</sub> Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS CO<sub>2</sub> Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" **(Spanish only)**
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic **(Also printed in French)**
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
119. First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997

121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997
122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997
123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997
124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 (**also printed in Spanish**)
125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997
126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997
127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998
128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997
129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997
130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998
131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997
132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997
133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998
134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997
135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998
136. Seventh Session of the Joint IOC-JGOFS C02 Advisory Panel Meeting, Germany, 1997
137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998
138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998
139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998
140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998
141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 (**Spanish only**)
142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998
143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998
144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999
145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999
146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999
147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999
148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999
149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999
150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999
151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999
152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999
153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999
154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998  
IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998
155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999
156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 (**also printed in Spanish and French**)
157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999
158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999
159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999
160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000
161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000
162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000
163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000
164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000
165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 (**also printed in Spanish and French**)
166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000
167. First GOOS Users' Forum, 2000
168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001
169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 (**also printed in French**)
170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001
171. First Session of the IOC-SCOR Ocean CO<sub>2</sub> Advisory Panel, France, 2000
172. *Cancelled*
173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 (**also printed in Spanish and French**)
174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001
175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001
176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000



177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 (**also printed in French**)
178. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002
179. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002
180. Second Session of the IOC-SCOR Ocean CO<sub>2</sub> Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 (**electronic copy only**)
181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) (**electronic copy only**)
182. Third Session of the GOOS Users' Forum and Coastal Ocean Observations Panel, Vietnam, 2002
183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002
184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 (**electronic copy only**)
185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001
186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 (**electronic copy only**)