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

# Implementation of Global Ocean Observations for GOOS/GCOS

**Second Session**
Paris, France
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## 1. OPENING

### 1.1 OPENING OF THE MEETING

The second meeting to develop an Implementation Action Plan for Global Ocean Observations for GOOS/GCOS opened at Meteo-France at 0915 hrs on Monday November 30, 1998. Dr.François Gérard, representative of the host organization, welcomed participants to Météo-France.

Dr. Angus McEwan then welcomed the attendees, explaining that this was the first meeting of the Interim Implementation Advisory Group (IIAG), of which he was Chairman, and which had been formed following the Workshop on the Implementation of Global Observations for GOOS/GCOS, which took place on March 4-7, 1998, in Sydney, Australia, to take forward the Action Plan. In addition to the Chairman, the IIAG comprises representatives of the Ocean Observations Panel for Climate (OOPC), the WMO's Commission on Marine Meteorology (CMM), the CMM's Voluntary Observing Ship (VOS) programme, the Ship of Opportunity Programme Implementation Panel (SOOP-IP) of the Integrated Global Ocean Services System (IGOSS), the International Oceanographic Data and Information Exchange programme (IODE) of the IOC, the Data Buoy Cooperation Panel (DBCP), the Tropical Atmosphere Ocean Implementation Panel (TAO-IP), and the Global Sea Level Observing System (GLOSS), along with representatives of the Secretariats of WMO and IOC. Dr. McEwan invited participants to introduce themselves. Apologies were noted from Dr. Nagasaka. The list of participants appears in Annex I.

### 1.2 ADOPTION OF THE AGENDA

The workshop adopted an agenda provided by the Chairman.

### 1.3 WORKING ARRANGEMENTS

The participants agreed on hours of work and other logistical arrangements. Documentation was introduced by the Secretariats.

## 2. OVERVIEW OF THE ACTION PLAN

Participants were provided with version 3.1 of the draft Action Plan (full title: **Global Ocean Observations for GOOS/GCOS: An Action Plan for Existing Bodies and Mechanisms**), which was missing Annexes IV (planned workshops and meetings relevant to implementation) which remains to be created, and VI (the wiring diagrams explaining the organisation of implementation). Sections 5, 6, and 7 were incomplete and would be the focus of the meeting. Section 2 required condensing.

In terms of outputs, it was agreed (i) that a report would be made of the meeting; (ii) that the Action Plan would be published by the GPO as a GOOS and GCOS Numbered Report in the GOOS Series; and (iii) that the reports of this meeting and the Sydney meeting would be published on the GOOS Homepage on the Web, with condensed versions appearing in the GOOS and GCOS Newsletters. These reports too would be given GOOS and GCOS numbers.

**[ACTION 1: Secretariat to arrange publications.]**

## 3. REVIEW OF ACTIONS AND EVENTS SINCE THE SYDNEY WORKSHOP

### 3.1 STATUS OF THE JOINT WMO-IOC TECHNICAL COMMISSION ON OCEANOGRAPHY AND MARINE METEOROLOGY (J-COMM)

Colin Summerhayes circulated copies of the Resolution made the previous week by the IOC Executive Council (EC) to endorse the concept that the CMM and IGOSS be merged to form a new jointly sponsored single body for oceanography and marine meteorology (J-COMM). This proposal had been endorsed by the WMO-EC in June 1998. Peter Dexter explained that the CMM and IGOSS would effectively disappear with acceptance of the endorsements of the two bodies by the WMO Congress and the IOC Assembly by July 1999, following which JCOMM could be created. The Secretariats are now working on the papers required to present the case to the Congress and the Assembly. The meeting at which J-COMM will be set up is being planned for St Petersburg, Russia, during the week of July 19th, 1999, and should be attended by the IIAG members. The first formal meeting of J-COMM is likely to take place in the year 2000, and J-COMM will meet at 4-yearly intervals thereafter. Recognizing that a substantial amount of work may be needed by J-COMM during its early

years, a J-COMM management group may be created to meet annually to take care of business between sessions.

The IIAG has an opportunity through the Action Plan to shape the course of J-COMM, provided that the Plan is published before the St Petersburg meeting. The IIAG will eventually be superseded by JCOMM, and specifically by its management group.

3.2 PROGRESS WITH GOOS

Colin Summerhayes briefly described progress with GOOS since the last meeting. The GOOS Steering Committee (GSC) met for the first time in April and set the broad directions for GOOS implementation. It authorized production of "The GOOS 1998", a Prospectus, which was published in November and was well received at the IOC Executive Council. The new Living Marine Resources (LMR) and Coastal Module Panels (C-GOOS) met for the first time in March 1998, and reports of those meetings have now been published. The GSC agreed that C-GOOS should take a fast track, with two meetings a year, so as to produce an implementation plan for coastal seas by the end of 1999.

The Coastal Panel met for the second time at the end of October, in Curitiba, and identified the main lines of the design for a coastal observing system. The design will comprise a coarse resolution Global Coastal Network embedded in which will be higher resolution sets of observations in the form of pilot projects to demonstrate the working of some particular aspect of GOOS, or of measurements for particular purposes - for instance transects across key straits. The initial focus of the observing system will be on physical measurements, which are relatively easy to make, can be designed to address key issues, and can be implemented immediately. Biological and chemical measurements will be needed, but at present the science is not sufficiently far advanced to make it clear in many instances what should be measured to meet the needs of coastal resource managers. In those cases C-GOOS will identify the research needs that have to be met before the biological and/or chemical parts of the observing system can be developed. An initial design for the Global Network of physical observations will be completed by the next meeting (April 1999), at which a set of initial C-GOOS pilot projects will be agreed upon.

Good progress is being made in developing regional GOOS programmes in Europe (EuroGOOS) and N.E. Asia (NEAR-GOOS), and some new regional GOOS programmes have started, including PacificGOOS around the Pacific islands, and MedGOOS in the Mediterranean. All of the regional programmes tend to focus on implementation in coastal seas, apart from EuroGOOS, where there is an ocean basin dimension as well, which includes the Atlantic and the Arctic.

At the global level the GOOS Initial Observing System (GOOS-IOS) was inaugurated this year, and ties the existing observing systems together into what we hope will become a more efficient and effective operation. The Global Ocean Data Assimilation Experiment (GODAE) (see section 3.3, below) is now active, and a GODAE Office has been set up in Melbourne, with Neville Smith as its first Director.

In early November 1998 the Fourth Conference of the Parties (COP4) to the Framework Convention on Climate Change (FCCC) considered a report compiled by GCOS with the assistance of GOOS and GTOS on the adequacy of climate observing systems. The thrust of the report was that the present systems were inadequate in the range of measurements made and their geographic coverage, and that the numbers and kinds of measurements were decreasing. COP4 recommended that Governments put much more effort into monitoring the climate system and man's effect on it, and included a recommendation to collect more ocean measurements, especially from data sparse areas like the Southern Ocean. In addition more capacity building was called for to enable developing countries to contribute to and benefit from global climate observations. Hopefully the COP4 resolution will lead to increased investment in GOOS and GCOS.

3.3 OOPC

Neville Smith provided details of progress made by the GCOS/GOOS/WCRP Ocean Observations Panel for Climate (OOPC). He noted that the Panel is striving hard to realize the recommendations of the OOSDP Report (and its subsequent modifications) through a variety of channels. The GOOS-IOS, GODAE and focused activities (the Sea Level Workshop; the recent SST workshop, etc.) provide one avenue. The proposed J-COMM provides a mechanism for integrating and focusing several of these activities.

For SST, the OOPC recently co-hosted a Workshop to look at the adequacy of the network with respect to climate change problems. The workshop identified several problem areas including the assembly and interpretation of ice concentration data used in SST analyses.

In the subsurface, the major issues relate to the detail of the post-TOGA/WOCE thermal sampling program and, in particular, to the SOOP network. The sampling design needs to be revisited in the light of the ENSO observing system (mainly TAO), the record of XBT sampling over the past decade, and the prospects for other direct (e.g., ARGOS and indirect (e.g., altimetry and acoustic thermometry) networks. Strategies for hydrographic sections and for deep measurements need to be considered as well.

The many gaps in the subsurface system should be plugged by the Argo array of 3000 or so PALACE floats which will be distributed globally to collect vertical salinity and temperature profiles every two weeks or so over periods of 2 to 4 years from depths of about 2000 m to the surface. The Argo array will not replace the TAO array, nor will it make the SOOP network obsolete. The challenge is to identify and exploit complementarity. Argo will not solve all subsurface measuring problems. For instance it will not help much with western boundary currents, as subsurface floats tend to either ground or spin out of the current in eddies. The lifetime of the floats depends on improvements in technology, such as a two-way communication capability in System ARGOS, which - when it is available - will double the life span of subsurface floats by requiring them to spend less time at the surface telemetering information to satellites, thereby reducing demands on batteries.

The OOPC is also considering implementation of Global Eulerian Observatories (GEO), which are in essence 12-30 carefully picked time series stations at which a multiplicity of different measurements will be collected on a permanent basis. The idea is to re-occupy with modern moorings some of the sites formerly occupied by ocean weather ships, or to revisit the sites with research ships on a regular basis. Continuation of measurement at these sites will provide long records going back decades through the periods when weather ships were on site, to illustrate climate trends. In addition, meteorological agencies are accepting that having GEO sites as surface reference flux sites to validate operational ocean models of surface fluxes is an important strategy. GEO sites could act as multi-disciplinary natural laboratories.

**[ACTION 2: P. Woodworth to explore the possibility of emplacing bottom pressure recorders at GEO sites].**

GODAE is one of OOPC's initiatives. It is meant to help to put the global operational system in place and test it to its full extent for the first time; GODAE is not essential for climate and should not be 'sold' as such. However GODAE will extend the boundaries of predictions in time and space, and demonstrate the vital links between coastal seas and the open ocean; GODAE is important for providing improved boundary conditions for coastal forecasting models. It provides a means of demonstrating to the operational agencies that by integrating both *in situ* and satellite data the output is far improved over what it would be without that integration. What we need to make it work are the models, the assimilation techniques, and global subsurface data like those intended to be provided by Argo.

Satellites are another of OOPC's concerns. They are integral to the operation of GOOS, and certain of their observations are essential (e.g. SST, altimetry, scatterometry). We need better quality measurements on finer scales. We also need guarantees of continuity. At present SST is only part-guaranteed through the operation of NOAA Polar Orbiting satellites and Geostationary satellites. The JASON-2 altimetric mission (or its equivalent) is not guaranteed.

One of the issues facing OOPC, and research programmes like CLIVAR, is how to reach consensus on the mix of methods that should be supported on a sustained basis. In order to reach this consensus, a Conference on Ocean Observations for Climate is being planned for the third week of October 1999. The conference will encompass *in situ* and satellite measurements and data management. It is timely because the utility of ocean observing systems for scientific purposes has now become widely recognized. Part of the preparations for the Conference will include analyses of the adequacy of surface and subsurface observing systems, possibly by consultants. These analyses will be needed also for the follow up to the COP4 resolution, which requires annual reports to the COP of the FCCC on the nature and adequacy of the climate observing system. This same work was planned as part of the Action Plan.

3.4 GLOSS

Phil Woodworth indicated that the GLOSS Group of Experts (GE) is now working to follow the GLOSS Implementation Plan. Regional Coordinators are being increasingly relied upon to ensure the necessary actions are taken. East Africa is working well; West Africa not so.

Because the cost of GPS receivers has fallen, it has been possible to equip most Atlantic island tide gauge sites with them, thereby improving the use of the sites for calibrating altimetric data. Adding GPS receivers at all GLOSS tide gauge sites may not be feasible, especially in developing countries, as it doubles the cost of equipping a site. Recognizing this, GLOSS is now looking for external sponsorship from industry.

Training materials such as CD-ROMs and Web-based materials are now needed for training courses, in order to make training more widely available at lower cost. Developing countries favour the use of Fellowships to develop skills.

At the International Sea Level Workshop conducted in Hawaii on June 10-11, 1997, under the auspices of the OOPC and the CLIVAR (UOP), and under the sponsorship of NOAA, it was suggested that scientific advice on sea level, especially for climate, should be supplied by a scientific advisory panel. In discussions about whether this need could be met by the GLOSS-GE, or by a newly formed sub-group of the GLOSS-GE, or by some new independent group, a preference was expressed by some to create a new independent group. Views were not unanimous. The IIAG should consider whether scientific advice needs to be completely separate from implementation oversight. As presently constituted the GLOSS-GE is supposed to provide both scientific advice and implementation oversight. This twin responsibility is typical of many of the existing operational bodies (such as DBCP, IGOSS, CMM and WMO's CBS).

**[ACTION 3: IIAG together with the GLOSS Group of Experts to decide whether or not we need a separate body to provide advice on sea level, or if it can be provided through an expanded GLOSS-GE).**

3.5 TAO ARRAY

Mike McPhaden talked about the TAO Implementation Panel (IP), which is a body that provides both implementation oversight and scientific advice. The TAO-IP, which is sponsored by GOOS and reports to the OOPC and the CLIVAR-UOP, is now an action group of the DBCP. The TAO-IP is keen to ensure widespread distribution of TAO data; scientific utilization of the data; geographical expansion of the array (e.g. into the Atlantic with PIRATA, and into the Indian Ocean with Japanese TRITON buoys); and technological enhancement of the array (e.g. like the recent additions of rainfall and salinity measurements).

At the seventh session of the TAO-IP in Abidjan (November 11-13, 1998), the scientific themes had been ocean salinity measurements, and the hydrological cycle over the oceans.

Japan is taking over management of the western part of the TAO array, replacing the ATLAS buoys with more TRITON buoys at 12 sites. The transition to TRITON should be completed by the end of 1999.

PIRATA (Pilot Research Array in the Tropical Atlantic) is a 3-year project, which, if it is successful, could become a permanent operational programme.

The TAO-IP meeting had addressed the issue of vandalism. The buoys vandalized most often in the TAO array are those towards the eastern and western ends, nearest to land, where fishing activity is concentrated (especially the western end, which is home to the world's largest tuna fishery). Mike used photographs to prove that equipment had been deliberately cut from buoys.

Given these experiences, vandalism could prove to be a costly problem for Coastal GOOS, when coastal observing system buoys are deployed. Mike reported that ATLAS buoys deployed in the South China Sea were sabotaged within weeks. Because some of the removed equipment contained System Argos transmitters, it had proved possible to track where it went (to Da Nang, Vietnam). It has been reported by Johannes Guddal of CMM that to prevent vandalism of SEAWATCH buoys off Vietnam, they have to be protected by the Vietnamese Navy.

Clearly vandalism by fishermen is a threat to moored devices for climate observation. Recognizing this problem, the IOC-EC, at its meeting in Paris (November 17-27, 1998), passed a resolution about the need to act against vandalism.

One way to deal with the problem may be through education. The TAO-IP has issued leaflets in several languages to fishing organizations and fishing boats, but so far without effecting any significant decrease in vandalism. One remedy may be to simply rely on alternative means of collecting the required measurements in hard hit areas, e.g. from subsurface buoys, ships of opportunity, and/or satellites.

3.6 DBCP

Etienne Charpentier presented the DBCP, and its activities. Currently (November 1998) there are 695 buoys distributing about 6000 observations/day onto the GTS. Nearly every buoy measures SST. About 250 buoys measure air pressure. By the end of this year the meteorological data from Indian moored buoys (NIOT) should be distributed on the GTS (the subsurface data from those buoys remain embargoed by the Indian Navy).

Thanks to improvement of numerical models and comparison of observed data with the first guess field (e.g. ECMWF, NCEP, Météo France, UKMO) it was shown that the quality of drifting buoy data is excellent for SST (65% RMS (Obs.-FG) < 1C with NCEP model), air pressure (55% RMS (Obs.-FG) <1 hPa with ECMWF model), and wind speed (65% RMS (Obs.-FG) < 2m/s with ECMWF model).

Since the establishment of the DBCP, cooperation has increased between meteorologists and oceanographers. The so called SVP Barometer drifter (SVPB) was developed under WOCE at Scripps Institution of Oceanography and was tested by a number of meteorological agencies. The SVPB drifter is useful to oceanographers because it is a Lagrangian drifter, and to meteorologists because it is equipped with a barometer and transmits its data onto the GTS. SVPB drifters, which are low cost, are now deployed in large quantities in the world oceans and are an excellent source of *in situ* SST and air pressure data. New developments are being conducted to produce Lagrangian drifters also capable of measuring wind, thanks to the WOTAN technique (Wind Observation Through Ambient Noise). Early results are very promising.

The DBCP 'pillars' are its Action Groups. These now include :

(i) the European Group on Ocean Stations (EGOS) for the North Atlantic;
(ii) the International Arctic Buoy Programme (IABP);
(iii) the International Programme for Antarctic Buoys (IPAB);
(iv) the International South Atlantic Buoy Programme (ISABP);
(v) the International Buoy Programme for the Indian Ocean (IBPIO);
(vi) the Global Drifter Programme (GDP);
(vii) the Tropical Atmosphere Ocean (TAO) Implementation Panel (TAO-IP) [as mentioned in 3.5 (above)].

Météo France is producing for the DBCP so called Data Availability Index Maps (DAIM), which show for basic variables (air pressure, SST, wind speed, air temperature) how well requirements of 8 observations per day for an area of 500Km*500Km are met (index 100). These maps also show the percentage of buoy data compared to total ship plus buoy data which contribute to meet the displayed index value. These maps are very useful to identify data sparse area for given variables, and consequently aid adjustment of deployment plans.

The DBCP has recently completed an Implementation Plan and is defining its deployment strategy to optimize deployments according to defined WWW, GOOS and GCOS requirements. The DBCP Implementation Plan will be integrated within the GOOS/GCOS action plan.

3.7 IODE

Ben Searle noted that IODE's Ocean-PC programme software is now incorporated into the IODE resource kit for training activities.

IODE is now working to get the commercial community integrated into the data collection process. Large quantities of commercial data are potentially available, and could be useful to GOOS and GCOS. Many of these data start by being commercial in confidence, but can be released after a time.

IODE is currently considering its strategy for the future and engaging in discussions with various potential stakeholder groups including the EU, NOAA, the US Navy, and UNEP, among others, looking for better methods for data management, and to avoid duplication of effort.

IODE is fully supportive of GOOS and is a partner in the IGOSS-IODE data management strategy for GOOS which was published in 1996. IODE offers a mechanism for long term archival of the high resolution data collected through GOOS operations.

IODE presently covers 65 countries. Japan is sponsoring a conference in Malaysia next year to persuade other (especially Asian) countries to join, and to help make the system operational. Progress is bedeviled by institutional problems (particularly the lack of integration and data exchange between different national data collecting agencies), and by the sensitivities of navies, many of whom are the key holders of national ocean data collections.

The difference between real-time and delayed-mode data is gradually disappearing, thereby potentially changing the role and function of the IODE.

In the context of J-COMM, IODE can develop protocols and structure for data exchange and management, and assist with data integration.

The question was posed - how can we develop an integrated system for the management of oceanographic and marine meteorological data without IODE being in it? The favoured answer has been that IODE serves not only GOOS clients, but also many customers who sit well outside the group covered by J-COMM, GOOS and GCOS. But, many of the groups within J-COMM (like DBCP) also have customers outside GOOS and GCOS. The IIAG concluded that it should proceed as if IODE is an integral part of the J-COMM process, and that the interface between the two should be transparent.

3.8 SOOP-IP

Rick Bailey told participants that the SOOPIP met last month, in Noumea. It is in the process of developing a Strategic Implementation Plan, which will indicate its role in servicing the needs of GOOS and GCOS. Upper ocean thermal data is collected along approximately 50-60 lines by approximately 80-100 vessels. The programme is global in scope, but it is supported mainly by five core countries. Although most of the measurements concern upper ocean temperature, there are also some measurements of surface and subsurface salinity along a number of lines, and proposals in place for biological and chemical sampling. After withdrawal of support for the IGOSS Coordinator position during 1997, new arrangements and funding have been made to support the position from 1999 onwards. The Coordinator for the programme will now be Etienne Charpentier, who will also continue his work with the DBCP.

Extensive programme monitoring and data quality activities continue to be implemented in conjunction with GTSPP. Feedback mechanisms have been instigated to ensure data flow and quality. Changes in the practices of shipping companies, however, in response to increasing competition and the drive for increased efficiency, mean that it has not been possible to maintain all the SOOP lines. Several lines are now under-sampled or not sampled at all due to the lack of shipping. SOOPIP is therefore trying to coordinate and focus resources to ensure those well sampled lines are maintained to meet the OOPC and previous TOGA/WOCE recommendations. Coverage is therefore variable. The Pacific and North Atlantic remain relatively well sampled, whereas in the South Atlantic many lines are not being sampled at all at present. Some lines are beginning to disappear in the Indian Ocean, and all efforts are being made to correct the situation. Sampling in the Southern Ocean remains weak due to the obvious lack of regular shipping, although efforts are being made to ensure the optimal use of all existing shipping wherever possible.

The proposed ARGO programme is clearly becoming increasingly desirable as a means of filling gaps in the collection of subsurface data. An integrated subsurface programme, in conjunction with other platforms such as TAO, OTS, etc, is therefore clearly desirable to ensure ongoing success of subsurface monitoring. Other requirements are (I) improved coordination with the WMO's VOS programme, and (ii) persuading more Navies to contribute their subsurface data.

Some problems continue to exist in the transition of SOOP from research to an operational programme. Countries such as the US and Australia have shown commitments to maintain their activities on an operational basis, however, problems still exist in obtaining operational funding for the program in France, Japan and Germany.

3.9 VOS

Peter Dexter briefly reported on progress in the WMO's VOS programme, which will have a meeting of its oversight group in Athens in March 1999 to evaluate the performance of the system and the way in which it needs to change to meet new requirements, like those from GOOS and GCOS, and to coordinate more closely with SOOP.

## 4. ACTION PLAN REVIEW AND REVISION

4.1 CURRENT STATUS OF OBSERVING SYSTEMS IN RELATION TO REQUIREMENTS

Section 5 of the Action Plan should be re-titled **"The Initial Observing Systems for Physical Observations for GOOS/GCOS."**

This section should start with a statement about the adequacy of the observing system, which can be extracted from the recommendations of the report made by GCOS for the Subsidiary Body for Scientific and Technological Advice (SBSTA) for COP4, and endorsed by COP4 in Buenos Aires in November 1998.

**[ACTION 4: Colin Summerhayes to provide details from SBSTA and COP4]**

The text will take sections 3 and 4 of the draft Action Plan as a starting point (Existing Operational Implementation Mechanisms, and Data Management and Exchange Mechanisms), and describe what these lead to in the way of the requirement for a global marine meteorological and oceanographic observing system.

Section 5.1 will begin with an analysis and description of the system, using the headings from the left hand column of the table in Annex II of the draft Action Plan, detailing the requirements, the remit and the scope of the system. The description will also use the wiring diagram for J-COMM, currently Annex VI of the draft Action Plan. Remote sensing from satellites will be included, and not separate from this description. The end product will be a statement of what J-COMM should be concerned with as far as GOOS and CGOS are concerned.

Section 5.2 will then turn to the main categories and issues, in particular surface, subsurface and sea-level, expanding on section 5.2 of the draft Action Plan and using the text from the right-hand columns of Annex II of the draft Action Plan. The end product will be a description of how we propose to develop a structure for implementation.

Section 5.3 will then describe the status of specific networks, such as ENSO, platforms (including satellites), and models, and discuss how they map across onto the new section 5.2 and contribute to meeting the requirements. Neville Smith offered the following model for the construction of the new section 5.3:

The ENSO network:
- data and information flows
- quality assurance
- archiving standards
- resources
- technical support

Remote Sensing SST (copy for scatterometry, altimetry, sea-ice, communications etc):
- the several platforms (e.g. including AVHRR)
- data and information flow
- spatial resolution (is sub-critical)
- archiving (is not satisfactory)

In describing the status of SOOP lines, it should be borne in mind that the lines that have been occupied for longest have the most value.

In describing the present networks an attempt needs to be made to estimate what percentage of the described networks are funded through research programmes and therefore are not guaranteed sustained support.

An analysis of the status of WWW observations should be included, which means that WWW requirements have to be added to Section 2 of the Action Plan.

**[ACTION 5: Peter Dexter to add WWW parts to sections 2 and 5.]**

Section 5.1.4 of the draft Action Plan should be included in the new section 5.3, but needs modifying to include a page on Experimental Operational Systems that are Pilot Candidates for eventual addition to the GOOS Initial Observing System. These include for instance: PIRATA, ARGO, ATOC, Global Bottom Pressure Recorder Network, and GEO. One paragraph will be needed for each and it should be made clear (i) that their inclusion is no guarantee of eventual acceptance, and (ii) that the list is not exhaustive.

Similarly section 5.1.4 of the draft Action Plan needs modifying to split out the regional GOOS programmes, for each of which a descriptive paragraph should be supplied indicating its objectives and present status in relation to the Action Plan.

**[ACTION 6: Colin Summerhayes to draft a modification to section 5.1.4]**

Section 5.3 will also include a sub-section on the status of measurements of the individual variables listed in Table A of Annex I of the draft Action Plan, when those variables are not covered adequately by the system descriptions.

The reports of the latest Global Observing System Space Panel (GOSSP) and OOPC meetings should be used for reference material on satellite activities. The text needs to explain more clearly that the

requirements in Table A of Annex I of the draft Action Plan include both satellite and *in situ* data. It also needs to spell out the need for continuity of satellite measurements.

Section 5.3 will include the combination of these elements into the GOOS Initial Observing System and its physical components (i.e. excluding the Global Coral Reef Monitoring System, which is not relevant for GCOS). In effect it will be a description of the status of the physical components of the GOOS Initial Observing System.

**[ACTION 7: Colin Summerhayes to provide draft of the latest GOSSP Report.]**

Statistics such as those presently provided by Météo-France on the extent to which requirements are met in individual 500 km squares should be provided for the individual variables listed in Table A of Annex I of the draft Action Plan.

Section 5 will conclude in section 5.4, which should be an expansion of section 5.3 of the draft Action Plan, with a statement about responsibilities, addressing the actions required to implement and maintain the system. The text should recognise that the IIAG is not the responsible body for satellite data; care will be needed to address the remote sensing issue adequately, especially in the future in J-COMM. The Action List (currently Annex III of the draft plan) will be updated and presented as a check-list that will be assessed periodically, modified, and updated.

**[ACTION 8: Peter Dexter and Colin Summerhayes to do the initial re-write for section 5, identifying where IIAG members should provide text to fill gaps.]**

The new section 5 will also include the items listed as Cross-Cutting Issues in section 6 of the draft Action Plan. A paragraph will be required for each of the bullet items when they are included in the new section. The list should include other generic issues - evaluating and assessing new systems and technologies; (how things become eligible for the GOOS label); development of tools for monitoring and analysing system status.

**[ACTION 9: Angus McEwan to re-write section 6 of the draft Action Plan for inclusion in the new section 5.]**

In developing the new section 5, the writers should consider whether or not to include reference to Karl's principles, as modified at the J-DIMP Meeting in Hawaii in April 1998 (included here as Annex II).

4.2 IMPLEMENTATION COORDINATION AND MANAGEMENT

Sections 7.1 and 7.2 of the draft Action Plan will be modified to take into account the arrival of J-COMM on the scene.

**[ACTION 10: Peter Dexter to modify section 7.1.]**

**[ACTION 11: Colin Summerhayes to modify section 7.2 of the draft Action Plan.]**

## 5. OTHER BUSINESS

The Secretariat will first modify the Table of Contents and send the revised list of chapter headings to IIAG members.

**[ACTION 12: Peter Dexter to send revised list of chapter headings.]**

Section 2 needs tightening up a little.

**[ACTION 13: Neville Smith and George Needler to provide the revision for section 2.]**

The first draft of the revised Action Plan should be ready for review by the GOOS Steering Committee at its meeting in Beijing (April 26-29, 1999), which means that it should be completed by April 1st for circulation to GSC members well before the Beijing meeting.

The final draft will be needed to inform the discussion at the J-COMM meeting during the week of July 19th, 1999, in St. Petersburg, which means it should be completed by the end of June. If possible it should be available for the I-GOOS meeting in Paris (June 16-18, 1999).

Since the draft will not be available until after the February 1998 meeting of the GCOS Steering Committee, GCOS will be asked to appoint an executive group to provide GCOS approval.

**[ACTION 14: Secretariats to make appropriate arrangements with GOOC and GCOS GSCs.]**

## ANNEX I

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## ANNEX II

## PRINCIPLES OF ENVIRONMENTAL DATA MONITORING

As specified by J-DIMP, these principles are:

- Assess the impact of new systems or changes to existing systems prior to implementation.
- Require a suitable period of overlap for new and old observing systems.
- Results of calibration, validation, algorithm changes, and data homogeneity assessments should be treated with the same care as the data.
- Ensure a capability to routinely assess quality and homogeneity, including high resolution data and related descriptive information for extreme events.
- Environmental monitoring products and assessments, like IPCC, should be well-integrated into global observing priorities.
- Maintain long uninterrupted stations and observing systems.
- Data-poor regions and regions sensitive to change should be given high priority for additional observations.
- Network operators, designers, and instrument engineers must be provided with long-term requirements at the outset of new system design and implementation.
- Promote the conversion of research observing systems to long-term operations in a carefully planned manner.
- Data management systems that facilitate access, use, and interpretation are essential.

## ANNEX III

## LIST OF ACRONYMS

| | |
|---|---|
| ALT | Altimetry |
| ARGO | Array for Real Time Geostrophic Oceanography |
| ARGOS | French Data Collection and Location System (on NOAA Operational Satellites) |
| ATLAS | Autonomous Temperature Line Acquisition System |
| ATOC | Acoustic Thermometry of Ocean Climate |
| AVHRR | Advanced Very High Resolution Radiometer |
| CBS | Commission on Basic Systems (of WMO) |
| C-GOOS | Coastal Module Panel of GOOS |
| CLIVAR | Climate Variability and Predictability |
| CMM | WMO's Commission on Marine Meteorology |
| COP4 | Fourth Conference of the Parties (to the FCCC) |
| DAIM | Data Availability Index Maps |
| DBCP | Data Buoy Cooperation Panel |
| ECMWF | European Centre for Medium Range Weather Forecasting |
| EC | Executive Council |
| EU | European Union |
| EGOS | European Group on Ocean Stations |
| ENSO | El Niño-Southern Oscillation |
| EuroGOOS | European GOOS programme |
| FCCC | Framework Convention on Climate Change |
| GCOS | Global Climate Observing System |
| GDP | Global Drifter Programme |
| GEO | Global Eulerian Observatory |
| GLOSS | Global Sea Level Observing System |
| GLOSS-GE | Group of Experts for GLOSS |
| GODAE | Global Ocean Data Assimilation Experiment |
| GOOS | Global Ocean Observing System |
| GOOS-IOS | GOOS Initial Observing System |
| GOSSP | Global Observing System Space Panel |
| GPO | GOOS Project Office |
| GPS | Global Positioning System |
| GSC | GOOS Steering Committee |
| GTOS | Global Terrestrial Observing System |
| GTS | Global Telecommunication System |
| IABP | International Arctic Buoy Programme |
| IBPIO | International Buoy Programme for the Indian Ocean |
| ICSU | International Council for Science |
| IGOSS | Integrated Global Ocean Services System |
| IIAG | Interim Implementation Advisory Group |
| I-GOOS | Intergovernmental Panel for GOOS |
| IPCC | Intergovernmental Panel on Climatic Change |
| IOC | Intergovernmental Oceanographic Commission |
| IOC-EC | IOC Executive Council |
| IODE | International Oceanographic Data and Information Exchange programme |
| IPAB | International Programme for Antarctic Buoys |
| ISABP | International South Atlantic Buoy Programme |
| J-COMM | Joint WMO-IOC Technical Commission on Oceanography and Marine Meteorology |
| J-DIMP | Joint Data and Information Panel |
| LMR | Living Marine Resources Panel of GOOS |
| MedGOOS | GOOS programme in the Mediterranean |
| NCEP | National Centre for Environmental Prediction |
| NEAR-GOOS | N.E. Asia Region GOOS programme |
| NOAA | National Oceanic and Atmospheric Administration |
| OOPC | Ocean Observations Panel for Climate |
| OOSDP | Ocean Observing System Development Panel |
| PALACE | Profiling Autonomous Lagrangian Circulation Explorer |
| PIRATA | Pilot Research Array in the Tropical Atlantic |
| RMS | Root Mean Square |
| SBSTA | Subsidiary Body for Scientific and Technological Advice |

| | |
|---|---|
| SOOP | Ship of Opportunity Programme |
| SOOP-IP | SOOP Implementation Panel |
| SST | Sea Surface Temperature |
| SVTB | Surface Velocity Programme Barometer drifter |
| TAO | Tropical Atmosphere Ocean |
| TAO-IP | TAO Implementation Panel |
| TOGA | Tropical Ocean and Global Atmosphere |
| TRITON | Triangle Trans-Ocean Buoy Network |
| UKMO | UK Meteorological Office |
| UNEP | United Nations Environment Programme |
| UOP | Upper Ocean Panel (CLIVAR) |
| VOS | CMM's Voluntary Observing Ship programme |
| WCRP | World Climate Research Programme |
| WMO | World Meteorological Organization |
| WOCE | World Ocean Circulation Experiment |
| WOTAN | Wind Observation Through Ambient Noise |
| WWW | World Weather Watch |
| XBT | Expendable Bathythermograph |