WORLD METEOROLOGICAL ORGANIZATION

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY

FIRST SESSION

AKUREYRI, 19–29 JUNE 2001

ABRIDGED FINAL REPORT WITH RESOLUTIONS AND RECOMMENDATIONS

WMO-No. 931

Secretariat of the World Meteorological Organization - Geneva - Switzerland

REPORTS OF RECENT WMO SESSIONS

Congress and Executive Council

867 — **Executive Council**. Forty-ninth session, Geneva, 10–20 June 1997.
880 — **Twelfth World Meteorological Congress**. Proceedings, Geneva, 30 May–21 June 1995.
883 — **Executive Council**. Fiftieth session, Geneva, 16–26 June 1998.
902 — **Thirteenth World Meteorological Congress**. Geneva, 4–26 May 1999.
903 — **Executive Council**. Fifty-first session, Geneva, 27–29 May 1999.
915 — **Executive Council**. Fifty-second session, Geneva, 16–26 May 2000.
929 — **Executive Council**. Fifty-third session, Geneva, 5–15 June 2001.

Regional associations

874 — **Regional Association III** (South America). Twelfth session, Salvador, 17–26 September 1997.
882 — **Regional Association VI** (Europe). Twelfth session, Tel Aviv, 18–27 May 1998.
890 — **Regional Association V** (South–West Pacific). Twelfth session, Denpasar, 14–22 September 1998.
891 — **Regional Association I** (Africa). Twelfth session, Arusha, 14–23 October 1998.
924 — **Regional Association II** (Asia). Twelfth session, Seoul, 19–27 September 2000.
927 — **Regional Association IV** (North and Central America). Thirteenth session, Maracay, 28 March–6 April 2001.

Technical commissions

860 — C**ommission for Marine Meteorology**. Twelfth session, Havana, 10–20 March 1997.
870 — **Commission for Climatology**. Twelfth session, Geneva, 4–14 August 1997.
879 — **Commission for Atmospheric Sciences**. Twelfth session, Skopje, 23 February–4 March 1998.
881 — **Commission for Instruments and Methods of Observation**. Twelfth session, Casablanca, 4–12 May 1998.
893 — **Commission for Basic Systems**. Extraordinary session, Karlsruhe, 30 September–9 October 1998.
899 — **Commission for Aeronautical Meteorology**. Eleventh session, Geneva, 2–11 March 1999.
900 — **Commission for Agricultural Meteorology**. Twelfth session, Accra, 18–26 February 1999.
921 — **Commission for Hydrology**. Eleventh session, Abuja, 6–16 November 2000.
923 — **Commission for Basic Systems**. Twelfth session, Geneva, 29 November–8 December 2000.

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NOTE

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. **OPENING OF THE SESSION** (agenda item 1)

1.1 The first session of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was opened by Mr Dieter Kohnke, co-president of the Commission, at 10 a.m. on Tuesday, 19 June 2001, in the Akureyri Conference Centre in Akureyri, Iceland.

1.2 On behalf of the World Meteorological Organization (WMO), Professor G. O. P. Obasi, Secretary-General, welcomed the delegates to the historic first session of the new joint WMO/ Intergovernmental Oceanographic Commission (IOC) technical commission. In doing so, he expressed his sincere appreciation to the Government of Iceland, to the City of Akureyri and to the Icelandic Meteorological Office, for having offered to host the session and for the excellent facilities and support services which had been made available.

1.3 In noting the substantive achievements during the past inter-sessional period, which began under the predecessor of JCOMM, the WMO CMM and the joint IGOSS, and had continued successfully through the complex transition to the new Commission, Professor Obasi paid a particular tribute to the Commission's interim co-presidents, Messrs Johannes Guddal (Norway) and Dieter Kohnke (Germany), for their personal contributions to that work. He noted further that Mr Kohnke would be retiring from the Commission at the end of the session, after 10 years of distinguished service to IGOSS and subsequently JCOMM, and wished him every success in his future career.

1.4 After reviewing the long partnership between WMO and IOC, which could be traced to the mid-1950s when UNESCO and WMO collaborated in ocean activities, Professor Obasi emphasized that the two Organizations were now entering a new era of enhanced cooperation and joint programme activities. Considering that enhanced mutual understanding not only between WMO and IOC, but also between meteorologists and oceanographers, had greatly facilitated the successful development and implementation of a number of joint activities, he noted with pleasure that most national delegations to the session comprised equal numbers of scientists from both disciplines.

1.5 Professor Obasi emphasized that it was important to ensure that JCOMM was developed as an efficient mechanism for coordinating and integrating marine observing systems, data management and services. JCOMM represented a new paradigm in interdisciplinary and inter-agency cooperation and might eventually be the model for similar cooperative developments in other disciplines.

1.6 Recognizing the lack of high quality and timely data from many ocean areas in support of weather forecasting, climate analysis and research, he nevertheless noted that there were major developments in marine observing and communication systems which would assist greatly in overcoming that lack. At the same time, he emphasized that WMO and IOC had a major role to play in assisting the national meteorological and oceanographic agencies, especially those in developing countries, to contribute to, and benefit from, those new developments. He then noted that VOS continued to provide a significant component of marine meteorological observations. He also recognized that the VOSClim Project, which provided a high-quality reference set of VOS data, was expected to contribute to GCOS, GOOS and WCRP.

1.7 Referring to the requirement of a fully integrated and mutually-supportive approach to ocean observations and ocean data management, which was a major driving force for the creation of JCOMM, Professor Obasi noted the proposals for integration of all ship-based observing systems and for the establishment of a JCOMM *In Situ* Observing Platform Support (JCOMMOPS) Centre. Long-standing and successful work such as MCSS, GDSIDB and GTSPP should be fully integrated into the JCOMM new ocean data management system.

1.8 The Secretary-General then turned to the services to support marine users and noted that the increasing diversity of maritime users, the complexity of their operations and the considerable economic values of those operations resulted in substantially increased requirements for specialized marine meteorological and oceanographic services. He noted that the services in support of the safety of life and property at sea remained vitally important. The WMO marine broadcast system for GMDSS, in response to the revision of SOLAS, was fully implemented by the end of 1998. That implementation represented a significant achievement, and it was important that the Commission continued to be responsive to the requirements of marine users. With regard to the marine environment, MPERSS provided an excellent basis to provide appropriate meteorological and oceanographic advice and services, on a timely basis, to those authorities responsible for dealing directly with marine pollution emergencies. He stressed the important role to be played by JCOMM in the further implementation of that system.

1.9 Professor Obasi urged the Commission to ensure that appropriate technical and organizational guidance, material assistance and trained personnel were made available to Member countries, to assist especially developing countries in their capacity building efforts. He noted with interest that JCOMM had already developed an overall Capacity Building Strategy and urged the full implementation of the Strategy. He further

noted the effectiveness of cooperative regional projects, and referred specifically to regional projects in south-east Asia and the western Indian Ocean as a useful approach to national and regional development. Referring to UNCED and Agenda 21, he stressed that JCOMM had a major role to play in the provision of new and expanded marine products and services to support the protection and sustainable development of the marine environment.

1.10 Professor Obasi informed the Commission that the fifty-third session of the WMO Executive Council, held the previous week, had wished the Commission a successful first session. The Council had emphasized the importance of a number of specific issues, including in particular, the phased implementation of an operational, integrated ocean observing and data management system for climate, in support of GOOS and GCOS; the development of new, integrated, marine products and services in accordance with expressed user requirements, as well as the monitoring of user response to those products and services; and the implementation of the JCOMM Capacity Building Strategy, including new and innovative approaches to funding, as a way of successfully implementing the Strategy.

1.11 In noting the need for a greater involvement of developing countries in the scientific and technical work of WMO, Professor Obasi emphasized the importance of the participation of many countries in the work of JCOMM. He urged the Commission to keep in mind the need to effect balancing with regard to the officers and experts who would be charged with the responsibilities of guiding and implementing its work programme during the inter-sessional period, to ensure true global partnership.

1.12 In concluding, Professor Obasi assured the Commission of the full support of the WMO Secretariat, and finally wished delegates an enjoyable and fruitful stay in Akureyri.

1.13 On behalf of the Government of Iceland, the Minister for the Environment, Ms Siv Fridleifsdottir, welcomed the delegates to Iceland. In noting that the Iceland economy was heavily dependent on the sea and its resources and that maritime security was a great concern to Iceland, she stressed that the scientific contents of the session directly touched the daily lives of Icelanders. She then noted the importance of the protection of the ocean environment itself, as being another major concern for Iceland. Ms Fridleifsdottir indicated that Iceland was taking a leading role in addressing ocean environmental issues such as persistent organic pollutants. She recognized the importance of multilateral cooperation and that scientific knowledge must be accompanied with a will to act and a commitment to cooperation. In closing, she expressed the pleasure of Iceland for being able to host a number of intergovernmental meetings, including the present session and a forthcoming meeting related to environmental protection. She then wished participants a fruitful session and a very enjoyable stay in Akureyri and in Iceland.

1.14 On behalf of UNESCO's IOC, the Assistant Director-General of UNESCO and the Executive Secretary IOC, Mr Patricio Bernal, expressed his full support for the work of JCOMM, which was charting a new way to conduct joint work within the United Nations system. He noted three of the primary reasons for the decision to establish that new mechanism: the long history of cooperation between WMO and IOC; a basic commonality between oceanography and meteorology; and recent advances in observing and computing capability, which had made it possible to develop a new generation of coupled models of ocean and atmosphere.

1.15 Mr Bernal stated that IOC was leading the development of GOOS, which comprised three components: an observing subsystem; a data communications and management subsystem; and a modeling and applications subsystem. He noted in particular the GOOS Initial Observing System, as well as pilot projects, which included GODAE and the Argo profiling float programme. In stressing the necessity to improve communication links and data exchange protocols and practices, he recognized that IOC and WMO played their own unique roles as intergovernmental organizations in their own domains of competence, thus jointly helping to create the required new structures. In that context, he stressed the fundamental role that JCOMM was playing in the development of operational oceanography.

1.16 Mr Bernal recognized that the challenges of understanding and predicting global change would require operational observations of the physics, chemistry and the biology of all the natural systems that regulated the life-support system of the planet. In concluding, he expressed the appreciation of IOC to the Government of Iceland for hosting the session in Akureyri and wished the Commission a successful session.

1.17 On behalf of the Icelandic Meteorological Office, the Permanent Representative of Iceland with WMO, Mr Magnus Jonsson, welcomed the delegates to Iceland and to Akureyri, and expressed his pleasure at being able to host the first session of JCOMM, which was a milestone of cooperation between WMO and IOC. Mr Jonsson also welcomed particularly the presence of the Minister for the Environment, Ms S. Fridleifsdottir, the Secretary-General of WMO, Professor G. O. P. Obasi, the Executive Secretary IOC, Mr P. Bernal, the Mayor of Akureyri, Mr Kristjan Thor Juliusson, and the Rector of the University of Akureyri, Mr Thorsteinn Gunnarsson, at the opening of the session.

1.18 Mr Jonsson indicated that it was particularly gratifying that the session was being held in a country that was more dependent on the weather and the ocean than most other nations. When the Icelandic Meteorological Office was established in the 1920s, its primary task was marine meteorology and the reduction in the loss of life of fishermen. Mr Jonsson then noted that it had long been well know that the ocean had a great influence on weather. However, until recently it was not known that the ocean area to the north of Iceland was the location for the climate generator for a much larger part of the world than suspected.

1.19 Mr Jonsson recalled that many important matters were to be discussed during the session, which

were expected to be of great significance for a large part of the world. In noting the importance of closer cooperation between all international organizations and associations involved in ocean affairs, he stressed that the establishment of JCOMM was a great step forward in strengthening that cooperation. In concluding, he wished participants a constructive and fruitful session.

1.20 The Mayor of Akureyri, Mr Kristjan Thor Juliusson, welcomed all delegates to the city of Akureyri and wished everyone an enjoyable and fruitful stay. In noting that the fishing industry, which depended on ocean currents and temperatures as well as weather, was important to the city and that changeable weather condition affected the daily life of Akureyri, he expressed his pleasure to be able to host the session in the city.

1.21 Following a recommendation of the 1991 Meeting of the Presidents of Technical Commissions of WMO concerning the formal recognition of outstanding services by individuals to the activities of technical commissions, certificates of outstanding service to CMM and IGOSS, and subsequently to JCOMM, were awarded to:

(*a*) Mr S. Ragoonaden (Mauritius), in recognition of his outstanding contribution over more than 15 years to the development of marine observing systems and services in the Indian Ocean and to the enhancement of the capacity building of maritime countries worldwide in marine meteorology and oceanography;

(*b*) Mr Y. Tourre (France), in recognition of his outstanding contribution over more than 15 years to the development of operational oceanography, including, in particular, the creation and maintenance of the electronic IGOSS/JCOMM Products Bulletin as a major data and information resource in support of oceanographic services.

1.22 There were 113 participants in the session. Those included representatives of 42 Members of WMO and/or Member States of IOC and of 11 international organizations. A complete list of participants is given in Appendix A to this report.

2. ORGANIZATION OF THE SESSION (agenda item 2)

2.1 CONSIDERATION OF THE REPORT ON CREDENTIALS (agenda item 2.1)

At the first and subsequent plenary meetings, the representative of the Secretary-General of WMO presented brief reports on delegations whose credentials had been found valid. Those reports were accepted by the Commission. It was decided not to set up a Credentials Committee.

2.2 ADOPTION OF THE AGENDA (agenda item 2.2)

The provisional agenda was adopted without amendments at the first plenary meeting on the understanding that, at any time during the session, additions or alterations could be made. The final agenda is given in Appendix B to this report.

2.3 ESTABLISHMENT OF COMMITTEES (agenda item 2.3)

WORKING COMMITTEES

2.3.1 Two working committees were established to deal with specific agenda items:

(*a*) Committee A to deal with agenda items 5, 6 and the relevant parts of 4, 9 and 10. Messrs P. Parker (Australia) and T. Jakobsson (Iceland) were elected chairperson and vice-chairperson, respectively;

(*b*) Committee B to deal with agenda items 7, 8 and the relevant parts of 4, 9 and 10. Ms S. Narayanan (Canada) and Mr Yu Zhouwen (China) were elected chairperson and vice-chairperson, respectively.

The session decided to deal with agenda items 11, 12, 13, 14, 15, 16 and 17 as a Committee of the Whole, chaired by the co-presidents of the Commission.

COORDINATION COMMITTEE

2.3.2 In accordance with WMO General Regulation 28, a Coordination Committee was established consisting of the co-presidents, the chairpersons of the working committees and the representatives of the Secretary-General of WMO and the Executive Secretary IOC.

NOMINATION COMMITTEE

2.3.3 To facilitate the election of the officers of the Commission and the appointment of the chairpersons of working groups and subgroups, a Nomination Committee was established consisting of the principal delegates of Chile, Germany, Japan, New Zealand, Nigeria and the United States. Mr R. Stainer (New Zealand) was elected chairperson of the Nomination Committee.

2.4 OTHER ORGANIZATIONAL MATTERS (agenda item 2.4)

Under the present agenda item, the Commission decided on its working hours for the duration of the session. It was agreed that, in accordance with WMO General Regulation 112, no minutes of the session would be prepared, but that statements by delegations might be reproduced and distributed as and when requested. A full list of documents presented at the session is given in Appendix B to this report.

3. REPORT BY THE INTERIM CO-PRESIDENTS OF THE COMMISSION (agenda item 3)

3.1 The Commission noted with interest and appreciation the report of the interim co-presidents of JCOMM, Messrs J. Guddal and D. Kohnke, covering both achievements during the past inter-sessional period and also priorities for the next four years. The Commission offered its thanks and congratulations to the co-presidents and other members of the interim JCOMM Management Committee, in particular for the smooth and effective transition arrangements put in place for JCOMM, as well as for the detailed planning undertaken for JCOMM-I and the substantive proposals developed for the structure and work of the Commission in the future. The Commission recognized that much had been

achieved in a short time. It agreed that the vision of JCOMM was both exciting and, at the same time, realistic. It looked forward with optimism to the future of JCOMM, as a mechanism for the international coordination of operational oceanography and also as a manifestation of the strong partnership and commonality of interest between meteorology and oceanography.

3.2 The Commission expressed its considerable appreciation for the substantive achievements during the past inter-sessional period, through the former CMM and IGOSS and all the groups now reporting to JCOMM. It noted in particular:

(*a*) The full implementation of the marine broadcast system for the GMDSS;
(*b*) Further implementation of the MPERSS;
(*c*) Expansion to the GDSIDB;
(*d*) The successful Workshop on Advances in Marine Climatology (Vancouver, September 1999) and enhanced marine climatological support to the WCP;
(*e*) Implementation of the VOSClim Project and of new ASAP routes;
(*f*) Operational maintenance of the SOOP;
(*g*) Substantial enhancements to operational buoy programmes;
(*h*) The JCOMM Products Bulletin;
(*i*) Training workshops for PMOs and on wind wave analysis and forecasting, regional cooperative capacity building project development and the new JCOMM Capacity Building Strategy.

3.3 The Commission further noted and supported the priority areas outlined by the co-presidents for JCOMM work and development during the coming four years. Those included:

(*a*) Phased implementation of an operational, integrated ocean observing and data management system, in response to expressed user requirements, including those of GOOS and GCOS, which made full use of modern communications and data management technologies;
(*b*) Implementation of an integrated approach to ship-based observations; the gradual evolution of the SOOP strategy in response to developing requirements and the Argo project; the full implementation of VOSClim; and the implementation of new ASAP lines;
(*c*) Further expansion to drifting and moored data buoy deployments, in particular to provide vital surface pressure data, especially from southern hemisphere oceans;
(*d*) Support the evolution of Argo to operational status and its integration with other JCOMM observing system elements;
(*e*) Implementation of a JCOMMOPS Centre;
(*f*) Implementation of an end-to-end ocean data management system and its gradual integration with marine climatological data management;
(*g*) The wider rapid real-time distribution of oceanographic data and products on the GTS, for the enhancement and development of operational oceanography in all Members/Member States;
(*h*) Evaluation, certification and integration of new and enhanced techniques and procedures for ocean measurements, data management, product preparation and eventual data and product delivery;
(*i*) In cooperation with GOOS, development of an active, flexible and open dialogue with ocean satellite operators through all available mechanisms, including the IGOS partnership, the Consultative Meetings on High-level Policy on Satellite Matters and other bodies such as CGMS and CBS, including its rolling review requirements process, in order to assure continuing support for oceanographic and meteorological satellites;
(*j*) Development of new, integrated, marine products and services, in accordance with expressed user requirements, as well as the monitoring of user response to those products and services;
(*k*) Ongoing interactions with GOOS regarding the operational collection and management of non-physical ocean data;
(*l*) Implementation of the JCOMM Capacity Building Strategy, including new and innovative approaches to funding, incorporating cooperation and coordination between potential donor agencies and marine user projects.

3.4 The Commission clearly recognized that JCOMM constituted a unique development in international and interdisciplinary cooperation. At the same time, the success of JCOMM would depend on parallel cooperation and coordination at the national level among meteorological and oceanographic scientists and institutions. In that context, it requested the Management Committee to develop some guidelines to assist Members/Member States in developing national coordination and integration. As part of a wide-ranging discussion on the future of JCOMM, the Commission made the following specific suggestions and proposals:

(*a*) In recognition of the many substantive contributions made by a number of individuals and bodies to the development of the concept of operational oceanography and of international cooperation between meteorology and oceanography going back over many years, the Management Committee should arrange for the preparation and publication of a comprehensive historical review of the antecedents to JCOMM. Such a review might also eventually be presented as a paper to the proposed 150th anniversary Brussels Conference (see general summary paragraph 3.6);
(*b*) In order to publicze fully the JCOMM ideals, priorities and programmes, the Management Committee should arrange for the preparation and wide distribution of a JCOMM brochure;
(*c*) The Management Committee needed to develop, as a priority activity, a set of concrete goals and measurable objectives for JCOMM for the next four years, and coordinate input to the WMO Long-term Plan;
(*d*) The Capacity Building Coordination Group should work to develop alliances and collaborative projects

with external bodies and non-governmental organizations such as the IOI;

(*e*) JCOMM needed to ensure that it maintained an open and flexible approach to its interaction with the operators of ocean satellites, covering all available mechanisms;

(*f*) The enhancement of coordination at the national level in support of JCOMM was essential; a national coordination committee for JCOMM had already proven to be a success in some countries and that approach might be followed elsewhere; at the same time, operational oceanography was much less developed than meteorology in many countries, so that time and caution was required to ensure eventual success.

Further discussion on both the achievements and future work priorities for JCOMM was recorded under subsequent agenda items, and in particular a detailed work plan was considered under agenda item 17.

3.5 The Commission noted with interest the proposal presented by the co-presidents for the future substructure of JCOMM. It recognized the importance to the future success of the Commission of putting in place a substructure that allowed a seamless continuation of the major ongoing activities under CMM and IGOSS, was appropriate to addressing new priority areas already identified, was flexible enough to encompass evolving requirements, was realistic in terms of available funding support and, at the same time, created synergistic effects. The substructure should also include, where possible, horizontal linkages, to enable critical cross-cutting and regional issues (e.g. in the polar regions) to be addressed adequately. At the same time, the Commission clearly recognized that the substructure finally adopted at the present session should be sufficiently flexible to allow evolution during the coming inter-sessional period in response to developing requirements. In addition, a full review of the substructure would, under normal procedures for technical commissions, be undertaken at JCOMM-II. The Commission agreed that requirements for specific aspects of the sub-structure should be addressed under the appropriately relevant agenda items. In addition, however, it agreed that it was also important to review and refine the substructure as a whole, prior to formal approval, which was recorded under agenda item 16. The Commission therefore decided to establish for the duration of the present session an ad hoc sessional Working Group on the Future JCOMM Substructure, charged of preparing, for consideration and adoption by the Commission in plenary, a detailed proposal for the JCOMM substructure, including terms of reference and membership. That Working Group would be open, but with a core membership comprising the principal delegates from Australia, Canada, Chile, China, France, Germany, Iceland, Japan, Morocco, Nigeria, Republic of Korea, Russian Federation and the United States and would be chaired by the principal delegate from the United Kingdom.

3.6 The Commission noted with interest a proposal to commemorate, in some substantive way, the 150th anniversary, in 2003, of the Brussels Conference of 1853. It recognized that that Conference, which had addressed the standardization of meteorological and oceanographic observations from ships and the provision of meteorological services to shipping in return, had been a significant step in the development of international meteorological coordination and cooperation. It therefore welcomed the decision of the WMO Executive Council that WMO should be directly involved in that important commemorative event. The Commission recommended to the IOC Assembly that IOC should also be associated in some way with the event.

3.7 The Commission emphasized the need for the proposed Conference and that due consideration should be given to cost implications. It further agreed with the suggestion of the WMO Executive Council that consideration should be given to coordinating or even merging the Conference with the proposed second CLIMAR Workshop and the proposed second OceanObs Conference. The Commission requested the co-presidents to assist the Secretary-General of WMO and the Executive Secretary of IOC to develop a specific proposal that might highlight the establishment of JCOMM for consideration and approval by the two Executive Councils in 2002. At the same time, and in view of the long lead time needed for preparation of such a conference, the Commission requested the Management Committee to proceed with the establishment of an interim Organizing Committee to begin planning, including preparation of a draft programme and the identification of venue and co-sponsors. In that context, the Commission noted and accepted with appreciation the offer of support and co-sponsorship by the IOI, as well as the offer of Belgium to host the Conference in Brussels.

4. REPORTS BY THE CHAIRPERSONS OF THE MAJOR SUBSIDIARY AND REPORTING BODIES (agenda item 4)

The Commission noted the reports by the chairpersons of the major subsidiary and reporting bodies of JCOMM and expressed its appreciation for their excellent work and for the time and effort spent in carrying out their tasks. Those reports were discussed in detail under the relevant agenda items.

5. SCIENTIFIC INPUT AND REQUIREMENTS (agenda item 5)

5.1 CLIMATE RESEARCH AND PREDICTION (agenda item 5.1)

5.1.1 The Commission noted with interest and appreciation the report by the chairperson of the GCOS/GOOS/WCRP OOPC, Mr N. Smith, covering the overall objectives of the Panel, the strategy adopted to meet those and, in particular, the aspects of its work relevant to JCOMM. It recognized that, as the primary scientific body for providing advice on requirements for ocean data for climate and related physical ocean systems, the OOPC was the scientific partner of JCOMM in the development of an operational ocean observing

system. The Commission therefore welcomed the opportunity to review the work of the Panel and its place in the overall JCOMM objectives and strategy.

5.1.2 The Commission noted with approval that the OOPC had identified a variety of objectives and applications in the development of an ocean observing system. Those included monitoring and detection of climate change; seasonal to interannual climate prediction; marine and weather forecasts; short-range ocean forecasts; understanding decadal variations; support of scientific research; and routine ocean state determination. The implementation strategy being adopted by the OOPC for a sustained, operational ocean observing system was also multifaceted. It included JCOMM as the primary mechanism for the implementation and maintenance of the *in situ* components, including sea level, in particular where the methods were well known and proven. Other components of the strategy, which would constitute partners of JCOMM in system implementation, included informal mechanisms such as POGO; pilot projects such as GODAE and Argo; and research programmes such as the WCRP and its components.

5.1.3 The Commission recognized that the first International Conference on the Ocean Observing System for Climate (OceanObs Conference, St Raphaël, France, 18–22 October 1999), jointly convened by the OOPC and the CLIVAR Upper Ocean Panel had provided a watershed in the development of the ocean observing system. The Conference had arrived at a consensus on the blend of observations required to meet the objectives set out by the Panel for the system and agreed on an implementation schedule and pathway to achieve that. The Commission was pleased to note the substantial role identified for JCOMM by the Conference in that implementation and agreed that the Conference conclusions would provide a blueprint for much of its own work over the coming decade. The Commission noted that the recommendations from the OceanObs Conference covered a broad range of measurements including essential space-based measurements and *in situ* measurements and embracing time-series stations and deep-sea measurements among others. The Commission recognized the importance of deep-sea measurements for understanding the operation of the climate system.

5.1.4 The Commission agreed that there were at least six significant issues arising from the work of the OOPC that would require attention from JCOMM during the coming inter-sessional period:

(*a*) Working with the Argo Science Team and others to ensure global implementation of the programme, including broadening the range of countries involved and obtaining commitments for long-term support;

(*b*) Ensuring the transition of SOOP as proposed by the Upper Ocean Thermal Review, to complement Argo and altimetry;

(*c*) Full implementation of an operational VOSClim Project and a high-quality surface mooring network to provide the required surface flux reference dataset;

(*d*) Assessment and fine-tuning of the tropical mooring arrays;

(*e*) Development of an integrated JCOMM data management system to support the full observing network;

(*f*) Identifying the long-term resources required to sustain activities, such as Argo, SOOP and remote sensing, that were currently supported fully or partly from research budgets.

The Commission requested its Management Committee to coordinate among the appropriate programme areas the implementation of those and other actions referred to JCOMM by the OOPC.

5.2 **OPERATIONAL USERS** (agenda item 5.2)

5.2.1 The Commission recognized that operational users, other than climate modellers, of marine meteorological and oceanographic data and products included operational meteorology (the WWW) and operational oceanography as well as a wide range of marine user groups. The requirements of those users had been established and maintained in the past by CMM, IGOSS and relevant GOOS bodies, among other relevant bodies and programmes. It agreed that the review and updating of those requirements was now the responsibility of JCOMM, working closely with CBS and relevant GOOS bodies, as appropriate. In addition, of course, it was the primary responsibility of JCOMM to implement those requirements, again coordinating closely with CBS, IGOOS, the GOOS Steering Committee and similar bodies in particular where difficulties were encountered in such implementation. The Commission agreed that although good progress had been made, yet more effort was needed to establish user requirements as the basis for guiding product development and requested the co-presidents and the Management Committee to set in process mechanisms to assess user requirements and the satisfaction of users with the products available.

5.2.2 The Commission noted that the CEOS/WMO database had been implemented and was being developed as the primary resource giving the consolidated requirements for both *in situ* and satellite-derived observational data in support of all WMO Programmes. In addition, it also now included requirements for joint WMO/IOC Programmes such as GOOS and GCOS. The database contained user estimates of expected observational performances for both *in situ* and satellite-derived variables, and thus provided the basic information needed for the CBS rolling review requirements process. That process, in turn, had led to the preparation of a detailed statement of guidance regarding how well satellite capabilities met user requirements in several application areas. That statement would be later expanded by the inclusion of *in situ* system capacities.

5.2.3 The Commission agreed on the importance of the database containing up-to-date and accurate information regarding the requirements for marine data for all applications as well as for the preparation of a statement of guidance relating to marine user requirements. It therefore decided that JCOMM should participate in

the CBS rolling review requirements process. To that end, it requested the co-presidents, in consultation with other members of the JCOMM Management Committee and officers of GOOS, to designate one or more JCOMM expert to participate in that process and, in particular, to participate in the appropriate CBS expert teams. Those JCOMM experts should also take primary responsibility for finalizing the statement of guidance relating to marine user requirements, which should be published as a JCOMM technical report and should be widely distributed.

5.3 **OTHER** (agenda item 5.3)

The Commission recalled that the requirements for observational ocean data for climate were addressed in detail in the GOOS/GCOS Implementation Action Plan. Those requirements had been considered in the report of the chairperson of the OOPC, under agenda item 5.1. At the same time, the Commission recognized that the requirements for the operational collection and exchange of data for the coastal component of GOOS were only just emerging. Such requirements had been compiled separately into strategic design plans by three former GOOS advisory panels (the GOOS Coastal Panel, the Living Marine Resources Panel and the Health of the Oceans Panel) and published on the GOOS Web site (http://ioc.unesco.org/goos). The requirements for coastal seas documented in the three design plans had been summarized in an information document prepared by the GOOS Project Office. The design plans were now being integrated to produce in 2002 an implementation plan for the coastal component of GOOS, which, while dominated by physical measurements that were largely the domain of JCOMM, would include a range of non-physical measurements for both coastal regions and the open ocean. The Commission recognized that coordinated physical, biological and chemical measurements of the ocean and atmosphere were needed to obtain a comprehensive view of the behaviour of coastal seas and their responses to natural and anthropogenic forcing, in support of sustainable development. The Commission agreed therefore that it would assess the requirements for implementation of non-physical measurements in support of the coastal component of GOOS, and this matter was addressed further under agenda item 12.1.

6. MARINE METEOROLOGICAL AND OCEANOGRAPHIC SERVICES (agenda item 6)

6.1 MARITIME SAFETY SERVICES (agenda item 6.1)

WMO GMDSS MARINE BROADCAST SYSTEM

6.1.1 The Commission noted that the provision of operational marine meteorological and oceanographic services in support of the safety of life at sea was of the highest priority within both WMO and IOC, as recognized, for example, by Thirteenth Congress, the twentieth IOC Assembly and as contained in the 5LTP. Such services were therefore also a primary focus and high priority for the work of JCOMM. Chapter V, Regulation 5 — Meteorological services and warnings, of SOLAS specified the responsibilities of signatory countries to provide meteorological forecast and warning services, and those services were now disseminated within the context of GMDSS. The WMO *Manual on Marine Meteorological Services* (WMO-No. 558) specified the responsibilities of NMSs in that regard.

6.1.2 In that context, the Commission recalled that details of the new WMO GMDSS marine broadcast system had been adopted by CMM-XI (Lisbon, April 1993). The system was subsequently approved by the WMO Executive Council for inclusion in the *Manual* as Volume 1, Part I bis, to operate in parallel with the existing terrestrial broadcast system at least until the final date for full implementation of the GMDSS on 1 February 1999. The Commission noted with satisfaction that the WMO GMDSS marine broadcast system had been fully implemented before 1 February 1999 and was now operating smoothly, with minimal changes to procedures and broadcast schedules. Those schedules were maintained by the WMO Secretariat and made available to users in a variety of ways, including via the WMO Web site, by publication in the *Admiralty List of Radio Signals* (United Kingdom), and through IHO and IMO. The Commission recognized that accurate broadcast schedules were essential to users. It therefore urged all Issuing Services to keep the WMO Secretariat fully and rapidly informed of any future changes, if possible well in advance. It further urged Issuing Services to maintain their broadcast times as close as possible to those published schedules.

6.1.3 The Commission expressed its considerable appreciation to the Issuing and Preparation Services for the GMDSS marine broadcast system, to the Ad Hoc Group on the GMDSS and to its chairperson, Mr H. Savina, for their significant efforts in implementing the system on schedule and for its successful ongoing maintenance. It also offered its thanks to IMO, IHO, ICS and Inmarsat Ltd. for their cooperation and assistance in implementing and operating the system and expressed its satisfaction with the close liaison which existed between WMO/IOC and those other organizations.

6.1.4 The Commission reviewed the amendments to the WMO GMDSS marine broadcast system proposed by the Ad Hoc Group and agreed that they should be incorporated into the *Manual on Marine Meteorological Services*. The recommendation to effect that decision was dealt with under agenda item 9. The Commission further reviewed the proposal, already provisionally agreed by IMO, IHO and Inmarsat Ltd., for the creation of two new Nav/Metareas, numbered 17 and 18, to facilitate the provision of maritime safety services to shipping in Russian Arctic waters. In doing so, it noted with appreciation the information provided by the representative of IMSO, that Inmarsat and GMDSS services had been somewhat improved in polar regions. The Commission noted that the Russian Federation had already formally accepted to act as Issuing Service for both those new Metareas. It therefore agreed to the proposal, which would be incorporated into the amendments proposed

by the ad hoc group as noted above. In doing so, it recommended to the Expert Team on Maritime Safety Services to consider the possibilities for designating additional Metareas to cover the remaining Arctic waters, in close consultation with Canada, the Russian Federation, the United States, IHO and IMO. In doing so, the team should also take into consideration the implication of extending GMDSS services further north, so as to facilitate the provision of enhanced maritime safety services in those regions.

6.1.5 The Commission recognized that meteorological analysis and forecast charts, traditionally delivered to users at sea by radio-facsimile broadcast, were regarded by those users as essential adjuncts to forecasts and warnings in text format and of vital importance to the safety of life at sea. The 2001 amendments to SOLAS, Chapter V, Regulation 5 — Meteorological services and warnings, explicitly acknowledged that importance and stated that, *inter alia*, "...(weather information suitable for shipping) shall be transmitted in text and, as far as practicable, graphic form...". The Commission further recognized, however, that radio-facsimile broadcasts were gradually being curtailed or eliminated completely in a number of countries, for reasons beyond the control of NMSs. In that context, it noted with interest and appreciation the project being undertaken by Inmarsat Ltd., in conjunction with the Australian Bureau of Meteorology and the Ad Hoc Group on the GMDSS, to develop a facility within SafetyNET for the transmission of graphical information in digital form via Inmarsat-C and for its reconstitution on board ships. The Commission agreed on the potential value of that facility to both Issuing Services and users alike, and urged that the project be completed and implemented as quickly as possible. At the same time, it urged NMSs to continue to impress on relevant national authorities the importance of the provision of meteorological information to shipping in chart form, and thus of the maintenance of radio-facsimile broadcast facilities.

MARITIME SAFETY SERVICES NOT FORMALLY REQUIRED UNDER THE GMDSS

6.1.6 The Commission recognized that a formal international requirement to provide meteorological forecasts and warnings to shipping via terrestrial high frequency radio broadcasts no longer existed. It therefore understood that the existing Volume I, Part I, sections 1, 2 and 3 of the *Manual on Marine Meteorological Services* (WMO-No. 558), dealing with the international coordination of such broadcasts, were no longer formally required, and in fact no longer reflected the reality of such broadcasts. At the same time, however, the Commission agreed that broadcasts via high frequency radio and similar facilities remained essential for non-SOLAS vessels and shipping in coastal waters not covered by NAVTEX in many parts of the world. In addition, the formal recognition of the importance of such broadcasts, through inclusion in the *Manual*, remained an important requirement for many countries. The Commission therefore agreed:

(*a*) To maintain the existing terrestrial broadcast section of the *Manual* on a temporary basis;

(*b*) To request the Expert Team on Maritime Safety Services to develop a new text relating to non-GMDSS marine broadcast services, for eventual adoption by the Commission for inclusion in the *Manual* to replace that existing terrestrial broadcast section.

HARMONIZATION OF METAREA SUB-AREAS

6.1.7 The Commission noted with interest a report presented on the successful work undertaken by France, Morocco, Portugal and Spain, coordinated by *Météo-France*, to develop a common set of forecast sub-areas within Metarea II. Consequent on that work, the United Kingdom had also slightly adjusted its sub-areas within Metarea I. The Commission expressed its appreciation to all concerned for the success of that difficult but essential work, and recommended that that set of common forecast sub-areas be submitted to both WMO Regional Associations (RAs) I and VI, to formally agree to the common areas. In doing so, it recognized that a similar harmonization might also be required in other Metareas. It therefore recommended to the Issuing Services concerned to review the situation and to endeavour to coordinate the work necessary to effect such harmonization, as appropriate.

NAVTEX SERVICES

6.1.8 The Commission recalled that CMM, at its eleventh session (Lisbon, April 1993), had appointed a rapporteur, Mr M. Ziemianski (Poland), to develop a system for the international coordination of meteorological broadcasts for the Baltic Sea region through the international NAVTEX service. CMM-XII (Havana, March 1997) had reviewed draft guidelines for such coordinated broadcasts, prepared by Mr Ziemianski and his group of national focal points, and had:

(*a*) Adopted general procedures and principles for the international coordination of meteorological broadcasts through NAVTEX, which had subsequently been included in the *Manual on Marine Meteorological Services*, Volume I, Part II;

(*b*) Urged finalization of the draft guidelines specifically for the Baltic Sea region, their acceptance by the countries concerned and their trial implementation.

6.1.9 In that context, the Commission noted with interest that the guidelines had been implemented and operated on a trial basis since April 1998. On the basis of those trials, the guidelines were now in the process of finalization, prior to formal approval by the Permanent Representatives of the countries concerned. The Commission agreed that, once the guidelines had been approved in that way, they should be included in Volume II of the *Manual*, in the section covering marine services within WMO RA VI (Europe). To that end, the Commission recommended that they should be submitted for approval to the thirteenth session of RA VI, scheduled for April 2002 in Budapest. The Commission

congratulated and expressed its considerable appreciation to all concerned in that project, particularly Mr Ziemianski, the rapporteur, for the difficult and detailed work which they had so successfully accomplished, which would be of great benefit to all maritime users in the Baltic region.

OTHER SERVICES

6.1.10 The Commission recognized that marine user requirements for meteorological and oceanographic data, products and services were continually expanding and diversifying. Such requirements were included for new and more detailed maritime safety services, specialized data and services for specific user groups, as well as for marine climate related services. In addition, there was an ongoing need to keep the WMO GMDSS marine broadcast system under review and updated in the light of developments in technology, user requirements and international agreements, and also to review requirements for the international coordination and refinement of meteorological broadcasts through NAVTEX. The Commission therefore agreed that it was essential for JCOMM to establish an Expert Team on Maritime Safety Services, comprising at least representatives of the Issuing Services for the GMDSS, representatives of IMO, IHO, ICS, IMSO, and other user groups, as appropriate.

6.1.11 The Commission recommended that the Expert Team meet during 2002 in order to prepare proposals on the following points:

(*a*) NMS-specific recommendations on compiling reports for the NAVTEX broadcast;

(*b*) The summarization of options for describing the state of the sea and a formal method for the description of rogue and freak waves;

(*c*) The standardization of terminology used for defining visibility at sea;

(*d*) The continuation of the project started by Australia, Inmarsat Ltd. and the WMO Secretariat on the format and content of a graphical sea broadcast under GMDSS;

(*e*) The harmonization of practices, as needed, in order to coordinate the content of forecasts for overlapping zones (definition of common zones, specific examination of scales, parameters and thresholds used by NMSs, etc.);

(*f*) Definition of a system of indicator(s) for monitoring user responses and their satisfaction with the quality of marine services.

PROPOSAL FROM KENYA

6.1.12 The Commission noted with interest a proposal from Kenya for the Kenya Meteorological Department (KMD) to be formally designated as a Preparation Service, and possibly also an Issuing Service, for the WMO Marine Broadcast System for the GMDSS, within Metarea VIII. The Commission recalled that KMD had played a major role, within the former WMO terrestrial broadcast system, for the issue of forecasts and warnings for a part of the central western Indian Ocean. It recognized that KMD most likely continued to have the capabilities to provide accurate meteorological information for mariners in that region under the new GMDSS broadcast system. At the same time, however, the Commission recognized that it did not have sufficient information available to allow it to agree to the formal inclusion in the *Manual*, at the present time, of KMD as a GMDSS Preparation Service. It therefore requested the Expert Team on Maritime Safety Services to review urgently that question and to make an appropriate recommendation, for the consideration of the co-presidents and the Management Committee on behalf of JCOMM. The Commission further requested the KMD to coordinate with France, India and Mauritius regarding the modalities and timing of the delivery of its products for broadcast by the respective Issuing Services, with the assistance of the WMO Secretariat, as necessary. France (La Réunion) would continue to prepare and issue all tropical cyclone warnings for the whole of Metarea VIII(S).

6.1.13 With regard to the additional proposal for Kenya to also become an Issuing Service, the Commission recalled that there were already such services designated for Metarea VIII (India for north of the Equator, and France and Mauritius for south of the Equator). In addition, it was essential that the Metareas remained closely coordinated with the IHO Navareas, to facilitate and simplify the provision of maritime safety information to users. Furthermore, Kenya did not, for the moment, have direct, or even relative easy, communications access to an Inmarsat LES, which was an essential requirement for an Issuing Service. The Commission therefore did not feel it appropriate for the time being to agree to the designation of Kenya as an Issuing Service. It nevertheless again requested the Expert Team on Maritime Safety Services to keep that matter under review, with a view to a possible designation of that type in the future.

6.2 **WIND WAVES AND STORM SURGES** (agenda item 6.2)

6.2.1 The Commission noted with appreciation the report of the chairperson of the Subgroup on Wave Modelling and Forecasting, Mr V. E. Ryabinin (Russian Federation). It recalled that the WMO Wave Programme was first proposed at CMM-VIII in 1981 and came into existence in 1984. The general objective of the Programme was to help WMO Members in the provision of high quality data as well as wave analysis and forecast services to a large variety of applications including highly specialized activities. The CMM Subgroup on Wave Modelling and Forecasting continued the activities of the Ad Hoc Group on Wave Modelling established by Resolution 5 (CMM-X). The Subgroup was first established in April 1993 by Resolution 3 (CMM-XI). In March 1997 it was re-established by Resolution 2 (CMM-XII) as a part of the CMM Working Group on Marine Meteorological Services. The most important task of the Subgroup was support and development of the WMO Wave Programme.

6.2.2 The Commission recognized with appreciation the continuing progress made in the provision of wave

data and forecast services. Among the most important developments in the area of wave observation, modelling, forecasting and related services, it highlighted the following:

(*a*) Massive use of third generation spectral wave models for the provision of operational services;
(*b*) Increased availability of surface pressure, near-surface wind and wind wave analysis, hindcast, and forecast data on the Internet;
(*c*) Wider use of satellite data, improved quality of remotely-sensed wave heights and spectra including directional spectrum, elimination of 180° ambiguity in directional spectrum derived from satellite data;
(*d*) Development of wave data assimilation techniques with positive impact on the forecast quality;
(*e*) Increased availability of real-time services based on high frequency wave radar data;
(*f*) Broader availability of codes of modern numerical models such as WAM, WaveWatch III, SWAN, MOSCOW;
(*g*) Operational production of ensemble wave forecasts at the ECMWF paving the way to explicit estimation of forecast uncertainty and to a new basis for ship routing services;
(*h*) Development and implementation of operational applications of coupled models of atmospheric general circulation and wind waves;
(*i*) Positive results of using the meteorological reanalysis data for wave climate hindcasting and assessment of long return period wave heights.

6.2.3 At the same time, the Commission recognized that measured wave data were of considerable value to national agencies for many practical applications, but that such data were often not released for such purposes, nor was there much information available on their existence. It therefore:

(*a*) Urged Members/Member States to make every effort to identify and obtain the release of wave data measured nationally, for distribution where possible on the GTS and/or inclusion in national archives;
(*b*) Requested the Expert Team on Marine Climatology to investigate the possibility of re-establishing a global wave metadata archive centre.

SEMINARS/TRAINING COURSES/CONFERENCES

6.2.4 The Commission noted with appreciation that WMO, jointly with COMET (UCAR/United States), conducted the second International Workshop on Ocean Waves in Miami in May 1997, which delt with numerical wave analysis and forecasting. Lectures and practical sessions were given to 22 participants from all WMO Regional Associations. The previous seminar organized by the same sponsors took place in Boulder, Colorado, in December 1995. Another event of relevance and importance for JCOMM was a conference co-sponsored by WMO, IOC, the European Commission, *Météo-France* and CNES, which focused on operational application of ocean wave data and was held at UNESCO Headquarters in Paris from 21–25 September 1998. Issues related to wave forecasting, hindcasting and climatology were also discussed at the Workshop on Advances in Marine Climatology (CLIMAR99), which was co-sponsored by WMO, NOAA and the Meteorological Service of Canada and was held in Vancouver from 8–15 September 1999. The Commission agreed that workshops on wave modelling, analysis and forecasting were highly valuable in assisting countries to improve their capabilities in that important field. It therefore strongly urged WMO and IOC to ensure that they continued on a regular basis in the future.

***GUIDES*/RELEVANT PUBLICATIONS**

6.2.5 The Commission recalled with satisfaction that the second edition of the WMO *Guide to Wave Analysis and Forecasting* (WMO-No. 702) had been published and was made available to the WMO Members. It expressed its appreciation, in particular, to the editor of the *Guide*, Mr A. Laing (New Zealand) for his work in coordinating and overseeing its preparation. In view of ongoing developments of practices in numerical wind wave forecasting the Commission stressed the need for the relatively regular updating of the *Guide*, which would go in concert with progress in the field. Increasing accessibility of the Internet to centres providing wind wave prediction services and sufficiently high costs of publishing many hard copies of the *Guide* made it possible and desirable to consider making the *Guide* available on the Internet and accessible through the WMO home page.

6.2.6 Taking into account its extended mandate (see general summary paragraph 6.2.15), the Commission further noted that in addition to the WMO *Guide on Wave Analysis and Forecasting*, its work would require also guidance on storm surge prediction. In view of the likely considerable volume of those documents it was considered desirable to keep the two publications separate. It requested the Expert Team on Wind Waves and Storm Surges to prepare an outline for such guidance material on storm surge prediction, as well as a plan for its preparation, for consideration and further action by the Services Coordination Group.

6.2.7 The Commission recalled that the Offshore Weather Panel had prepared the *Handbook of Offshore Forecasting Services*. It was considered a valuable source of information on environmental data requirements of offshore activities including data on wind waves and storm surges. The Commission expressed its appreciation to the Panel for that work and to the Secretariats for its publication and distribution.

6.2.8 The Commission noted with appreciation that, in accordance with the identified interest of the wave forecasters in the prediction and evaluation of highest waves, two specialized technical reports were prepared during the inter-sessional period and published as JCOMM technical reports. The first of them was more oriented towards real-time services. The second report focused on evaluation of long return period wave heights and considered some aspects of wind wave climate. It

supplemented the WMO *Guide to Wave Analysis and Forecasting* in matters related to wave climate and design criteria.

VERIFICATION ACTIVITIES

6.2.9 The Commission recalled that the twelfth session of CMM had adopted Recommendation 4 (CMM-XII) by which "the wind wave model forecast verification scheme ... should be further developed and formally implemented ..." and "that all Members operating global or basin-scale wave forecast models should be urged to participate". CMM-XII had requested the Subgroup on Wave Modelling and Forecasting to develop further details of the scheme, for eventual consideration and adoption, on a trial basis, by interested Members.

6.2.10 The Commission noted with interest that five centres, namely ECMWF, the Met Office (United Kingdom), the Fleet Numerical Meteorology and Oceanography Center (United States), the Canadian Meteorological Centre (Canada) and the National Centers for Environmental Prediction (United States), had participated in the numerical wave forecast verifications. On a monthly basis, they exchanged predicted wave height, wave period, and wind speed data and compared the predictions with observations made at a number of moored buoys and fixed platforms and distributed on the GTS. The initial results had revealed some common and specific features of operational numerical wave forecasts. The centres engaged in the exchange of verification data had benefited considerably from those activities because they learned the actual skill of their forecasts and sources of most significant errors, and the first trials of the scheme were therefore regarded as successful. The Commission considered that making the information about the wave forecast verification scheme widely known was important because it would facilitate corresponding activities of other interested Members and, in parallel, stimulate more intensive insertion of wave observations on the GTS. It therefore requested the Expert Team on Wind Waves and Storm Surges to develop procedures for the distribution of such information. The Commission also encouraged additional wave modelling and forecast centres to participate in the project and requested the expert team to investigate the possibility of introducing some form of wave model certification scheme, perhaps based on the results of the verification project.

COORDINATION WITH GOOS

6.2.11 The Commission noted with interest the activities of the Subgroup on Wave Modelling and Forecasting aimed at the review of the role of wind wave observations, services, and modelling in the GOOS. The study was conducted jointly with a group of leading scientists involved both in development of wave models, corresponding services, and in the GOOS activities. The results had been presented and discussed at the CLIMAR99 Workshop (Vancouver, September 1999) and at the first OceanObs Conference (Saint Raphaël, France, October 1999). Among other matters, the review contained a first description of wave data requirements by GOOS modules and addressed problems of adequate development of wave observing systems as a part of GOOS. Links between the Subgroup and OOPC were established, which should facilitate coordination of future activities.

TECHNOLOGY TRANSFER/IMPLEMENTATION ASSISTANCE/ CONSULTING SERVICES

6.2.12 The Commission recalled that, since 1994, the Subgroup had been offering consulting services on matters pertinent to wave modelling and forecasting services to all WMO Members. It recognized the usefulness of such services and expressed the view that interested Members/Member States should use the potential services to a larger extent. It was also noted that the broad mandate of JCOMM might require a similar opportunity for the development of storm surge prediction services.

6.2.13 The Commission noted with interest that, in 1999, Mr J. Guddal, JCOMM interim co-president and Subgroup chairperson, took part as a JCOMM expert, in a project for the development of a storm surge prediction system. The project was implemented by the Governments of Norway and Viet Nam. The role of the JCOMM experts was to conduct a local survey, prepare an outline and plan for the future forecasting system, initiate and conduct a tender on a contract for hardware and software acquisition and corresponding training. All those tasks were successfully completed by the end of November 1999. The Commission recognized that that project underlined the important catalyst role that JCOMM and, of course WMO and IOC themselves, should play in the area of forecasting system implementation assistance. It also agreed that experience gathered in the course of that project could be instrumental for other regions and applications including the South China Sea and the northern part of the Indian Ocean. In addition, the Commission recognized that many Members/Member States had considerable expertise in both wind wave and storm surge modelling, and it urged those countries to make such expertise available, through JCOMM, for the assistance of all. In that context, it noted with appreciation the kind offer of Japan to provide technical support to other countries in storm surge modelling.

COOPERATION WITH THE WMO TROPICAL CYCLONE PROGRAMME

6.2.14 The Commission agreed that the lessons of the project on storm surge prediction system development, which was conducted in Viet Nam, underlined the need for close cooperation between JCOMM and the WMO TCP. Particularly important were matters related to the prediction of storm surges and wind waves associated with tropical cyclones. The Commission noted that the Subgroup chairperson had participated in the twenty-seventh session of the WMO/ESCAP Panel on Tropical Cyclones (Muscat, Oman, 29 February–6 March 2000) and in the WMO Regional Technical Conference on

Tropical Cyclones and Storm Surges (Chiang Mai, Thailand, 13–17 November 2000). At both events an introduction to JCOMM activities and a review of modern means of wind wave and storm surge prediction were given. The Commission agreed that close cooperation with TCP would be particularly essential for the successful development of the IOC/IHP/WMO Project on Storm Surge Disaster Reduction in the northern part of the Indian Ocean. The Commission agreed to provide expert assistance for the Project in matters of wind wave and storm surge prediction. The Commission further noted that the WMO/ESCAP Workshop on Typhoon Forecasting Research, to be held in Korea in September 2001, would include a component on wind wave and storm surge forecasting, and it urged as many countries as possible in the region to participate.

JCOMM WIND WAVE AND STORM SURGE PROGRAMME

6.2.15 The Commission agreed that it would be logical to transform the WMO Wave Programme into the JCOMM Wind Wave and Storm Surge Programme. Most important considerations were that storm surge prediction support was included in the new expanded terms of reference of JCOMM and that there were many commonalties between systems providing wind wave and storm surge prediction. The Commission recognized that a draft JCOMM Wind Waves and Storm Surges Programme had been prepared. It requested the Expert Team on Wind Waves and Storm Surges to review and finalize that programme, for publication as a JCOMM Technical Report. In doing so, the Commission clearly recognized that it was a very ambitious programme, which would require substantial efforts by JCOMM members, other experts and Members/Member States during the coming four years.

ORGANIZATION OF FUTURE JCOMM ACTIVITIES IN WIND WAVE AND STORM SURGE MODELLING AND FORECASTING

6.2.16 The Commission agreed that the JCOMM Wind Wave and Storm Surge Programme contained elements that cut across all programme areas. At the same time, the Commission recognized the value of developing specific expertise for that theme, and therefore agreed to establish an Expert Team on Wind Waves and Storm Surges. Further action in that regard was taken under agenda item 16.

OPERATIONAL OCEANOGRAPHY

6.2.17 In the context of its discussion on the wind waves and storm surges programme, the Commission noted the emerging requirements for related programmes encompassing ocean modelling, product preparation and service provision for other ocean processes. However, it recognized that those requirements extended beyond wind waves and storm surges. It therefore requested the Management Committee and the Services Coordination Group to keep that matter under review, with a view to proposing eventually new programme activities to JCOMM.

6.3 **SEA ICE** (agenda item 6.3)

GLOBAL DIGITAL SEA-ICE DATA BANK

6.3.1 The Commission noted with interest the report of Mr I. Frolov (Russian Federation), chairperson of the JCOMM Subgroup on Sea Ice. It expressed its appreciation to him, to members of the Subgroup, and to the GDSIDB for the considerable and very valuable work accomplished during the period after CMM-XII. The Commission, in particular, noted with satisfaction that cooperation among sea-ice experts from Canada, Denmark, Finland, Japan, Russian Federation, Sweden and the United States had resulted in the inclusion, within the GDSIDB, of newly digitized datasets for Arctic and Antarctic areas. Separate datasets were prepared for the Sea of Okhotsk, Baltic Sea and Canadian Arctic area. The Commission further noted with appreciation that the Argentine Navy Hydrographic Service had started to submit information on sea-ice observations to the GDSIDB's centres (NSIDC, Boulder and AARI, St Petersburg), as well as the offer by Australia and China to contribute data to the GDSIDB. The Commission noted with interest that a special report on the availability of sea-ice data for the Caspian and Black Seas and the Sea of Azov was prepared and discussed during the eighth session of the Steering Group for the GDSIDB.

6.3.2 The Commission noted with appreciation that members of the GDSIDB had agreed to prepare historical sea-ice data for the Sea of Bohai from 1952 to the present (State Oceanic Administration, China) for the Baltic Sea for 1980–1998 (Baltic Sea Ice Meeting) and for 1960–1982 (German Federal Maritime and Hydrographic Agency), and for the Antarctic for 1970–1990 (AARI and Australia through the Antarctic Sea-ice Processes, Ecosystems and Climate Programme). Additional sea-ice data sources were identified as Denmark for Greenland waters in the twentieth century; Chile and South Africa for the Antarctic; and the Russian Federation, Ukraine and Kazakhstan for the Black, Azov and Caspian Seas.

6.3.3 The Commission noted with appreciation that special pages describing historical sea-ice data were published on the NSIDC and AARI Web pages. Work on the operational exchange of sea-ice data through the World Wide Web, including the establishment of home pages by both the AARI and the NSIDC devoted to historical sea ice data, had been completed. The home page addresses of the GDSIDB centres were:

(*a*) http://www.aari.nw.ru/gdsidb/gdsidb_2.html (AARI, St.Petersburg, Russia);

(*b*) http://www.dmi.dk/pub/gdsidb_mirror/content.html (mirror of AARI site at DMI);

(*c*) http://www-nsidc.colorado.edu/NOAA/index.html (NSIDC, Boulder, Colorado, United States).

The Commission also noted that those pages could be accessed directly from the Programme Areas section of the WMO Marine Programme Web page.

6.3.4 The Commission, recognizing the direct value of the GDSIDB to the WCP and WCRP, as well as to services and other sea-ice activities of Members concerned, recommended that WMO and IOC should continue to

support the valuable work of the Steering Group for the GDSIDB during the coming inter-sessional period. It agreed with the proposed project objectives for that period, which were included in the overall Commission's work plan (see agenda item 17).

DATA FORMATS AND SEA-ICE NOMENCLATURE

6.3.5 The Commission noted with interest that special ad hoc working groups were designated by the Steering Group for the GDSIDB to extend the existing WMO SIGRID format and to develop a new format in order to standardize the international exchange of operational sea-ice data for electronic sea-ice charts. The Commission recognized that a considerable part of that work was shared during 1999–2001 with the IICWG and with Canada, Denmark, Russia and the United States ice centre experts experimenting with shape file vector format to construct a superior SIGRID-based format for data exchange. The Commission agreed that JCOMM should refer further work on the formats to the Expert Team on Sea Ice for consideration and adoption during the inter-sessional period.

6.3.6 The Commission also recognized the work of the IICWG to develop an international colour code for ice charts as a first step toward developing a mechanism to incorporate sea-ice information in electronic navigation charts. The Commission noted that, while considerable progress had been made toward obtaining agreement on a colour code, the IICWG would not be in a position to propose a standard to JCOMM before late 2001. It agreed that a standard proposed by the IICWG should be reviewed by the new JCOMM Expert Team on Sea Ice, prior to submission to the JCOMM co-presidents for formal approval on behalf of JCOMM, and publication by WMO.

6.3.7 The Commission expressed its appreciation to the experts from the Swedish Meteorological and Hydrological Institute and AARI for the development of appropriate amendments and extensions to the SIGRID and SIGRID-2 formats, which were designed to preserve the accuracy of the original data in BASIS while converting them to the SIGRID formats.

6.3.8 The Commission noted the results of research undertaken by experts from the Commonwealth of Independent States, under the AIRSS, to identify ice decay from radar backscatter. The Commission agreed that as a result of that work, appropriate amendments to the nomenclature for coding sea-ice decay should be developed during the next inter-sessional period.

6.3.9 The Commission expressed its appreciation to Mr A. Bushuev (Russian Federation) for the preparation of a draft revised version of the WMO sea-ice nomenclature. It agreed that that revised version should be reviewed by the JCOMM Expert Team on Sea Ice, prior to submission to the JCOMM co-presidents for formal approval on behalf of JCOMM, and publication by WMO.

PUBLICATIONS

6.3.10 The Commission noted with appreciation that Messrs V. Gavrilov (Russian Federation) and W. Weeks (United States) had prepared the English version of the *Handbook on the Analysis and Forecast of Sea Ice*, as recommended by CMM-XII. That text was being reviewed prior to being issued by WMO in 2002.

6.3.11 The Commission noted with appreciation that the new version of the publication *Sea-Ice Information Services in the World* (WMO-No. 574) had been reviewed by the members of the former Subgroup on Sea Ice and issued by WMO in 2000.

OTHER ACTIVITIES

6.3.12 The Commission noted that during the inter-sessional period two informal sessions of the JCOMM Subgroup on Sea Ice, combined with the sixth and seventh sessions of the Steering Group for the GDSIDB, were held in Copenhagen (October 1997) and in Boulder (August 1998) to discuss and coordinate sea-ice activities internationally. Aspects of the current and future of the Subgroup on Sea Ice Activities were also discussed at the eighth session of the Steering Group for the GDSIDB, which took place in Ottawa (April–May 2000). The Commission noted with appreciation the proposal of Argentina to host a session of the proposed JCOMM Expert Team on Sea Ice and the ninth session of the Steering Group for the GDSIDB in Buenos Aires, tentatively in October 2002.

6.3.13 The Commission noted with interest and appreciation that the Joint WMO/Canadian Ice Working Group Workshop on Mapping and Archiving Sea-ice Data Derived from Radar Data Processing had taken place in Ottawa in May 2000, hosted by Canada. The Commission expressed its considerable thanks to Canada and to the workshop organizers for that highly successful event, which had addressed recent developments in remote sensing instrumentation for sea-ice parameters, radar signal interpretation, data management, data assimilation and sea-ice modelling. Those were important components of the future work of JCOMM, as part of its overall mandate to implement and coordinate the running of an operational observing and services system for the global ocean, including polar regions.

6.3.14 The Commission noted with interest an initiative developed under the Satellite Application Facilities Programme of EUMETSAT, in which *Météo-France*, the Danish Meteorological Institute and the Norwegian Meteorological Institute were developing such a programme dedicated to ocean and sea-ice products. When operational, that facility would be of great value to JCOMM sea-ice activities. The Commission further noted with interest the information provided by Iceland regarding the Integrated Weather, Sea Ice and Ocean Service System Project, which was a three-year research project supported by the European Commission involving six institutes in four countries. The project aimed at developing a prototype marine information system to provide a single entry access to meteorological, sea-ice and oceanographic data and products in electronic form, for a variety of applications. The Commission recognized the potential value of such projects to its own

work and requested the Services Coordination Group to keep that matter under review and to coordinate JCOMM interaction and input as appropriate.

6.3.15 In addition to the subjects dealt with above, the Commission considered that there were a number of topics in the field of sea ice which would require attention during the coming inter-sessional period, in particular:

(*a*) Future development and revision of the sea-ice nomenclature and terminology, data formats and software codes;

(*b*) Preparation of historical sea-ice datasets for sea-ice covered areas;

(*c*) Development of cooperation and coordination with climate-oriented programmes such as WCRP, WCP and especially with the CLIC Project, for which the GDSIDB was a valuable sea-ice data resource;

(*d*) Developing techniques and capabilities systematically to measure ice thickness by means of remote sensing;

(*e*) The provision of support to southern hemisphere countries, including technical advice and access to satellite data, to enhance Antarctic ice services.

6.3.16 The Commission expressed its appreciation for the proposals made at the Meeting of Experts to Develop a Polar Region Strategy for JCOMM/GOOS, which was organized by WMO in Geneva in December 1999, following a recommendation by the first JCOMM Transition Planning Meeting (JCOMMTRAN-I, St Petersburg, July 1999). The Commission noted that the meeting of polar experts had agreed on the importance of developing an integrated Polar Region Strategy Document for JCOMM. As the first step in the development of a strategy document, an IOC/WMO consultant, Mr G. L. Holland (Canada), prepared a report on oceanographic and marine meteorological observations in the polar regions. The report, entitled *Oceanographic and Marine Meteorological Observations in the Polar Regions: A Report of the Joint WMO/IOC Technical Commission on Oceanography and Marine Meteorology* (WMO/TD-No. 1032, JCOMM Technical Report No. 8), was reviewed by participants at JCOMMTRAN-II in Paris, June 2000, and subsequently published.

6.3.17 The Commission also noted that that meeting of experts had agreed on the importance to JCOMM of having available a mechanism to review, coordinate and advise on appropriate matters relating to polar seas and other areas effected by sea ice. The meeting had recommended that JCOMM establish a Working Group on Polar Seas and other Sea-Ice Regions. However, following advice from the eighth session of the Steering Group for the GDSIDB and other polar region experts, the interim JCOMM Management Committee decided not to accept that recommendation, but instead to recommend to JCOMM to retain an expert team on sea ice.

6.3.18 In the light of those considerations, the Commission agreed on the need to establish an Expert Team on Sea Ice of the Services Programme Area. Further action in that regard was taken under agenda item 16.

6.3.19 Finally under the present agenda item, the Commission noted with appreciation the important work being undertaken by regional and international groups, such as the Baltic Sea-ice Meeting, the IICWG and the IHO electronic chart display information system. It agreed that future collaboration should be continued between the Expert Team on Sea Ice and those groups, and requested the chairperson of the Expert Team and the Secretariats to arrange for such collaboration, as appropriate.

6.4 MARINE POLLUTION RELATED SERVICES (agenda item 6.4)

6.4.1 The Commission noted with interest and appreciation the comprehensive report of the Rapporteur on MPERSS, Mr P. Daniel (France), which included the summary results of a questionnaire on the status of implementation of the system. The Commission further expressed its appreciation to the Secretary-General of WMO and the Australian Bureau of Meteorology for organizing, convening and hosting the very successful MARPOLSER98 Seminar and Workshop on MPERSS (Townsville, Australia, July 1998), as well as for publishing the full proceedings of the Seminar as a WMO technical document.

6.4.2 The Commission noted with appreciation that IMO, through its Marine Environment Protection Committee, had expressed its strong support for the concept and eventual full implementation of MPERSS, and had offered to assist in that implementation to the extent possible. The Commission recognized that, while much progress in MPERSS development had been made in many of the designated MPI areas, system implementation nevertheless remained far from complete in some parts of the world. In that context, the Commission reiterated its belief in the value of MPERSS as a support to combating the effects of major marine pollution emergencies originating in sea areas outside national jurisdiction and stressed the importance of the full implementation of the system as soon as possible.

6.4.3 At the same time, the Commission recognized that, while MPERSS was concerned with pollution emergencies on the high seas, meteorological and oceanographic data and services were highly relevant to marine environment protection in many other ways and in other ocean areas, in particular in coastal and regional seas. That impinged very much on interactions with GOOS, including coastal GOOS and regional activities such as EuroGOOS. It therefore requested the Services Coordination Group to keep that whole topic under review and to develop proposals for new services and support activities as appropriate, in close coordination with the GOOS COOP (see also discussions under agenda items 5.3 and 12.1). In doing so, the Commission emphasized that a capability for operational response and the operational delivery of data and products was an essential criteria in the provision of meteorological and oceanographic support to many types of marine environmental protection in coastal waters and regional seas, as it was in high sea areas.

6.4.4 The Commission therefore agreed that MPERSS trials should continue during the coming inter-sessional period, and to that end decided to keep in force Recommendation 2 (CMM-XI) — Marine Pollution Emergency Response Support System for the High Seas. At the same time, however, it noted and agreed with the substance of the recommendations of the MARPOLSER98 Workshop concerning modifications to details of the system, specifically:

(*a*) To include the concept of centres of excellence in meteorological and oceanographic support for pollution emergency response, as support for the Area Meteorological and Oceanographic Coordinators. While those centres would not necessarily provide operational products, or be considered formally as WMO RSMCs, they could nevertheless perform a very valuable role in areas such as the provision of expert advice and specialized training to Area Meteorological and Oceanographic Coordinators and supporting services;

(*b*) To investigate possible adjustments to the areas of responsibility as presently defined (the MPI areas), to better reflect existing technical and geographical realities, as well as the roles and responsibilities of regional and national combating centres;

(*c*) Other operational support should include a Web site with real-time information on incidents and support provided;

(*d*) Section 2.3.1 of the JCOMM work plan should recognize that, ideally, meteorological and oceanographic information and support should be prepared and delivered on time- and space-scales relevant to the requirements of the operational response which it was supporting;

(*e*) Both the principles and section 2.3.1 should note specifically that the provision of high quality meteorological and oceanographic support products required real-time interaction with, and feedback from, the users; that included on-site observations as well as feedback on product quality and timeliness;

(*f*) In addition to (*e*) above, reference should be made to the fact that those NMS running oil spill models required input information from users on the oil type involved in each incident;

(*g*) Section 2.3.1(*d*) should include some generic reference to modern communications facilities, rather than specific reference to Inmarsat alone;

(*h*) The information given in Annex IV to the MARPOLSER98 Workshop report should replace that given in Appendix II to the plan;

(*i*) Appendix I should be revised appropriately following the review of the MPI areas recommended above;

(*j*) IMO should provide WMO with amendments to section 2.4 and Appendices III, IV and V, as appropriate.

The Commission therefore requested:

(*a*) The Services Coordination Group to prepare specific proposals based on recommendations (*a*) to (*c*) above, for review by the Management Committee and eventual distribution to Members/Member States concerned for their consideration and agreement;

(*b*) The Services Coordination Group and the Secretariats to prepare an updated version of the system plan on the basis of recommendations (*d*) to (*i*) above, again for review by the Management Committee and eventual distribution to Members/Member States.

6.4.5 The Commission recognized that the other recommendations made by the MARPOLSER98 Workshop, relating to the role of NMSs, service and product enhancement, and guidance and capacity building, would, if implemented, assist substantially in facilitating MPERSS implementation. It therefore requested the Services Coordination Group to review those recommendations and develop a plan for their implementation.

6.4.6 The Commission strongly encouraged all Members/Member States that had accepted responsibilities under MPERSS to continue their efforts to implement fully the system during the coming inter-sessional period, and to report again on implementation status to JCOMM-II. In addition, the Commission:

(*a*) Encouraged bilateral collaboration between those Area Meteorological and Oceanographic Coordinators which had been largely successful in implementing MPERSS in their MPI areas and those where implementation problems remained; in that context, it requested the coordinators to consider establishing MPI area coordination subgroups, to assist in implementation;

(*b*) Requested the Secretariats to consult with IMO, with a view to having MPERSS included as part of intergovernmental protocols and contingency plans relating to emergency response operations;

(*c*) Agreed that the existing MPI Area III (Mediterranean Sea) should be formally divided into two sub-areas: III(A), western Mediterranean (AMC from France); and III(B), eastern Mediterranean (AMC from Greece);

(*d*) Further agreed that a new MPI sub-area III(C) should be created, comprising the Black Sea, and requested the Secretariats to discuss with Bulgaria the possibility of Bulgaria assuming the responsibility of Area Meteorological and Oceanographic Coordinator for that sub-area;

(*e*) Proposed that a second seminar/workshop on MPERSS should be convened in 2002 or 2003 and accepted with appreciation the kind offer of France to host that event. It requested the co-presidents of JCOMM and the Rapporteur on MPERSS, in consultation with the Secretariats, to identify appropriate funding support for the event. It also urged that that workshop should include substantial participation from maritime safety agencies and other user organizations, which would assist greatly in the implementation and recognition of the system;

(*f*) Requested the Services Coordination Group to develop a mechanism to deal with technical and scientific issues related to the implementation of

MPERSS, including the development of a specific implementation plan and timetable, directed at ensuring full implementation of the system during the coming inter-sessional period;

(*g*) Further requested the Services Coordination Group to develop appropriate technical guidance on MPERSS, including a compilation of available oil spill models, to assist in system implementation.

6.4.7 In order to implement properly the tasks listed in general summary paragraphs 6.4.4 and 6.4.6, the Commission suggested to the Services Coordination Group that an appropriate approach might be to propose to the co-presidents to establish a small ad hoc task team to work on the issues by correspondence.

6.5 **JCOMM PRODUCTS BULLETIN** (agenda item 6.5)

6.5.1 The Commission noted with appreciation that the JCOMM Electronic Products Bulletin, through the use of the latest information technology, provided ways of downloading datasets and tailored oceanic products, all scientifically controlled, platform transparent and produced by national and scientific institutions. The Commission was informed that the JCOMM Products Bulletin would be coordinated and harmonized with the GOOS Products Bulletin and could be viewed at:

http://iri.ldeo.columbia.edu/climate/monitoring/ipb/

At the same time, new and more comprehensive climate highlights could be viewed at:

http://iri.ldeo.columbia.edu/climate/cid/

6.5.2 The Commission noted with appreciation that multidisciplinary applications of climate and climate variability, in support of GOOS and GCOS, were summarized each month within the Bulletin highlights, along with the latest ocean products. One-year animations of different oceanic products were provided by default: heat storage anomalies, sea-surface temperature anomalies, thermocline depth, etc. The products could be animated for the full dataset periods, if required. All the animations were in GIF format so that no special software was needed besides a Web browser. On-line computation of time-series could be easily accomplished. Users could display the results in colour or black and white, as necessary, while figures could be saved in JPEG, PS and GIF formats. Climatology for different variables, such as mixed layer depth, sea-surface temperature, heat storage, among other things, could be adapted to users' needs and subsequently downloaded.

6.5.3 The Commission agreed that a specialized workshop on JCOMM products in support of operational oceanography and marine meteorology, co-sponsored by IODE, could provide an important forum for the discussion of new ideas and a catalyst for further development in operational ocean products. Such a workshop might be similar to the IGOSS workshop that took place in Tokyo in April 1991. In addition, the workshop should address the question of supporting the Products Bulletin in future from the financial and manpower standpoints, since it had, up to the present, been realized pro bono by its Editor. The Commission requested the Management Committee, in consultation with the Editor of the Products Bulletin, to develop a concrete proposal for such a workshop, to take place during the coming inter-sessional period. It accepted with appreciation the kind offer of France to host that workshop.

6.5.4 The Commission agreed that information and education delivered through the JCOMM Electronic Products Bulletin was also very important. Educational modules could be a part of the Bulletin, including climate variability and climate fluctuations, from intra-seasonal to multi-decadal. It noted with interest that, in collaboration with the Scripps Institution of Oceanography, a "climate engine" was presently being put together so that users could have access to their favourite climate signal and see through the Web the evolution of different oceanic parameters associated with that signal. The animation could then be downloaded on personal PCs. That ambitious development required close collaboration between the Lamont-Doherty Earth Observatory/Scripps Institution of Oceanography and other key institutions in the world, with a potential key role being played by POGO. The development of "cache sites" in Germany (Europe), Japan (Asia), Australia-South Africa-Brazil (southern hemisphere) was still in the implementation phase. With the implementation of Argo, a range of new products (including salinity at depth) could be developed and made available in real-time to the community. The Commission agreed that that was indeed an interesting and potentially valuable new possibility for the Bulletin. It therefore again requested the Bulletin Editor and the Management Committee to prepare a detailed proposal and implementation plan, including identification of the required resources for its long-term maintenance.

6.6 **OTHER SERVICE ISSUES** (agenda item 6.6)

MONITORING OF MARINE METEOROLOGICAL SERVICES

6.6.1 The Commission recalled that development of a MMS monitoring programme had been initiated by the former CMM in 1981. The outline for a monitoring programme had subsequently been prepared, adopted by CMM-IX and distributed to WMO Members for action in April 1985.

6.6.2 The Commission further recalled that, in 1989, CMM-X had directed its Subgroup on Warning and Forecast Preparation to evaluate the results of the monitoring of MMS and to advise on the development of services. The report of the Subgroup, based on the results of a global survey, provided an up-to-date assessment of the quality of the MMS in the various oceanic regions of the world, along with mariners' suggestions for improvement to those services. CMM had invited WMO Members to review carefully the results of the survey and to take appropriate actions to correct any identified deficiencies. CMM had agreed on the need for an ongoing marine services monitoring programme, to be undertaken on a four-yearly basis.

6.6.3 The results of the next survey were presented to CMM-XII, which had agreed that the monitoring

process should continue. In that context, the Commission noted with interest the results of the monitoring survey undertaken during 2000, coordinated by the WMO Secretariat, with the questionnaires distributed to ships' masters through national PMOs. The survey had generated a total response of 650 questionnaires completed by ships' masters, and the Commission expressed its appreciation to the PMOs and the ships' masters for their efforts to assist NMSs to enhance their marine services.

6.6.4 The Commission noted and agreed with the general findings of the survey, which were summarized in narrative and tabular form in Annex I to this report. The Commission further noted that, in addition to the statistical analysis, many ship captains had provided written suggestions for improvement of services and descriptions of specific problems that they had encountered. That response highlighted the importance the marine user community placed on the availability of high quality MMS. The Commission recognized in particular that there remained considerable room for improvement with regard both to the quality and content of services, and to their coverage and timeliness in some oceanic regions. It requested that the detailed results of the survey, including the comments, should be distributed to NMSs disseminating MMS, and encouraged those NMSs to take corrective action in areas of identified weakness.

6.6.5 In doing so, the Commission recognized that:

(*a*) MMS of high quality, reliable accuracy and ready availability continued to be of great importance to mariners. There had been almost total agreement among responding mariners confirming the usefulness of those services;

(*b*) Pictorial weather information, transmitted to ships at sea via radiofacsimile or other means, was highly regarded by mariners and should receive priority consideration for continuation and improvement. While alternate methods of transmitting marine weather images were being developed, NMS were encouraged to support their own internal facsimile services as a vital component of MMS;

(*c*) User response to current MMS was generally favourable. Nevertheless, there was room for improvement in certain geographic areas, including in particular the Indian Ocean, as well as in various aspects of service delivery. Reliability of schedules continued to be a problem, especially in some areas of the southern hemisphere. The inability of ships to access a single source for current information on products, frequencies, times, media and geographic coverage was also of some concern;

(*d*) The priority that JCOMM gave to MMS, as well as to the communications systems employed for their delivery, was fully justified by user responses to those services;

(*e*) The monitoring of MMS was a very useful diagnostic tool for improving the quality and value of those services, which was also appreciated by the user, and should be continued on a systematic basis.

6.6.6 As a follow-up to those conclusions, the Commission agreed on the need to continue maintaining a systematic long-term global MMS monitoring programme, based on the questionnaire and response format presently in use. That format should be reviewed for currency and applicability of content by the Expert Team on Maritime Safety Services prior to its distribution, by the Secretariats, to national PMOs, for onward distribution to ships' masters. The Commission decided to keep in force Recommendation 1 (CMM-XI) — Marine Meteorological Services Monitoring Programme, on that subject. The Commission further recommended to the Expert Team to consider the possibilities of disseminating the survey in future to ships' masters via SafetyNET, to ensure a wide receipt, bearing in mind the cost implications of such an action for NMSs concerned.

6.6.7 The Commission invited Members/Member States to review carefully the results of the survey, including the comments and suggestions made by the users, particularly those that had been repeated from previous surveys, and to take appropriate measures to correct identified deficiencies. In the context of the value that mariners placed on pictorial and chart information, the Commission noted with interest the project being undertaken to develop a facility, within SafetyNET, for the transmission of graphical information in digital form via Inmarsat-C and for its reconstitution onboard ship, as a GMDSS service. It expressed its appreciation to the Australian Bureau of Meteorology, Inmarsat Ltd. and the WMO Secretariat for their efforts to develop that facility, and urged that the project be completed as soon as possible. At the same time, it strongly requested NMSs to continue their support to radiofacsimile broadcast facilities, which provided vital products to mariners.

OTHER MARINE SERVICES

6.6.8 The Commission recognized that the requirements of all users for improved, expanded and new marine meteorological and oceanographic services and service types were developing rapidly. Such developments included requirements for data and information on other than the traditional marine meteorological and oceanographic variables, as well as for service types such as climate-related data and products.

6.6.9 The Commission agreed that it should monitor and review such developments, and provide advice and guidance to Members/Member States as necessary. Recalling the decision recorded in general summary paragraph 6.2.17, it therefore requested the Services Coordination Group to undertake that review on an ongoing basis and to coordinate the preparation of advice and guidance, as appropriate.

7. DATA MANAGEMENT (agenda item 7)

7.1 MARINE CLIMATOLOGY (agenda item 7.1)

MARINE CLIMATOLOGICAL SUMMARIES SCHEME

7.1.1 The Commission noted with satisfaction that the modified MCSS, as adopted by the eleventh session

of the former CMM and revised at the twelfth session of CMM, had continued to provide substantial support to the WCP and marine climatological services and applications alike during the past inter-sessional period. Although implementation of the scheme among contributing Members/Member States remained rather slow, continuing improvements in data throughput had been achieved, together with the correction of some non-standard working practices through action by the GCCs. The Commission expressed its considerable appreciation to contributing and responsible Members/Member States and, in particular, to the GCCs (in Germany and the United Kingdom) for their very valuable effort in implementing, maintaining and improving the scheme. It strongly urged all potential contributing Members/Member States (i.e. those operating VOS) to make every effort to digitize their ship reports and to submit them to the GCCs in the IMMT format, according to the agreed procedures, and with minimum quality control applied.

7.1.2 The Commission recalled that MQC standards, to be applied by Contributing Members/Member States prior to data submission, had been first adopted by CMM-XI (Lisbon, April 1993), and revised by CMM-XII (Havana, March 1997). The eighth session of the Subgroup on Marine Climatology (Asheville, April 2000), based on advice from the GCCs, had developed some small additional revisions and updates to those MQC standards, designed to enhance further the quality of VOS data submitted to the GCCs. Those revisions also included an MQC standards version number. The Commission noted that the revisions based on recommendations by CMM-XII and the Subgroup on Marine Climatology now formed a part of the *Guide to Marine Meteorological Services* (WMO-No. 471) as MQC standards version 3. After the publication of the *Guide*, the Subgroup developed additional revisions and the Commission agreed with those revisions as MQC standards version 4. A recommendation for their adoption and inclusion in the *Manual* was recorded under agenda item 9.

7.1.3 The Commission noted with appreciation that recommendations made at the eleventh and twelfth sessions of the former CMM had now been included in the latest edition of the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47) (the ship catalogue), and in particular that:

(*a*) Detailed specifications for the full database fields had been completed by the Subgroup on Marine Climatology;

(*b*) An upgraded database structure using those new fields had been prepared by the Secretariat;

(*c*) The new database would very shortly be available on the WMO Web site, for search, downloading and updating.

The Commission further noted and supported the recommendations of the Subgroup on Marine Climatology concerning:

(*a*) The use of the IMO ship number as a unique identifier;

(*b*) That the catalogue should include full search capability, allowing for the easy extraction of information on individual ships and their instrumentation;

(*c*) That the search capability using the IMO number should be able to identify duplicate data entries from ships.

The Commission recalled the recommendation of the twelfth session of the former CMM regarding the inclusion of digital ship imagery in the catalogue. It noted that that was being implemented first for the VOSClim Project, which could therefore serve as a pilot project for a more complete ship catalogue in the future. It therefore recommended to the Expert Team on Marine Climatology, and to the Secretariat, to prepare the format and entries necessary for inclusion of that imagery in the catalogue in the future. It further requested the Secretariats to make a formal call to VOS operators to submit digital ship imagery once that format had been implemented.

7.1.4 The Commission agreed that the major discussion concerning the VOSClim Project should take place under agenda item 8.1. At the same time, it noted with interest the aspects of the project relating specifically to data management issues. Modifications to the IMMT format had been prepared by the Subgroup on Marine Climatology in support of the project, to allow the additional information required by the project to be recorded, exchanged and archived. In addition, the project had developed an expanded metadata catalogue format, to include digital imagery and other additional information required to enhance the quality of the observational data reports. Many of those additional metadata would be acquired through an expanded ship survey report, which might eventually be proposed to the Commission for adoption by all VOS operators as a unique standard. The Commission noted with appreciation the establishment both of the VOSClim Data Assembly Center by the NCDC, NOAA and of the Real Time Monitoring Centre at the Met Office (United Kingdom). Together, those would ensure a smooth flow and archival of project data, as well as a real time review of the quality of those data, to allow rapid response and correction, as necessary.

7.1.5 The Commission noted with interest that the Subgroup on Marine Climatology was addressing the development of a standardized code format required for the exchange of historical ship data digitized from national logbooks. It recognized that such data were especially significant for data-sparse time periods such as the duration of the two world wars, the nineteenth century and earlier data. The Subgroup had agreed that such a format would need to be flexible, expandable and simple enough to meet unanticipated requirements and characteristics of such data, as well as to simplify practical implementation by Members/Member States. That format, the International Maritime Meteorological Archive format, was being developed by Mr S. Woodruff (United States) and, was expected to be finalized by the Expert Team on Marine Climatology within one year,

with a view to its eventual submission to JCOMM for formal adoption. That format would be in ASCII and could offer a solution for the standardization of the comprehensive ocean-atmosphere dataset and its blend with the United Kingdom marine data bank, to facilitate improved near-real-time marine climate products.

7.1.6 The Commission noted and supported the efforts by the Subgroup on Marine Climatology to verify the availability of documentation relating to the history of the marine ship codes, as well as the feasibility of making such documentation available on the Web. That documentation would be extremely valuable in particular to the correct interpretation of observational data contained in the archives, which were clearly sensitive to the codes and formats used for their exchange. Since both the SHIP code and the IMMT format were approved through resolutions of the WMO Executive Council, a table of changes to the codes had been prepared, based on past WMO Executive Council, CBS and CMM resolutions, recommendations and reports. The Commission expressed its appreciation to the Subgroup, and in particular Ms T. Manabe (Japan), for the thorough study that had been undertaken. At the same time, it recognized that substantial work remained to be done to actually finalize that study. The Commission therefore requested the Expert Team to continue that study as an ongoing priority task, in particular with regard to the IMMT format. The Commission further supported the efforts of the Subgroup to continue with the digitization of earlier (non-electronic) versions of the *International List of Selected, Supplementary and Auxiliary Ships*.

MODIFICATIONS TO THE *MANUAL* AND THE *GUIDE ON MARINE METEOROLOGICAL SERVICES*

7.1.7 The Commission noted with appreciation that the fully revised version of the *Guide to Marine Meteorological Services* (WMO-No. 471), which had been provisionally approved by CMM-XII, had been finalized during the inter-sessional period. That finalization included the addition of new annexes as well as some minor editorial corrections agreed by the Subgroup on Marine Climatology, such as the replacement of references to CMM by JCOMM. The English edition of that revised *Guide* was to be issued shortly by the WMO Secretariat, with the other language versions to follow in due course. At the same time, the Subgroup had identified a number of additional changes to both the *Guide* and *Manual* that would require JCOMM approval. Those included in particular the discontinuance of the ISCDC, maintained by the Met Office (United Kingdom). The Commission agreed with the Subgroup that the operation of that Centre was no longer required, in view of the fact that there had been no submissions of data to the Centre in Bracknell for at least the past 10 years, nor had there been any requests to the ISCDC for the provision of such data during the same period. The Commission expressed its appreciation to the Met Office for its efforts in maintaining the ISCDC over many years and recommended that the data holdings of the Centre should eventually be transferred to the appropriate WDC. Specific actions to effect the necessary modifications to both the *Manual* and the *Guide* to reflect the discontinuance of the ISCDC, as well as to incorporate agreed modifications to the IMMT format and MQC standards, were recorded under agenda items 9 and 10, respectively.

7.1.8 More generally, the Commission recognized that there were probably a number of similar oceanographic and marine meteorological data holdings in existence, which should be identified and, if possible, included in freely accessible data archives. It therefore requested the Data Management Coordination Group to undertake a review of that situation and to propose appropriate follow-up actions. In addition, it recognized the need for an archive system for surface current data from all sources, and again referred action on that matter to the Data Management Coordination Group.

CLIMAR99 AND THE *GUIDE TO THE APPLICATIONS OF MARINE CLIMATOLOGY* (WMO-NO. 781)

7.1.9 The Commission recalled that CMM-XII had agreed that the *Guide to the Applications of Marine Climatology* should, in the future, comprise two distinct sections, to enhance its utility and facilitate updating. Those would be:

(*a*) A static part, which would be maintained as a hard copy and could be expected to remain valid for a long time;

(*b*) A dynamic part, which would deal with new technologies and climate change and be maintained electronically, and possibly also in hard copy form.

In keeping with that agreement, CMM-XII had supported a proposal to convene a self-funding workshop to provide input for the dynamic part of the *Guide*. The Commission noted with appreciation that the CLIMAR99 Workshop had taken place in September 1999 in Vancouver, hosted by the Meteorological Service of Canada, with additional sponsorship from WMO, NOAA's Office of Global Programs, and the United States National Weather Service. The Commission was pleased to note that the Workshop was considered very successful, with over 80 participants from 30 countries, including representations from Members/Member States from all WMO Regions. The Commission noted further that a subset of the papers presented at the Workshop had subsequently been peer reviewed and recommended by the Subgroup on Marine Climatology for inclusion in the *Guide* as the "Dynamic part". The Commission supported that recommendation, and action to implement it was taken under agenda item 10. Based on the success of CLIMAR99 the Commission agreed on the desirability of convening a second such workshop, CLIMARxx, to be held prior to JCOMM-II. The Commission further agreed that the scope of that second workshop should be widened to cover also ocean climate issues. It requested the co-presidents of JCOMM, together with the Data Management Coordination Group and the Secretariats, to establish an organizing committee for the workshop and to identify a host organization and potential sponsors as soon as possible, to facilitate its planning and

conduct. The Commission also suggested that consideration should be given to merging the workshop with a future OceanObs and the 150th anniversary, in 2003, of the Brussels Conference of 1853.

ODAS METADATA FORMAT

7.1.10 The Commission recalled that it had requested the Subgroup on Marine Climatology to consider the development of a comprehensive metadata base for ocean data acquisition systems (ODASs), including moored and drifting buoys, offshore platforms, etc. That database would allow a full and accurate interpretation of the observational data from ODAS that were available in climatological archives, in support of global climate studies as well as a range of marine climate applications. In that context, the Commission noted with interest and appreciation that the Subgroup had developed a detailed proposed format for the metadata base, which had subsequently been extensively reviewed and eventually agreed by both the Subgroup and the DBCP, representing buoy operators. The Commission agreed with the proposed format, and action to adopt it formally was taken under agenda item 7.4. The Commission recognized the urgent need to identify a centre willing to host that important metadata base. It requested the co-presidents, in consultation with the chairpersons of the DBCP and the Data Management Coordination Group, and the Secretariats, to obtain the agreement of such a host centre as soon as possible.

BEAUFORT EQUIVALENT SCALES

7.1.11 The Commission recognized that wind data derived from Beaufort estimations continued to be of vital importance for global climate studies as well as for operational purposes. It reiterated the recommendations to Members/Member States made by the former CMM that:

(*a*) Observations should continue to be made using the WMO recommended scale as given in the *Manual on Marine Meteorological Services* (WMO-No. 558);

(*b*) Original observed Beaufort values should be maintained in the climatological records.

The Commission recalled that CMM-XII had accepted the kind offer of Germany for Mr R. Lindau to finalize a technical report on Beaufort equivalent scales. It noted with appreciation that that study had been completed by Mr Lindau, in consultation with the Subgroup on Marine Climatology, and that the report had been recommended by the Subgroup for inclusion as one of the papers making up the Dynamic part of the *Guide to the Applications of Marine Climatology* (see action under agenda item 10). The Commission recognized that the scale proposed by Mr Lindau took into account both the error differences in individual observations and the effects of natural variability, a procedure which guaranteed a correct determination of the common relationship between Beaufort scale and wind speed. The Commission therefore also supported the recommendation of the Subgroup that that scale be used in the future for scientific purposes.

SUPPORT FOR THE WCP

7.1.12 The Commission recognized that marine climatological data and products were of considerable importance to the WCP and that its own activities in that field were of continuing and increasing value. In that context, it endorsed actions or recommendations taken by the Subgroup on Marine Climatology including:

(*a*) Requesting Members/Member States to establish links from national Web pages to the INFOCLIMA pages on the WMO server, to enhance its visibility and utility, as INFOCLIMA was directly relevant and important also to JCOMM;

(*b*) Proposing some new sections and topics for the *Guide to Climatological Practices* (WMO-No. 100) and offering to assist in their preparation;

(*c*) Seeking additional entries into INFOCLIMA.

The Commission noted with interest the proposal which had been presented to the fifty-second session of the WMO Executive Council to establish closer collaboration among the World Climate Data and Monitoring Programme, the WWW and GCOS. The objective of the proposal was to provide interactive Internet access to an enlarged database listing of climate datasets which were available in various services and institutions as well as in national climate centres. The Commission supported that proposal, in particular because that opened INFOCLIMA to effect an integration with the oceanographic community, which was one of the objectives of JCOMM. The Commission recognized additional, ongoing JCOMM activities contributing to the WCP, such as refinements to, and the ongoing operation of, the MCSS, and the upgrade to the *Guide to the Applications of Marine Climatology*.

7.1.13 The Commission recognized that JCOMM activities in marine climatology were directly relevant to the climate module of GOOS and to GCOS in general. It therefore requested the Expert Team on Marine Climatology to develop a mechanism for close collaboration with relevant bodies of GOOS and GCOS, such as AOPC.

OTHER MATTERS

7.1.14 The Commission recalled that CMM-XII had supported the project being undertaken by the Subgroup on Marine Climatology to compile a catalogue of global storm surge data holdings. It reiterated the potential value of such a catalogue for both operational and climatological purposes. In that context, it noted with interest the review of the project undertaken by the eighth session of the Subgroup, which had reconfirmed earlier findings that:

(*a*) Substantial amounts of storm surge data were archived in a number of countries;

(*b*) There was some interest in having a global catalogue of data holdings;

(*c*) There was also some interest in the eventual international exchange of those data, at least regionally.

The Commission supported that view as well as the proposal from the Subgroup to reactivate the project, if

possible, with the continued assistance of Mr E. Zaharchenko (Latvia), the author of the original study, and WDC-B (Russian Federation). It therefore urged the Expert Team on Marine Climatology to make every effort to continue and to finalize that important project. At the same time, the Commission recognized the need to converge all metadata catalogues such as that one towards common standards and formats. It therefore requested the Expert Team to work closely with IODE in that regard and to consider the inclusion of the storm surge and other similar catalogues within the IODE MEDI catalogue.

7.1.15 The Commission noted that the eighth session of the Subgroup on Marine Climatology had reviewed and supported proposals from relevant WMO tropical cyclone bodies and workshops for improvements to the report format of the "Global tropical cyclone track and intensity dataset". Those included, in particular, provision for additional information on tropical cyclone core radius and radius of maximum wind gust. The Commission recognized that that revised format had already been implemented operationally through all the WMO tropical cyclone regional bodies and expressed its appreciation to all concerned for their efforts in developing and implementing the format so efficiently.

7.1.16 The Commission reiterated the potential value of wave data holdings to global climate studies as well as to the provision of various marine services. It noted that a questionnaire relating to a possible catalogue of national, satellite-derived ocean wave databases, prepared by Mr V. Swail (Canada) had been distributed to members of the Commission during the inter-sessional period. Although limited, the responses had indicated that there existed some relevant and valuable satellite-derived ocean wave data in a few national databases. It therefore requested the Secretariat to contact those Members/Member States having answered the questionnaire affirmatively and to invite them to provide relevant information on their database holdings to INFOCLIMA.

7.1.17 The Commission recalled that WMO RA VI (Europe) was proceeding with the implementation of the unit "m s^{-1}" as the sole unit for reporting wind speed in standard WMO codes (with the exception of the aeronautical codes), in accordance with the decision contained in WMO Congress Resolution 30 (Cg-V) — Units for wind speed in meteorological messages for international exchanges. At the same time, it recognized that the "knot" had been the traditional unit of speed among mariners and remained in use at the present time in a number of countries. In that context, it agreed with the views of the Subgroup on Marine Climatology that the use in a number of cases of "m s^{-1}" in place of "knot" to report wind speed in meteorological messages could potentially:

(*a*) Cause confusion in the everyday recording and reporting of meteorological observations from ships;

(*b*) Introduce a bias in the climatological record, through simplified conversion methods and overestimation of values due to rounding procedures;

(*c*) Introduce observational errors which might be difficult to correct;

(*d*) Cause loss of data resolution, particularly for operational forecasting models as well as climate studies.

The Commission therefore recommended to the WMO Executive Council and Regional Associations to consider the special needs and traditions of the marine community, as well as the potential difficulties being created regarding the marine climatological database, with a view to allowing the continued use of "knot" as a unit of wind speed in marine weather reporting.

EXPERT TEAM ON MARINE CLIMATOLOGY

7.1.18 The Commission recognized that the MCSS was continuing to make a major contribution to global climate studies and to the provision of marine climatological services, that there were many other aspects of the exchange and processing of marine climatological data which required ongoing attention, and that there were several specific issues which had been identified at the session which required attention during the coming four years. It agreed that the mechanism employed by the former CMM to deal with marine climatology remained generally appropriate, and therefore decided to establish an Expert Team on Marine Climatology within the Data Management Programme Area. Specific action in that regard was taken under agenda item 16.

7.2 OCEAN DATA (agenda item 7.2)

GLOBAL TEMPERATURE SALINITY PROFILE PROGRAMME

7.2.1 The Commission noted with interest and appreciation a status report on the GTSPP, covering its objectives and performance. It recognized that the GTSPP was an important component in the collection, management and delivery of data and information to the ocean and meteorological community. The GTSPP was originally a joint programme of the IOC Committee on IODE and the Joint IOC/WMO Committee on IGOSS. As such, the GTSPP was now jointly sponsored by JCOMM and IODE.

7.2.2 The Commission recalled that development of the GTSPP had begun in 1989 with the long-term goal being to develop and implement an end-to-end data management system for temperature and salinity profile data, which could serve as a model for future oceanographic data management systems. GTSPP had begun operation as a pilot programme in November 1990. The first version of the GTSPP Project Plan was published the same year. In 1996, the GTSPP ended the pilot phase and became a permanent programme. At the same time, a revised project plan was written. The objectives of the GTSPP were, among other things, to provide a timely and complete data and information base of ocean temperature and salinity data of known and documented quality in support of users.

7.2.3 The Commission recognized with appreciation that, over the 10 years of operation, the GTSPP had accomplished a number of things including improved

quality control, better data monitoring, improved data availability and enhanced cooperation between data centres and scientific organizations. Because of the advancements made, the end-to-end data system which the GTSPP represented had been adopted by WOCE and SOOPIP and had been recognized as part of GOOS. The Argo programme would also be heavily influenced by GTSPP through the ideas incorporated and participants of groups involved in the GTSPP. Through contributions to Argo and elsewhere, GTSPP was expected to contribute to CLIVAR. The GTSPP was being continually reviewed and changes were made to improve performance and support other clients. Consideration was presently being given to improved efficiencies in quality assessment and to provide better access to information about GTSPP and to its data holdings.

7.2.4 The Commission agreed that continuing oversight of real-time temperature and salinity profile data, in concert with IODE, was an essential task of the Commission. The Commission also agreed that support for GTSPP by Members/Member States could make valuable contributions in a number of areas, including:

(*a*) Encouraging an increase in the number of temperature and salinity observations transmitted in near-real time;

(*b*) Undertaking quality control checks according to the GTSPP *Quality Control Manual* on data collected by national programmes and attaching GTSPP metadata and flags;

(*c*) Improving mechanisms allowing the more timely submission of both near-real-time and delayed mode data;

(*d*) Encouraging national research agencies to develop data and information products as part of the scientific quality assurance process and as a service to national and international users;

(*e*) Actively acquiring historical temperature and salinity data that had not previously been exchanged;

(*f*) Providing software that could be used by centres managing the GTSPP data and could be distributed to centres in Members/Member States.

7.2.5 The Commission noted that a proposal for the creation of an international project to manage surface salinity data had been developed following a recommendation by the SOOPIP and had been presented at the IOC/IODE sixteenth session in Lisbon in November 2000. It noted further that the basic concept was to develop an end-to-end system, similar to that of the GTSPP, but oriented to handling surface salinity measurements. Such data were recognized as very important to understanding climate and in modelling the upper ocean. IODE had recommended that a pilot project be established, with a Steering Group established to discuss the specifications of the data management and to implement and monitor the pilot project, in collaboration with existing structures at WDC-A and ICES and some scientific practices in Members/Member States. Initial participants in the project included Canada, France, Germany, Greece, the United Kingdom, ICES and the WDC-A (United States). Discussions were to start by e-mail immediately. The Commission recognized that the need for increased collection and careful management of surface salinity data had been highlighted by groups such as OOPC.

7.2.6 The Commission welcomed that initiative and agreed that it was very useful. However, the Commission noted that in keeping with the JCOMM principle to integrate meteorological and ocean measurements and to provide multi-parameter products and services that met the needs of the user community, it was seeking more general solutions to its end-to-end data management systems. Furthermore, the Commission noted that similar requirements had been identified including various types of coastal and surface current data. The Commission therefore requested the Data Management Coordination Group to consider urgently the overall issue of end-to-end data management for ocean and meteorological measurements and to develop a strategy for the Commission. For the specific case of the IODE sea-surface salinity pilot project, the Commission requested the Data Management Coordination Group, through its Expert Team on Data Management Practices, to recommend a mechanism for effective participation.

7.2.7 Specifically with regard to SOOP data management, the Commission noted the expressed need for using extra bandwidth in the real-time data distribution system to enable the transmission of full-resolution XBT data (as recommended by the upper ocean thermal review). The Commission agreed that telecommunication systems such as Inmarsat already provided sufficient bandwidth and that the problem could eventually be resolved by using the BUFR code form for real-time GTS distribution of XBT data. It therefore strongly encouraged SOOPIP to investigate eventually transmitting the data in BUFR. More generally, the Commission agreed that SOOP data management must continue to be driven by user requirements and best scientific practice.

FUTURE OCEAN DATA MANAGEMENT UNDER JCOMM

7.2.8 The Commission recognized that the overall needs for ocean data management were large and complex. It could not necessarily be expected that JCOMM, working with IODE, would have all the expertise and capability to design and implement the needed systems. However, there would be a number of external agencies which could become part of data management system design teams and provide data management services when the systems were implemented. They could also provide centres that would carry out data-processing and management services and would thus become associated with JCOMM and IODE as appropriate specialized data centres.

7.2.9 The Commission agreed that, now that initial data requirements for GOOS and GCOS were becoming better defined, JCOMM and IODE, in consultation with GOOS/GCOS, were in a better position to define responsibilities for the development and implementation of the end-to-end systems needed to manage those data. It recognized that, in general, scientific panels or design

bodies would be responsible for the scientific aspects of the systems, scientific standards, user products and the general requirements for end-to-end data management. JCOMM and IODE would then provide the data management aspects, integration of the flows and delivery of the various integrated datasets to the wide spectrum of users, in line with the model already developed by GTSPP and WOCE.

7.2.10 The Commission recognized that the initial emphasis in end-to-end ocean data management would necessarily be on physical data and those data for which JCOMM and IODE presently had experience. On the other hand, GOOS was beginning to elaborate requirements for, and to deal with, other types of ocean data, chemical and biological. That would necessitate some effort on the part of JCOMM and IODE to examine the requirements and to begin to develop procedures and facilities to participate effectively in those aspects of GOOS, without redirecting effort from the existing systems.

7.2.11 The Commission agreed that development and implementation of effective end-to-end data management practices was a high priority. The Commission noted that the creation of an Expert Team in Data Management Practices provided an effective mechanism for addressing that high priority issue. The Commission recognized the continuing value of the GTSPP and commended it as a programme of the Expert Team on Data Management Practices, jointly with IODE. Furthermore, in consideration of the conclusions in general summary paragraph 7.2.6, the Commission agreed that an urgent initial task was a review and assessment of the general requirements for end-to-end data management functions and that it was highly desirable to conduct that review in concert with IODE.

7.3 **BUOYS AND FLOATS** (agenda item 7.3)

7.3.1 The Commission reviewed the current status of data management systems in place for the surface drifting and moored buoy programmes as well as for floats, as detailed in subsequent paragraphs. Those systems were presently being coordinated through the DBCP and the Argo pilot project, respectively. The Commission agreed that the DBCP mechanisms had demonstrated their efficiency and that they should be continued and integrated within JCOMM through the Data Management Programme Area Coordination Group. The Commission also agreed that the data management procedures, tentatively put in place for floats, were promising and encouraged the Argo project to pursue its activities in that regard, with a view to also including eventually those data management procedures within JCOMM.

DATA BUOY COOPERATION PANEL

ARCHIVAL

7.3.2 The Commission recalled that surface drifting and moored buoy data were quality controlled and archived by the IOC/IODE Responsible National Oceanographic Data Center for drifting buoys, operated by the Marine Environmental Data Service of Canada. The SOC for drifting buoys related to the former IGOSS, operated by *Météo-France*, also extracted reports in BUOY code from the GTS and prepared a number of monitoring products based on those data. Those products included monthly global maps of the distribution of ship and drifter reports of wind, pressure, air temperature and sea-surface temperature. The SOC had reported that data amounts collected by buoys now were generally higher than those obtained through the VOS scheme, even within zones well covered by the VOS fleet. In that context, the Commission questioned the eventual usefulness of having several international data centres dealing with the same kind of data and requested the DBCP and the Ship Observations Team to address jointly the matter, with a view to making appropriate recommendations to both the Data Management Coordination Group and the Observations Coordination Group.

SPECIFIC MECHANISMS

7.3.3 The Commission noted that the DBCP Action Groups such as the Global Drifter Programme and the TIP also maintained their own data management systems basically for providing users with scientific quality data in delayed mode. Data display products were also made available through the Web site of TAO and PIRATA. Scientific datasets were also provided to the Responsible National Oceanographic Data Centre/database and to the appropriate WDCs.

METADATA

7.3.4 The Commission recognized that the Subgroup on Marine Climatology provided oversight for the collection and archival of metadata for all ocean observing systems, including drifting and moored buoys. It noted that the DBCP was taking steps to provide eventually the Subgroup with appropriate metadata in the new format (see agenda item 7.4) and recognized that the various metadata systems in use should eventually converge. To facilitate the use of the new format for drifting buoys, manufacturers would be asked to fill out a standardized sheet each time a new drifter was being delivered. The Panel had also recommended that calibration procedures for buoys should be adequately documented, archived and finally submitted to the Subgroup.

GTS AND REAL-TIME DISTRIBUTION

7.3.5 The Commission noted with appreciation that the Panel was taking steps to initiate GTS distribution of buoy data in BUFR code. Required software developments had been included within the Argos development programme for implementation in 2003. Following recommendations from the DBCP, a modification of the BUOY code had been approved by CBS for implementation in November 2001. That modification would permit encoding of metadata in BUOY code (e.g. anemometer height, buoy type). When BUFR was

implemented, GTS distribution in BUOY format would continue during a transition period of several years.

QUALITY CONTROL

7.3.6 The Commission noted with appreciation that real-time automatic quality control checks were implemented with the Argos GTS subsystem, which processed practically all of the drifting buoy data and some of the moored buoy data (including those from TAO) for GTS distribution purposes. Deferred time quality control of GTS buoy data was achieved through the so-called DBCP quality control guidelines. Principal Meteorological or Oceanographic Centres responsible for GTS buoy data quality control were routinely providing buoy operators with information regarding the quality of their buoy data (i.e. reports on specific problems, buoy monitoring statistics). The quality control guidelines continued to be extremely effective in ensuring that data quality was maintained at the highest level. Recent statistics showed that the root-mean-square of the difference between observed data and the ECMWF meteorological model first-guess field were in the order of 1.2 hPa for air pressure buoy data, and between 2 and 3 m s^{-1} for wind speed buoy data. The Commission recognized the importance of that quality control work and urged additional centres to participate as Principal Meteorological or Oceanographic Centres.

DATA BUOY TEAM

7.3.7 Consistent with the establishment of JCOMM, and the reporting of the DBCP to JCOMM, the Commission approved the designation of the Panel as the JCOMM Data Buoy Team.

ARGO

7.3.8 The Commission recognized that Argo was a relatively new project and was still working towards standardization of its data management procedures. Several basic principles had been agreed upon by the Argo Data Management Subcommittee at its first meeting in Brest on 3–5 October 2000, hosted by the French Research Institute for the Exploitation of the Sea. Those included: (*a*) the need for products to evaluate continuously the ability of Argo to meet requirements; (*b*) using the same formats for real time GTS exchange (TESAC then BUFR), Internet exchange and metadata; (*c*) the need for a unique float identifier; (*d*) using the same automatic quality control tests among the different Argo data centres; (*e*) the evaluation of the different delayed mode quality control procedures and eventual achievement of standardization; (*f*) the establishment of at least two global Argo data centres (i.e. the United States GODAE and the French CORIOLIS Argo data centres); (*g*) the provision of float positions to AIC; and (*h*) the establishment of the United States National Oceanographic Data Center as the long-term data depositary for Argo. All Argo data management aspects would be ontained in the *Argo Data Management Handbook*, which was currently being drafted. The Ad Hoc Argo Data Management Subcommittee had become a formal subcommittee of the International Argo Science Team. The Commission noted with appreciation that good working relationships were already established between the Argo data management and the IODE system and that such cooperation was expected to increase in the future. In particular, the Commission was pleased to note that data centres operating within both IODE and JCOMM were participants in the Argo Data Management Subcommittee. It viewed that as a positive example of cooperation among JCOMM, IODE and science programmes.

7.3.9 The Commission noted with appreciation the commitment of the United Kingdom to establish an Argo regional data centre for the Southern Ocean. In that regard, the Commission recognized that the wording "regional data centre" might be understood in two ways, namely, addressing either data from within a geographical region, as planned by the United Kingdom for the Southern Ocean, or meeting the needs of several countries within one region. It agreed that the question was one that should be addressed under the general concept of integration, which implied the adoption of common rules and procedures for different centres and data types.

7.3.10 The Commission agreed that Argo data management procedures should eventually be taken into account by the Data Management Programme Area. It therefore requested the Data Management Coordination Group to keep the development of Argo data management under review and to liaise closely with the Argo Data Management Subcommittee.

7.4 **INFRASTRUCTURE** (agenda item 7.4)

7.4.1 The Commission recognized that JCOMM data management infrastructure included codes and formats for both real-time and delayed mode data exchange, communication facilities for data collection, data exchange and data delivery, and the monitoring of data quality and data flow. The following paragraphs briefly reviewed the current status of those topics in the context of the work of JCOMM, including specific actions implemented during the past inter-sessional period.

CODES AND FORMATS

7.4.2 The Commission recalled that relevant codes and formats included the existing GTS alphanumeric marine codes (SHIP, BUOY, BATHY, TESAC, TRACKOB, TEMP SHIP, WAVEOB) and table-driven codes (BUFR and CREX), together with delayed mode exchange formats, such as IMMT and SIGRID. It noted with interest and appreciation the following actions relating to modifications to the marine alphanumeric GTS codes undertaken by CBS during the past inter-sessional period:

(*a*) Implementation on 5 November 1997 of a modification to BUOY to include location quality class. An additional modification to BUOY was to be implemented on 7 November 2001 to allow inclusion of some buoy metadata with the real time data reports;

(*b*) Implementation on 3 May 2000 of a modification to BATHY to give location in decimal form and of modifications to TESAC to also give decimal locations as well as to include information on recorder

type; the new code versions were now prefixed by the identifiers JJVV and KKYY, respectively;

(*c*) Minor modifications to SHIP, TEMP SHIP and WAVEOB.

7.4.3 The Commission further noted, however, that CBS had not accepted a proposed modification to SHIP to include additional observational data elements for the VOSClim Project. As a general policy, CBS was no longer readily accepting modifications to alphanumeric codes, as part of an overall strategy for migration to the table-driven codes BUFR and CREX. In that context, the Commission noted that:

(*a*) The development of BUFR Master Table 10 for oceanographic data was completed in 1998, and BUFR was now capable of being used for the GTS exchange of all types of marine data, including chemical and biological as well as physical;

(*b*) On the other hand, CREX, although essentially operational, still required some development with respect to marine data;

(*c*) Following agreement by the DBCP, it was expected that distribution of buoy data in BUFR on the GTS would begin in early 2003, in parallel to a continuing distribution of the same data in BUOY;

(*d*) CBS was planning to phase-in the extended use of BUFR/CREX and, at the same time, phase-out use of the alphanumeric codes, beginning in late 2002, with a detailed plan for such migration to be considered by CBS-Ext. in 2002.

7.4.4 The Commission recognized that the table-driven codes offered great advantages compared to the traditional alphanumeric codes in being universal and flexible, and that they could be easily expanded to satisfy all observational requirements including national needs for specific data exchange. In that regard, it particularly recognized the potential value of BUFR for the GTS exchange of new oceanographic data as the need arose. It therefore requested the Observations and Data Management Coordination Groups to keep the requirement for such exchange under close review and to initiate actions for the BUFR encoding and distribution of new oceanographic data at the appropriate time. It also urged the Argo community to implement BUFR encoding and GTS distribution of profiling float data from the project as soon as possible.

7.4.5 At the same time, however, the Commission agreed that, in addition to the problems being posed for many NMSs by such a migration, and which were being addressed in a general way by CBS, there were also other problems specific to marine data collection and exchange, in particular, those related to report encoding on board ship. While automated systems such as BATOS, OBS-JMA, SEAS and TurboWIN could, and eventually would, be enhanced to allow for BUFR/CREX encoding, many reports, in particular basic ship meteorological reports, were still manually encoded, a practice which might continue for a considerable time. The Commission recognized that a conversion to the on-board manual encoding of CREX messages, while theoretically possible, would nevertheless most likely be unacceptable to ships' officers, with a resulting decrease in already scarce ship weather reports. It therefore requested the JCOMM Management Committee to address that issue, in consultation with CBS, with a view to developing an appropriate practical solution.

7.4.6 The Commission recalled that an updated version of the IMMT format (IMMT-1) was adopted by CMM-XI (Lisbon, April 1993) and was now included in the WMO *Manual on Marine Meteorological Services*. That format was used for the international, delayed mode, exchange of marine climatological data, in particular under the MCSS. The Commission noted that a slightly revised version of the format (IMMT-2), to include some additional information required by the VOSClim Project, had been prepared by the Subgroup on Marine Climatology. It agreed that that version of the format should be adopted to replace eventually IMMT-1, with a global implementation date of 1 January 2003, so as to allow sufficient time for Contributing Members, Global Collecting Centres and Responsible Members for the MCSS to prepare for the change. At the same time, the Commission recognized that the format was already in use on a limited basis within the VOSClim Project. Specific action on that issue was taken under agenda item 9.

7.4.7 The Commission recalled that the SIGRID code, for the delayed-mode exchange and archival of sea-ice data in digital form, had been adopted by CMM-X (Paris, February 1989) as an annex to the WMO *Manual on Marine Meteorological Services*. A shortened version of that code (SIGRID-2) had subsequently been developed by the Subgroup on Sea Ice to facilitate the digitization and archival of historical sea-ice chart data. The Commission noted that the Subgroup on Sea Ice had now developed a number of amendments to SIGRID and SIGRID-2, designed to preserve the accuracy of the original data in the Baltic Sea Ice Data Bank when converting to SIGRID. At the present time, activities were under way, together with the IICWG, to develop a superior format, based on SIGRID, supporting the exchange of sea-ice data in the form of electronic charts. Specific action to adopt those amendments was taken under agenda items 6.3 and 9.

7.4.8 The Commission recalled that CMM-XII (Havana, March 1997) had requested the Subgroup on Marine Climatology to consider the development of a comprehensive metadata base for ODAS, including moored and drifting buoys, offshore platforms, etc. It noted with appreciation that a format for such a metadata base had been developed by the Subgroup, had been reviewed extensively by the DBCP, had interested Members/Member States and individual experts, and had finally been agreed by the Subgroup at its eighth session (Asheville, April 2000). The Commission reiterated its belief in the value of an ODAS metadata archive in facilitating a full and accurate interpretation of the data from such platforms. It therefore adopted Recommendation 1 (JCOMM-I) on the subject, at the same time requesting one or more interested Members/Member States to consider hosting the archive. In doing so, it urged Members/Member States to provide, at frequent

intervals, the information necessary to maintain that and other marine metadata catalogues fully up-to-date.

COMMUNICATIONS

7.4.9 The Commission recalled that there were now several marine telecommunication facilities available for the collection and transmission of meteorological and oceanographic data from ships at sea. Some of those systems were terrestrially based, such as the traditional high/medium frequency services through CRS, while others made use of satellite technology. Those latter included the Inmarsat system, Argos and IDCS using the geostationary meteorological satellites. In addition, new satellite systems, such as Orbcom, also had potential for the collection of meteorological and oceanographic data from ocean platforms.

7.4.10 The Commission recognized that the availability of CRS for the collection of ships' meteorological and oceanographic observations was now rapidly declining, with ships making almost exclusive use of the Inmarsat system to relay their reports to shore. The Commission further recognized that, as a consequence, the number of SHIP reports collected by CRS was decreasing. That, in turn, was causing concern to some Members, in particular for developing countries which did not host an LES and, thus, had to rely on the GTS for most of their VOS data. The Commission, therefore, urged Members:

(*a*) Which received VOS reports through an LES to ensure that such reports were inserted onto the GTS;

(*b*) Which wished to receive VOS reports for their area of interest to ensure that they requested the relevant SHIP bulletins on the GTS from their 'upstream' RTH.

7.4.11 The Commission recognized that the Inmarsat-A and Inmarsat-C systems offered low-cost transmission media for relaying meteorological and oceanographic data from ship to shore, and that the use of the Code 41 short dialling procedure ensured that the cost of the transmission was charged to an NMS rather than the ship. With the full implementation of the GMDSS achieved on 1 February 1999, virtually all ships subject to SOLAS were now equipped with Inmarsat-C, including the great majority of the VOS. The Commission noted that not all LES either carried the Code 41 facility or had an agreement with the local NMS for its use, with the full list of LES with Code 41 available for use in VOS reporting being maintained on the WMO Web site. It expressed appreciation for the fact that Arvi (India) and Yamaguchi (Japan) had been added to the list during the past inter-sessional period. At the same time, the Commission reiterated its concern that the cost burden for the collection of VOS reports via Inmarsat was carried by a relatively small number of NMSs. It therefore urged all other NMSs with LES in their countries to make arrangements with them for the receipt of meteorological and oceanographic reports using Code 41, which would both reduce the individual cost burdens for all and improve the geographical spread of report receipt and GTS insertion. The Commission also recognized that there was a marked lack of uniformity among LES and their associated NMSs regarding the policy for accepting ship reports using Code 41, with restrictions being applied in some cases, which resulted in loss of valuable data. It therefore requested the Ship Observations Team, in concert with the Data Management Coordination Group and its expert on communications, to review that question, with a view to developing, if possible, a common policy and approach to the application of Code 41, in particular which minimized such restrictions.

7.4.12 The Commission recalled that a number of software packages now existed for the compilation of meteorological and oceanographic reports on board ships and for their transmission via Inmarsat. Those included BATOS (France), OBS-JMA (Japan), SEAS (United States) and TurboWIN (Netherlands). SEAS encoded the messages in a compressed binary format, which greatly reduced transmission costs through Inmarsat-C, but such transmission could be used only through LES in the United States. The other systems all provided for encoding in standard code forms and transmission as telex messages. The Commission recognized the value of those systems, in particular in facilitating the tasks of the shipboard personnel, in enhancing data quality and in reducing transmission errors. It recommended that information on all available systems should be made available to VOS operators and urged all such operators (and also SOOP operators, where appropriate) to make use of systems such as those on as many of their ships as possible, if that was not already being done.

7.4.13 The Commission, having noted the foregoing and having reviewed Recommendation 8 (CMM-XI) — The collection of meteorological and oceanographic information using Inmarsat, decided to keep that recommendation in force in view of its continuing relevance. It also urged that close coordination should continue among WMO, IMO, IMSO and Inmarsat Ltd., with a view to ensuring the full utilization of new developments in Inmarsat technology. In that context, the Commission noted the present status of Inmarsat coverage, given in Annex II to this report.

7.4.14 The Commission recognized that the Argos system remained the primary mechanism for the collection and location of data from remote unmanned ocean platforms (drifting and moored buoys and floats), as well as from some ships and remote land stations. Argos also, in particular and in contrast to alternative systems, provided, through its GTS processing subsystem, extensive ground-processing facilities, which included simple automatic quality control checks as well as encoding in standard WMO code forms and subsequent GTS distribution. Non-commercial users of the Argos system benefited from a favourable tariff rate, which was negotiated each year with CLS/Service Argos during a meeting on the Joint Tariff Agreement. Global usage of the Argos system continued to expand, in particular within the context of the Argos bonus usage scheme, which allowed system users to exploit better system capacity at no or minimal additional cost to either the users or CLS/Service Argos.

7.4.15 The Commission noted with interest and appreciation that CLS/Service Argos was continuing to enhance its facilities and services. Such enhancements, either recently implemented or imminent, included improved satellite coverage and timeliness, higher system capacity and data rates, wider bandwidth, the processing of profiling float data, a BUFR encoder within the GTS subsystem (due for implementation early 2003), and future two-way communication with platforms. The Commission agreed that the Argos system was likely to remain a major global facility for the collection and location of data from remote ocean platforms for many years to come. It thanked, in particular, the DBCP and its technical coordinator for their efforts in working with CLS/Service Argos to enhance the value and responsiveness of the Argos system to users and their requirements. The Commission encouraged Members/Member States to make use of communications systems such as Argos wherever appropriate.

7.4.16 The Commission noted with appreciation the continuing availability of the IDCS for the collection of data from remote ocean platforms and expressed its appreciation to the satellite operators for that service. It urged Members/Member States to consider making use, where appropriate, of that valuable component of the overall marine data collection system, recognizing that there remained unused data-collection capacity on all the geostationary meteorological satellites participating in the IDCS, and that the system was available for the collection of many types of environmental data, including sea-level observations.

7.4.17 The Commission noted with interest that there were a number of commercial satellite communication systems, either already operational or planned, which might ultimately be of use for the collection of data from automated marine platforms. Although most such systems offered attractive facilities, such as two-way communication, reliable high data throughput rates and near real-time coverage, the Commission recognized that in many cases the future of the systems was uncertain. That concern was compounded by the lack of influence that the meteorological and oceanographic communities could have with the satellite operators. In the particular case of the Orbcom system, which had been implemented with good results by a number of buoy and float operators, serious doubts as to its long-term financial viability had been expressed. The Commission nevertheless agreed on the importance of keeping abreast of developments with such systems, and therefore requested that the results of the DBCP review of new communications systems should be made widely available within JCOMM.

7.4.18 The Commission recognized that the GTS continued to be the primary mechanism for the real-time global exchange of marine data and products. At the same time, it was clear that alternative facilities and procedures including, in particular, those based on Internet technology, were being increasingly used in both meteorology and oceanography for such exchange. It noted that CBS was already deeply involved in studying the use of such technologies as part of the WWW, as both a part of, and alternative to, the GTS. The Commission agreed that it was essential for JCOMM to be part of, and contribute to, that work, in view of the need to ensure the implementation and use of optimal facilities and procedures for real-time marine data exchange. It therefore requested the Management Committee and the Data Management Programme Area Coordination Group to ensure an appropriate JCOMM participation in the CBS activities related to data exchange.

MONITORING

7.4.19 The Commission noted with appreciation that the Met Office (United Kingdom) had continued to monitor the quality of both SHIP and BUOY reports received over the GTS, in fulfilment of its formal role as a CBS monitoring centre for surface marine data quality, and that it was expanding that activity to meet the needs of VOSClim. Regular reports on buoy data quality were delivered to the technical coordinator of the DBCP for possible follow-up action. Monthly reports identifying those ships showing consistent errors in their reports for specific variables were sent directly to a number of NMSs/PMOs concerned, while detailed six-month reports containing similar information were sent to the WMO Secretariat for follow-up action. Based on those reports, the specific NMSs concerned were, in turn, contacted by the Secretariat with a request to undertake remedial actions. The Commission was pleased to learn that that concerted monitoring and follow-up had resulted in a measurable reduction in the number of ships whose reports on the GTS showed persistent errors. It thanked the Met Office for its monitoring work and urged that that activity, and the coordinated follow-up, should continue in the future.

7.4.20 The Commission noted with appreciation that, in addition to that CBS monitoring, the DBCP had for a number of years been operating a set of GTS quality control guidelines for data on the GTS in BUOY code. Those guidelines, which had now been included in the *Guide on the Global Observing System* (WMO-No. 488), involved a joint effort by operational meteorological and oceanographic centres, buoy operators and CLS/Service Argos, coordinated by the DBCP technical coordinator. They allowed the identification of consistently bad reports of specific variables (most particularly air pressure) and their subsequent recalibration or removal from GTS distribution. The operation of the guidelines, coupled with model enhancements, had resulted in substantial reductions in RMS differences between buoy reports and first guess model fields. The Commission congratulated the DBCP for that work and urged that it be continued.

7.4.21 The Commission further noted with appreciation that both the ASAP Panel and the SOOPIP, working in conjunction with appropriate meteorological and oceanographic data and analysis centres, also regularly monitored the quality of sub-surface and upper-air sounding data and took remedial action as necessary. In

the case of SOOP, the technical coordinator provided both the focus and a coordination mechanism for monitoring and follow-up. The Commission recognized the importance of that monitoring to both real-time and delayed-mode data users, and urged that it be continued in the future.

7.4.22 The Commission recognized that monitoring the flow of all types of marine data on the GTS was undertaken within the context of general WWW/GTS monitoring as part of exercises coordinated on a regular basis by the WMO Secretariat. Results of that monitoring were communicated to WMO Members and other interested institutions and agencies, with follow-up again being coordinated through the Secretariat. In addition, the Commission noted with appreciation the monitoring undertaken by *Météo-France*, as a Specialized Oceanographic Centre of the former IGOSS, of the GTS exchange of data in SHIP, BUOY, BATHY and TESAC code forms, with reports being published on a monthly basis. As a part of that monitoring, diagnostic charts were prepared, in which reports from all sources containing specific variables (air pressure and temperature, SST and surface wind) were compared with the WWW requirements for those data on a 500 × 500 km square basis. Such monitoring tools allowed the immediate identification of data-sparse ocean areas and facilitated appropriate follow-up actions, such as additional buoy deployments. The Commission thanked *Météo-France* for that work and requested it to continue its former IGOSS role as a contribution to the work of JCOMM.

7.4.23 The Commission agreed that such monitoring tools were of considerable value to platform operators, data users and the Secretariats alike, and that that value would be further enhanced if the analyses could be extended to cover other marine variables, including subsurface. It therefore accepted with appreciation the offer of France to liaise with JCOMMOPS on the issue, with a view to extending the monitoring tools and the display of information.

7.4.24 The Commission noted with appreciation that both Germany and Japan also undertook regular monitoring of the exchange of different types of marine data, again originated under the auspices of the former IGOSS. It acknowledged the value of that monitoring for a number of applications and user groups and requested that it continue. At the same time, it agreed that the whole system of SOCs and of marine monitoring established under IGOSS needed to be reviewed and probably restructured in the context of agreed JCOMM requirements, role and operations. It therefore requested the Data Management Coordination Group to support the Management Committee in undertaking such a comprehensive review during the coming inter-sessional period, with a view to making concrete proposals on the issue to JCOMM-II.

7.4.25 The Commission recognized the value and importance of effective monitoring of data flow and quality for its operational systems and urged Members/Member States to respond to issues identified in a timely and effective manner. It further recognized that such monitoring was needed in the Services, Observations and Data Management Programme Areas. The Commission therefore requested the Management Committee to develop an integrated strategy for monitoring within JCOMM, taking account of the several existing activities undertaken by Members/Member States. That strategy should take account of, and be harmonized with, monitoring activities under CBS and other relevant groups. The Commission reiterated the importance of monitoring information flow at all points of the end-to-end system and requested the Data Management Coordination Group to implement a mechanism, within the Data Management Programme Area, to provide timely and accurate information on data and products.

FUTURE WMO INFORMATION SYSTEMS

7.4.26 The Commission noted with interest that the WMO CBS had recently approved the recommendations of the Inter-programme Task Team on Future WMO Information Systems. The future WMO information system should:

(*a*) Include the support for ad hoc requests as well as routine distribution of information;

(*b*) Include a dataset catalogue to enable users to locate data and products they required;

(*c*) Conform to open, global standards to the greatest extent possible.

Distribution of ad hoc non-routine products should be accomplished via request/reply or "pull" systems. Routine collection and dissemination should be accomplished via a "push" system, which could be implemented via a combination of technologies. The "push" and "pull" systems, operating in parallel, should be available to all users of WMO data and products.

7.4.27 The Inter-programme Task Team had developed a logical topology for the future WMO information system that was significantly different to the current GTS and included definitions for three new levels of participating centres: Global Information System Centres, Specialized Product Centres and National Centres. Several Global Information System Centres formed the top level of the future system, would collect all observations and products intended for global distribution from supplying centres within their area of responsibility and would combine observations into large aggregated data sets. Several dozen centres would serve as Specialized Product Centres. Existing WMO RSMCs would function as Specialized Product Centres. However, many additional centres would also serve as Specialized Product Centres, including suppliers of special observations (e.g. Argos, Arinc), research projects and centres producing products related to a specific discipline. National Centres would form the foundation of the future WMO information system. Many National Centres would be part of an NMHS but others would have national responsibility for functions falling within WMO Programmes but located outside of the NMHS.

7.4.28 CBS had agreed to continue the work of the Inter-Programme Task Team and asked it to:

(*a*) Review data exchange requirements (volume, timeliness, connectivity) of the WWW and other WMO (including joint) Programmes;
(*b*) Review the current and anticipated capabilities of public and dedicated data communication networks and services and conduct pilot studies;
(*c*) Develop a vision for future WMO information systems to meet cost-effectively WMO requirements for real and non real-time data exchange;
(*d*) Develop a project plan including proposed applications and responsibilities of centres. Propose steps toward implementation of the improved information system.

7.4.29 JCOMM recognized that the Inter-programme Task Team on Future WMO Information Systems was considering important issues that were likely to affect operational oceanography and marine meteorology. It requested the Data Management Coordination Group to keep that work under close review and, in particular, to develop specific JCOMM requirements for input to the work of the Task Team. The Commission further recognized that codes and formats were critical elements to the effective implementation of all JCOMM activities. As in meteorology, oceanographers had also developed their own methods (self-describing ASCII formats, NetCDF, etc.) and immediate work was, therefore, necessary to develop interfaces between the meteorological and oceanographic systems. The Commission requested the Data Management Coordination Group to also take up that issue, through assigning an expert to represent its interests in the Inter-programme Task Team on Future WMO Information Systems.

STANDARD MARINE METADATA LANGUAGE

7.4.30 The Commission recognized that the exchange of real-time and delayed-mode marine data among the different sectors of the marine community could be improved. Those included many types of organizations, research institutes, ships, satellites, moored instruments, drifting instruments, government agencies and commercial companies, which could be both data originators and receivers of data products (see also general summary paragraph 7.4.1). Real-time marine data were required for climate research, environmental studies and management, compliance with international treaties and conventions, and commercial applications.

7.4.31 The Commission agreed that a standard marine metadata language would facilitate the exchange of marine data both within and among those sectors. In particular there was the need for a standard marine metadata language to facilitate the rapid exchanges of data needed to assemble marine data from many different sources prior to assimilation in real-time models and for the distribution of model data products and forecasts.

7.4.32 The Commission recalled that EuroGOOS was the association of government agencies in European countries dedicated to the development of operational oceanographic services. It noted with interest that EuroGOOS had been in correspondence with the chairperson of IODE, with the chairperson of the WMO CBS Expert Team on Integrated Data Management, with representatives of ICES, and with hydraulic institutions (HR of Wallingford, RIKZ in the Netherlands), all of whom had started to consider the value of developing a marine consortium for XML. EuroGOOS had also consulted industrial and commercial organizations interested in the future development of marine XML. In that context, the Commission noted that the GOOS Steering Committee had recommended support for XML, that it was desirable to have a single specification for XML, and that EuroGOOS should promote the discussion of XML in Europe.

7.4.33 The Commission noted the establishment of the International Marine XML Consortium, which would manage the development of a specification for a marine XML that would be publicly available as an open standard. The Commission also noted that IODE, at its sixteenth session, recommended participation in the Consortium that would include membership from the government, academia, research and the commercial sectors.

7.4.34 The Commission concluded that there was a window of opportunity in the next year during which all sectors of the marine community would be able to consider the adoption of a standard marine metadata language. The Commission requested the Data Management Coordination Group to address urgently the issue of an agreed standard marine markup language for JCOMM activities. In particular, the Group should develop a strategy that took account of the marine XML consortium, of the related activities of CBS, and of the many national activities related to standard marine metadata language, namely markup languages such as XML. Furthermore, the strategy should take account of the several agreed standards such as GIS-ML.

OCEAN AND MARINE METEOROLOGY DATA AND INFORMATION TECHNOLOGY

7.4.35 The Commission recognized the considerable challenges to be faced in the area of data and information management. Major issues were evident in telemetry, standards and formats, data assembly, scientific and data management community cooperation, uptake of modern information technology, modes of operational and scientific data exchange, and in dealing with coastal and biological observations and non-conventional ocean observations. It noted that there had been no proper scoping and assessment of the existing problem or of that to be faced in the future and that there was no agreement on the strategy and implementation plan for climate and physical oceanography. Moreover, there was inadequate investment, both in terms of resources and of intellectual engagement.

7.4.36 The Commission recalled that general summary paragraphs 7.4.9 through 7.4.18 drew attention to the strengths and weaknesses of the present telecommunication systems. The Commission accepted that emerging and future demands were likely to exceed greatly capacity unless strong action was taken immediately. It noted, however, that several groups were enthusiastic about addressing that problem.

7.4.37 The Commission further recalled that general summary paragraphs 7.4.2 through 7.4.8 and the actions recommended, highlighted the urgent need for agreement on standards, such as marine XML (general summary paragraphs 7.4.30 through 7.4.34) for both metadata and the data themselves. The Commission noted the various efforts under way within the international community related to standards for spatial data and the conclusions of the CBS Inter-programme Task Team on Future WMO Information Systems related to the adoption of international standards. It welcomed efforts such as those of the OOPC and of the Argo project to develop rigorous procedures for identifying original data and for maintaining the integrity of data and datasets. The Commission also noted the specific problems of standards for non-physical and unconventional data and the issues associated with rendering existing data holdings consistent with new standards. The Commission recognized that advanced systems for data management were deployed in activities beyond meteorology and oceanography and that interoperability was aided by adoption of shared standards. The Commission agreed that standards for observations, data exchange and datasets were fundamental requirements for its data management activities.

7.4.38 The Commission agreed that quality control and assurance procedures required adherence to accepted procedures and that it needed to be better acquainted with the requirements from areas such as climate change assessment and environmental management. Furthermore, the Commission agreed on the need for a more formal procedure for recognizing and/or discriminating between value adding procedures.

7.4.39 The Commission noted the work of the Inter-programme Task Team on Future WMO Information Systems in relation to future data and product exchange and dissemination methods. It agreed that, in addition to the issues identified in general summary paragraphs 7.4.26 to 7.4.29, its own activities spread beyond WMO and covered data providers and users with a wide range of requirements. The Commission welcomed the emergence of several innovative projects targeting improved methods for data exchange and access, mostly based on the Internet, and noted that both request-reply and "push" techniques would be required.

7.4.40 The Commission recognized the fundamental importance of effective user interface mechanisms, particularly for enabling broad access to both sophisticated and less sophisticated users. It welcomed evidence of several innovative approaches and encouraged further work in that area, noting in particular the work within the JCOMM Electronic Products Bulletin.

7.4.41 The Commission further recognized the need for an innovative, visionary approach to ocean and marine meteorology data and information management based on leading-edge information technology.

7.4.42 The Commission agreed that the priority issues should include: (*a*) telemetry; (*b*) standards and protocols; (*c*) datum and dataset integrity; (*d*) data exchange and dissemination; (*e*) product dissemination and service; (*f*) data assembly and quality control; (*g*) non-conventional data; and (*h*) innovative user interfaces.

7.4.43 The Commission requested the Data Management Coordination Group and the Expert Team on Data Management Practices to work with the proponents of the ocean and marine meteorology data and information technology initiative to explore opportunities for the Commission to collaborate, taking into consideration the expertise available within JCOMM's parent organizations, their subsidiary bodies as well as from their experts.

7.5 **INTEGRATION ISSUES** (agenda item 7.5)

7.5.1 The Commission recognized that virtually all marine data users, whether involved in operational, research or climate study activities, were now requiring highly integrated data streams including meteorological and oceanographic, physical and non-physical data. While some integration could and should take place at the level of the observing systems, it nevertheless agreed that such integration should occur primarily through the data management process. The ultimate aim for JCOMM data management was thus to provide a fully integrated, end-to-end system, to deliver high-quality datasets based on the expressed needs of all users. The Commission considered that the existing mechanisms, involving well-developed and sophisticated procedures to deliver marine climatological and oceanographic datasets on realistic time-scales, provided a good basis on which to build the future integrated JCOMM data management process. It therefore requested the Data Management Coordination Group to review existing operations and procedures, with the aim of developing a detailed plan for end-to-end, integrated JCOMM data management, for consideration by the Management Committee and eventually by JCOMM-II.

7.5.2 The Commission recognized that a number of important concerns regarding integration between different geographic scales, and between different levels of scientific and administrative detail, could not be addressed or resolved during the present session. Those matters would, however, require careful attention during the coming inter-sessional period and were also of relevance to the implementation of the JCOMM structure and to interactions with GOOS, GCOS and other IOC and WMO Programmes. The issues included in particular the relation, interface and user applications of data and products required and delivered on different scales and with different resolutions, for open oceans, enclosed water bodies, and coastal and shelf seas. They also involved relations and interfacing among marine meteorological and physical, chemical and biological ocean data and products. The Commission therefore requested the Management Committee, together with the Observations and Data Management Coordination Groups to address those issues. In particular, the work should include an analysis of how decisions or problems at the local or regional scale, and with multi-parameter data streams, could be prepared by coastal GOOS or GOOS regional alliances, so that key factors could be summarized and presented effectively to JCOMM.

8. **OBSERVING SYSTEMS** (agenda item 8)

8.1 **SHIP-BASED OBSERVATIONS** (agenda item 8.1)

VOS PROGRAMME

8.1.1 The Commission recognized that the requirements for surface meteorological and oceanographic observational data from the VOS were ongoing and expanding. Those included, in particular, real-time data in support of operational meteorology and maritime safety services, both high quality real-time and delayed-mode data in support of marine climatological services and global climate studies (WCP, GCOS, GOOS), and VOS metadata for operational monitoring of data quality and for global climate studies.

STATUS

8.1.2 The Commission noted with concern the significant decrease in the number of ships participating in the VOS since the mid-1980s. That was due in large part to the increase in ship size and the decrease in crew numbers affecting the worlds' fleet. In that context, however, the Commission noted with appreciation the revision to Chapter V of the SOLAS Convention, which strengthened the wording related to the requirements for ships to make and transmit meteorological observations while at sea. It agreed that that would assist Members/Member States in retaining, expanding and exploiting that valuable international resource. The Commission also acknowledged the absolutely essential work that the international network of PMOs undertook in supporting the VOS. It strongly encouraged Members/Member States to continue to support their national PMO services, to ensure frequent ship visits, to consider the preparation and issuing of newsletters for the VOS, and to make use of Web sites and other modern communications technology as means for enhancing recruitment to, and maintenance of, the VOS. The Commission further requested the Ship Observations Team to consider the possibilities for some form of international award scheme for the VOS.

TELECOMMUNICATION

8.1.3 The Commission recalled that as a result of the implementation of the GMDSS, the vast majority of meteorological reports were now being transmitted through Inmarsat. That had resulted in a measurable increase in the number of observations received by countries operating LES. It was noted with appreciation that *Météo-France*, operating as an SOC for the former IGOSS, undertook regular monitoring of data available on the GTS, including VOS reports in SHIP code. That monitoring had demonstrated an increasing trend in the total number of ship observations available on the GTS, due in part to more days at sea for ships and the greater reliability of satellite data collection systems such as Inmarsat.

QUALITY CONTROL

8.1.4 The Commission recalled that the Met Office (United Kingdom) undertook, on behalf of WMO/CBS, a regular monitoring of the quality of surface marine data, including reports from the VOS distributed on the GTS in SHIP code. The results of that monitoring were regularly distributed to national PMOs for follow-up action. The Commission was pleased to note that those actions together had lead to a measurable enhancement of the quality of such data, in particular for atmospheric pressure. The Commission expressed its considerable appreciation to the Met Office and the PMOs for their work. It urged that the work be continued and, if possible, extended to cover additional variables such as air temperature and humidity.

8.1.5 The Commission recognized that a great improvement in the quality and quantity of marine meteorological data could be achieved through the enhanced use of automated systems for observations, data storage, message compilation and report transmission. It noted with appreciation the efforts taking place in several countries to develop hardware and software systems that would satisfy the future need for stand-alone, reliable and inexpensive systems that were easy to install and maintain. It further noted that several countries provided laptop and similar computers to their VOS, which also greatly enhanced and facilitated their capabilities for accurate observation and message compilation. The Commission recognized, however, that it would be a large task to satisfy all those needs, but considered that continued progress in that area would result in large benefits for marine meteorological applications in the future.

VOSCLIM

8.1.6 The Commission recalled that the VSOP – NA had demonstrated the potential value of VOS observations to global climate studies and had made a number of recommendations to enhance both the quality of the observations and the availability of relevant metadata for climate study purposes. The Commission appreciated that it had proved difficult in practice to apply those recommendations to the whole of the VOS. In that context, it noted with interest the work already under way to implement a project to establish a subset of the VOS, for which all the recommendations of the VSOP-NA had been fully implemented. The primary objective of the project (the VOSClim Project) was to provide high quality marine meteorological data and associated metadata, to serve as a reference dataset to support global climate studies. The Commission strongly supported that project, which it agreed would contribute substantially to GCOS, GOOS and the WCRP, as well as to a range of operational and climatological services, noting that scientific advice to the project was being provided through the AOPC and OOPC.

8.1.7 The Commission noted with appreciation that a project Data Assembly Center, located at NCDC/NOAA (United States), and an RTMC, located at the Met Office (United Kingdom), had been established. The Project Leader was Captain G. Mackie (United Kingdom). VOS operators and initial ship participants had been identified, various format changes had been developed to accommodate new data and metadata requirements (see

also agenda item 9) and a variety of documentation, including survey forms and a publicity brochure, had been finalized. With ship recruitment and data returns already under way, the Commission considered that project implementation had formally begun and noted with interest that both information and data relating to the project would be available through the project Web site at: http://www.ncdc.noaa.gov/VOSClim.html/. The Commission noted further that a complete description of project objectives and structure could be found in *The Voluntary Observing Ships Scheme: Project Document* (WMO/TD-No. 1010, JCOMM Technical Report No. 5), which was also available through the Web site. The Commission expressed its considerable appreciation to all concerned in the project, and especially to the ships' officers and crews, whose support and interest was vital to its success.

INFORMATION EXCHANGE

8.1.8 The Commission noted with appreciation that the modifications to the format and contents of the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47), which had been adopted by CMM-XII (Havana, March 1997), had been finalized and implemented. Specifically, those included:

(*a*) A new format and specifications for ship metadata;
(*b*) A search engine to facilitate access to individual entries in the database in a variety of ways and to recognize duplicate data entries using the IMO ship number as a unique identifier;
(*c*) The inclusion of digital ship imagery;
(*d*) A harmonization of country codes and the addition of data fields concerning the type and location of shipboard instrumentation;
(*e*) On-line availability of the publication through the WMO Web site.

8.1.9 The Commission recognized that the two major problems continuing to hamper the value of the *International List of Selected, Supplementary and Auxiliary Ships* to operational meteorology and global climate studies, as well as to the full development of the MCSS, were the low rate of updates by Members to the catalogue and the failure to apply fully the minimum quality control procedures at data source by the VOS operators. The Commission therefore strongly encouraged Members to update regularly their ship lists in the catalogue, using the on-line facility provided, and to apply fully the MQC procedures as specified in the regulations.

8.1.10 The Commission noted with appreciation that *The Voluntary Observing Ships Scheme: A Framework Document* (WMO/TD-No. 1009, JCOMM Technical Report No. 4) had been prepared by the Subgroup on the VOS and published. The document was designed to provide VOS operators with a global framework in which to develop and maintain their national VOS programmes. The document outlined a VOS implementation strategy, described current WWW and ocean climate data requirements, provided information about the current and past status of the VOS programme, and provided details regarding data management and real-time and non-real time data quality control for VOS instrumentation and data.

8.1.11 Finally on that topic, the Commission noted with appreciation that a brochure designed to enhance understanding of both the operations and the value of the VOS scheme had been prepared and published by WMO in four languages. It requested that that brochure should be made available to Members/Member States in sufficient quantities to ensure a wide distribution among both the shipping industry and government policy makers alike.

SHIP-OF-OPPORTUNITY PROGRAMME

8.1.12 The Commission recognized that the requirements for oceanographic observational data (surface and subsurface) met by the ships-of-opportunity were also ongoing and expanding. Those included, in particular, real-time data in support of operational climate and marine forecasting services, and both high quality real-time and delayed-mode data in support of global climate studies.

8.1.13 The Commission noted with interest and appreciation the recent developments under the SOOP, including the results from the third session of the SOOPIP, hosted by the Scripps Institution of Oceanography in La Jolla, United States on 28–31 March 2000. The Commission was particularly pleased to note that SOOPIP was steadily establishing SOOP as an operational programme in support of GOOS and GCOS in particular, as well as various oceanographic research activities.

8.1.14 The Commission noted with satisfaction that SOOPIP had been fully involved in the JCOMM integration process from the beginning and that SOOPIP accepted the principle of integrating the SOOP, VOS programme, and ASAP activities through the proposed Ship Observations Team of the JCOMM Observations Programme Area (see agenda item 8.5). It recognized that such integration could involve, in particular, issues relating to meeting joint scientific objectives, ship recruitment, servicing, installation of instruments and acquisition systems, standardization, instrumentation quality assurance and real-time observations and data telecommunication.

SOOP IMPLEMENTATION, OCEANOBS99 AND GLOBAL UPPER OCEAN THERMAL NETWORK REVIEW

8.1.15 The Commission noted that the OOPC, SOOPIP and the CLIVAR Upper Ocean Panel had convened a study and an international workshop to review the global upper ocean thermal network (see http://www.marine.csiro.au/JAFOOS). Funding for those activities was provided by NOAA's Office of Global Programs, by the Australian Bureau of Meteorology and by the Commonwealth Scientific and Industrial Research Organization Marine Research. The workshop was held in Melbourne during August 1999. The background study was undertaken by the Commonwealth Scientific and Industrial Research Organization/Australian Bureau of Meteorology

Research Centre Joint Australian Facility for Ocean Observing Systems. The present and past SOOP was evaluated against a set of revised scientific objectives, with each XBT line being quantitatively assessed against a set of selected criteria in the context of other developing ocean observing programmes such as Argo, satellite altimeters and equatorial mooring arrays such as TAO.

8.1.16 Recommendations from the review included the identification of an ongoing unique role for SOOP in an integrated observing system, but with sampling focused on line sampling (both frequently repeated and high-density, eddy resolving lines). Broadcast, low-density sampling would gradually be phased out as Argo was implemented and proven. Further recommendations included:

(*a*) The need for greater bandwidth in real-time data transmission systems (satellite and GTS) to enable the transmission of full-resolution data; and

(*b*) The need for a unique data identification tag to eliminate the significant problems associated with the proliferation of near-duplicate profiles in the databases. Those recommendations were endorsed at the third session of SOOPIP.

The Commission noted that the conclusions of the review had also been presented and endorsed at the OceanObs99 Conference held in St Raphaël, France, in October 1999. The Conference regarded SOOP as a core component of the integrated observing system for GOOS and GCOS.

8.1.17 The Commission noted that SOOP had refined its implementation plan in line with the Global Upper Ocean Thermal Network Review conclusions and the OceanObs99 Conference statement. At the same time, the Commission recognized that SOOP was now facing problems, including:

(*a*) XBT probe cost increased (50 per cent increase in 1999);

(*b*) Financial constraints in the face of national priorities with regard to *in situ* and remote-sensing ocean observations, leading to reduced budgets for some of the national XBT ship-of-opportunity programmes;

(*c*) Priorities within national XBT ship-of-opportunity programmes to address specific scientific and/or operational issues;

(*d*) Logistic problems, such as availability of shipping, ships changing ownership and changes in ship crews;

(*e*) Concerns with regard to the Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol).

8.1.18 The Commission noted with appreciation that SOOPIP was making every effort to find solutions to those problems, but could not avoid some reduction in activity in 1999 and 2000, especially in the Atlantic and Indian Oceans. Some 28 000 XBT probes had been deployed in 1999 in the global oceans (excluding the Mediterranean Sea with 2 000 drops). It had been estimated by SOOPIP that to support the sampling recommended by the Global Upper Ocean Thermal Network Review, about 35 000 probes would be needed every year. At the same time, the Commission recognized that extensive sampling of upper-ocean temperature and salinity continued to be undertaken by research institutes in many countries, but that those data were not always made available on the GTS to support global programmes. It therefore requested the SOOPIP and its Technical Coordinator to make every effort to identify such data and to encourage their quality control and timely distribution on the GTS.

8.1.19 The Commission also noted with appreciation that SOOPIP had recognized the importance of VOSClim for global climate studies and had therefore fully supported the project. The Panel had agreed that ships-of-opportunity from SOOP should be recruited to participate as appropriate. The combination of surface flux and subsurface heat storage measurements would help to reduce errors in global heat flux estimates of coupled ocean-atmosphere forecasting models. Similarly, SOOPIP had also fully supported the establishment of a JCOMM *in situ* JCOMMOPS (see agenda item 8.5).

DATA MANAGEMENT

8.1.20 The Commission noted that SOOP data management was done primarily through GTSPP in association with the SOOP operators (see discussion on that issue under agenda item 7.2).

EVALUATION AND NEW INSTRUMENTATION

8.1.21 The Commission noted with interest that SOOP participants were regularly evaluating the performance of instrumentation and suggesting solutions to any identified problems (developing calibration procedures, XBT fall rate equation corrections, assessing instrument malfunctions due to manufacturing changes, identifying problems with air bubbles during XCTD calibration causing errors in measuring the conductivity in the surface-layers, etc.). Tests included comparisons with other instruments at sea (e.g. XBT and CTD comparisons). Manufacturers also conducted evaluation programmes on their own. SOOPIP was coordinating those efforts and the preparation and distribution of evaluation reports. New instrumentation being evaluated by SOOP included moving vessel profilers, thermosalinographs, pCO_2 analyzers and biological measurement systems (e.g. fluorescence, pigment analysis, nutrients). The Commission noted with appreciation that cooperation with VOS was under way to install meteorological instrumentation on ships-of-opportunity.

8.1.22 The Commission noted that, while some countries were collecting surface oceanographic data and distributing them on the GTS in TRACKOB code, it was not evident that those data were being used to any extent. It therefore requested the Ship Observations Team to review the use of TRACKOB and to advise on its continuation, taking note of the discussions and conclusions in general summary paragraph 7.2.6.

8.1.23 The Commission agreed that there was a developing requirement to establish properly-resourced

procedures for evaluating and possibly accrediting instrumentation and procedures used operationally by JCOMM observing system components, including SOOP. It recognized that such procedures would be neither simple nor inexpensive to establish, but nevertheless agreed that that should be considered as a priority issue for JCOMM. The Commission therefore requested the Management Committee to review the matter, with a view to making a concrete proposal regarding appropriate procedures, taking into account the instrument evaluation and intercomparison procedures already in place in WMO for meteorological instrumentation. In a similar vein, the Commission recognized the need to work towards implementing mechanisms to ensure that data collected by observing system operators conformed to agreed upon basic standards, formats and levels of data quality. The Commission therefore requested the Management Committee to also address that issue.

***SOOP** DATABASE AND MONITORING*

8.1.24 The Commission noted that SOOP was routinely undertaking monitoring exercises to ensure and improve data flow and data quality. Those included:

(*a*) Monthly monitoring of BATHY and TESAC reports on the GTS at designated centres to identify and correct data flow problems (results compiled by the Coordinator);

(*b*) A JJVV/JJYY/KKYY monthly report (by MEDS) to ensure that recent BATHY and TESAC GTS code changes were properly implemented; and

(*c*) A monthly data quality control report with feedback to operators to ensure remedial action was taken (by MEDS).

8.1.25 The Commission noted with interest that SOOP metadata were submitted to the Coordinator on a six-month basis. Those metadata were kept in the SOOP database, compiled into the SOOP semestrial survey and made available to the GTSPP. Metadata, for each profile, included date, time, location, maximum depth, quality of the profile, a unique identification tag, the name of the operator, line name, ship name and call sign, cruise number, transect number, drop number, telecommunication system used, data acquisition system used, including software version, instrument and probe type, fall rate equation coefficients, and probe batch date. The database allowed a global perspective on the operational status of the programme for comparison with requirements, to facilitate adjustments to the implementation plan. It also permitted specific evaluation studies and the tracking of specific problems (e.g. bad probe batches, telecommunication).

INFORMATION EXCHANGE AND SOOP WEB SITE

8.1.26 The Commission noted with appreciation that a SOOP Web site had been established, hosted and supported by the *Institut de recherche pour le développement* (France), and maintained by the SOOP Technical Coordinator (http://www.brest.ird.fr/soopip). The Web site provided information about the programme, including the latest programme review, monthly reports, on-line documents such as the conclusions from the Global Upper Ocean Thermal Network Review, various *Guides*, the list of selected ships, a description of SOOP lines, points of contact, including references of SOOP operators, and a list of manufacturers. Information was also exchanged through electronic mailing lists, for which addresses and details on how to register were also available via the SOOP Web site. Links were maintained to related sites, including the operators' Home pages.

8.1.27 The Commission noted with appreciation that SOOP was preparing an SOOP *Operations Guide*. That *Guide* would include a set of practical *Guides* dealing with topics such as ship recruitment, installation of equipment, ship greeting, re-supplying, training, ship visits, probe launching, XBT/XCTD standard test procedures, fall rate equation, installation of a thermosalinograph, etc.

AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME

8.1.28 The Commission recalled that the ASAP had existed since 1985 and continued to be an important part of the WWW. The programme was efficient and provided high quality upper-air profile data from the data-sparse ocean areas and at a relatively low unit cost. It noted that a total of 21 units were active in 1999, the soundings reached on the average 22.1 km, and were communicated to the GTS at an average efficiency of 90 per cent. The operators were Denmark (two units), France (four), Germany (three), Japan (seven), Russia (one), Sweden-Iceland (one), the United Kingdom (two) and the United States (one). The number of soundings in 1999 was well above the six-year average, mainly because of increased activity by Japan and the United States. In addition, the activity of the new ASAP unit operated by the United Kingdom contributed to the increase in 1999.

8.1.29 The Commission recognized that the majority of the soundings continued to be taken over the Atlantic Ocean, but there were also a considerable number from the western part of the north Pacific. However, through capacity building of ASAP expertise in countries and/or groups of countries willing and able to finance ASAP, an expansion to ocean areas void of upper-air profile data might be achievable.

8.1.30 The Commission noted that the ASAP Panel, which was formerly called the ASAP Coordinating Committee, consisted of a group of national operators along with ECMWF and EUMETSAT. As part of its promotional activities the Panel published an ASAP *Annual Report*.

8.1.31 The Commission noted with appreciation that the EUMETNET ASAP Programme was in the process of implementing an ASAP in the Mediterranean and another ASAP in the Atlantic, both under joint funding among the members of EUMETNET. That activity would increase ASAP coverage from 2001, at least on the European scale, with additional upper-air profiles taken both from the Atlantic and the Mediterranean.

8.1.32 The Commission noted with interest and appreciation the efforts being made through the ASAP

Panel to implement an ASAP on a ship plying in both the southern and northern hemispheres. Initial establishment of the Worldwide Recurring ASAP Project had taken place in early 2001, to provide much needed data from the Southern Ocean, for the benefit of both weather forecasting (numerical weather prediction) and global climate studies (GCOS). The Commission recognized that the establishment of the Worldwide Recurring ASAP Project as a joint effort represented a major development in the work of the ASAP Panel, in demonstrating the ability of the Panel to coordinate funds and other national contributions to the implementation of ASAP on global routes. It also recognized the important input and support to the Worldwide Recurring ASAP Project and to ASAP enhancement in general, being provided by the AOPC of GCOS and the WCRP.

8.1.33 The Commission recognized that the deficiencies in the global observing system were becoming a limiting factor for improvements in numerical weather prediction. One of those deficiencies was the lack of profile data from the oceans. It agreed that the need for more upper-air profiles from the oceans was indisputable and ASAP was an efficient and economical way to obtain them. In that context, the further enhancement of the contact between data users and data providers was welcomed, in order to optimize the use of resources spent on providing those data, which were of great importance for the WWW and GCOS.

RESOURCES NEEDED FOR SHIP-BASED OBSERVATIONS

8.1.34 The Commission recognized that all ship-based observation programmes (VOS, SOOP and ASAP alike) were facing serious decreases in resources, coupled with instrument and consumable cost increases (e.g. XBTs and sondes) and that that could potentially adversely affect the products and services provided through JCOMM. It re-emphasized the fact that ship-based observations were essential for: (*a*) operational meteorology and oceanography; (*b*) marine scientific research; (*c*) global climate studies and model validation; and (*d*) satellite products (ground truth for calibration and validation). That was particularly the case for specific variables in ocean areas not covered by other *in situ* marine observing systems (e.g. outside the tropics for subsurface thermal data, North Pacific for meteorological data, etc.). In addition, VOS provided essential platforms for the deployment of other ocean observing platforms such as buoys and floats.

8.1.35 The Commission also stressed again that national support to PMOs was essential for the successful operation of all ship-based observing programmes. Similarly, it emphasized very strongly that the SOOP/DBCP Coordinator position was essential for the implementation and operation of both programmes. The Commission further agreed that the VOS and ASAP could benefit substantially from having available a similar coordination and technical support mechanism (see action under general summary paragraph 8.5.6).

8.1.36 The Commission therefore strongly recommended that Members/Member States considered increasing the resources committed to such programmes and to their associated international coordination mechanisms. It adopted Recommendation 2 (JCOMM-I) on the subject. On a related matter, the Commission noted the work being undertaken within EUMETNET to evaluate and possibly restructure all meteorological and oceanographic observation networks in Europe and surrounding ocean areas. It recognized the relevance and possible global impact of such evaluations to the VOS network in general and, therefore, requested the Ship Observations Team to arrange for appropriate cooperation and coordination with EUMETNET in that work.

INTERNATIONAL SEAKEEPERS SOCIETY

8.1.37 The Commission noted with interest the work undertaken by the International SeaKeepers Society to develop a fully automated module for installation on board its members' yachts, cruise ships and cable-laying vessels, to make a range of meteorological and oceanographic observations and to transmit those data to shore in real time. It was informed that the Society had undertaken that development work in collaboration with the University of Miami and had also implemented procedures for data collection through NOAA/National Weather Service of the United States. Extensive discussion and review had taken place on issues relating to instrumentation, quality control, calibration and communications. The Commission noted with appreciation that operational trials of the module had begun in May 2001, with transmission from a number of vessels, and that meteorological and some oceanographic data were already being sent onto the GTS through the National Weather Service gateway.

8.1.38 The Commission agreed that those vessels, equipped with the SeaKeepers module, were of potential value to an integrated GOS, for both meteorological and oceanographic variables, and would thus contribute directly to the WWW, GOOS and GCOS. At the same time, the members of the International SeaKeepers Society could become valuable partners in the work to develop and expand the ocean observing system to support many applications. The Commission therefore expressed its appreciation to the Society and its members for their work in support of global ocean and atmospheric monitoring. It agreed that, subject to ongoing evaluation of the quality, reliability and utility of the data provided, the SeaKeepers yachts should be incorporated formally as a part of the integrated SOOP/VOS scheme, coordinated through the Ship Observations Team. The Commission invited the Society to participate actively in the work of the Ship Observations Team, which would then act as the review body for the operational meteorological and physical oceanographic data from the SeaKeepers vessels as part of its overall monitoring of the VOS, SOOP and ASAP activities. The Commission further suggested that the GOOS COOP might undertake the role of scientific review body for the non-physical SeaKeepers oceanographic data. Recommendation 3 (JCOMM-I) on that subject was adopted.

8.2 **BUOYS AND FLOATS** (agenda item 8.2)

DATA BUOY COOPERATION PANEL

8.2.1 The Commission recalled that the Drifting Buoy Cooperation Panel was established in 1985 by WMO Resolution 10 (EC-XXXVII) and IOC Resolution EC-XIX.7. In 1993, the DBCP changed its terms of reference and title to include moored buoys on the high seas in its activities. The Panel was served by a full-time Technical Coordinator funded through voluntary contributions by some Member States of IOC and Members of WMO.

8.2.2 The Commission noted that the terms of reference of the DBCP had recently been changed to reflect the fact that the DBCP was now reporting to JCOMM. At its sixteenth session in Victoria, Canada (16–20 October 2000), the Panel had noted with interest a report on the status of implementation of JCOMM, including the position of the DBCP within the proposed new JCOMM structure, with the Panel providing the major component of the proposed Data Buoy Observations Team. The Commission was pleased to learn that: (*a*) the DBCP supported that overall concept, as well as its own role within it; and (*b*) the DBCP reaffirmed its belief that JCOMM represented a very significant and potentially far reaching step on the road to truly operational oceanography. The DBCP had acknowledged the integrating role of JCOMM as being of primary importance, with the Panel itself providing an excellent model as a forum and mechanism for coordination and integration in a specific field among meteorologists and oceanographers, research and operations. In addition, the Technical Coordinator, particularly in his dual role as DBCP/SOOP coordinator, now offered an example and basis for the future technical coordination of all operational ocean observing systems under JCOMM. In that context, the Commission supported the proposal for the establishment of a JCOMM *in situ* JCOMMOPS, based initially on the DBCP/SOOP and Argo coordinators (see agenda item 8.5 for specific action in that regard).

STATUS

8.2.3 The Commission noted with interest a report regarding the status of buoy programmes. In December 2000, data from over 1 300 drifting buoys were collected through Service Argos. Among those buoys, nearly 60 per cent had their data distributed on the GTS. Among drifting and moored buoys which reported on the GTS in BUOY format in December 2000, 250 reported atmospheric pressure (mainly Lagrangian barometer drifters), 688 reported SST (mainly Lagrangian drifters), 93 reported wind (mainly TRITON, TAO and PIRATA moorings), 153 reported air temperature and 78 reported subsurface temperatures (mainly TAO). More details could be found at the DBCP Web site at http://dbcp.nos.noaa.gov/dbcp/1sigm.html. The Commission noted with appreciation the proposal made by the IODE Responsible National Oceanographic Data Centre for drifting buoys, operated by MEDS, to coordinate its activities with those of the JCOMM SOC for drifting buoys, operated by *Météo-France*.

IMPLEMENTATION

8.2.4 The Commission recognized that implementation of buoy programmes was done primarily through the DBCP Action Groups. There were presently seven Action Groups, namely the European Group on Ocean Stations (North Atlantic), the International Arctic Buoy Programme, the International Programme for Antarctic Buoys, the International South Atlantic Buoy Programme, the International Buoy Programme for the Indian Ocean, the Global Drifter Programme and the Tropical Moored Buoy Implementation Panel. A proposal to establish a new action group for the North Pacific was under consideration.

8.2.5 The Commission noted that the former TAO Implementation Panel (TIP) dissolved itself at the conclusion of TIP-9 in Perth, Australia, November 2000, to be replaced in 2001 by a new Tropical Moored Buoy Implementation Panel (also referred to as TIP). The original mandate of the Panel covered multinational implementation and maintenance of only the Pacific moored array. The Pacific focus was viewed as too narrow in light of ongoing and planned programmes in all three tropical oceans — TAO/TRITON in the Pacific, PIRATA in the Atlantic and the nascent plans for design and implementation of an Indian Ocean moored buoy array. Consequently, new terms of reference had been agreed by the GOOS Steering Committee and the JCOMM Interim Management Committee, expanding the scope of that Panel to the global tropics, with emphasis on technical and logistic issues related to implementing and sustaining moored buoy programmes in support of climate studies.

8.2.6 The Commission noted with interest that the DBCP implementation strategy had been developed in order to provide an overall framework for its work, in the light of developing requirements for marine observations, and especially buoy data, to support operational meteorology and oceanography, marine scientific research and global climate studies. At its sixteenth session, the DBCP had reviewed its strategy in line with an emerging consensus on such requirements as well as latest developments with JCOMM, data telecommunication systems, and emerging regional programmes (e.g. Black Sea, Southern Ocean).

8.2.7 The Commission noted with appreciation that integration of buoy deployment opportunities had already started through the operation of an interim JCOMMOPS, based upon existing coordination facilities offered by the DBCP, SOOP and Argo. That interim JCOMMOPS offered a single point of logistical information for the DBCP, SOOP and Argo programmes. Such information included points of contact, area of operations, information on air deployments, ship deployments, type of ships, frequency, and whether ships carried or could embark dedicated personnel. A JCOMM joint circular letter had been issued, requesting Members/Member States to provide the information required.

8.2.8 The Commission noted with appreciation that 13 countries were expected to contribute on a voluntary basis to the financial support of the Panel in 2001:

Australia, Canada, France, Greece, Iceland, Ireland, Japan, the Netherlands, New Zealand, Norway, South Africa, the United Kingdom and the United States. The Panel's Technical Coordinator, Mr E. Charpentier, had continued to be employed by UNESCO/IOC as a fund-in-trust expert and was located with CLS/Service Argos in Toulouse, France. While appreciative of those voluntary contributions, the Commission nevertheless recognized it might be time to introduce some more formal and secure funding mechanism, to ensure the continuity of the position of Technical Coordinator of the DBCP and SOOP. It therefore requested the DBCP and SOOPIP to address that question and to make relevant proposals to the Observations Programme Area Coordination Group.

8.2.9 The Commission praised the efforts of the DBCP for maintaining and coordinating buoy programmes. It recognized that integration through the Data Buoy Observations Team of the Observations Programme Area would make it possible to develop further those networks in accordance with expressed requirements and complementary to other types of marine observing systems.

VANDALISM

8.2.10 The Commission recognized that vandalism of ocean data buoys, both accidental and deliberate, was an ongoing problem. It noted with appreciation that efforts had been made to bring that problem to the attention of the global maritime community. At the request of WMO, IHO had issued a special hydrogram on the presence of data buoys in the seas and of their importance, including for maritime safety. The hydrogram would, in principle, be published by National Hydrographic Services at least once a year in their "Notices to mariners" (http://dbcp.nos.noaa.gov/dbcp/vandalism.html). The Commission agreed that, although useful, that action alone might not be sufficient to limit vandalism on data buoys. It therefore adopted Recommendation 4 (JCOMM-I) on the subject.

INSTRUMENTATION, EVALUATION

8.2.11 The Commission noted with interest the work of the DBCP Subgroup on Surface Velocity Programme Barometer drifter evaluation, indicating that the quality of data from surface velocity programme barometers had substantially improved in the last 12 months, especially regarding early mortality and air deployment success rates. Surface velocity programme barometer evaluation was being continued.

INFORMATION EXCHANGE

8.2.12 The Commission expressed its appreciation to the DBCP for the exchange of general and technical information regarding data buoy programmes. The DBCP technical document series now included DBCP Annual Reports, DBCP technical workshop reports, a *Reference Guide to the GTS Subsystem of the Argos Processing System* (No. 2), a *Guide to Data Collection and Location Services Using Service Argos* (No. 3), a *WOCE Surface Velocity Programme Barometer Drifter Construction Manual* (No. 4), a *Guide to Moored Buoys and Other Ocean Data Acquisition Systems* (No. 8) and the *DBCP Implementation Strategy* (No. 15). Recently, the DBCP had established a general purpose (for DBCP members) and a buoy operators (to exchange technical information) Internet mailing lists (http://www.jcommops.org/mailing_lists.html#DBCP). It also maintained a Web site (http://dbcp.nos.noaa.gov/dbcp/) and an electronic discussion forum (http://www-dbcp.cls.fr/visible/dbcp/disptach.cgi).

ARGO

8.2.13 The Commission noted with interest the current status of Argo, which was a COOP as well as a GOOS/GCOS OOPC GODAE pilot project. That project was essential to CLIVAR because the Argo network provided an enhanced real-time capability for measurement of temperature and salinity through the upper 2 000 metres of the ocean and contributed to a global description of the seasonal cycle and interannual variability of the upper ocean thermohaline circulation. Argo was the primary *in situ* data-gathering component of GODAE, to contribute to short-term ocean forecasting, to provide boundary conditions for forecasting in coastal areas, and to contribute to seasonal to inter-annual climate forecasts. Argo would provide data for GODAE models as well as for assessment of model performance.

8.2.14 The Commission noted that Argo consisted of a broad-scale global array of temperature/salinity profiling floats. It planned to develop a global array of about 3 000 floats by 2005, at a horizontal resolution of about 3°×3°. The floats measured water temperature and salinity profiles in the upper 2 000 metres of the water column. All Argo data would be made available on the GTS within 24 hours of collection and fully quality-controlled datasets would also be made generally available in delayed mode in other ways.

8.2.15 The Commission noted further that Argo was an internationally-coordinated project managed by the Argo Science Team (http://www.argo.ucsd.edu), which coordinated project planning, including sampling and technical issues. The Argo Science Team was formed in July 1998 and its first meeting was held in March 1999. The Commission took that opportunity to place on record its appreciation for the work of the chairperson of the Argo Science Team, Mr D. Roemmich, for his dedication to the project. Countries presently having Argo plans that included float procurement or production included Australia, Canada, China, Denmark, France, Germany, India, Japan, New Zealand, the Republic of Korea, the Russian Federation, Spain, the United Kingdom and the United States, plus the European Union Gyroscope Project. Combined deployments from those nations were planned to exceed 700 floats per year by 2002. In November 2000, more than 400 floats were already funded and a number of those deployed. Broad participation in Argo by many nations was anticipated and encouraged. Such participation could include float procurement, logistical support for float deployment, or

analysis and assimilation of Argo data. In that context, the Commission noted than more than half of the Argo floats would need to be deployed in the southern hemisphere and strongly encouraged all float-deploying nations to pay due attention to remote ocean areas in the southern hemisphere.

8.2.16 The Commission was informed that float deployments were being planned and coordinated on a regional basis and that the first step in that process was implementation planning meetings for the Pacific, Atlantic and Indian Oceans. The first Pacific Ocean implementation planning meeting was held in Tokyo in April 2000, hosted by the Japan Meteorological Agency. The first Atlantic Ocean implementation planning meeting was held in Paris in July 2000, at the invitation of the French Research Institute for Exploitation of the Sea. The first Indian Ocean implementation planning meeting would be held in Hyderabad, India in July 2001, hosted by the Indian Department of Ocean Development. The United States NOAA had also provided support for organizing those meetings. In addition, two meetings dealing with data management were noted — the first one had been held in Brest, France, in October 2000 and the second one, which would be the first session of the newly-established Argo Data Management Subcommittee, would be held in Ottawa, in September 2001.

8.2.17 The Commission recalled that Thirteenth Congress had strongly endorsed Argo as an important component of the operational ocean observing system of GOOS and GCOS, and also as a major contributor to CLIVAR. Congress had requested JCOMM to address the issue of coordinating Argo with other components of the system, such as SOOP and the tropical moored buoy array, and had urged Members to participate in, and contribute to, the implementation of Argo wherever possible, in view of its importance to global climate studies.

8.2.18 The Commission further recalled that, at its twentieth Assembly, IOC had accepted Argo as an important contribution to the operational ocean observing system of GOOS and GCOS, as well as a major contribution to CLIVAR and other scientific research programmes. At the same time, the Assembly adopted Resolution XX-6, which required that "the concerned coastal States must be informed in advance, through appropriate channels, of all deployments of profiling floats which might drift into waters under their jurisdiction, indicating the exact location of such deployments."

8.2.19 The Commission noted with appreciation that to meet that requirement, the IOC, with the support from interested Member States, had established an international AIC (http://argo. jcommops.org/) staffed by a Coordinator. The Centre which was located in Toulouse, France, informed designated contact points in Member States about float deployments, how to track float positions and how to access float data, in compliance with the IOC Resolution. At the same time, the AIC supported the international Argo programme in a number of ways, including providing liaison between float providers and float-deployment opportunities. The Argo Coordinator acted as a clearing house for information on all aspects of float use and promoted an improved international dialogue between oceanographers and meteorologists, and between research and operational communities.

8.2.20 The Commission strongly supported the steps taken by WMO, IOC and Members/Member States to establish the AIC and agreed that the AIC should be included within JCOMMOPS (see agenda item 8.5), which would, among other things, provide integrated information on logistic opportunities available for marine platform deployments (e.g. deployment of floats and drifting buoys, servicing of moored buoys, ships of opportunity, air deployments, etc.).

8.2.21 The Commission agreed that the Argo project presented an excellent opportunity to improve ocean and climate forecasting, with consequent benefits for the protection of life and property and effective planning for the effects of seasonal to inter-annual climate variability. It noted that Argo was a transition from research to operational oceanography. As a pilot project, it could not yet be fully integrated within the JCOMM Observations Programme Area. The Commission however agreed that it should review progress with the Argo project through its Observations Coordination Group. That group, in close consultation with the Argo Data Management Subcommittee and the JCOMM Expert Team on Data Management Practices, would also be charged with developing and overseeing the implementation of procedures for the full integration of Argo into the overall observing system at the appropriate time. In that regard, the Commission noted that most deployments relied totally on research funding and it urged Members/Member States to seek means for the continued long-term funding of such deployments as part of an operational programme.

CLS/SERVICE ARGOS

8.2.22 The Commission noted with interest a presentation of the Argos Data Collection and Location System given by the CLS/Service Argos representative. That included an overview of the Argos system infrastructure and operation, of the *in situ* networks using the satellite system and an insight on current and future enhancements being implemented. The major outcome would be the implementation of a two-way capability starting with the ADEOS-II Japanese satellite (February 2002), and of a 4.8 kbps high-rate channel starting with METOP-I (2005), which would accommodate data message lengths up to 4 800 bits, thus increasing Argos data bandwidth by more than one order of magnitude. The Commission agreed that the two-way capability of Argos would be important for the global management of the Argo float programme, as well as other autonomous platforms.

8.2.23 The Commission expressed its interest in the development of telecommunication capabilities increased by several orders of magnitude and in all initiatives that could lead to that objective. It therefore supported the

idea that the Japanese space agency NASDA might be invited to consider flying Argos on its GCOM satellite, a follow-on of ADEOS. In the same spirit, it agreed that it should be associated with the studies undertaken by the French space agency CNES on the preliminary specifications of Argos 4, which was to fly by 2010.

8.3 REMOTE SENSING (agenda item 8.3)

PRESENT STATUS OF OCEANOGRAPHIC SATELLITES

8.3.1 The Commission recalled the essential role played by oceanographic satellites and their potential to enhance further operational oceanography. The Commission noted with appreciation the contribution made by satellite operators in the past in providing valuable data, products and services.

8.3.2 The Commission also recalled that data, products and services from satellites in the WWW GOS constellation, both geostationary and polar-orbiting, were important for analyses of ocean surface variables such as sea-surface temperature, sea state, sea-ice and ocean surface wind. In particular, the Commission recognized the important contributions from the present operational geostationary constellation of satellites consisting of Meteosat-7 at 0° longitude and Meteosat-5 at 63°E (operated by the EUMETSAT), GOMS-1 at 76°E (operated by the Russian Federation), FY-2B at 105°E (operated by the People's Republic of China), GMS-5 at 140°E (operated by Japan), and GOES-10 at 135°W and GOES-8 at 75°W (operated by the United States). The operational polar-orbiting constellation consisted of METEOR-2 and 3 series satellites (operated by the Russian Federation), NOAA-15 and 16 (operated by the United States) and FY-1C (operated by the People's Republic of China).

8.3.3 The Commission also recognized the research and development satellites such as ERS-1 and 2 (operated by ESA), Topex-Poseidon (operated by NASA and CNES), QuikSCAT (operated by NASA) and ADEOS-1 (operated by NASDA). The Commission noted that significant products and services were already emerging from those satellites including ocean surface topography and sea-level estimates from altimeters, ocean surface wind vectors, sea state and various ocean colour applications. In addition, it noted the importance of satellite radars for the mission of JCOMM. The Commission agreed that the future contributions from satellites such as Metop with its advanced scatterometer, NPOESS with its conical microwave imager sounder and altimeter, the Jason series with their altimeters, ICESat and ADEOS-2, presaged a vast increase in valuable data and products for operational oceanography. The Commission also noted the important role in telecommunications referred to under agenda item 8.2.

8.3.4 The Commission recognized the importance of the Satellite Application Facility of EUMETSAT and its significant contribution to the goals of the Commission. It also recognized the contribution of commercial satellites to the goals of JCOMM in ocean observations and, in particular, the value of space-based synthetic aperture radar for sea-ice observations.

8.3.5 The Commission recognized that the immediate challenge was to work with satellite operators, through various mechanisms, to develop continuity and sustained operation, as discussed in the IGOS Oceans Theme. The Commission also noted the significance of the conclusions of the first OceanObs Conference (St Raphaël, France, October 1999), at which broad consensus was reached on the requirements of the Commission. In addition, the Commission recognized the challenges to be ready to utilize fully the voluminous data streams.

OBSERVATIONAL REQUIREMENTS

8.3.6 The Commission agreed that it was of fundamental importance to identify the observational requirements of JCOMM in relation to continuing satellite missions and to establish a dialogue on the complementary value of JCOMM data and products to satellite agencies. Furthermore, it recognized the importance to satellite agencies of providing strong and persuasive socio-economic and scientific arguments supporting such requirements and to keeping the agencies informed of the positive impacts experienced by users. Feedback from the user community represented by JCOMM, to the satellite agencies, would be most beneficial. The Commission noted that multiple paths existed for dialogue with satellite operators regarding those requirements (see also general summary paragraph 8.3.15).

8.3.7 The Commission noted the extensive consultation that had taken place in the development of the IGOS Oceans Theme and, in particular, the consensus that had been reached with satellite agencies on observational requirements. Furthermore, the Commission noted that the satellite agencies, through CEOS, had agreed to use the Oceans Theme report as the strategic approach to implementation. The fourth session of the GOOS Steering Committee had recommended that the Oceans Theme Team remain in place to guide the implementation of the Oceans Theme.

8.3.8 The Commission noted that a WMO/CEOS database of requirements and available observing systems, both satellite and *in situ*, allowed for a Rolling Review Requirements process, presently used by the WMO CBS Open Programme Area Group on Integrated Observing Systems in redesigning the WWW GOS. Both the database and the Rolling Review Requirements process would be of importance in activities related to JCOMM. The Statement of Guidance of that process would provide an indication of how well the observational data requirements in the CEOS/WMO database would be met by present and planned observing systems. The Commission therefore agreed that JCOMM should participate in the CBS Rolling Review Requirements process. To that end, it requested the co-presidents, in consultation with other members of the JCOMM Management Committee and officers of GOOS, to designate one or more JCOMM experts to participate in that process and, in particular, to participate in the appropriate CBS expert teams (see also general summary paragraph 5.2.3).

INTERACTIONS WITH SATELLITE OPERATORS

8.3.9 The Commission agreed that it was important to have active interactions with the satellite operators. It noted that the Oceans Theme had resulted in constructive and fruitful interactions with satellite operators, particularly those involved with oceanographic measurements. The Commission further noted that the GOOS Scientific Committee had recommended to the IGOS Partners that the Oceans Theme be continued for the purposes of guiding implementation of ocean satellite programmes, including regular review of the requirements and available satellite data.

8.3.10 The Commission noted that the fifty-second session of the WMO Executive Council had agreed that a mechanism for discussions with satellite operators should be provided through the convening of Consultative Meetings on High-Level Policy on Satellite Matters at one- to two-year intervals. It was of the view that the Consultative Meetings should give early consideration to:

(*a*) Evaluating satellite missions to ensure, *inter alia*, the better use of existing and planned research and development missions in support of WMO Programmes and to provide an assessment on their operational utility; and

(*b*) Reviewing and revising the space-based component of the WMO GOS to take into account both operational and research and development opportunities and the need to maximize cost efficiency and effectiveness of satellite observing programmes.

The Commission noted that the topics for the Consultative Meetings were germane to the needs of its programme. The Commission agreed to the importance of participating in the Consultative Meetings and requested the WMO Secretary-General that it should be represented at future such meetings.

8.3.11 The Commission noted that the First Consultative Meeting on High-Level Policy on Satellite Matters had developed and recommended to the WMO Executive Council guidelines for requirements that should be agreed upon in order to provide operational users within WMO with a measure of confidence in the availability of research and development observational data, and data providers with an indication of their utility.

8.3.12 The Commission noted the outcome of a panel discussion on the need for enhanced international low Earth orbiting satellite cooperation, organized and hosted by the National Environmental Satellite, Data and Information Service on 17 October 2000, in connection with the twenty-eighth Plenary meeting of CGMS at Woods Hole, United States. Participants on the panel included representatives of CMA, CNES, ESA, EUMETSAT, IGBP, ISRO, NASA, NASDA, NOAA, PLANETA, ROSHYDROMET and WMO. The participants at Woods Hole had agreed that satellite and user organizations should work together as partners in contributing towards the development of a more complete polar operational satellite system, with a commitment to long-term observations.

8.3.13 The Commission noted that, through the nomination by WMO at the twenty-eighth plenary meeting of CGMS, IOC had become a CGMS member. Thus, both IOC and WMO would represent their user communities at future meetings of CGMS. The Commission expressed its pleasure at that development and requested that IOC and WMO continue their strong and important cooperative roles at future CGMS meetings.

8.3.14 The Commission noted that both WMO and IOC had become Partners within the IGOS Partnership. IGOS sought to provide a comprehensive framework to harmonize the common interests of the major space-based and *in situ* systems for global observation of the Earth, principally in support of GCOS, GOOS and GTOS. It was being developed as an over-arching strategy for conducting observations relating to climate and atmosphere, oceans and coasts, the land surface and the Earth's interior.

8.3.15 The Commission noted the developments within WMO to expand the definition of the present space-based component of the WWW GOS to include research and development satellites. The Commission also recognized the considerable progress being made within the Oceans Theme that, among other things, had developed and promoted procedures for the transition of research and development satellites into a sustained mode. It agreed that that transition process was of particular importance. The Commission recognized the value of those processes and of continued direct dialogue with, and involvement of, satellite agencies in the JCOMM Programme. The JCOMM Management Committee and the Observations Programme Area Coordination Group were requested to ensure that those interactions were coordinated and constructive. To that end, the Commission agreed to include a satellite expert as a member of the Observations Coordination Group. Action in that regard was taken under agenda item 16.

USER FEEDBACK

8.3.16 The Commission noted the importance of assessing the value of satellite observations of ocean variables to end users. Those end users included the offshore oil and gas industry, the fishing industry, aquaculture, ship routing, environmental agencies, etc. Those organizations tended to use combined data products, where the remote-sensing data had been assimilated through models and combined with *in situ* data. In October 2000, EuroGOOS had convened a conference, jointly with EUMETSAT, at which a wide range of users presented detailed technical analysis of their requirements, with a summary of economic factors. The main recommendation of the conference was that the JASON-2 mission should be supported by EUMETSAT as an Optional Programme.

GROUND-BASED RADAR OCEAN SENSING

8.3.17 The Commission recalled that a Subgroup on Radar Ocean Sensing (ROSE) had been established by the former CMM, partly in response to recommendations of the successful International ROSE Workshop, held in Geneva in March 1995. That Subgroup had become a part of the JCOMM interim structure. The objectives of

the Subgroup, as formulated in its terms of reference, were to design demonstration monitoring projects, establish requirements for standardization and compile and promulgate information on cost-benefits and operational capabilities of ocean radars.

8.3.18 The Commission noted that a number of informal international ROSE workshops had taken place during the inter-sessional period. A further such Workshop was convened in Bergen in March 2000 to bring together operators from Europe and North America. As such, it had provided a very useful forum in which to compare system configurations, operational capabilities and applications. The strong conclusion of that Workshop was that certain types of ocean radars were now effectively operational in several countries and that the EuroROSE project was providing an essential demonstration of specific operational applications and capabilities.

8.3.19 At its conclusion, the Workshop stressed the importance of informing and educating Members/Member States on ROSE capabilities and applications. It therefore had agreed on the need to maintain the ROSE group as an informal international association and of maintaining some association with WMO/IOC through JCOMM. It had also agreed on the importance of enhancing awareness of ROSE within operational agencies.

8.3.20 The Commission noted that EuroROSE was a project being undertaken by a consortium of six European institutions in four countries to develop operational tools for ocean analysis and forecasting in support of coastal marine operations and construction and the protection of the marine environment. Specifically targeted initial users were VTS operators and harbour and coastal marine managers. The operational tool under development was a monitoring and prediction system for metocean conditions which combined observational data from high frequency groundwave radars and navigational X-band radars (waves and surface currents) with assimilation into high resolution (500 m) ocean models.

8.3.21 The project was centred around two operational field experiments, the first in collaboration with the VTS centre on Fedje Island, near Bergen, Norway, (mid-February to end-March 2000) and the second with the VTS centre near Gijon, Spain (mid-October 2000 to end-March 2001). Both experiments clearly demonstrated that the assimilated observational data greatly enhanced model performance and output quality and that the operational products were increasingly accepted and relied on by the VTS operators and ship pilots.

8.3.22 The Commission recognized that the success of that project could lead to important commercial, integrated ocean systems development and operational spin-offs within Europe. It agreed that it was essential that all maritime Members/Member States should be kept informed of the results of the project and of the potential for application in other parts of the world of the tools which it had developed and tested. It therefore requested the EuroROSE participants to consider preparing eventually a comprehensive report on the project, for publication in the JCOMM technical report series.

8.3.23 The Commission further noted that airborne remote-sensing measurements and related forms of ocean remote sensing were also of considerable potential value to JCOMM as operational observations facilities.

8.3.24 Overall, the Commission recognized that ground-based high frequency radars were close to being operational. The Commission also noted that projects similar to EuroROSE were already in operation or under planning in the United States and that some systems were available as off-the-shelf packages, for both high frequency and X-band radars. It agreed on the importance of continuing a close interaction with ROSE operators worldwide and of informing Members/Member States of new developments. It therefore requested the Observations Programme Area Coordination Group to identify a suitable expert to liaise with relevant ROSE groups worldwide, to review on an ongoing basis the status of such systems, and to prepare appropriate technical guidance and advice on the subject for the benefit of Members/Member States.

8.4 **SEA LEVEL** (agenda item 8.4)

8.4.1 The Commission recognized the major importance of the GLOSS, both to a variety of operational activities in Members/Member States and to global climate studies. It therefore noted with interest and appreciation the report by the chairperson of the GLOSS Group of Experts, Mr P. Woodworth, reviewing the achievements of, and deficiencies in, the programme and congratulated him on progress made.

8.4.2 The Commission noted progress made in elements of GLOSS such as the GCN development; certain regional GLOSS networks; use of tide gauges for ongoing altimeter calibration (GLOSS-ALT); provision of data and information to international scientific study groups such as IPCC; and enhancement of material for training, outreach and research. At the same time, it also noted the requirement for significantly-increased resources for programme development in many parts of the world, for both climate/oceanographic and coastal applications.

8.4.3 The Commission noted from the figure presented in Annex III to this report, that the GCN could be considered to be approximately two-thirds operational, using data receipts by PSMSL as a guide to operational status. The Commission noted that the lack of data from certain regions reflected largely either inadequacies in the present network, which would have to be corrected by the installation of new tide gauges, or inadequacies in data delivery from sites having adequate gauges. The Commission therefore urged members from regions that were not at present contributing data to the GCN, for example in parts of Africa and South America, as shown in the figure in Annex III to this report, to take all possible early steps to remedy that deficiency.

8.4.4 The Commission recognized the need for investment worldwide resulting from increasing requirements for real-time sea-level data (as opposed to the 'delayed mode' data available so far) and the use of tide gauge data transmission platforms for other

oceanographic parameters. It further recognized the potential value to both the meteorological and oceanographic communities of making the products of GLOSS-related Sea-level Centres (such as the Permanent Service for Mean Sea Level (United Kingdom) and the Hawaii Sea-level Center (United States)) more widely known through existing WMO information services. The Commission also invited Members/Member States to implement distribution of tide gauge data on the GTS, wherever possible.

8.4.5 In the light of the discussion recorded in the above paragraphs, the Commission adopted Recommendation 5 (JCOMM-I) on that general topic.

8.4.6 The Commission noted the encouraging developments in the monitoring of vertical land movements by new geodetic techniques (GPS, DORIS and absolute gravity). Those new techniques would permit the ongoing calibration of satellite radar altimetry by networks of tide gauges and would facilitate the decoupling of land movements from real sea-level change in tide gauge records, thereby enabling studies of changes of absolute sea level.

8.4.7 The Commission approved the changes made to the organization of the GLOSS programme with regard to the establishment of a subgroup capable of providing ongoing scientific input on sea-level matters to the GLOSS Group of Experts and to the wider community.

8.4.8 The Commission noted that there was a need for a global data bank of tidal constants and that it was the intention of the GLOSS Group of Experts, in collaboration with the International Hydrographic Bureau and MEDS, to provide such a data bank under GLOSS auspices, to substitute for that operated previously by the International Hydrographic Bureau. JCOMM members were urged to cooperate closely in the establishment and operation of that new facility.

8.4.9 Consistent with the establishment of JCOMM, and the reporting of the GLOSS Group of Experts to JCOMM, the Commission approved the designation of the Group as the JCOMM GLOSS Group of Experts.

8.4.10 The Commission noted that GLOSS had been active in the regular provision of training materials and training courses on sea-level measurements and interpretation and encouraged members to continue their support for such activities.

8.4.11 The Commission requested its Capacity Building Coordination Group to provide advice to, and to coordinate with, the GLOSS Technical Secretariat at IOC with regard to obtaining funds necessary to ensure the modernization and extension of the programme.

8.5 **INTEGRATION ISSUES** (agenda item 8.5)

8.5.1 As discussed under agenda item 7.5, the Commission recognized that integration within JCOMM would occur primarily within the Data Management Programme Area. At the same time, however, it agreed that there existed some possibilities to enhance integration at the level of the observing systems themselves. That was particularly the case for ship-based observations, where there was the potential to use the same ship platform to provide observational data from almost the bottom of the ocean to the top of the troposphere. In addition, there was also considerable potential to encourage integration in observations and reduce costs and ship management complications through enhanced coordination among those managing the VOS, SOOP and ASAP. The Commission therefore welcomed the proposal for the Ship Observations Team concept, which would involve initially, an investigation of the synergies among the VOS group, SOOPIP and the ASAP Panel in ship management, with a view to an eventual possible full integration of ship-based observing systems on commercial and research vessels.

ESTABLISHMENT OF JCOMMOPS

8.5.2 The Commission noted with interest the proposal to establish a JCOMMOPS Centre, to be based initially on the existing DBCP/SOOP and Argo coordination mechanisms. It recognized that that Centre would provide essential data and tools, as well as a centralized information and technical support facility required for coordinating and integrating many of the existing operational ocean observing networks under JCOMM. Through the activities of JCOMMOPS, the following goals were expected to be achieved:

(*a*) Facilitating decision making by programme managers (maintaining information on requirements, analysis products showing how requirements were met and information on telecommunication systems);

(*b*) Facilitating programme implementation (assistance regarding GTS distribution, identification of available deployment opportunities and assistance regarding standardization of real-time data telemetry formats);

(*c*) Enhancing operational and monitoring aspects (compiling quality control information and following up with solutions to correctly identified problems, acting as a clearinghouse on operational aspects of platform implementation and providing information on the status of relevant observing platforms).

8.5.3 The Commission recalled that the proposal had been discussed at the Second JCOMM Transition Planning Meeting (JCOMMTRAN-II) in Paris (14–16 June 2000) and noted that the concept had been strongly endorsed by the meeting. JCOMMTRAN-II had requested the Secretariats: (a) to specify the mechanisms for providing JCOMM guidance to the Centre; and (b) to seek the agreement of the DBCP and SOOPIP for the proposal, including terms of reference, since those bodies actually provided the funding to support the Centre. At its sixteenth meeting (Victoria, 16–20 October 2000), the DBCP strongly endorsed the concept as well, on the understanding that implementation of the Centre would not adversely affect the services provided by its Technical Coordinator to Panel members. SOOPIP was asked to review the proposal by mail and subsequently endorsed it as well.

8.5.4 The Commission further recalled that JCOMMTRAN-II had agreed that the Centre could, in practice, begin operating almost immediately on an interim basis. It noted with appreciation that some support had already been provided to JCOMM operations through the development of a Web site (http://www.jcommops.org/) and through integration of floats, drifting and moored buoy deployment opportunities.

8.5.5 The Commission expressed its considerable appreciation to the DBCP, SOOP, Argo and, especially, the Member States contributing to their respective trust funds, for providing the resources required to operate the proposed Centre. It strongly endorsed the proposal to establish the Centre and adopted Recommendation 6 (JCOMM-I) on the subject. The terms of reference for JCOMMOPS were given in the annex to that recommendation. The Commission noted with appreciation the offer made by the Editor of the JCOMM Electronic Products Bulletin to work closely with JCOMMOPS and to include some monitoring products delivered through JCOMMOPS in the Bulletin.

8.5.6 The Commission requested the Observations Coordination Group to consider the benefits and efficiencies that could be realized by extending the terms of reference of JCOMMOPS to include also support for VOS and ASAP.

DEPLOYMENT OF *IN SITU* MARINE INSTRUMENTS IN ANTARCTIC WATERS

8.5.7 The Commission noted that the SOOPIP had recognized a potential problem regarding the deployment of XBTs and other observation instruments and platforms in Antarctic waters. It recalled that, within the context of the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol, 1991), national Governments might restrict research and other activities south of 60°S. SOOPIP was particularly concerned by that situation because of the importance of ocean observation and research programmes in the Southern Ocean and Antarctic region. It had requested the Secretariats to bring that matter to the attention of relevant bodies of WMO and IOC, with a view to sensitizing Antarctic Treaty countries to the value of such programmes as well as to the minimal risk of environmental damage from them. The question had also been brought to the attention of the DBCP, considering that restrictions might also apply for the deployment of drifting buoys in the region if environmental dangers were perceived in those deployments. The Argo programme was also potentially affected by the question.

8.5.8 The Commission recalled that the issue was discussed at JCOMMTRAN-II and that the meeting had agreed that appropriate actions should be taken to assure Governments of the great value of such observations and of the minimal environmental risks involved. The WMO Secretariat subsequently brought the issue to the attention of the Scientific Committee on Antarctic Research, through the WMO Executive Council Working Group on Antarctic Meteorology, with a view to ascertaining the extent of the problem and to obtaining advice on possible actions. The Executive Officers and Secretariat of the Scientific Committee on Antarctic Research were now dealing with the issue and would provide appropriate advice to WMO/IOC as well as to Member States concerned, in due course.

8.5.9 The Commission reiterated the vital importance of continuing marine observation programmes in the Southern Ocean and Antarctic waters, in support of maritime safety, global climate studies and oceanographic research in particular. It supported the actions already taken on the issue and, additionally, urged its members to make every effort to impress on their relevant national government departments that importance as well as the minimal environmental risk posed by those programmes.

TRANSITION TO OPERATIONAL SYSTEMS

8.5.10 The Commission recognized that candidate operational systems would normally pass through several different phases on the path from idea and concept to a mature, robust technique. It was rare for that research and development process to occupy less than a decade. Four broad phases were recognized:

(*a*) Development of techniques within the oceanographic and marine meteorological community;

(*b*) Community acceptance of the methodology gained through experience within pilot projects whose principal objectives were evaluation and demonstration;

(*c*) Sustained pre-operational use of the methods and data by researchers, application groups and other end users. That was to ensure proper integration within the global system and that the augmentation (and perhaps phased withdrawal of an old technique) had no negative impact on the integrity of the overall global dataset and its dependent products;

(*d*) Incorporation of the methods and data into a continuing framework with sustained support and for sustained use.

8.5.11 A pilot project would develop capacity by engaging a segment of the community in an activity which contributed in a non-trivial way to a broader system (e.g. GOOS, GCOS or WWW, or even a pilot project thereof, such as GODAE). The Commission noted that a possible formal definition for pilot project could be:

> A pilot project is defined as an organized, planned set of activities with focused objectives designed to provide an evaluation of technology, methods or concepts within a defined schedule and having the overall goal of advancing the development of the JCOMM programme.

8.5.12 The Commission agreed that the Management Committee would have the responsibility of reviewing and advising JCOMM on the integration of new components into the overall operational system. It therefore requested those bodies to take those factors into consideration when reviewing possible candidate pilot projects.

9. REVIEW OF TECHNICAL REGULATIONS OF INTEREST TO THE COMMISSION (agenda item 9)

9.1 The Commission recalled that, under agenda item 6.1, it had agreed to adopt a number of amendments to the WMO GMDSS marine broadcast system, which was included in Volume I, Part I bis of the *Manual on Marine Meteorological Services* (WMO-No. 558). It therefore adopted Recommendation 7 (JCOMM-I) to effect that decision. In doing so, it recognized that the revised amendment to paragraph 2.2.3.7.2 in Part I bis, to authorize the use of PAN PAN for all urgent warnings of Beaufort 12 and above, had not yet been formally agreed by the Expert Team on Maritime Safety Services. The Commission therefore approved that amendment provisionally, subject to such agreement. The Commission further recalled that under agenda item 7.4 it had agreed to amend slightly the IMMT format to incorporate new data elements required for the VOSClim Project, with that new version of IMMT (IMMT-2) to replace the existing version (IMMT-1) from 1 January 2003. It therefore adopted Recommendation 8 (JCOMM-I) to that effect.

9.2 The Commission recalled that under agenda item 7.1 it had agreed to remove references to the exchange of sea-surface current data obtained from a ship's set and drift from both the *Guide* and the *Manual on Marine Meteorological Services*, in view of the discontinuance of such exchange over the past 10 years. Furthermore, under agenda item 7.1 it had agreed to some modifications to the MQC standards applied to marine climatological data exchanged under the MCSS. It therefore adopted Recommendation 9 (JCOMM-I), to effect those changes to the *Manual*. It agreed that those same modifications should also be applied to the MQC standards in the *Guide to Marine Meteorological Services*. No further modifications to relevant parts of the WMO *Technical Regulations* (WMO-No. 49) were considered necessary.

9.3 The Commission recognized the value of the WMO *Technical Regulations*, in particular the *Manual on Marine Meteorological Services*, in ensuring the provision of high quality and timely services to marine users, as well as in assisting and guiding NMSs in that regard. It further recognized that the services required by users increasingly involved oceanographic variables and products and that oceanographic institutes and agencies were becoming more involved in the preparation and dissemination of oceanographic services. In that context, and in view of the joint nature of JCOMM, it recommended that consideration be given to the preparation of an equivalent set of IOC technical regulations relating to the provision of oceanographic services. It requested the Services Programme Area Coordination Group to review that question, with a view to developing some draft technical regulations for further consideration by the JCOMM Management Committee, JCOMM-II and eventually the IOC Governing Bodies.

10. *GUIDES* AND OTHER TECHNICAL PUBLICATIONS (agenda item 10)

GUIDE TO MARINE METEOROLOGICAL SERVICES (WMO-No. 471)

10.1 The Commission expressed its appreciation that the fully revised version of the *Guide*, as adopted at CMM-XII, had been published in English during the inter-sessional period and hoped that the other language versions would soon be available also for distribution to Members/Member States. At the same time, it recognized that developments and advances relating to marine meteorological services were ongoing and that the *Guide* should be maintained as up-to-date as possible. In that context, it noted the proposals of the Subgroup on Marine Climatology relating to modifications to the *Guide*. It agreed with those proposals and adopted Recommendation 10 (JCOMM-I).

GUIDE TO THE APPLICATIONS OF MARINE CLIMATOLOGY (WMO-No. 781)

10.2 The Commission recalled that CMM-XII had agreed that the *Guide to the Applications of Marine Climatology* should in the future comprise both a static and a dynamic part. CMM-XII had further supported the convening of an international workshop on the subject (CLIMAR99, held in Vancouver in September 1999), as a means of developing input to the dynamic part. Recalling its discussions and conclusions under agenda item 7.1 on that subject, the Commission noted the proposal made by the Subgroup on Marine Climatology for the list of papers from CLIMAR99 to be included in the *Guide* as the dynamic part. It agreed with that proposal and adopted Recommendation 11 (JCOMM-I) on the subject.

OTHER WMO *GUIDES*

10.3 The Commission noted with appreciation that the second edition of the *Guide to Wave Analysis and Forecasting* (WMO-No. 702) had been published during the inter-sessional period. It requested the Expert Team on Wind Waves and Storm Surges to keep the contents of that *Guide* under review and to advise on the need for future updating, as necessary. It also requested the WMO Secretariat to make the *Guide* available for purchase and for download via the Web as soon as possible.

IGOSS PUBLICATIONS

10.4 The Commission noted the status of publications, including *Guides*, status reports and information service bulletins, prepared and maintained under IGOSS. It recognized that there was a need to review fully, update and possibly rationalize those in the light of the new mandate of JCOMM and the development of an integrated approach to marine observing systems, data management and services. It therefore agreed on specific actions regarding those publications as detailed in Annex IV to this report.

OTHER TECHNICAL PUBLICATIONS

10.5 The Commission noted with appreciation that the restructuring of the format and contents of the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47) had been implemented by the WMO Secretariat as proposed by CMM-XII. A new ship metadata base had been implemented and would shortly be made available for search and download through the WMO Web site. Requests would also shortly be distributed to Members for input to the database in the new format. The Commission reiterated the high value of that database, including to global climate studies, operational meteorology and data quality monitoring, and urged Members to submit regularly and frequently their ship metadata to the WMO Secretariat for inclusion in the database. The Commission also requested the Secretariat to ensure that the version of the database available for access via the Web should include facilities for both download of the entire database and search for details of specific ships by IMO number, call sign and ship name.

10.6 The Commission noted with appreciation that nine technical reports in the series Marine Meteorology and Related Oceanographic Activities had been published by WMO during the inter-sessional period and were available, on request, from the WMO Secretariat. Those publications covered a variety of topics and included, as requested by CMM-XII, the *Handbook of Offshore Engineering Services* and the proceedings of the COST conference on the Provision and Engineering Application of Ocean Wave Data. The Commission further noted with approval that, following the formal advent of JCOMM to replace CMM and IGOSS, that publication series had been discontinued and replaced by a JCOMM Technical Report series. Subsequently, 10 technical reports in that new series had been published and distributed. Again, additional copies of those reports could be obtained on request from the WMO Secretariat. The Commission additionally expressed its approval for the efforts now under way to make those JCOMM technical reports also available in electronic form through the WMO Web site. It urged that that work should continue, so that eventually all JCOMM technical and meeting reports were available to Members/Member States in electronic form in that way. At the same time, it agreed that not all countries were yet able to make use of such a service and that delivery of those documents in hard copy form should continue.

10.7 The Commission noted with appreciation that, through the WMO *Bulletin*, the international meteorological and oceanographic communities were being kept up-to-date on activities of both WMO and IOC now falling under JCOMM. It requested the Secretariats to continue preparing and publishing those summaries, which appeared in the *Bulletin* as programme notes. The Commission also expressed appreciation for the special issue of the WMO *Bulletin* published in January 1998, focusing on ocean-related topics in support of the International Year of the Ocean 1998.

10.8 The Commission noted with appreciation that articles relating to the work of JCOMM had also been published from time to time in publications such as the *World Climate News*, *GOOS News*, the *IALA Bulletin* and *EEZ Technology*. It encouraged both JCOMM members and the Secretariats to continue to prepare and submit such articles whenever possible, in view of the international exposure they provided for the work of the Commission.

DBCP PUBLICATIONS

10.9 The Commission recognized with appreciation that the DBCP had, for many years, maintained an important Technical Document publication series, which included the comprehensive Annual Reports of the Panel as well as various other technical reports. A total of 11 reports in that series had appeared during the past inter-sessional period. In recent years, those reports had been made available through the DBCP Web site, as well as appearing as printed documents, all of which could be obtained, on request, from the DBCP Technical Coordinator. The Commission strongly supported that work by the Panel and urged that it be continued.

GLOSS PUBLICATIONS

10.10 The Commission noted with appreciation the publication of the latest GLOSS Training Course reports (Cape Town, November 1998; Sao Paulo, September 1999; Jeddah, April 2000), as well as of various other reports (meetings, workshops, status reports, etc.). It further noted the publication of a GLOSS brochure in English, Portuguese, Spanish and, shortly, French, in PDF form on the Web (http://www.pol.ac.uk/psmsl/training/training.html). The Commission supported that work by the GLOSS community, undertaken with the assistance of PSMSL, and urged that it be continued.

ASAP PUBLICATIONS

10.11 The Commission recognized with appreciation that the ASAP Panel had for a number of years been publishing an Annual Report. That report, in addition to providing valuable updates on the status of the global and national ASAP, also contained reports from monitoring centres as well as occasional technical articles relating to all aspects of the programme. The Commission supported its continuation and also recommended that additional technical information relating to ASAP and its benefits should be prepared by the Panel for distribution to Members/Member States.

BROCHURES AND PAMPHLETS

10.12 The Commission noted with appreciation that the following brochures and pamphlets relating to aspects of the work of JCOMM had been published during the past inter-sessional period:

(*a*) *Automated Shipboard Aerological Programme* (in English only), being updated by the ASAP Panel;

(*b*) *Global Oceanographic Data* (in English only);

(*c*) *Data Buoy Cooperation Panel* (in English, French, Spanish and Portuguese), being updated by the DBCP;

(*d*) *The Voluntary Observing Ship Programme: An Enduring Partnership* (in English, French, Russian and Spanish).

It recognized the value of those brochures in helping to promote different aspects of the work of JCOMM among a wider community and urged that they be continued, revised and expanded, as necessary.

10.13 The Commission agreed that all those technical publications had provided very valuable support to Members/Member States in implementing their marine-related activities and urged that publication of such reports and documents should be continued during the coming inter-sessional period. However, the Commission noted with concern that several of the required new publications identified at CMM-XII could not be addressed during the inter-sessional period due to the continuing difficulties in locating rapporteurs who were willing and who had the time to prepare the relevant technical documents. While appreciating those difficulties, the Commission insisted on the great need for guidance material in many important topics and requested Members/Member States and the Secretariats to continue their efforts to find the experts who could prepare such publications. With regard to specific new technical publications, the Commission:

(*a*) Recognized the potential value to Members/Member States of a guide to storm surge analysis and forecasting, and urged the Expert Team on Wind Waves and Storm Surges to develop a plan for the preparation of such a guide as soon as possible;

(*b*) Noted with interest and appreciation the preparation and publication by the United States of the *Mariners Guide for Hurricane Awareness in the North Atlantic Basin*. It requested the WMO Secretariat to consider republishing the *Guide* as a JCOMM technical report and to giving it a wide distribution to Meteorological Services and users alike. It also requested the United States to consider the preparation of a similar *Guide* for the Pacific Ocean, also for eventual publication and distribution as a JCOMM technical report.

GOOS PUBLICATIONS

10.14 The Commission recognized that a large number of technical documents relevant to its own work were published by IOC in support of GOOS. It noted that most existing GOOS documents were listed on the GOOS Web site at http://ioc.unesco.org/goos/docs/doclist.htm. A great part of those documents (and all the recent ones) were downloadable. Some other "basic" GOOS documents were listed in the same site at http://ioc.unesco.org/goos/key1.htm. The Commission expressed satisfaction at the means provided by the GOOS Project Office for easy document consultation.

WEB SITES

10.15 The Commission noted with appreciation that there were now a number of Web sites in operation which directly supported JCOMM programmes and activities. Those included in particular JCOMMOPS and its associated DBCP, SOOP and Argo sites, GOOS and the WMO marine programme/JCOMM itself. Details of those sites are given in Annex V to this report. It recognized the important role which those sites played as a means of rapid and efficient data and information dissemination, including documents and technical publications. At the same time, the Commission also recognized their potential for direct communication and interaction among JCOMM members and other experts on a range of technical and related topics. Such interaction could occur, for example, through mailing lists, discussion groups and direct feedback to Web sites. The Commission therefore strongly encouraged the further development of such Web sites, in particular that maintained by WMO for JCOMM itself, as being essential tools in the implementation of JCOMM programme activities. It urged the WMO Secretariat to ensure that that Web site also included links to all other Web sites either directly or indirectly related to JCOMM and its work.

11. EDUCATION AND TRAINING, TECHNOLOGY TRANSFER AND IMPLEMENTATION SUPPORT (agenda item 11)

11.1 SPECIALIZED EDUCATION AND TRAINING (agenda item 11.1)

11.1.1 The Commission reviewed those activities related to specialized education and training in marine meteorology and physical oceanography which had taken place during the inter-sessional period. It expressed its particular appreciation to Messrs S. Ragoonaden (Mauritius), vice-president of the former CMM, and W. Appleby, chairperson of the Working Group on Education, Training and Implementation Support, as well as to the members of the Group, for their efforts in support of JCOMM capacity building. The Commission agreed that, in general, the activities undertaken in that area had been particularly successful, especially with regard to the workshops and training seminars, which were considered of great value in stimulating and assisting in the further development of marine meteorological and oceanographic observing systems and services in developing countries. The Commission noted with pleasure that Thirteenth Congress had agreed that related workshops and seminars should continue in the future.

11.1.2 The Commission agreed that the series of international and regional seminars and workshops had very well achieved its purpose and that the new orientation, namely, to plan and implement courses in more specific subjects, corresponded well with national and regional requirements. In that context, the Commission noted in particular the second international workshop on wave analysis and forecasting (1997), the three regional workshops for PMOs (1998, 1999, 2000), the MPERSS seminar and workshop (1998), the international workshop on the remote sensing of sea ice (2000), the GLOSS training workshops (1997, 1998, 1999, 2000), and the workshops on an ocean data and information network for East Africa (1997, 1998, 1999, 2000). The

Commission expressed its thanks to all Members/Member States which had hosted seminars, workshops and training events during the inter-sessional period, including in particular Australia; Brazil; Canada; Chile; Hong Kong, China; Kenya; Portugal; the Russian Federation; Saudi Arabia; South Africa; the United Kingdom; and the United States. The Commission noted with appreciation that some workshops and related training events were already planned for the coming inter-sessional period, on topics such as wind wave and swell, and storm surge forecasting, the exploitation of remote-sensing data, marine environmental prediction, and GLOSS.

11.1.3 The Commission noted with appreciation that GLOSS activities now included a large number of regional projects and products and a range of international training courses and materials. The GLOSS Implementation Plan 1997 provided a review of activities. Training on how to operate a tide gauge was available as part of the IOC *Manuals*, accessed through the PSMSL training page, and a manual on how to operate GPS at gauge sites was planned. The existing *Manuals* were also available in CD-ROM form from the PSMSL. Training courses and workshops on sea-level measurement and interpretation had been held at least annually since 1983 covering tide gauge installation, maintenance and operation; data reduction of sea-level observations; geodetic fixing of tide gauge benchmarks; uses of sea-level data in scientific analysis and practical coastal applications; and data exchange. Since 1993, emphasis had been given to training in computer-based data analysis with hands-on training sessions and to the application of the results to studies of regional and local processes and for practical purposes. Both paper and electronic reports on GLOSS courses were available from the IOC Secretariat.

11.1.4 The Commission was highly appreciative of the fellowships that had been awarded by WMO for studies related specifically to marine meteorology and physical oceanography, and noted that 12 such fellowships had been awarded during the past inter-sessional period. The Commission expressed the hope that fellowships would continue to be awarded to applicants in those fields. The Commission agreed that, in view of the increasing difficulties in obtaining funding for training activities from traditional sources, including the United Nations Development Programme and the WMO and IOC regular budgets, some new sources of funding should be investigated. The Task Team on Resources was therefore requested to address the issue of funding for training as a priority. In addition, the Commission:

(*a*) Noted with appreciation that several countries had conducted a variety of both short-term and long-term training activities in marine meteorology, oceanography and related fields during the past inter-sessional period, which were of direct support to the work of JCOMM;

(*b*) Further noted with appreciation that several countries were offering to host similar training activities during the coming inter-sessional period;

(*c*) Noted with interest that the training project EUROMET of the European Commission, available on the Internet, might be further developed to include also marine meteorology and oceanography;

(*d*) That the WMO network of RMTCs might be better exploited to extend specialist training in marine meteorology and physical oceanography;

(*e*) That greater use of distance learning techniques and facilities should be implemented to assist in training activities relevant to JCOMM.

11.1.5 The Commission noted that the issue of revising the classification of meteorological personnel had been raised several times in the past, in particular at Twelfth Congress in 1995. The Executive Council Panel of Experts on Education and Training had thoroughly considered that matter in 1996 and 1998 and had recommended a new classification, which was approved by the WMO Executive Council in 1998. The new classification was contained in Annex IV of the *Abridged Final Report with Resolutions of the Fiftieth Session of the Executive Council* (WMO-No. 883). The Council had further approved a proposal for the revision of the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258).

11.1.6 The Commission recognized that the need to revise the WMO classification and curricula arose not only from important advancements in meteorology as an applied science and from the ongoing revolution in information technology, but also because the new economic, social and political patterns, evolving in many parts of the world, were giving rise to new demands and changes in many facets of the profession. It was likely that the emerging approach of proven job competencies — clusters of knowledge, skills and attitudes — would eventually prevail over the traditional approach biased towards educational qualifications.

11.1.7 In that context, the Commission noted that an Editorial Task Force, in cooperation with the Secretariat and after consultations and interactions with the Executive Council Panel of Experts on Education and Training, had produced a preliminary version of the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology*, Fourth edition, Volume I, Meteorology. That had been circulated to all WMO Members on June 2000 for comments. That preliminary version, as well as a briefing note on its design and implementation, could be downloaded from the WMO Web page at http://www.wmo.ch, under the Education and Training subpage. A final, consolidated, version taking into consideration the feedback from Members, was expected to be issued by the end of 2001.

11.1.8 The Commission noted further that Chapter 8 of that preliminary publication illustrated the job competency and relevant knowledge and skills required of meteorological personnel assigned to different branches of activity or specialization. Experts from individual NMS, or other relevant institutions, had provided those examples in response to specific requests from WMO. The entry on “Marine meteorology”, had been prepared

by Mr L. N. Karlin from the Russian State Hydrometeorological University. The Commission requested the Education, Training and Capacity Building Coordination Group to arrange for that entry to be reviewed as a matter of urgency, with any comments and suggestions to be passed to the WMO Secretariat by October 2001.

11.1.9 The Commission noted with appreciation the renewed Capacity Building programme of IOC's IODE, based upon the development of a standard data and information management training curriculum (OceanTeacher), providing to Member States an integrated capacity building package including training, equipment and operational support (see agenda items 11.2 and 11.3, respectively).

11.1.10 The Commission was informed about the IOI Virtual University Project. The goals of the Project were to make high-quality postgraduate education in marine affairs available to all countries and affordable. The Project utilized the networked structure of the IOI with 17 operational centres based at host organizations/institutions around the world.

11.1.11 The IOI curriculum was focused on providing a Masters degree in marine affairs but also catered for training in specific subjects and delivery of professional development courses. The IOI Virtual University courses contained approaches and elements which directly concerned JCOMM activities. In addition, they covered many areas relevant to JCOMM users.

11.1.12 The IOI also offered JCOMM its newly developed platform for distant learning called KEWL (http://kewl.uwc.ac.za). That open source-code software facilitated preparation and delivery of courses and offered many other options for successful learner-centred education. KEWL could contribute to JCOMM training in oceanography and marine meteorology. Furthermore, IOI-South Africa offered JCOMM a free course-hosting service.

11.1.13 The Commission noted with appreciation the information provided on the IOI Virtual University and KEWL and thanked IOI for its kind offer. The Commission requested the Capacity Building Coordination Group to investigate ways and means to collaborate with IOI on those matters.

11.2 TECHNOLOGY TRANSFER AND IMPLEMENTATION SUPPORT (agenda item 11.2)

11.2.1 The Commission recognized that, if JCOMM was to fulfil successfully its role as the international coordination body for operational oceanography, it was essential that all maritime Members/Member States be in a position both to contribute to, and benefit from, its work. That applied equally to the operation of marine observing systems, the receipt and management of marine data and the generation and delivery of products and services. In that context, the capacity building component of the JCOMM work programme was of the highest importance. The Commission noted with interest and appreciation that the interim Management Committee had prepared, on behalf of the Commission, a comprehensive Capacity Building Strategy for JCOMM, covering general principles, priorities and implementation actions. That strategy was also designed to be complementary to GOOS and other relevant marine capacity building activities within WMO and IOC. Following extensive review, that full strategy document had been published as a JCOMM technical report.

11.2.2 The Commission reviewed the Executive Summary of the Capacity Building Strategy Document, which it agreed provided a useful summary of the general principles and main issues addressed by the strategy, as well as the priorities for future action. It therefore formally adopted that Executive Summary, which is contained in Annex VI to this report.

11.2.3 The Commission noted the opinion of Thirteenth Congress that continuing high priority should be given to assisting Members in the further implementation of marine meteorological services, within the context of the Fifth WMO Long-term Plan. Such implementation support was normally provided through the WMO Technical Cooperation Programme, at the specific request of the Members concerned, although some limited activities (normally expert advisory missions) were also implemented through the implementation support project of the Marine Meteorology Programme.

11.2.4 The Commission recalled that the WMO VCP had been established essentially to facilitate the global implementation of the WWW and that the programme could also now be used to enhance both marine observing systems and marine services. The Commission, therefore, urged maritime Members/Member States to consider the possibilities of formulating appropriate VCP requests, in line with established procedures, as a means of enhancing their marine observing systems in support of the WWW, marine meteorological and oceanographic services, GCOS and GOOS. The Commission noted that there were some pending VCP requests and, therefore, urged possible donor Members to provide, to the extent possible, assistance to the Members which had formulated those requests. The Commission recognized with appreciation the kind offer of Hong Kong, China to provide VCP support in marine meteorology and Web-based information dissemination and training.

11.2.5 The Commission recognized the value of input and reports from regional rapporteurs to many aspects of its work, including marine services, implementation support, and education and training. It recalled the valuable role played by those rapporteurs within the Working Group on Education, Training and Implementation Support of the former CMM. In reiterating the importance of its capacity building activities to the success of the overall work of JCOMM and the full implementation of its programme, the Commission agreed to establish an Education, Training and Capacity Building Coordination Group within the Education, Training and Capacity Building Programme Area to include input from the regional rapporteurs. Appropriate action was taken under agenda item 16.

11.2.6 The Commission was highly appreciative of the IODE OceanTeacher system, which consisted of two modules: the IODE Resource Kit and the *Training Manual*. The IODE Resource Kit contained a range of marine data and information management materials such as software tools, quality control and analysis strategies, training manuals and relevant IOC documents. The Kit was divided into three major sections: The IODE Data Centre system (what was a data centre, global programmes, science plans, data policy, reference library); the data management systems (computer systems database technology, metadata, data collection, quality control, the internet, GIS); and the data analysis and products (formats, data, software, classroom, data products). The *Training Manual* was a collection of outlines, notes, examples and other documents that were used in conjunction with the Resource Kit to organize training activities such as training courses in marine data and information management.

11.2.7 The OceanTeacher system was available on CD-ROM and on-line at http://oceanteacher.org. The data management modules were operational (and had been used during three regional training programmes) and the information management modules would be available as from September 2001. Recognizing the importance of the system as a powerful and flexible capacity building tool, the IODE Committee, during its sixteenth session (Lisbon, October–November 2000) recommended the establishment of the IODE Resource Kit Pilot Project. That Pilot Project was supported by a Steering Group. The first session of the Steering Group was held in Miami in March 2001 where the core development team was composed. The IODE work plan identified the necessary funding for the further development and maintenance of the OceanTeacher system (2001–2003).

11.2.8 The modular structure of the OceanTeacher system allowed for the organization of training courses targeted at different audiences. Furthermore, specific data CDs, containing datasets relevant to the audience, were prepared for each training course. Whereas OceanTeacher was currently available in English only, the Pilot Project would also investigate the possibility to produce OceanTeacher in other languages.

11.2.9 The Commission welcomed the IODE's OceanTeacher system, identifying it as an innovative and flexible tool for data and information management training. The Commission requested the Capacity Building Coordination Group to discuss with IODE the possibility of expanding the scope of OceanTeacher to cater for JCOMM training requirements.

11.3 **REGIONAL DEVELOPMENT** (agenda item 11.3)

11.3.1 The Commission recalled that regional cooperative projects to enhance marine observing systems and services had been recognized by the former CMM and by IOC as a very cost-effective approach to enhancing national capacity as well as the delivery of marine data and services. In that context, the Commission noted with interest the progress made in the SEACAMP Project of the ASEAN and WIOMAP countries.

11.3.2 The Commission recalled that the twelfth session of CMM had reviewed progress in SEACAMP development and had urged countries in the region and outside to support and participate in its implementation. It noted with interest that the ASEAN Subcommittee on Meteorology and Geophysics had carefully reviewed the detailed project document and decided that it should be divided into four separate, but linked, modules to facilitate its consideration for funding purposes. That modularization had been undertaken by the Singapore Meteorological Service (the individual modules being for capacity building, communications, observations and SEACAMP), and the project resubmitted to the Subcommittee on Meteorology and Geophysics, which had recommended its formal acceptance as an ASEAN project. The Commission reiterated the importance of the project, both to the countries concerned and as a pilot for similar cooperative projects elsewhere. It therefore once more urged Members/Member States to contribute actively to its rapid implementation and offered to provide technical support and expertise as required.

11.3.3 The Commission further recalled that CMM-XII had also strongly encouraged the embryo proposal for the development of WIOMAP. It therefore noted with appreciation that a first Implementation Planning Meeting, Marine Services Project in Eastern and Southern Africa (Mauritius, May 1997), convened jointly by WMO and IOC, had agreed on requirements for the project and developed objectives and a project outline and timetable. Subsequently, Mr S. Ragoonaden, vice-president of CMM and acting as WMO consultant, had undertaken a study mission to all countries potentially concerned in the project and prepared a first draft project document based on the results of his mission and the decisions of the planning meeting. That document had then been reviewed, both within WMO and IOC and by external bodies and individuals, and revised on the basis of those reviews, including a modularization similar to that for SEACAMP. At the same time, the project concept had been submitted to, and endorsed by, several regional bodies of both WMO and IOC, including RA I and IOCINCWIO. The finalized project document would shortly be submitted to the Permanent Representatives of WMO and the Heads of Oceanographic Institutes concerned for approval, before final submission to various funding bodies for their consideration.

11.3.4 The Commission noted with approval that the project included, *inter alia*, plans for advanced training in marine meteorology and physical oceanography, based on advanced technology, computer-assisted learning, video conferencing and the Internet, to be distributed among regional educational institutions having some existing marine expertise. That advanced training concept also now encompassed the earlier proposal regarding long-term training in marine meteorology and physical oceanography at the WMO RMTC Nairobi. It further noted with interest that a related project was also under development to implement an array of moored buoys in the equatorial Indian Ocean

(comparable to the existing TAO/TRITON and PIRATA arrays, respectively, in the Pacific and Atlantic Oceans), to support global and regional climate studies and prediction. That second project was being developed under the auspices in particular of CLIVAR, GCOS and GOOS. The Commission strongly supported both WIOMAP and the moored buoy project and urged that they be finalized and submitted for funding as soon as possible. It also encouraged Members/Member States to be actively involved in, and support, their implementation wherever possible.

11.3.5 The Commission considered that many other ocean regions and subregions could well benefit from similar cooperative projects. It therefore requested the Capacity Building Coordination Group to review requirements for such projects and to assist in the development of detailed proposals, as appropriate. At the same time, it recognized that regional GOOS activities such as MedGOOS also contained strong capacity building elements, including in areas such as ocean observations and modelling, which could be of direct benefit to JCOMM capacity building. It therefore requested the Capacity Building Coordination Group to develop close links with all GOOS regional alliances, with a view to implementing mutually-supportive capacity building projects.

11.3.6 The Commission noted with appreciation the development of ODINAFRICA, whose main objectives were: (*a*) to provide assistance with the development of National Oceanographic Data Centres and Information Centres, including infrastructure, and establish their networking in Africa; (*b*) to provide training opportunities in ocean data and information management, applying standard formats and methodologies as defined by IODE; (*c*) to assist with the development and maintenance of national, regional and Pan-African metadata, information and data holding databases; and (*d*) to assist with the development of ocean data and information products responding to the needs of a wide variety of user groups using national and regional networks. The ODINAFRICA applied the IODE Capacity Building Strategy linking training, equipment and operational support, providing computer infrastructure, organizing training courses (and follow-up support) and providing operational financial support (including Internet access). The project would also undertake an African Global Ocean Data Archaeology and Rescue subproject focusing on rescuing and making available to Africa, ocean data collected in Africa.

11.3.7 The countries participating in the project were Benin, Cameroon, Comoros, Côte d'Ivoire, Gabon, Ghana, Guinea, Kenya, Madagascar, Mauritania, Mauritius, Morocco, Mozambique, Nigeria, Senegal, Seychelles, South Africa, Togo, Tunisia and the United Republic of Tanzania. ODINAFRICA, which would operate between 2001 and 2004, was financially supported by the Government of Flanders (Belgium), IOC and the cooperating Member States. The project proposal was developed by the Member States based upon the success of ODINEA, successfully implemented between 1998 and 2000 and leading to the establishment of seven National Oceanographic Centres or Designated National Agencies in the IOCINCWIO region. Following the success of the ODIN strategy in Africa, the IODE Committee, during its sixteenth session, recommended the development of ODINLAC.

11.3.8 The Commission was informed that, in order to ensure interaction with a broad range of user communities, the project maintained a Web site (http://idc.unesco.org/odinafrica) and published a newsletter (WINDOW). Furthermore, to serve users beyond the traditional research community, ODINAFRICA had established links with the Integrated Coastal Area Management community.

11.3.9 The Commission expressed its appreciation for the ODINAFRICA project, that could serve as an operational model for JCOMM regional capacity building efforts and was compliant with the JCOMM Capacity Building Strategy. The Commission requested the Capacity Building Coordination Group to investigate with IODE the possibilities of using the ODINAFRICA (and other existing or planned ODIN) network as a mechanism for relevant aspects of JCOMM regional capacity building.

11.4 RESOURCES (agenda item 11.4)

The Commission recognized that the resources to support capacity building activities relevant to the work of JCOMM had traditionally come through the regular budgets of WMO and IOC, through the VCP of the two Organizations, and from external funding agencies, both national and international (United Nations Development Programme, Global Environment Facility, World Bank). It noted that some extra impetus had recently been given to funding possibilities for marine observing systems through the COP of the UNFCCC. At the same time, the Commission agreed that it was becoming more difficult to secure funds from those traditional sources for the development of operational marine capabilities and that new sources and ways of funding such development therefore had to be identified, including from commerce and industry and other private sector sources. The Commission therefore agreed on the value of establishing a special Task Team on Resources, within the Capacity Building Programme Area, specifically to work with representatives of potential sources of JCOMM capacity building funding support, to identify and secure such support. Specific action in that regard was taken under agenda item 16.

12. RELATIONSHIP WITH OTHER PROGRAMMES/ BODIES OF WMO AND IOC (agenda item 12)

12.1 GLOBAL OCEAN OBSERVING SYSTEM AND GLOBAL CLIMATE OBSERVING SYSTEM (agenda item 12.1)

GLOBAL CLIMATE OBSERVING SYSTEM

12.1.1 The Commission was pleased to note the solid progress in planning and implementing an ocean observing system for climate under the guidance of the

GCOS/GOOS/WCRP OOPC. It recalled in particular, as noted already under agenda item 5.1, the positive results of the OceanObs Conference (St Raphaël, France, October 1999), in reaching a consensus on the optimum mix of measurements needed for ocean observations and in furthering their implementation. It further noted the excellent cooperation that existed among GCOS, GOOS, WWW and WCRP in that regard and encouraged its continuation.

12.1.2 The Commission noted the participation of GCOS and GOOS in the IGOS and the development of the IGOS Oceans Theme Report, which presented a strategy for implementation of satellite and complementary *in situ* observations.

12.1.3 The Commission noted with appreciation the cooperation that existed between OOPC and AOPC on a number of topics of direct concern to JCOMM, including improvement in sea-surface temperature products, especially in the vicinity of the ice edge in the polar regions. It supported the continuing development of close interactions with AOPC, in particular regarding the integration of the VOS, SOOP and ASAP and related initiatives.

12.1.4 The Commission noted the request of the fifty-second session of the WMO Executive Council for the presidents of technical commissions, in particular CAS, CBS, CCl and JCOMM, to strengthen the cooperation between GCOS and their respective technical commissions. It stressed the importance of developing concrete actions between JCOMM and GCOS, and supported the initiative already taken by the chairperson of the GCOS Steering Committee and the co-president of JCOMM in that regard.

12.1.5 The Commission welcomed the request of the GCOS Steering Committee for the OOPC to work closely with JCOMM to ensure the satisfactory integration of the various elements of the ocean observing system for climate. It reiterated its agreement, expressed under agenda item 5.1, that the OOPC was a primary advisory body with regard to defining the requirements for ocean observations for climate and the related physical ocean environment. It also noted the action by the GCOS Steering Committee to have the GOOS and GCOS Secretariats, in consultation with the OOPC, develop a joint paper defining precisely which components of GOOS constituted the ocean elements of the GCOS Networks. The Commission reiterated the importance of the recommendation from the GCOS Steering Committee that OOPC, in collaboration with the GOOS and GCOS Secretariats, agree on a set of performance metrics for ocean measurements for climate which could be used to grade the performance of the networks for purposes of, *inter alia*, providing reliable information to COP and SBSTA. It recommended that the planned JCOMMOPS Centre be consulted in that regard to ensure that related monitoring, coordinated by JCOMMOPS, was consistent with the performance metrics of the ocean observing system for climate developed by GCOS.

12.1.6 The Commission recognized the important work that the GCOS Secretariat had done with the UNFCCC COP and its SBSTA. It urged members of the Commission to be actively involved within their countries in preparing detailed reports on systematic observation networks to the UNFCCC to ensure that the interests of JCOMM were represented in those reports. The Commission also recognized the importance of making known the needs and deficiencies in global ocean observations for climate. It agreed to work with the GCOS Secretariat in developing data, analyses and metrics that would indicate the performance of the operational ocean observing system that was relevant for climate and could be reported to the COP and its SBSTA.

12.1.7 The Commission supported the resolutions from the fifty-second session of the WMO Executive Council and IOC EC-XXXIII that requested the GCOS Secretariat to organize, in consultation with relevant international and regional bodies, regional workshops on improving observing systems for climate and to assist Members, especially developing countries, in the preparation of implementation plans to improve their observing systems for climate. It requested that the GCOS Secretariat work with the GOOS and JCOMM Secretariats in organizing regional workshops so that ocean observations and related services were included to the extent possible.

GLOBAL OCEAN OBSERVING SYSTEM

12.1.8 The Commission noted with appreciation the considerable progress in the development of GOOS during the last few years, expressed, *inter alia*, through various publications such as *The Strategic Plan and Principles for the Global Ocean Observing System*; the *Global Ocean Observing System 1998 — A Prospectus*, etc., and the GOOS Web site (http://ioc.unesco.org/goos). It noted that the IOC Assembly had acknowledged that progress, in particular in its Resolution XX-7 — The Global Ocean Observing System, in which the Assembly, *inter alia*, agreed "that the concept of GOOS as defined in the aforementioned publications was a realistic and achievable means of combining and enhancing the marine observing systems of the world into an integrated, operationally functioning system". The Resolution further specified "that GOOS should provide the infrastructure necessary to assess the present and forecast the future states of seas and oceans and their living resources, in support of their sustainable use, as well as to contribute to the prediction of climate change and variability."

12.1.9 The Commission noted further that the GOOS had progressed from planning to implementation. Many observational elements of GOOS already existed and many of those would be managed by JCOMM (including SOOP, VOS, TAO, GLOSS, DBCP). The GOOS also included pilot projects such as GODAE, Argo and PIRATA, as well as regional programmes such as NEAR-GOOS and EuroGOOS.

12.1.10 The Commission noted that much progress within the GOOS was related to climate issues, both at the planning and implementation levels, as already

described under agenda item 5.1 and general summary paragraphs 12.1.1 through 12.1.7. In that connection, it especially welcomed the publication *Global Physical Ocean Observations for GOOS and GCOS: An Action Plan for Existing Bodies and Mechanisms* (GOOS Publication No. 66, GCOS Publication No. 51). That *Action Plan* placed primary responsibility on JCOMM as the implementation mechanism for such observations (as confirmed later also by the OceanObs99 Conference held in St Raphaël, France in October 1999). The Commission noted that the *Action Plan* was available on the Web in HTML format at http://ioc.unesco.org/goos/docs/GOOS_066_act_pl.htm.

12.1.11 The Commission noted with interest, new developments in GOOS planning and in particular the merging of the previous Coastal, Health of the Ocean and Living Marine Resources Module Panels into a single COOP. COOP was designed to plan and facilitate implementation of an end-to-end observing system to provide systematic datasets and products to users. Its goals were to monitor, assess, and predict effects of natural variations and human activities on the marine environment and ecosystems of the coastal ocean. It would focus principally on issues of ecosystem (including human) health, living marine resources, natural hazards, and safe and efficient marine operations. It was not intended that "coastal" be limited by specific geographic boundaries. Although the emphasis would be on coastal ecosystems (e.g., estuaries, bays, sounds, fjords, open waters of the continental shelf), boundaries should be determined by the problems being addressed and the products that were to be produced. Thus, the broad area of concern extended from semi-enclosed systems in the coastal zone to the continental shelf and the deep ocean, as required, to provide products relevant to the issues listed above. COOP and the OOPC were committed to close collaboration in areas of common interest.

12.1.12 The Commission noted with interest that the COOP was charged with developing an Integrated Strategic Design Plan for the coastal component of the GOOS. It was expected that the design would be completed in 2001, to be followed by an initial Plan for Implementation to be completed by the end of 2002. It was desirable that COOP and JCOMM collaborate in the development of the Implementation Plan, so as to develop agreements on the mechanisms to be used for the coordinated implementation of the coastal component of GOOS.

12.1.13 The Commission recognized that the observing system being developed by COOP for coastal seas as part of GOOS would encompass a broad range of variables. At the present point in time, it was clear that many of them would be physical variables. Since a number of its present activities, for instance in the context of the GMDSS or MPERSS, were directly related to COOP goals, it should be possible to accommodate those variables within the overall work programme of JCOMM. The Commission recognized that implementation of the coastal component of GOOS would be by national and regional bodies. In general, those same nations and regions would be involved, through JCOMM, in the coordinated implementation of the climate and marine services component of GOOS. In that context, the Commission noted and agreed with the recommendation of COOP that, with the proper representation and structure, JCOMM could incorporate the coordinated implementation of the physical components of the coastal component of GOOS into its work programme.

12.1.14 The Commission observed that some of the variables required for implementation of the coastal component of GOOS would be non-physical, largely chemical and/or biological. As the COOP Implementation Plan emerged, the Commission would have to consider the extent to which those variables could be accommodated within the overall work programme of JCOMM.

12.1.15 In that context, the Commission noted that various national or regional bodies had already implemented mechanisms for the collection and management of non-physical data, or were currently working out technical issues regarding the operationalization of research measurements on such variables. Those external developments would have to be taken into consideration in any future decisions regarding the extent to which JCOMM was required to assist in the implementation of programmes of observation of non-physical variables.

12.1.16 Bearing those various points in mind, the Commission agreed that it should work inter-sessionally, as requested, to prepare for, and contribute to, implementation of the coastal component of GOOS, considering, as appropriate, the inclusion of required non-physical measurements, products and services. The Commission recommended the appointment of a rapporteur to develop a position paper on the strategy that JCOMM should adopt for new activities beyond those in the present work programme and, in particular, those of the GOOS COOP and other non-physical requirements. The rapporteur would be asked to:

(*a*) Liaise, considering the statement of requirements from COOP, with the COOP Panel Co-chairpersons and the GOOS Secretariat to develop a position with respect to GOOS coastal requirements;
(*b*) Identify, based on input from members, any other emerging areas;
(*c*) Consider ramifications for all programme areas;
(*d*) Suggest guidelines for handling interfaces to multi-disciplinary regional programmes;
(*e*) Consider the process of transitioning potential systems from regional activities and/or pilot activities into JCOMM.

The position paper would be provided to the Management Committee at its first meeting for consideration and action. The Commission noted the complexity of that issue and that the Management Committee might consider that the issues warranted the creation of a task team to develop practical procedures for the future.

12.2 OTHER WMO AND JOINT WMO/IOC PROGRAMMES (agenda item 12.2)

JOINT GROUP OF EXPERTS ON THE SCIENTIFIC ASPECTS OF MARINE ENVIRONMENTAL PROTECTION

12.2.1 The Commission noted with interest the information provided on activities of the IMO/FAO/UNESCO-IOC/WMO/WHO/IAEA/UN/UNEP GESAMP which, when needed, could be requested to provide advice on various multi-disciplinary issues related to the marine environment. The WMO and IOC Secretariats were requested by the Commission to keep it informed about the presently conducted GESAMP evaluation process and consequent decisions of the GESAMP sponsoring organizations and the CSD with regard to the future role and activities of that inter-agency group.

WORLD CLIMATE PROGRAMME

12.2.2 The Commission recalled that the WCP had provided information at the eighth session of the Subgroup on Marine Climatology (Asheville, North Carolina, 10–14 April 2000) regarding the status of the work of CCl to update the WMO *Guide to Climatological Practices* (WMO-No. 100). The Subgroup, in its final report, had proposed that two new sections be added to Part II of the *Guide*, devoted to the topics of spatial statistical techniques and statistical or diagnostic techniques. It further expressed the need, in relevant sections of Part I, for inclusion of information on marine data, marine metadata and marine activities, respectively. The Commission agreed that it should assign experts to assist CCl in preparing appropriate sections of its revised *Guide to Climatological Practices* that dealt with the recording, processing and archiving of marine climate data. It requested the co-presidents, in consultation with the chairpersons of the Data Management Coordination Group, the Expert Team on Marine Climatology and the Secretary-General of WMO, to identify appropriate experts for that task.

12.2.3 The Commission noted that the meeting of the CCl Advisory Working Group (Reading, United Kingdom, 3–7 April 2000) had recognized the importance of ocean processes in driving the climate system and had stressed the need for the meteorological and oceanographic communities to continue to work together. CCl was currently working with other WMO Commissions in developing the global and regional infrastructure for climate services, including prediction, notably through the Climate Information and Prediction Services Project. It was agreed that CCl should also work more closely with JCOMM in ensuring that the relevant outputs of emerging operational programmes in oceanography were fully integrated into proposals. The CCl Advisory Working Group had decided that the scientific and technical conference to be held immediately prior to the thirteenth session of CCl (Geneva, 19–30 November 2001) should give special attention to that subject. The Commission agreed on the desirability of JCOMM to provide contributory support and requested the Data Management Coordination Group to coordinate with the appropriate CCl subsidiary body, with a view to arranging for such a contribution.

COMMISSION FOR BASIC SYSTEMS

DISCONTINUATION OF HIGH FREQUENCY RADIO BROADCASTS

12.2.4 The Commission was informed that the extraordinary session of CBS (Karlsruhe, 1998) had noted that several WMO Members had already discontinued the operation of high frequency broadcasts, which had high recurrent operational costs and a limited efficiency, in some instances replacing them by satellite distribution systems. CBS had noted that there might still be requirements to continue high frequency broadcasts in some areas and stressed the importance of assessing at the regional level the remaining requirements and the importance of considering alternative means to satisfy those requirements. It had noted that the maritime community (ships) had still some requirements to receive products by high frequency broadcasts. CBS had considered that alternative means, such as the use of Inmarsat distribution systems within the framework of the GMDSS, or direct access to databases, should be considered to distribute products to ships. It had considered further that the former CMM was in the best position to determine the requirements of the maritime community in that respect and to identify the most appropriate systems to meet them.

12.2.5 The Commission was further informed that the twelfth session of WMO Regional Association II (Seoul, 19–27 September 2000) had underlined the high financial burden of the operation of high frequency radio broadcasts for the Regional Telecommunication Hubs concerned and the limited efficiency. Each Global Data-processing System Centre in the Region was located in the area of coverage of one or several satellite data-distribution systems, and the implementation of satellite-receiving systems in GTS centres had significantly progressed during the last years. The Association had noted that the survey on the requirements for high frequency broadcasts and alternative means showed that only a few RA II Members expressed remaining requirements for such broadcasts. The Association had agreed that the discontinuation of the high frequency radio broadcasts should be planned for the near future. It had noted that there were still some requirements for high frequency broadcasts from the marine community, and concurred with CBS-Ext.(98) that alternative means should be considered to distribute products to ships, such as Inmarsat data-distribution systems within the framework of the GMDSS or direct ships' access to databases. The Association had again agreed that JCOMM was in the best position to determine the relevant requirements of the maritime community and to identify the most appropriate systems to meet them. The Association had invited JCOMM to keep the RA II Working Group on Planning and Implementation of the WWW informed of

the results of its action in that respect and had requested the Working Group to plan the discontinuation of Region II high frequency radio broadcasts.

12.2.6 The Commission recalled that it had also discussed that issue under agenda item 7.4. It recognized that the implementation of the project for the transmission of graphical information to shipping through Inmarsat-C, as a part of SafetyNET and a component of the GMDSS, would largely eliminate the requirement for high frequency radio-facsimile broadcasts. It therefore urged that that project should be completed as soon as possible. At the same time, the Commission requested the Expert Team on Maritime Safety Services to ascertain the remaining requirements of the maritime community regarding the continuance of high frequency radio broadcasts and to provide that information, through the WMO Secretariat, to future sessions of both CBS and RA II.

GLOBAL OBSERVING SYSTEM

12.2.7 The Commission noted with interest that the CBS Expert Team on Observational Data Requirements and Redesign of the Global Observing System had considered some proposals for the redesign of the marine part of the GOS on the basis of input provided by JCOMM. It further noted that CBS had expressed its pleasure that JCOMM would use the Rolling Review Requirements process in developing a statement on how well the requirements of WMO Programmes would be met by present and planned marine surface and remote-sensing observing systems.

12.2.8 The Commission agreed that it was essential to maintain very close interaction in the future between CBS and JCOMM. In discussing how such interaction might be effected, the Commission recognized the importance of coordinating programme implementation with CBS at the regional/ocean basin levels. In that context, the Commission agreed that there should be much closer interaction and coordination between the WMO Regional Rapporteurs on the GOS and those on Marine Meteorological Services.

COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATION

12.2.9 The Commission recalled that, when discussing SOOP activities under agenda item 8.1, and following from the report of the chairperson of the SOOPIP, it had recognized the need for the evaluation of the performance characteristics of not yet well tested and of new oceanographic instrumentation, under field conditions. It noted that, under the auspices of CIMO, several instrument intercomparisons of meteorological instrumentation had already successfully been carried out with similar objectives and that comprehensive experience had thus been obtained in that field of common concern. In that context, the Commission noted especially the relevant guidelines for organizing and performing such tests, as contained in the *Guide to Meteorological Instruments and Methods of Observations* (WMO-No. 8). The Commission recognized that CIMO might therefore be consulted for the provision of support in organizing required evaluation tests.

12.2.10 The Commission agreed that action should be taken to establish procedures for evaluating and possibly accrediting instrumentation and practices to be used operationally by various ocean observing system components, including SOOP. It recognized that such procedures would be neither simple nor inexpensive to establish, but nevertheless agreed that that should be considered as a priority issue for JCOMM. The Commission noted in that context the experience already obtained through the operation of WMO RICs, established, among other things, for the calibration and certification of national standard instruments. Such RICs were already available within all WMO Regions, under the auspices of CIMO (see also the CIMO Guide). The Commission therefore agreed that CIMO should be consulted, in order to take advantage of experience obtained with the operation of those RICs, before developing any concrete proposals regarding similar JCOMM procedures. It requested the Observations Coordination Group to undertake such a consultation, with a view to preparing a more detailed proposal for JCOMM instrument evaluation and intercomparison procedures, for consideration by the Management Committee.

12.2.11 In recalling the importance of the need for increased quality of upper-air observations obtained through ASAP, the Commission noted with interest that WMO had undertaken, through CIMO and under tropical conditions, an Intercomparison of GPS Radiosondes (Brazil, May/June 2001). It invited CIMO to provide information to the Ship Observations Team and the ASAP Panel on the results of that intercomparison.

12.3 OTHER IOC PROGRAMMES (agenda item 12.3)

THE INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE

12.3.1 The Commission recognized that, in the past, IODE had been a very close partner of IGOSS. It therefore welcomed the conclusions of the IOC Committee for IODE, at its sixteenth session (Lisbon, 31 October–8 November 2000) that, from the IODE perspective, a constructive relationship should be established between IODE and JCOMM (in that regard reference was made to agenda item 16 where the Commission had included IODE in the membership of the JCOMM Management Committee). The Commission recognized there were many practical domains for cooperation between JCOMM and IODE and that those should be explored by the Data Management Coordination Group and IODE. Initial cooperation with IODE could focus on, *inter alia*, the GTSPP (which had already been dealt with under agenda item 7.2); the management and final archival of relevant delayed-mode ocean data, on the metadata directory system for the tracking and location of marine data (MEDI) (see general summary paragraph 12.3.3), on

the development of a marine XML (see agenda item 7.4) and on capacity building (see agenda item 11).

12.3.2 The Commission noted the recommendation of the IODE Committee that JCOMM use the IODE data networks for the management and final archival of relevant delayed-mode ocean data. It further noted that such had been the IGOSS policy in the past and agreed that the establishment of JCOMM should not introduce significant changes in that policy. The Commission, at the same time, recalled the role of the MCSS in the international delayed-mode exchange and final archival of meteorological data (see agenda item 7.1). A general trend for the future was the integration of marine meteorological and oceanographic data and services, and data management was often the key to such integration. It therefore requested the Data Management Coordination Group to study the feasibility of, and possibilities for, such integration in close cooperation with IODE, GOOS, CBS and CCl.

12.3.3 Regarding the tracking and location of marine data, the Commission noted with satisfaction the successful development by IODE experts of MEDI, a directory system for marine related datasets and data inventories. Following the encouraging success of the MEDI Pilot Project and software, the sixteenth session of IODE (Oostende, Belgium, 23–27 April 2001) had established the MEDI Programme and its Steering Group. In cooperation with NASA/GCMD the Programme continued the development of a user-friendly, yet sophisticated MEDI software and was now preparing a Web-enabled version that would be available by August 2001. That version would strengthen the drive of IODE towards a decentralized data centre structure widening the scope of coverage as well as the range of users of IODE. The Commission further noted that the GOOS Steering Committee, at its third session (Paris, May 2000) had also welcomed the software and requested that it be used for GOOS data and information management. The Commission therefore requested the Data Management Coordination Group to review the status and capabilities of the software and make appropriate recommendations regarding its usage.

The International Coordination Group for the Tsunami Warning System in the Pacific and other tsunami warning activities

12.3.4 The Commission noted that the tsunami warning system was identified in the IDNDR publications as being one of the few existing operational disaster-warning systems. By its very nature, it had some linkage with JCOMM activities. On the other hand, the Commission recognized that the work of ITSU was of a highly specialized nature and that it should not, a priori, interfere with an activity of that nature that was self-sustained and successful. The Commission agreed therefore to establish firstly contact with the ITSU community (e.g. through the Secretariat report to the next ITSU session, or some equivalent means). Following such contact and feedback from ITSU, it would then, at its next session, review the possibility of further cooperation, if required or desired (for instance, if the project of Intra-Americas Sea Tsunami Warning System Education, Warning, Management and Research developed).

12.3.5 The Commission noted that tsunami hazards existed in areas other than the Pacific, such as the Indian Ocean, affecting, *inter alia*, Western Australia and Indonesia, but that no tsunami warning systems existed for such regions. The Commission therefore recommended to the IOC to consider the establishment of an Indian Ocean counterpart of ITSU.

IOC oceanographic data exchange policy

12.3.6 The Commission recalled that WMO Resolution 40 (Cg-XII) — WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities, included in Annex 1 "…all available *in situ* observations from the marine environment, e.g. data in SHIP, BUOY, BATHY, TESAC codes, etc." as being data to be exchanged without charge and with no conditions on use. The fifty-second session of the WMO Executive Council reaffirmed that "..that was of vital importance to Members, in particular in the context of maritime safety services and the operation of coupled atmosphere/ocean models" (*Abridged Final Report with Resolutions of the Fifty-second Session of the Executive Council*, WMO-No. 915, general summary paragraph 11.3.10). The Commission further recalled that an IOC Statement on Ocean Data Management for Global Science Programmes was developed by the IOC Committee on IODE at its fourteenth session in 1992, and was approved by the seventeenth session of the IOC Assembly in February–March 1993.

12.3.7 The Commission noted that the fourth session of the Intergovernmental Committee for GOOS (Paris, June 1999) and subsequently the twentieth session of the IOC Assembly (Paris, July 1999) had recognized that the advent of operational oceanography, manifest in particular through GOOS and JCOMM, was necessitating new technical arrangements regarding data and information exchange. Coupled with a range of existing international agreements and policies regarding oceanographic data exchange (including WMO Resolution 40 (Cg-XII)) had led, in turn, to a recognition by the Assembly of the need to review the IOC data exchange policy, in particular with regard to operational oceanographic data exchange. To that end, the Assembly had established an ad hoc group to review existing agreements and practices and to make appropriate proposals on the subject to the next session of the Assembly.

12.3.8 That ad hoc group met in Paris in May 2000. Participants in the meeting included the two interim co-presidents of JCOMM. The group concluded that issues of data commercialization were very complex and needed to be discussed among Member States. Although the group was unable to reach consensus on a new IOC data exchange policy, it brought together a substantial amount of information to aid the decision-making process of the IOC governing bodies. The thirty-third

session of the IOC Executive Council (Paris, July 2000) reviewed the work and conclusions of the ad hoc group and concluded that the matter now required the attention of an intergovernmental working group, composed of representatives from Member States of the IOC Executive Council. The Executive Council had further elected Mr A. McEwan as chairperson of the group.

12.3.9 The Commission further noted that the sixteenth session of IOC/IODE (Lisbon, November 2000) had reviewed developments regarding IOC oceanographic data exchange policy. It had recognized that its role, as agreed by the IOC Executive Council, was to examine the impacts that a change in the current IOC data exchange policy would have on marine science programmes and particularly how those changes might affect developing countries. IODE-XVI had adopted Recommendation IODE-XVI.5 on that subject.

12.3.10 The Commission noted with interest the results of the first session of the Intergovernmental Working Group on IOC Oceanographic Data Exchange Policy that was held in Brussels on 29–31 May 2001 and was attended by 21 Member States, as well as observers from ESA, the European Union, ICSU, IODE, SCOR and WMO. The Working Group was chaired by Mr A. McEwan. During its three days of deliberations the Group reviewed the results of the Ad Hoc Group of Experts (2000), the discussions held during the thirty-third session of the IOC Executive Council and the sixteenth session of the IOC Committee on IODE, and had been informed on the status of implementation of WMO Resolutions 40 (Cg-XII) — WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities, and 25 (Cg-XIII) — Exchange of hydrological data and products, as well as on the view of ICSU on data exchange policy. Participating Member States had also been given the opportunity to inform the Meeting on national policies. Although the Intergovernmental Working Group had not been able to complete the tasks assigned to it by the IOC Executive Council, it reached consensus on a statement to be presented at the twenty-first session of the IOC Assembly, entitled 'Towards an IOC oceanographic data exchange policy', in which it listed eight elements to be adopted as a basis on which the oceanographic data exchange and archival policy of the IOC would be formulated at a second session of the working group.

12.3.11 The Commission recognized that the establishment of an IOC policy and practice for the international exchange of oceanographic data and products was a matter for the IOC Governing Bodies, taking into account also the WMO policy and practice relating to meteorological and related data and products as expressed in WMO Resolution 40 (Cg-XII). At the same time, it agreed that whatever policy and practice was eventually adopted it would be of considerable significance for its own work in operational oceanography and marine meteorology. The Commission wished the IOC and its Intergovernmental Working Group success in its further deliberations on that matter.

13. RELATIONSHIP WITH OTHER ORGANIZATIONS AND BODIES (agenda item 13)

13.1 UNITED NATIONS SYSTEM AGENCIES (INTER-SECRETARIAT COMMITTEE ON SCIENTIFIC PROGRAMMES RELATING TO OCEANOGRAPHY, ADVISORY COMMITTEE ON COORDINATION/SUBCOMMITTEE ON OCEANS AND COASTAL AREAS) (agenda item 13.1)

13.1.1 The Commission recalled that the important and extensive bilateral and multilateral cooperation and joint activities involving WMO/IOC and IMO, UNEP and FAO, in particular, had been reviewed under appropriate technical agenda items. Under the present agenda item, the Commission therefore reviewed other matters of interest which involved mutual cooperation among WMO/IOC, the United Nations and other specialized United Nations agencies with major marine interests. Those included marine environmental protection, data management and aspects of UNCLOS. The Commission noted that many activities on those and similar topics had been previously coordinated through ICSPRO. In more recent years, that coordination had been effected through the more broadly-based ACC/SOCA. The Executive Secretary IOC was the chairperson of SOCA, for which IOC also provided the Secretariat. The Commission recalled that, under the terms of the ICSPRO Agreement, WMO continued to support the work of IOC, through the secondment of a professional officer to the IOC Secretariat and the provision of secretarial assistance. It agreed that that support clearly demonstrated the importance which WMO placed on its joint activities with IOC, including, in particular, now those under JCOMM. It therefore recommended to the WMO Congress and the Executive Council that that support should be continued. More generally, with regard to ICSPRO, the Commission recognized that it had a coordinating and implementing role among United Nations agencies with major marine interests complementary to that of SOCA and it, therefore, supported its continuation, with appropriately modified terms of reference.

13.1.2 The Commission noted and supported the major contributions which IOC and WMO were making to the work of SOCA. In addition to the lead role of SOCA in reporting on UNCED follow-up, as noted below, that included, in particular, the development of the United Nations Atlas of the Ocean, for which SOCA was providing inter-agency oversight. FAO was taking the lead role in that work, with funding support being provided by the Turner Foundation and in-kind support from participating agencies. Both IOC and WMO had concluded formal agreements with FAO concerning their participation in, and contributions to, the project. The Commission recalled that the Atlas was to be largely Web-based and should contain information, data, products and analyses produced under contributing agency programmes. The Atlas came on-line in 2001 and was being progressively developed as information became available. It could be accessed through both the IOC and WMO Web sites. The Commission recognized the value

of the Atlas and strongly recommended to Members/Member States to contribute products to the Atlas if so requested.

13.1.3 The Commission recalled that UNCLOS had come into force on 16 November 1994 and that IOC had been formally recognized under the Convention as a competent international organization, in particular with regard to marine scientific research. The Commission reiterated the importance of maintaining, within the context of UNCLOS and free of any impediment, routine marine monitoring programmes, and emphasized once more:

(*a*) The indispensable nature of routine marine meteorological and oceanographic observations, including from the Exclusive Economic Zone and territorial sea, *inter alia*, to the provision of services in support of the safety of life at sea and to global climate studies;

(*b*) The fact that those observations were made in the context of agreed operational systems and programmes of WMO and IOC and that they were freely exchanged among, and of general benefit to, all countries.

13.1.4 The Commission noted a specific problem, which was possibly in the domain of competence of UNCLOS, namely that of vandalism on unmanned equipment at sea. It recalled that the IOC Executive Council had already adopted Resolution EC-XXXI.4 — IOC support of efforts to reduce vandalism of oceanographic equipment at sea. That Resolution, *inter alia*, encouraged "appropriate action by the competent international organizations, taking into account the relevant provisions of the United Nations Convention on the Law of the Sea, as well as national legislation of Member States on unattended equipment in their respective Exclusive Economic Zones and international waters". The problem had also been recognized by the DBCP at its fifteenth session and was obviously a complex global issue, deserving specific attention. The Commission therefore requested its Observations Coordination Group to keep the matter under close review and to suggest possible remedial actions, as and when feasible (see also agenda item 8.2 and Recommendation 4 (JCOMM-I).

13.2 UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT FOLLOW-UP, COMMISSION ON SUSTAINABLE DEVELOPMENT AND THE CONVENTIONS (agenda item 13.2)

13.2.1 The Commission noted that the CSD was charged, *inter alia*, with overseeing the follow-up to, and implementation of, Agenda 21, adopted at UNCED (Rio de Janeiro, 1992), including in particular Chapter 17 — Protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources — on oceans and coastal areas. In that context, one of the major tasks of SOCA was coordinating the implementation of Chapter 17 and reporting on that to CSD. The CSD undertook a major review of oceans at its session in 1998, for which SOCA provided the substantive documentation. Subsequently, SOCA was now also coordinating input relating to Chapter 17 for the major review of UNCED implementation which was to be undertaken by the United Nations in 2002 (Rio+10).

13.2.2 The Commission was informed that the United Nations General Assembly had established UNICPOLOS, to facilitate the review by the Assembly of developments in ocean affairs, with an emphasis on identifying areas where coordination at the intergovernmental and inter-agency level could be enhanced. Meetings of UNICPOLOS had been held in May 2000 and April 2001, with IOC and WMO being represented at both those meetings. The Commission agreed on the importance of such representation, in particular in facilitating a wider recognition of the major roles played by both Organizations in ocean affairs, as well as in the high level of cooperation exercised in fulfilling those roles. It therefore strongly supported the continuing substantive involvement of IOC and WMO in SOCA, UNICPOLOS and related matters.

13.2.3 The Commission recalled that in conjunction with UNCED a number of conventions had been adopted, including in particular UNFCCC and the Convention on Biodiversity. Implementation of the UNFCCC was undertaken through COP, and the Commission was informed that both WMO and IOC had been active in providing technical input and advice to COP, *inter alia* through GCOS and GOOS. That activity had met with some success, as COP had now explicitly recognized the need to enhance ocean monitoring for climate, and requested the Global Environment Facility to assist developing countries in that regard. As requested by COP, GCOS had continued to provide status reports on, *inter alia*, *in situ* ocean observing networks as well as guidance to countries on national reports relating to the implementation of COP decisions. Those status reports were based to a large extent on data and monitoring statistics provided by JCOMM subsidiary and reporting bodies. The Commission recognized the importance of the COP decisions regarding ocean monitoring for climate. It urged Members/Member States to make maximum use of those when seeking the funding required to enhance climate-related marine observing systems. It also requested the Secretariats to provide assistance to countries, as required, in developing plans and funding proposals related to such enhancements.

13.3 INTEGRATED GLOBAL OBSERVING STRATEGY PARTNERSHIP (agenda item 13.3)

13.3.1 The Commission was informed that the IGOS Partnership grouped agencies such as WMO, IOC and UNEP, concerned with environmental monitoring, services and research, with environmental satellite operators (coordinated through CEOS) in a partnership to develop and implement a fully integrated approach to Earth environmental monitoring. The IGOS was being developed through a number of specialized themes, the first of which was oceans. The Commission noted that the

Oceans Theme Team Report comprised essentially a strategy for the implementation of satellite and complementary *in situ* observations. That report was fully consistent with the developing implementation strategy for GOOS and GCOS and with the recommendations of the OceanObs Conference (St Raphaël, France, October 1999). The report had been approved by the IGOS Partnership and endorsed by the GOOS Steering Committee (see also relevant discussions on the IGOS Partnership and the Oceans Theme Report recorded under agenda items 8.3 and 12.1).

13.3.2 The Commission agreed that that was an important development in ocean observations and that JCOMM would certainly have an important role to play in the implementation of the *in situ* component. It therefore agreed that the Management Committee and Observations Coordination Group should plan and oversee relevant JCOMM implementation activities, in consultation with the GOOS Steering Committee.

13.4 **NON-UNITED NATIONS SYSTEM ORGANIZATIONS AND PROGRAMMES** (agenda item 13.4)

13.4.1 The Commission recognized that, in addition to the joint activities with other United Nations system agencies, both WMO and IOC also collaborated extensively on marine issues with international organizations and programmes outside the system, both governmental and non-governmental, international and regional. Those included the ICSU/SCOR, which was a formal IOC advisory body), IHO, IMSO, the Permanent Commission for the South Pacific, the International Association of Lighthouse Authorities, the International Union for the Conservation of Nature and Natural Resources, ICES, IOI, etc. The Commission agreed on the high value to WMO and IOC of that collaboration and urged that it should be continued and further developed in the future. In particular, the Commission agreed that strengthening cooperation between JCOMM and the IOI would be instrumental in meeting the interests of wide user groups and communities, particularly in matters relating to education and training, capacity building, ocean protection and coastal area management. Furthermore, the Commission recognized that there were several regional conventions that were of direct relevance to JCOMM, including ICES, HELCOM, OSPAR and the Barcelona Convention. It therefore requested the Management Committee to ensure that the experience and monitoring work undertaken under those Conventions and associated bodies be properly taken into account and used in the implementation of JCOMM programme activities.

13.4.2 Specifically with regard to IMSO, the Commission noted that, following the privatization of Inmarsat in April 2000, IMSO had been established as an intergovernmental organization charged with providing the necessary oversight for the provision, by the new company Inmarsat Ltd., of satellite services for the GMDSS. As such, WMO would need to maintain a close working relationship with IMSO in the future, in particular with regard to the dissemination of meteorological information to maritime users under the GMDSS. The Commission therefore agreed that it would be appropriate for WMO to establish formal working arrangements with IMSO, and adopted Recommendation 12 (JCOMM-I) to that effect.

13.5 **INDUSTRY AND COMMERCE** (agenda item 13.5)

The Commission recalled that both WMO and IOC had, for many years, worked closely with organizations representing industrial and commercial marine-related activities and companies, such as ICS, the Oil Industry E and P Forum and CLS/Service Argos. Those organizations often represented, at the same time, both major users of marine data and services and also potential sources of data and collaborators in marine monitoring and research. The Commission agreed that it was very important that JCOMM maintained and expanded such partnerships in the future. It therefore requested the Management Committee to address specifically that issue, to identify additional potential partners within industry and commerce and to ensure that they were involved to the extent possible in the future work of JCOMM.

14. **LONG-TERM PLANNING** (agenda item 14)

FIFTH WMO LONG-TERM PLAN

14.1 The Commission noted the adoption by Thirteenth Congress of the 5LTP as well as the guidelines and directives developed by the Executive Council for its monitoring and evaluation. Since the 5LTP had been under implementation for only a year, the Commission made no attempt to review its implementation but requested the JCOMM Management Committee to keep it constantly under review. The Management Committee, in particular, was requested to contribute to the first report on the evaluation of the impacts of activities within the WMO marine programme performed under the Plan, covering the first two years (2000 and 2001). That would be submitted by the co-presidents of the Commission to the Executive Council Working Group on Long-term Planning in time for the preparation of a consolidated initial evaluation to be prepared for the Executive Council in 2002. Revised guidelines for monitoring and evaluation of WMO Long-term Plans were being prepared by the Working Group on the basis of guidance provided by the fifty-second session of the WMO Executive Council.

PREPARATION OF THE WMO SIXTH LONG-TERM PLAN

14.2 The Commission noted with interest that the WMO Executive Council had agreed that "...the Long-term Plan should be a document which outlined what the Organization was trying to achieve as a whole, with three main purposes:

(*a*) Serve as a basis for guiding the Secretariat and constituent bodies on the preparation of their programme plans and the monitoring of progress;

(*b*) For use by Members as a reference point to help guide planning at the national level;

(*c*) Provide a basis for briefing and informing other organizations/entities which potentially contributed to, and benefited from, the work of WMO and its Members" (*Abridged Final Report with Resolutions of the Fifty-second Session of the Executive Council*, WMO-No. 915, general summary paragraph 12.2).

14.3 The Commission noted that the WMO Executive Council had also endorsed proposals from the Working Group regarding the general approach, the period of coverage and the overall structure/contents of the 6LTP, as well as its ideas on the vision, strategic goals and wider outcomes to be included in the Plan. The Council had agreed that the Long-term Plans should form the basis for the preparation of the WMO programme and budget as well as the various programmes activities. In that context, guidelines for the preparation of the 6LTP had been made available, *inter alia*, to the co-presidents of JCOMM, in late 2000 and a draft of the 6LTP was presented to the fifty-third session of the WMO Executive Council in May 2001. That draft was also now available to JCOMM, to facilitate the preparation and planning of its programme and as a basis for specific input from the Commission to the finalized 6LTP to be eventually presented to Fourteenth Congress in 2003 for adoption.

14.4 The Commission welcomed that information, as well as the opportunity being provided to JCOMM to provide input to the preparation of the 6LTP, in particular with regard to the marine programme. It requested the co-presidents, in consultation with the JCOMM Management Committee, to develop that input in line with the timetable and guidelines provided for the Plan. In that context, the Commission considered that the marine programme component should encourage the further coordination of marine meteorology and oceanography, and in particular should reflect the following JCOMM priorities:

(*a*) Integration across and within all the JCOMM Programme Areas (Observations, Data Management, Services, and Education, Training and Capacity Building);
(*b*) Review and incorporate new technology, including new data and information technology;
(*c*) The vital importance of sustained and continuing missions for ocean satellites, of enhanced and expanded high resolution satellite sensing, and of the continuing use of meteorological satellites for atmospheric and ocean sensing;
(*d*) More generally, the importance of transitioning proven observing techniques and services into a long-term operational system;
(*e*) The role of JCOMM in maritime safety services, global climate studies and GOOS/GCOS implementation;
(*f*) The importance of user interactions and interfaces;
(*g*) Capacity building and technology transfer in support of marine observing systems, data management and services;
(*h*) The evolving capabilities and coverage of marine telecommunications facilities, including in particular in polar regions;
(*i*) The expanding capabilities of marine telecommunications and supporting facilities with regard to the dissemination in digital form of information, including graphics, to ships at sea and for their reconstitution and use on board ships;
(*j*) Support for marine pollution emergency response operations;
(*k*) JCOMM support for tropical cyclone warning services and for storm surge prediction services;
(*l*) Enhanced international marine data exchange;
(*m*) Joint programme activities within WMO, including in particular integrated coastal area management.

14.5 In addition, the Commission recalled the scientific lectures that were part of that session and noted their messages about future challenges and the important focus on data assimilation, Argo, modelling and services. In all of those lectures, priorities important to JCOMM were presented. As a result, the Commission noted the following additional specific priorities:

(*a*) Improving marine meteorological and ocean data assimilation, modelling and forecasting;
(*b*) Establishing an ongoing global operational Argo network and development of a similar technology for monitoring polar oceans and other ice-covered seas;
(*c*) Recognition of the importance of the work of JCOMM as a contribution to the research and modelling community, particularly to support seasonal climate predictions and goals of the WCRP;
(*d*) Improving understanding and monitoring of sea ice, particularly as it contributed to the understanding of climate change and climate variability;
(*e*) Recognition of the importance of critical areas within JCOMM where it had established expert teams and, in particular, the addition of storm surges to the wind wave programme.

The Commission further agreed that the long-term priorities of JCOMM should properly reflect the importance of the safety and security of the world's marine community.

15. SCIENTIFIC LECTURES (agenda item 15)

15.1 Following the decision of the interim Management Committee, scientific lectures at the session were arranged within the main technical part of the agenda on the theme of operational oceanography. The lectures were intended to serve as a means of informing the members of the Commission on aspects of operational ocean observing systems, ocean modelling and prediction, and applications, including seasonal to interannual climate prediction. They were directly relevant to, and in support of, the role of JCOMM as the intergovernmental technical body for coordinating and regulating operational oceanography.

15.2 The Commission agreed that all the lectures presented were highly informative and expressed its appreciation to the lecturers for the time and effort they had spent in preparing them. The Commission decided that the full texts of the lectures should be compiled by the Secretariats and published as a single report in the

JCOMM Technical Report series. The Commission greatly appreciated the presentation of such technical lectures at each Commission session and requested the Management Committee to prepare a similar set of lectures for its second session.

16. **ESTABLISHMENT OF WORKING GROUPS AND NOMINATION OF RAPPORTEURS** (agenda item 16)

16.1 The Commission recognized that a primary rationale for JCOMM was to provide a fully coordinated system for marine meteorology and oceanography, in which a coordinated set of data providers would feed into an integrated data management system of overlapping real-time and non-real time components. That system would, in turn, deliver data and products to a comprehensive range of user interests, either directly or through intermediate service providers. That system, to be successful, would need to be backed by a comprehensive and effective capacity building and support process.

16.2 The Commission further recognized that many of the elements of that integrated system already existed within the structures of the former CMM and IGOSS, as well as the various bodies now reporting to JCOMM, though in an uncoordinated form. It agreed that it was important to preserve essential existing activities and expertise from those bodies while, at the same time, developing an evolutionary and incremental approach towards an eventual fully integrated JCOMM structure and work programme.

16.3 In that context, the Commission noted with appreciation the work undertaken by the interim JCOMM Management Committee in preparing detailed draft proposals for a new JCOMM substructure. It recognized that that work had involved extensive consultation, review and eventually consensus by officers of all the subsidiary bodies of the former CMM and IGOSS, as well as of the bodies now reporting to JCOMM. The Commission agreed that the primary guidance, coordination and management of the work of JCOMM would be provided by the co-presidents and a Management Committee. That work would, in turn, be categorized and structured in four broad Programme Areas: Services, Observations, Data Management, and Education, Training and Capacity Building. Within each Programme Area, the work would be coordinated and integrated by a Coordination Group, the chairperson of which would also act as Programme Area Coordinator. More specific tasks within the different programme areas would then be undertaken by relatively small expert teams, task teams and rapporteurs, as well as by the reporting bodies and panels.

16.4 The Commission expressed its appreciation to the Secretary-General of WMO and the Executive Secretary IOC for having provided the draft structure proposals to Members/Member States well in advance of the session while, at the same time, requesting the nomination of experts as potential officers and members of the various bodies identified within the draft proposals. That early notification had greatly assisted both Members/Member States and the Commission itself in its review and adoption of the structure and in the nomination of experts to serve within it. At the same time, the Commission recognized the absolute importance to the future success of JCOMM and to the full development of operational oceanography of the work of the individual experts within the new structure. It therefore requested Members/Member States to ensure to the extent possible that their appointed experts were allowed sufficient time within their normal national work programme to complete allocated tasks in support of the Commission.

16.5 Finally, the Commission recognized the importance of involving and consulting JCOMM members in the implementation of the Commission's work programme. It therefore requested the Secretary-General of WMO and the Executive Secretary IOC to institute a regular consultation and information programme for members on the ongoing work of the Commission. That should be done as much as possible through the WMO and IOC Web sites and through written newsletters and circular letters, where appropriate.

16.6 The Commission adopted Resolutions 1 to 5 (JCOMM-I) to establish the Management Committee, the four programme areas and their component groups, expert teams, task teams and rapporteurs. Detailed terms of reference and membership were included as part of the respective resolutions. Owing to the limited funds available to the Secretariats, the Commission further requested Members/Member States to fund nationally, wherever possible, the participation of their selected experts in the work of the Commission.

17. **INTER-SESSIONAL WORK PROGRAMME** (agenda item 17)

The Commission considered its future work programme, based on proposals from working groups and other subsidiary and reporting bodies, on decisions and agreements reached during the present session, on proposals from other bodies and Programmes of WMO and IOC, and on the agreed terms of reference for JCOMM subsidiary bodies for the coming four years. It adopted the JCOMM work plan for 2001–2005, which is given in Annex VII to this report. The work was structured under the four programme areas, integrated across the subsidiary bodies of the Commission and prioritized to the extent possible.

18. **REVIEW OF PREVIOUS RESOLUTONS AND RECOMMENDATIONS OF CMM AND IGOSS AND OF RELEVANT RESOLUTIONS OF THE GOVERNING BODIES OF WMO AND IOC** (agenda item 18)

18.1 In accordance with WMO General Regulation 190, the Commission examined those resolutions and recommendations adopted by CMM and IGOSS prior to JCOMM-I which were still in force. It noted that action on most of the previous recommendations had already been taken and completed, or their substance incorporated into different WMO and IOC *Manuals* and *Guides*, as appropriate. Resolution 6 (JCOMM-I) was adopted.

18.2 The Commission also examined WMO and IOC Governing Body resolutions within the field of the activities of JCOMM. Recommendation 13 (JCOMM-I) was adopted.

18.3 The Commission recognized that some of the above resolutions and recommendations which it had agreed should be kept in force contained explicit reference to CMM and its subsidiary bodies and/or the Joint IOC/WMO Committee for IGOSS and its subsidiary bodies. In all such cases, the Commission agreed that those references should now be understood to mean JCOMM and its subsidiary bodies.

19. **ELECTION OF OFFICERS** (agenda item 19)

19.1 The Commission elected Mr J. Guddal (Norway) as its co-president for meteorology and Ms S. Narayanan (Canada) as its co-president for oceanography. The Commission agreed that, in order to avoid confusion regarding management responsibilities, Mr Guddal should assume primary authority for guiding the work of JCOMM during the first two years of the inter-sessional period and Ms Narayanan during the second two years. Notwithstanding that arrangement, the Commission recommended to the co-presidents to implement an arrangement whereby they shared, to the extent possible, responsibilities for overseeing different components of the technical work of JCOMM.

19.2 Following the election, the Commission took the opportunity to place on record its considerable and sincere appreciation to the retiring co-president for oceanography, Mr D. Kohnke. That appreciation covered not only his outstanding work in guiding the early planning for JCOMM, but also his long and distinguished involvement in the development of operational oceanography, through his chairpersonship of IODE and then the joint Committee for IGOSS.

20. **DATE AND PLACE OF THE SECOND SESSION** (agenda item 20)

The Commission was pleased to receive the tentative offer by Canada to host its second session in 2005. It requested the co-presidents to consult with the Secretary-General of WMO, the Executive Secretary IOC and the Government of Canada, with a view to confirming the offer and to determining the exact date and place, in accordance with WMO General Regulation 187.

21. **CLOSURE OF THE SESSION** (agenda item 21)

21.1 In closing the session, the co-president for meteorology, Mr J. Guddal, thanked all participants for their contributions to what had been an outstandingly successful first session of the new Commission. He recognized that that was the first time that the two disciplines of oceanography and meteorology had come together and agreed upon a common global programme for observing the oceans and coastal areas, for managing the data in an integrated way and for providing products and services based on those data. The session had very well achieved its initial goals of putting in place a structure, work programme and priorities, and it was now up to everyone to build on that success and ensure the long-term implementation of the programme. Mr Guddal thanked the Secretariats, including the interpreters, translators, document staff and secretaries, for their support. He then thanked, in particular, once more the session hosts, the Government of Iceland and the Icelandic Meteorological Office, for their warm welcome and generous and highly efficient support for the meeting, which had contributed substantially to its success.

21.2 The Director of the Icelandic Meteorological Office, Mr Magnus Jonsson, speaking for the Icelandic Government and all those involved in the local organization of the session, thanked participants for travelling to Akureyri and for taking part in the work of the meeting. In doing so, he recognized that the session, which marked the beginning of closer and more extensive cooperation between WMO and IOC than ever before, represented a small but historic step forward in finding solutions to issues which were relevant to all mankind. Mr Jonsson noted that Icelanders, perhaps more than most people, were directly influenced by, and dependent on, the atmosphere, the oceans and the whole global climate system, and were thus vitally concerned by the work now being undertaken under JCOMM. He recognized that the work of the Commission might eventually lead to the establishment of a World Ocean Watch, as the ocean equivalent of the WWW. Mr Jonsson then expressed the hope that Akureyri, and Iceland as a whole, had provided an interesting, congenial and stimulating environment for the session and for all participants, both for work and relaxation. He concluded by looking forward with keen anticipation to the second session of JCOMM in Canada in four years, by thanking the Secretariats for their support and by wishing all participants a safe journey home.

21.3 Mr Robert Shearman (United Kingdom) thanked the Icelandic Government and the Icelandic Meteorological Office for their hospitality and substantial efforts in support of JCOMM and of the present first session of the Commission. He also, in particular, thanked the local organizers and all the people of Akureyri for making everyone so welcome and at home. Mr Shearman then thanked the outgoing co-presidents for their substantive work in the initial establishment of JCOMM and wished the new co-presidents every success in managing the work of the Commission in the coming inter-sessional period. He concluded by also thanking the Secretariats for their past and ongoing high level of support for the Commission, including in particular the excellent support for the session, under the leadership of Mr E. Sarukhanian.

21.4 The comments and thanks of Mr Shearman were supported by delegates from Belgium, Iceland, Poland and the Russian Federation.

21.5 The incoming co-president for oceanography, Ms S. Narayanan, expressed her pleasure at being able to participate in the session and to use the opportunity to visit Iceland and learn something of its history, people and customs. She then noted that the session, which had been particularly successful, had created a strong

foundation for the future of JCOMM. That future would provide many challenges and opportunities for both the meteorological and oceanographic communities, but again success would depend on the input, cooperation and hard work of everyone involved and interested in the Commission and its work. Ms Narayanan then thanked all delegates for the confidence they had shown in her through her election to that high office. She looked forward with anticipation to working with the Management Committee, with the new groups and expert teams, with the Secretariats and with all members of the Commission in implementing the many and vital tasks of JCOMM during the next four years. She also thanked the Iceland Government, and in particular the Icelandic Meteorological Office, her committee co-chairperson, Mr T. Jakobsson, and the local organizers, for their wonderful support to the meeting. Ms Narayanan concluded by wishing everyone a safe trip home and by looking forward to welcoming participants to the next session in Canada in 2005.

21.6 Speaking on behalf of both WMO and IOC, Mr E. Sarukhanian, representative of the Secretary-General of WMO, expressed his pleasure and honour at being able to participate in that capacity at such an extraordinary event as the first session of JCOMM. He recognized that a completely new page in the history of both WMO and IOC had been turned in Akureyri and that the very positive results achieved held great promise for the future of that great enterprise. Mr Sarukhanian then offered once more the sincere thanks of both Organizations to the President, Government and people of Iceland for welcoming the session to Iceland and to Akureyri. He concluded by expressing personal thanks to Messrs Magnus Jonsson, Thor Jakobsson, Thorleifur Bjornsson and to all the local secretariat staff for their wonderful support, without which nothing would have been possible.

21.7 The first session of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology closed at 11.30 a.m. on Friday, 29 June 2001.

RESOLUTIONS ADOPTED BY THE SESSION

RESOLUTION 1 (JCOMM-I)

MANAGEMENT COMMITTEE OF THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) Resolution 1 (CMM-XII) — Advisory Working Group of the Commission for Marine Meteorology,

(2) Resolution 4 (JC-IGOSS-VII) — IGOSS Bureau,

(3) Resolution 14 (Cg-XIII) — Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM),

(4) Resolution 15 (Cg-XIII) — Marine Meteorology and Associated Oceanographic Activities,

(5) Resolution IOC XX-12 — Terms of reference of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology,

CONSIDERING:

(1) The requirement of the Commission to promote, coordinate and integrate marine meteorological and operational oceanographic programmes and activities,

(2) The contributions of the Commission to the WWW, WCP, WCRP, GOOS, GCOS and other major programmes of WMO and IOC,

(3) The need to coordinate the work of the Commission with other appropriate international organizations and their subsidiary bodies,

(4) The need for continued overall coordination of the work programme of the Commission and for advice on matters referred to it by the Executive Councils of WMO and IOC, the WMO Congress and the IOC Assembly,

DECIDES:

(1) To establish a Management Committee with the following terms of reference:

(*a*) Review the short and long-term planning of the work programme of JCOMM and advise on its implementation;

(*b*) Assess the resources required for the implementation of the work programme as well as the approaches to identifying and mobilizing these resources;

(*c*) Coordinate and integrate the work of JCOMM, as implemented through the various working groups, teams and rapporteurs;

(*d*) Review the internal structure and working methods of the Commission, including its relationship to other bodies, both internal and external to WMO and IOC, and develop proposals for modifications, as appropriate;

(*e*) Assess the implementation of activities and projects referred to JCOMM for action by WWW, WCP, GOOS, GCOS and other programmes, including in particular the GOOS/GCOS Implementation Action Plan;

(*f*) Contribute, as required, to the planning processes of WMO and IOC;

(2) That the co-presidents shall have the responsibility of undertaking jointly the duties required of presidents of technical commissions of WMO and technical committees of IOC as defined in their respective regulations. These would include or be extended to include the following:

(*a*) In joint consultation, guide and coordinate the activities of the Commission and its working groups inter-sessionally;

(*b*) In joint consultation, and with the assistance of the Secretariats, direct and approve inter-sessional actions including the creation and dissolution of ad hoc expert groups, task teams and rapporteurs, pending approval by the Commission in session;

(*c*) Carry out specific duties as prescribed by decisions of Congress and the Executive Council of WMO and the Assembly and Executive Council of IOC, as well as by the regulations of each Organization;

(*d*) Report to the governing bodies of WMO and IOC at their regular sessions on the activities of the Commission, as necessary;

(*e*) Ensure that the activities, recommendations and resolutions of the Commission are consistent with the provisions of the WMO Convention, the IOC Statutes, the decisions of WMO and IOC governing bodies, and the regulations of both Organizations;

(3) That the Management Committee will be composed of:

(*a*) The two co-presidents of the Commission;

(*b*) The Programme Area Coordinators;

(*c*) Mr P. Dandin (France);
Mr I. Frolov (Russian Federation);
Mr I. Hunter (South Africa);

(*d*) Senior Representatives of GOOS, GCOS and IODE.

Representatives of CBS and other bodies may be invited, as appropriate.

RESOLUTION 2 (JCOMM-I)

SERVICES PROGRAMME AREA

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) Resolution 2 (CMM-XII) — Working Group on Marine Meteorological Services,
(2) Resolution 2 (JC-IGOSS-VII) — IGOSS Group of Experts on Communications and Products,
(3) The report of the interim co-presidents of the Commission to JCOMM-I,
(4) The report of the chairperson of the Working Group on Marine Meteorological Services to JCOMM-I,

CONSIDERING:

(1) The continuing and expanding requirements of marine users for marine meteorological and oceanographic services and information,
(2) The need to ensure that the services provided to users meet these requirements, including in terms of timeliness and quality,
(3) The need to keep under review and to respond to the requirements of Members/Member States for guidance in the implementation of their duties and obligations with regard to marine services, in particular those specified in the WMO *Manual on Marine Meteorological Services* (WMO-No. 558),
(4) The need to monitor closely the operations of the WMO marine broadcast system for the GMDSS and the MPERSS, to develop modifications to the systems, as necessary, and to provide assistance to Members/Member States, as required,
(5) The need to coordinate closely with other programmes of WMO and IOC (WWW, WCP, GOOS, GCOS) as well as with other organizations such as IMO, IHO, IMSO and ICS in the provision of marine services and information,

DECIDES:

(1) To implement a JCOMM Services Programme Area with the following components:
    (*a*) A Services Coordination Group;
    (*b*) An Expert Team on Maritime Safety Services;
    (*c*) An Expert Team on Wind Waves and Storm Surges;
    (*d*) An Expert Team on Sea Ice;
(2) That the terms of reference of the Services Coordination Group and the Expert Teams shall be as given in the annex to this resolution;
(3) That the general membership of the Services Coordination Group and the Expert Teams shall also be as given in the annex to this resolution;
(4) To select, in accordance with WMO General Regulation 32:
    (*a*) Mr P. Parker (Australia) as chairperson of the Services Coordination Group and Services Programme Area Coordinator;
    (*b*) Mr H. Savina (France) as chairperson of the Expert Team on Maritime Safety Services;
    (*c*) Mr V. Swail (Canada) as chairperson of the Expert Team on Wind Waves and Storm Surges;
    (*d*) Mr V. Smolianitsky (Russian Federation) as chairperson of the Expert Team on Sea Ice;
(5) To select, in accordance with WMO General Regulation 32, the following experts to serve as members of the Expert Team on Wind Waves and Storm Surges:
    Mr S. Dube (India);
    Mr X. T. Bui (Viet Nam);
    Mr I. Lavrenov (Russian Federation);
    Ms P. Etala (Argentina);
    Mr M. Holt (United Kingdom);
    Mr J. M. Lefevre (France);
    Mr H. I. Tolman (United States);
    Mr G. Warren (Australia);
(6) To select, in accordance with WMO General Regulation 32, the following experts to serve as members of the Expert Team on Sea Ice:
    Mr H. Wu (China);
    Mr M. Matsumoto (Japan);
    Mr M. Picasso (Argentina);
    Mr W. Lumsden (Canada);
    Ms C. Bertoia (United States);
    Mr T. Jokobsson (Iceland);
    Mr K. Strubing (Germany);
    Mr H. Andersen (Denmark);
    Mr T. Grafstrom (Sweden);
(7) To select, in accordance with WMO General Regulation 32, as members of the Services Coordination Group, one member with specific expertise relative to MPERSS and the scientific editor of the JCOMM Electronic Products Bulletin:
    Mr P. Daniel (France);
    Mr Y. Tourre (France);
(8) To select, in accordance with WMO General Regulation 32, as members of the Services Coordination Group:
    Mr H. Bouksim (Morocco);
    Mr R. Nuñez (Chile);
    Mr Kwang-Joon Park (Republic of Korea);

REQUESTS the Secretary-General of WMO and the Executive Secretary IOC to invite IMO, IHO, ICS, IFSMA, IMSO, FAO and other relevant organizations and bodies to participate in the work within this programme area, as appropriate.

ANNEX TO RESOLUTION 2 (JCOMM-I)

TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE COORDINATION GROUP AND EXPERT TEAMS OF THE SERVICES PROGRAMME AREA

1. Services Coordination Group

Terms of reference

The Services Coordination Group, in close collaboration with CBS, GOOS and GCOS subsidiary bodies and related experts, shall:

(*a*) Keep under review and advise on the effectiveness, coordination and operation of the Services Coordination Group work programme, including performance with respect to timeliness, standards, quality and relevance to established user requirements;

(*b*) Through the assembly of requirements identified by specialist service groups and other Programme Areas of JCOMM, provide advice on JCOMM services that need to be implemented or discontinued;

(*c*) Develop interfaces to representative user groups in order to monitor the strength and weaknesses of existing services;

(*d*) With the concurrence of the co-presidents of JCOMM, establish and create expert teams, task teams, pilot projects and appoint rapporteurs, as appropriate, to undertake the work of the Services Programme Area;

(*e*) Ensure effective coordination and cooperation with groups and bodies in the area of service provision, including other Programme Areas of the Commission;

(*f*) Liaise with external bodies, in particular, those representing user communities.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:

Programme Area/Services Coordinator (chairperson);
Chairpersons of Expert Teams (three);
An expert in MPERSS;
Scientific Editor of the JCOMM Electronic Products Bulletin;
Three additional experts.

Representatives of JCOMM Programme Areas and of other expert bodies may be invited, as appropriate, with the concurrence of the co-presidents of the Commission, and in general with no resources implications to JCOMM.

2. Expert Team on Maritime Safety Services

Terms of reference

The Expert Team on Maritime Safety Services, in close collaboration with IMO, IHO, ICS, IMSO and other concerned organizations and bodies on maritime safety issues, including the GMDSS, shall:

(*a*) Monitor and review the operations of the marine broadcast system for the GMDSS and provide advice on improvements to the Services Programme Area, as necessary;

(*b*) Ensure effective coordination and cooperation with concerned organizations, bodies and Members and Member States on maritime safety issues;

(*c*) Propose actions, as appropriate, to meet requirements for the international coordination of meteorological and related communication services.

General membership

Chairperson, selected by the Commission.

Open membership, including representatives/nominations of the Issuing Services for the GMDSS, representatives of IMO, IHO, ICS, IMSO and other user groups, as appropriate.

The Chairperson, in consultation with the co-presidents of the Commission, should secure support to enable appropriate and adequate participation in the meetings of this group.

3. Expert Team on Wind Waves and Storm Surges

Terms of reference

The Expert Team on Wind Waves and Storm Surges shall:

(*a*) Review and advise on the implementation of wind wave and storm surge activities within JCOMM and propose amendments, as required;

(*b*) Develop technical advice on wave and storm surge modelling, forecasting and service provision and provide assistance and support to Member States, as required;

(*c*) Monitor projects for the verification of operational wind wave and storm surge model outputs and assist in their implementation, as required;

(*d*) Ensure effective coordination and cooperation with appropriate GOOS bodies on requirements for, and implementation of, wind wave and storm surge products and services;

(*e*) Provide advice to the Services Coordination Group and other JCOMM groups, as required, on issues related to wind waves and storm surges.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation.

Up to nine members, including the chairperson, representative of the range of activities related to wind waves and storm surges within JCOMM. Additional experts may be invited, as appropriate, with the concurrence of the co-presidents of the Commission and in general with no resource implications to JCOMM.

4. Expert Team on Sea Ice

Terms of reference

The Expert Team on Sea Ice shall:

(*a*) Review and catalogue the products and services required by user communities in sea-ice areas;

(*b*) Encourage and advise on the relevant numerical models and forecast techniques for products and services;

(*c*) Develop technical guidance material, software exchange, specialized training and other appropriate capacity building support with regard to sea-ice observations and services;

(*d*) Maintain linkages with relevant international organizations and programmes, in particular BSIM, CLIC, IICWG and ASPeCt;

(*e*) Keep under review and provide guidance, as appropriate, on the operations of the GDSIDB, including appropriate quality control, error analysis and archiving mechanisms, and encourage and facilitate enhanced submissions of sea-ice data to the bank;

(*f*) Review and propose amendments to formats, nomenclatures and procedures for sea-ice data and information exchange as well as to relevant terminology, coding and mapping standards;

(*g*) Provide advice to the Services Coordination Group and other JCOMM groups, as required, on issues related to sea ice and the ice-covered regions.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation.

Up to 10 members, including the chairperson, representative of the range of activities related to sea ice and the ice-covered regions within JCOMM.

Representatives of regional and international sea-ice bodies, in particular the BSIM and the IICWG will also be invited to participate at their own expense.

RESOLUTION 3 (JCOMM-I)

OBSERVATIONS PROGRAMME AREA

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) Resolution 3 (CMM-XII) — Working Group on Marine Observing Systems,

(2) Resolution 1 (JC-IGOSS-VII) — IGOSS Ship-of-Opportunity Programme Implementation Panel,

(3) WMO Resolution 4 (EC-LII) and IOC Resolution EC-XXXIII.8 — Data Buoy Cooperation Panel,

(4) IOC Resolution EC-XXXIII.9 — Global Sea Level Observing System,

(5) Final report of the eleventh session of the ASAP Coordinating Committee, Annex V — Terms of reference for the ASAP Panel,

(6) The *Abridged Final Report with Resolutions of the Thirteenth World Meteorological Congress* (WMO-No. 902), general summary paragraph 3.4.4.26,

(7) IOC Resolution XX-6 — The Argo Project,

(8) *Global Physical Ocean Observations for GOOS/GCOS: An Action Plan for Existing Bodies and Mechanisms* (GOOS Report No. 66/GCOS Report No. 51, 1999),

(9) Conference Statement of the International Conference: The Ocean Observing System for Cliamte, St Raphaël, France, October 1999,

(10) The reports of the chairpersons of the Working Group on Marine Observing Systems, the SOOPIP, the DBCP, the ASAP Panel and the GLOSS Group of Experts to the session,

CONSIDERING:

(1) The need to maintain, improve, coordinate and integrate a comprehensive *in situ* ocean observing system, in response to stated requirements for marine data to support the WWW, WCP, WCRP, GOOS, GCOS and marine services,

(2) The need to monitor new developments in marine observing technology and advise on their incorporation into operational observing networks, as appropriate,

(3) The need to coordinate the development and implementation of standardized, high quality marine observing practices and instrumentation,

(4) The need to review continuously and advise on, and assist in, the implementation of new marine telecommunications systems and procedures,

(5) The need to provide guidance to Members/Member States on technical aspects of marine observing systems,

(6) The need to identify and coordinate the provision of resources and logistic facilities for the deployment and servicing of marine observing platforms and instrumentation,

(7) The need to monitor continuously the performance and quality of marine observing systems and to assist in the implementation of remedial actions, as necessary,

(8) The need to coordinate with appropriate bodies of CBS, CIMO, GOOS and GCOS on marine instrumentation, observations networks and requirements for marine data,

DECIDES:

(1) To implement a JCOMM Observations Programme Area with the following components:
   (*a*) An Observations Coordination Group;
   (*b*) A Data Buoy Observations Team, known as the Data Buoy Cooperation Panel;
   (*c*) A Sea-level Observations Team, known as the GLOSS Group of Experts;
   (*d*) A Ship Observations Team, recognizing that during the inter-sessional period, this Team will develop coordination and synergies among the three existing ship-based panels, i.e. the SOOP Implementation Panel, the VOS Panel and the ASAP Panel;

(2) To maintain close liaison and coordination with the Argo Science Team;

(3) That the terms of reference for the Observations Coordination Group and the Ship, Data Buoy and Sea-level Observations Teams shall be as given in the annex to this resolution;

(4) That the general membership of the Observations Coordination Group and the Ship, Data Buoy and Sea-level Observations Teams shall also be as given in the annex to this resolution;

(5) To select, in accordance with WMO General Regulation 32:
   (*a*) Mr S. Wilson (United States) as chairperson of the Observations Coordination Group and Observations Programme Area Coordinator;
   (*b*) Mr R. Bailey (Australia) as chairperson of the Ship Observations Team;

(6) To select, in accordance with WMO General Regulation 32, as members of the Observations Coordination Group:
   (*a*) A satellite expert to be nominated later by the co-presidents;
   (*b*) Ms K.-H. Doublet (Norway);
   (*c*) Mr Yu Zhouwen (China);

(7) To select, in accordance with WMO General Regulation 32:
   (*a*) Mr A. Sy (Germany) as chairperson of SOOPIP;
   (*b*) Mr G. Kassimidis (Greece) as chairperson of the VOS Panel.

REQUEST the Secretary-General of WMO and the Executive Secretary IOC to invite relevant organizations and bodies to participate in the work of this programme area, as appropriate.

ANNEX TO RESOLUTION 3 (JCOMM-I)

TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE OBSERVATIONS COORDINATION GROUP AND THE SHIP, DATA BUOY AND SEA-LEVEL OBSERVATIONS TEAMS

1. Observations Coordination Group

Terms of reference

The Observations Coordination Group shall:

(*a*) Keep under review and advise on the effectiveness, coordination and operation of the Observations work programme, including performance measured against scientific requirements, delivery of raw data, measurement standards, logistics and resources;

(*b*) Provide advice to JCOMM and to Observations Teams on possible solutions for newly-identified requirements, consulting, as appropriate, with relevant scientific groups and with CBS;

(*c*) Review *in situ* data requirements and recommend changes, as appropriate, taking into account the continuing development of satellite observations and their capabilities;

(*d*) Coordinate the development of standardized, high quality observing practices and instrumentation and prepare recommendations for JCOMM;

(*e*) With the concurrence of the co-presidents of JCOMM, establish and create expert teams, task teams, pilot projects and appoint rapporteurs, as appropriate, to undertake the work of the Observations Programme Area;

(*f*) Examine trade-offs and use of new and improved techniques/developments against requirements and available resources;

(*g*) Liaise with, and input to, CBS activities regarding the consolidated requirements database and operational satellites.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:

Programme Area/Observations Coordinator (chairperson);
Chairperson Ship Observations Team;
Chairperson DBCP;
Chairperson GLOSS Group of Experts;
Chairperson Argo Science Team;
Chairperson Tropical Moored Buoys Implementation Panel;
Satellite expert;
Up to two additional experts.

JCOMMOPS will participate in the work and the meetings of the Coordination Group.

2. Ship Observations Team

Terms of reference

The Ship Observations Team shall:

(*a*) Review and analyse requirements for ship-based observational data expressed by the WWW, WCP, WCRP, GOOS, GCOS and in support of marine services, and coordinate actions to implement and maintain the networks to satisfy these requirements;

(*b*) Review marine telecommunications facilities and procedures for observational data collection, as well as technology and techniques for data processing and transmission and propose actions, as necessary, for improvements and enhanced application;

(*c*) Coordinate PMO/ship greeting operations globally, propose actions to enhance PMO standards and operations and contribute, as required, to PMO training;

(*d*) Review, maintain and update, as necessary, technical guidance material relating to ship observations and PMOs;

(*e*) Liaise and coordinate, as necessary, with other JCOMM Programme Areas and expert teams, in particular those relating to maritime safety services, marine climatology and ocean data management;

(*f*) Participate in planning activities of appropriate observing system experiments and major international research programmes as the specialist group on ship-based observations.

Terms of reference of component panels

SOOP Implementation Panel

(*a*) Review, recommend and, as necessary, coordinate the implementation of specialized shipboard instrumentation and observing practices;

(*b*) Coordinate the exchange of technical information on equipment and expendables, development, functionality, reliability and accuracy;

(*c*) Ensure the distribution of available programme resources to ships to meet the agreed sampling strategy in the most efficient way;

(*d*) Ensure the transmission of low-resolution data in real time from participating ships; ensure that delayed more high-resolution data are checked and distributed in a timely manner to data-processing centres;

(*e*) Maintain, through the SOOP Coordinator, appropriate inventories, monitoring reports and analyses, and information exchange facilities;

(*f*) Provide general guidance to the Coordinator on his support for the SOOP.

ASAP Panel

(*a*) Coordinate the overall implementation of the ASAP, including recommending routes and monitoring the overall performance of the programme, both operationally and in respect of the quality of the ASAP system data processing;

(*b*) As may be required by some members, arrange for, and use, funds and contributions in kind needed for the procurement, implementation and operation of ASAP systems and for the promotion and expansion of the programme;

(*c*) Carry out other activities as agreed by participating members to implement and operate ASAP and to promote and expand the programme internationally;

(*d*) Prepare annually a report on the status of ASAP operations, data availability and data quality.

VOS Panel

(*a*) Review, recommend and coordinate the implementation of new and improved specialized shipboard instrumentation, siting and observing practices;

(*b*) Support the development and maintenance of the VOSClim Project;

(*c*) Develop and implement activities to enhance ship recruitment, including promotional brochures, training videos, etc.

General membership

Chairperson, selected by the Commission;
Chairpersons of the SOOPIP, VOS and ASAP Panels;
Open membership, comprising operators of VOS, SOOP and ASAP, representatives of monitoring centres, data management centres and bodies, representatives of IMSO and other communications satellite systems, representatives of manufacturers, representatives of science advisory bodies and users, as appropriate.

The chairperson, in consultation with the co-presidents of the Commission, should secure support to enable appropriate and adequate participation in the meetings of this group.

JCOMMOPS will participate in the work and the meetings of the Ship Observations Team.

3. Data Buoy Observations Team

Terms of reference

Existing terms of reference for DBCP, TIP and action groups.

General membership

Open membership, comprising existing DBCP members, action groups and TIP.
JCOMMOPS will participate in the work and the meetings of the Team.

4. Sea-level Observations Team

GLOSS Group of Experts

Terms of reference

Existing terms of reference as determined by the IOC Executive Council.

Membership

Existing GLOSS Group of Experts and the GLOSS Scientific Subgroup.

RESOLUTION 4 (JCOMM-I)

DATA MANAGEMENT PROGRAMME AREA

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) Resolution 2 (CMM-XII) — Working Group on Marine Meteorological Services,

(2) Recommendation 3 (JC-IGOSS-VII) — Global Temperature Salinity Profile Programme,

(3) The WMO *Manual on Marine Meteorological Services* (WMO-No. 558),

(4) The reports of the chairpersons of subsidiary bodies of JCOMM,

(5) The report of the fourth session of the GOOS Steering Committee,

(6) The report of the sixteenth session of the IOC Committee on IODE,

CONSIDERING:

(1) The need to implement, maintain and make available to users a fully integrated ocean/atmosphere data stream,

(2) The requirement for the timely delivery of integrated data and associated metadata,

(3) The need to develop and maintain monitoring, evaluation and follow-up procedures,

(4) The need for generic practices including quality control, metadata, analysis, data flow and data exchange standards, formats and procedures,

(5) The need to identify and, as appropriate, rescue, digitize and archive historical data,

(6) The need to collaborate and coordinate closely with other programmes and bodies, both within and outside WMO and IOC,

(7) The capabilities and experience of existing data management centres, systems and programmes, both within and outside IOC and WMO,

(8) The need to develop and/or strengthen national data management capacity, especially in developing countries,

DECIDES:

(1) To implement a JCOMM Data Management Programme Area with the following components:
   (*a*) A Data Management Coordination Group;
   (*b*) An Expert Team on Data Management Practices;
   (*c*) An Expert Team on Marine Climatology;

(2) That the terms of reference of the Data Management Coordination Group and the Expert Teams shall be as given in the annex to this resolution;

(3) That the general membership of the Data Management Coordination Group and the Expert Teams shall also be as given in the annex to this resolution;

(4) To select, in accordance with WMO General Regulation 32:
   (*a*) Mr Wang Hong (China) as chairperson of the Data Management Coordination Group and Data Management Programme Area Coordinator;
   (*b*) Mr N. Mikhailov (Russian Federation) as chairperson of the Expert Team on Data Management Practices;
   (*c*) Mr M. Mietus (Poland) as chairperson of the Expert Team on Marine Climatology;

(5) To select, in accordance with WMO General Regulation 32, the following experts to serve within the Data Management Coordination Group:
   (*a*) Mr R. Keeley (Canada) as Expert on Data Exchange Codes and Formats;
   (*b*) Mr B. Sumner (Australia) as Expert on Communications Systems for Data Exchange;
   (*c*) An Expert on Data Flow Monitoring, to be nominated later by the co-presidents;
   (*d*) Mr Suk Moon-Sik (Republic of Korea);
   (*e*) An additional expert to be nominated later by the co-presidents;
   (*f*) IODE nominations.

(6) Invites Members/Member States to nominate experts for the Expert Team on Data Management Practices, to facilitate a final selection by the co-president in consultation with IODE to ensure equal balance between meteorological and oceanographical data management experts;

(7) To select, in accordance with WMO General Regulation 32, the following experts to serve as members of the Expert Team on Marine Climatology:
   Mr A. Lal (India);
   Mr M. Kaneda (Japan);
   Mr A. Vorontsov (Russian Federation);
   Mr S. Woodruff (United States);
   Mr V. Wagner (Germany);
   Mr F. Koek (Netherlands);
   Mr C. M. Tam (Hong Kong, China);
   Mr C. D. Hall (United Kingdom);
   Ms C. Rossler (Argentina);
   Mr K. Wurodu (Ghana);
   Mr J. Carreno Campos (Chile).

REQUESTS the Secretary-General of WMO and the Executive Secretary IOC to invite CBS, CCl, IODE, the directors of relevant WDCs and other relevant organizations and bodies to participate in the work of this programme area, as appropriate.

ANNEX TO RESOLUTION 4 (JCOMM-I)

TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE COORDINATION GROUP AND EXPERT TEAMS OF THE DATA MANAGEMENT PROGRAMME AREA

1. Data Management Coordination Group

Terms of reference

The Data Management Coordination Group, in close collaboration with IODE and CBS subsidiary bodies and related experts, shall:

(*a*) Develop the strategy, initiate and oversee the implementation of the Data Management Programme Area;
(*b*) Identify, review, assess and recommend priorities and actions for the Data Management Programme Area;
(*c*) In concurrence with the co-presidents of JCOMM, establish and create expert teams, task teams, pilot projects and appoint rapporteurs, as appropriate, to undertake the work of the Data Management Programme Area;
(*d*) Ensure collaboration, appropriate coordination and liaison with data management bodies and other bodies;
(*e*) Ensure full integration and effective cooperation of data management activities within the Commission;
(*f*) Keep under review, assess and coordinate the adoption of appropriate new information technology;
(*g*) Establish and maintain cooperation with science programmes and assist with their data management activities, as appropriate;
(*h*) Provide advice and feedback to users of the Data Management Programme Area functions, both through the appropriate JCOMM Programme Area and directly;
(*i*) Promote the adoption of good data management practices within the Commission and with external partners.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:

(*a*) Programme Area/Data Management Coordinator (chairperson);
(*b*) Chairpersons of Expert Teams (two);
(*c*) Three members with specific expertise in, respectively, data exchange codes and formats; communications systems for data exchange; and data flow monitoring;
(*d*) Up to two additional experts;
(*e*) A representative of IODE.

Additional experts may be invited, as appropriate, with the concurrence of the co-presidents of the Commission and in general with no resources implications to JCOMM.

2. Expert Team on Data Management Practices

Terms of reference

The Expert Team on Data Management Practices, in close collaboration with IODE and CBS subsidiary bodies and related experts, shall:

(*a*) Develop, recommend and implement principles and practices for an end-to-end data management system for JCOMM;
(*b*) Recommend best data management practices for adoption by JCOMM and other related/dependent activities, in particular for:
  (i) Standards of metadata and formats;
  (ii) Quality control and data assembly;
  (iii) Data and product flow;
(*c*) Review and assess the effectiveness of data management practices, including integration and consideration of new techniques and approaches;
(*d*) Provide advice to the Data Management Coordination Group and other groups of JCOMM, as required, on data management practices;
(*e*) In concurrence with the co-presidents of the Commission, propose the establishment of projects and task teams, as required and, if established, oversee them, including the GTSPP, in order to develop effective data management practices;
(*f*) Develop documentation and guidance material and promote the adoption of JCOMM data management practices;
(*g*) Liaise and collaborate with other groups, as needed, to ensure access to required expertise and appropriate coordination, and to avoid duplication.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:

(*a*) Up to nine experts, including the chairperson, selected from Members/Member States, representative of the range of responsibilities of the Expert Team, in consultation with IODE, as appropriate;
(*b*) Representatives of JCOMM Programme Areas and of other expert bodies may be invited, as appropriate, with the concurrence of the co-presidents of JCOMM and with no resources implications to the Commission.

3. Expert Team on Marine Climatology

Terms of reference

The Expert Team on Marine Climatology, in close collaboration with IODE, GOOS, GCOS, CCl and CBS subsidiary bodies and related experts, shall:

(*a*) Determine procedures and principles for the development and management of global and regional oceanographic and marine meteorological climatological datasets;
(*b*) Review and assess the climatological elements of the Commission, including the operation of the MCSS and the GCCs, and the development of required oceanographic and marine meteorological products;
(*c*) Review the GOOS and GCOS requirements for climatological datasets, taking account of the need for quality and integration;
(*d*) Develop procedures and standards for data assembly and for the creation of climatological datasets, including the establishment of dedicated facilities and centres;
(*e*) Collaborate and liaise with other groups, as needed, both to ensure access to expertise and appropriate coordination;
(*f*) Keep under review and update, as necessary, relevant technical publications in the area of oceanographic and marine meteorological climatologies.

General membership

The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:
(*a*) Up to 12 experts, including the chairperson, selected from Members/Member States, representative of the range of responsibilities of the Expert Team;
(*b*) Additional representatives from the responsible members for the MCSS and GCCs, from relevant projects and subsidiary bodies of IODE, as required, in consultation with the co-presidents;
(*c*) Representatives of JCOMM Programme Areas and of other expert bodies may be invited, as appropriate, with the concurrence of the co-presidents of JCOMM and with no resources implications to the Commission.

RESOLUTION 5 (JCOMM-I)

EDUCATION, TRAINING AND CAPACITY BUILDING PROGRAMME AREA

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:
(1) Resolution 4 (CMM-XII) — Working Group on Education, Training and Implementation Support,
(2) Summary report, seventh session, Joint IOC/WMO Committee for IGOSS, section 7 — Training, Education and Assistance Programme, Including Regional Implementation,
(3) The report of the chairperson of the Working Group on Education, Training and Implementation Support,
(4) The JCOMM Capacity Building Strategy,
(5) The reports of the WMO Regional Rapporteurs on Marine Meteorological Services to the session,

CONSIDERING:
(1) The need to initiate and provide oversight for the implementation of the JCOMM Capacity Building Strategy,
(2) The need to review and update, as necessary, existing training and guidance material and generate new material, where required,
(3) The value of coordinating support to Members/Member States in marine observing systems, data management and services on a regional or subregional basis,
(4) The need to coordinate closely with other JCOMM programme areas, other programmes and bodies of WMO and IOC and external programmes and bodies in the implementation of integrated specialized training and support activities,
(5) The need to identify and harness the resources necessary to support JCOMM capacity building,

DECIDES:
(1) To implement a JCOMM Education, Training and Capacity Building Programme Area, with the following components:
  (*a*) An Education, Training and Capacity Building Coordination Group;
  (*b*) A Task Team on Resources;
  (*c*) Rapporteur links to WMO/IOC regional bodies, other relevant WMO/IOC programmes and bodies (including GOOS and GCOS), other JCOMM programme areas;
  (*d*) User forums, involving both data and service providers and users;
(2) That the terms of reference and general membership for the Education, Training and Capacity Building Coordination Group and the Task Team on Resources shall be as given in the annex to this resolution;
(3) To select, in accordance with WMO General Regulation 32:
  (*a*) Mr H. Soldi (Peru) as chairperson of the Education, Training and Capacity Building Coordination Group and Programme Area Coordinator;
  (*b*) Mr S. Priamikov (Russian Federation) as chairperson of the Task Team on Resources;

(4) To select, in accordance with WMO General Regulation 32, the following experts to serve on the Education, Training and Capacity Building Coordination Group:
Ms R. Folorunsho (Nigeria);
Ms M. Andrioli (Argentina);
Mr S. Ragoonaden (Mauritius);
Mr Qi Peng (China);
Ms I. Ambar (Portugal);
Mr R. Aparicio (Venezula) representing the IOC Association for the Caribbean and Adjacent Regions;
(5) To invite Members/Member States to nominate experts to participate in the Task Team on Resources, to facilitate a final selection by the co-presidents;
(6) To request the co-presidents of JCOMM, in accordance with WMO General Regulation 32, to appoint specific rapporteurs to the Education, Training and Capacity Building Coordination Group, as required.

REQUESTS the Secretary-General of WMO and the Executive Secretary IOC to invite relevant external international and national donor agencies to nominate representatives to participate in the work of the Education, Training and Capacity Building Programme Area, as appropriate.

ANNEX TO RESOLUTION 5 (JCOMM-I)

TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE EDUCATION, TRAINING AND CAPACITY BUILDING COORDINATION GROUP AND TASK TEAM ON RESOURCES

1. Education, Training and Capacity Building Coordination Group

Terms of reference
The Education, Training and Capacity Building Coordination Group, in close cooperation with the WMO Expert Team on Technical Cooperation, the IOC Committee for Training, Education and Mutual Assistance in the Marine Sciences, GOOS, GCOS, IGOS and other relevant organizations and bodies involved in capacity building, shall:
(*a*) Plan, initiate and implement the Education, Training and Capacity Building work programme including, in particular, the JCOMM Capacity Building Strategy;
(*b*) Keep under review existing training and guidance material (paper and electronic) and advise on procedures for updating as well as for the development of new material;
(*c*) Review and assess regional requirements for capacity building and develop regional projects, as appropriate;
(*d*) Develop and implement integrated training and support activities, in collaboration with other programme areas and external bodies and programmes;
(*e*) Review and assess the resources needed for capacity building activities of JCOMM in light of the resource plan of the Task Team on Resources;
(*f*) Endeavour to mobilize the resources required for JCOMM capacity building, including those needed for the implementation of the work programme of the Services Programme Area.

General membership
The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:
Programme Area/Education, Training and Capacity Building Coordinator (chairperson);
Chairperson of the Task Team on Resources;
Experts to provide linkage with WMO/IOC relevant regional and technical bodies;
Five additional experts.

2. Task Team on Resources

Terms of reference
The Task Team on Resources shall:
(*a*) Monitor the existence, fields of interest and procedures of international and national aid programmes, foundations and all other possible sources of funding and advise on proposal development;
(*b*) Where possible, develop links and contacts to funding sources and aid programme management;
(*c*) Develop a plan for obtaining resources for JCOMM Capacity Building, in collaboration with GOOS and GCOS.

General membership
The membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation, and includes:
Four selected experts;
Donor agency representatives.

RESOLUTION 6 (JCOMM-I)

REVISION OF THE RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR MARINE METEOROLOGY AND OF THE JOINT WMO/IOC COMMITTEE FOR THE INTEGRATED GLOBAL OCEAN SERVICES SYSTEM

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

CONSIDERING that all resolutions adopted prior to JCOMM-I are now obsolete,
CONSIDERING FURTHER that all recommendations adopted prior to the twelfth session of CMM and still in force have been reconsidered,
NOTING the action taken on the recommendations adopted prior to JCOMM-I,

DECIDES:
(1) Not to keep in force Resolutions 1 to 5 (CMM-XII);
(2) Not to keep in force Recommendations 7 (CMM-XI); and 1, 2, 3, 5, 7, 8, 9, 10 and 12 (CMM-XII);
(3) To keep in force Recommendations 13 (CMM-X); 1, 2, 5, 8, 10, 12 (CMM-XI); and 4, 6, and 11 (CMM-XII);
(4) Not to keep in force Resolutions 1 through 5 (JC-IGOSS-VII);
(5) Not to keep in force Recommendations 2 (JWC-IGOSS-I); 11 (JWC-IGOSS-V); and 1 to 7 (JC-IGOSS-VII);
(6) To keep in force Recommendations 1 (JWC-IGOSS-IV); and 1 and 2 (JWC-IGOSS-V);
(7) To publish in the final report of JCOMM-I the text of the recommendations which are kept in force.

ANNEX TO RESOLUTION 6 (JCOMM-I)

RECOMMENDATIONS OF THE WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY ADOPTED PRIOR TO ITS FIRST SESSION AND MAINTAINED IN FORCE

Recommendation 13 (CMM-X) — Specialized long-term education and training in marine meteorology and physical oceanography

THE COMMISSION FOR MARINE METEOROLOGY,
NOTING:
(1) The high priority given by Tenth Congress to marine meteorological services and to improved specialized education and training in marine meteorology and physical oceanography,
(2) The report of the Rapporteur on Education and Training to CMM-X,
(3) Recommendation 11 (JWC-IGOSS-V) — Specialized long-term education and training related to IGOSS,
BEING AWARE that, with the notable exception of RMTC Manila, there is presently a lack of long-term specialized training courses in marine meteorology and physical oceanograhy at Regional Meteorological Training Centres,
CONSIDERING:
(1) That properly trained personnel are essential to the further development, implementation and operation of marine meteorological services, and that training should extend also to the users of marine meteorological services, where this does not already occur,
(2) That the expanded involvement of developing countries in programmes such as the Integrated Global Ocean Services System and the World Climate Research Programme is also dependent on the availability of specialized personnel in the field of marine meteorology and physical oceanography,
RECOGNIZING that long-term specialized training courses in marine meteorology and physical oceanography are essential for the provision of suitably trained personnel for these purposes,
RECOMMENDS:
(1) That high priority within WMO should be given to the development of long-term specialized training courses in RMTCs in the field of marine meteorology and physical oceanography;
(2) That in particular every effort should be made to establish a six-month course on marine meteorology and physical oceanography at RMTC Nairobi as a matter of some urgency;
(3) That, whenever possible, these courses should be developed and operated in close collaboration with IOC and the oceanographic community;
(4) That following the successful establishment of a course in Nairobi, consideration should then be given to the establishment of similar courses in RMTCs Oran and Buenos Aires;
REQUESTS the Secretary-General:
(1) To approach funding sources, including UNDP, with a view to establishing approporiate long-term funding support for such courses;
(2) In consultation with the president of CMM, the Secretary IOC and the Directors of the RMTCs concerned, to develop as soon as possible curricula for these courses, for the consideration of the EC Panel of Experts on Education and Training.

Recommendation 1 (CMM-XI) — Marine meteorological services monitoring programme

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 1 (CMM-VIII) — Marine meteorological services monitoring programme,

(2) Abridged final report, CMM-IX, general summary, paragraph 5.7 and Annex II,

(3) Report and recommendations to CMM-XI by the Sub-group of Experts on Warning and Forecast Preparation on Marine Meteorological Services Monitoring,

CONSIDERING:

(1) The continuing importance to mariners of the provision of high quality, timely marine meteorological services,

(2) The need for routine and continuous monitoring of marine meteorological services to maintain the highest possible standards,

(3) The importance of keeping up-to-date information on the requirements of marine users for meteorological and oceanographic information and services,

RECOGNIZING the activities for the monitoring of marine meteorological services already effected by many Members,

RECOMMENDS:

(1) That a systematic, long-term marine meteorological services monitoring programme be implemented;

(2) That the programme be based on the questionnaire and response summary format given in the annex to this recommendation;

(3) That the monitoring should be undertaken by Members and coordinated by the WMO Secretariat and should take place on a routine basis every four years;

(4) That a comprehensive analysis of the results of the monitoring should be prepared by the WMO Secretariat following each four-yearly monitoring, and transmitted immediately to Members for follow-up action, as appropriate;

(5) That a brief summary of the results of this monitoring should be prepared for each session of CMM, as well as for sessions of the Advisory Working Group and the Working Group on Marine Meteorological Services;

INVITES Members to carefully review the results of this monitoring, including detailed criticisms and suggestions provided by users, and to take appropriate measures to correct identified deficiencies in marine meteorological services within their respective areas of concern, including through the distribution of results to marine forecasters and PMOs;

REQUESTS:

(1) The Advisory Working Group and the Working Group on Marine Meteorological Services to closely follow the implementation and results of this monitoring programme and to propose modifications, as appropriate;

(2) The Secretary-General to arrange for Secretariat support for the monitoring programme as detailed under RECOMMENDS above.

_____

NOTE: This recommendation replaces Recommendation 1 (CMM-VIII) which is no longer in force.

Annex to Recommendation 1 (CMM-XI)

Marine meteorological services monitoring programme questionnaire

A. To masters, deck and radio officers of VOS

In order to monitor the effectiveness of the weather and sea bulletins produced and transmitted by Meteorological Services, the World Meteorological Organization would appreciate your cooperation in completing the following questionnaire. The objective of this programme is the improvement of meteorological support to shipping.

Ship's name (call sign) .....
Country of registry .....
Name of master .....
Operational area(s) .....
Voyage from .....to .....
Position of ship when questionnaire completed .....
Date and time .....

Please complete the following questionnaire by ticking the appropriate heading and inserting comments, as appropriate.

	Good	Fair	Poor	Met. service issued by	CRS
1. Storm and gale warnings					
(*a*) Clarity of information	_____	_____	_____	_____	_____
(*b*) Accuracy of information	_____	_____	_____		
(*c*) Timeliness	_____	_____	_____		
2. Weather bulletins					
(*a*) Clarity of information	_____	_____	_____	_____	_____
(*b*) Accuracy of information	_____	_____	_____		
(*c*) Timeliness	_____	_____	_____		
(*d*) Terminology used	_____	_____	_____		

3. Radiofacsimile broadcasts
(*a*) Maintaining schedules _____ _____ _____ _____ _____
(*b*) Accuracy of information _____ _____ _____
(*c*) Readability _____ _____ _____
(*d*) Symbology _____ _____ _____
(*e*) Quality of reception _____ _____ _____

4. Coastal Radio Stations (CRS)/Coast Earth Stations (CES)
(*a*) Establishing contact with receiving station (CRS/CES) _____ _____ _____ _____
(*b*) Delays with OBS messages _____ Yes (Time.....) _____ No
(*c*) Refusal of CRS/CES to accept OBS messages _____ Yes (CRS/CES.....) _____ Yes
(*d*) Use of five or ten-figure groups _____ 5 _____ 10

5. Other related problems (if any)
Date and time .....
Position of the ship .....
Radio frequency and station call sign .....

6. Suggested improvements .....

Use additional sheets if necessary
For each case complete one questionnaire
After completion, please return to Meteorological Service at the following address: .....

Master's signature

B. A summary of the replies to the questionnaire addressed to Voluntary Observing Ships (VOS) received by (Meteorological Service)

	Number of ships which replied			Percentage of total replies		
	Good	Fair	Poor	Good	Fair	Poor
1. Storm and gale warnings						
(*a*) Clarity of information						
(*b*) Accuracy of information						
(*c*) Timeliness						
2. Weather bulletins						
(*a*) Clarity of information						
(*b*) Accuracy of information						
(*c*) Timeliness						
(*d*) Terminology used						
3. Radio-facsimile broadcasts						
(*a*) Maintaining schedules						
(*b*) Accuracy of information						
(*c*) Readability						
(*d*) Symbology						
4. Coastal Radio Stations (CRS) / Coast Earth Stations (CES)						
(*a*) Establishing contact with receiving station						
(*b*) Delays with OBS message						
(*c*) Refusal of CRS/CES to accept OBS						
(*d*) Use of five or ten-figure groups						

5. Other related problems
.....
.....
.....
.....

6. Suggested improvements

Recommendation 2 (CMM-XI) — Marine Pollution Emergency Response Support System (MPERSS) for the high seas

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 2 (CMM-X) — Meteorological support for marine pollution emergency operations,

(2) The final report of the meeting of the IMO Working Group on the International Convention on Oil Pollution Preparedness, response and Cooperation (London, October 1992),

(3) Recommendation 3 (CMM-XI) — New WMO GMDSS Marine Broadcast System,

CONSIDERING:

(1) That operations at sea in response to marine pollution emergencies are fundamentally dependent on the support of meteorological services,

(2) That marine pollution emergency events outside waters under national jurisdiction are essentially international in character,

(3) That no coordinated system currently exists for the provision of meteorological support for operations in response to such events,

(4) That considerable benefits would accrue to all coastal states through the establishment of such a coordinated system for meteorological support,

RECOMMENDS:

(1) That a new WMO Marine Pollution Emergency Response Support System (MPERSS) for the high seas, as detailed in the annex to this recommendation, should be implemented on a trial basis;

(2) That the trial system should ideally be implemented on or as soon as possible after 1 January 1994;

EXPRESSES ITS APPRECIATION to those Members which may accept provisional responsibilities under the new system,

BEARING IN MIND:

(1) The need for substantial further work to be undertaken, nationally and internationally, in developing the concept and structure of the MPERSS,

(2) The continuing need to provide guidance and support to Members in the development and implementation of the services required in support of marine pollution emergency response operations,

(3) The work being undertaken on marine pollution monitoring, assessment and modelling by IOC, UNEP and IMO,

REQUESTS:

(1) The Working Group on Marine Meteorological Services to:

(*a*) Further develop the concept and structure of the proposed MPERSS in cooperation with Members concerned as well as with appropriate international organizations;

(*b*) Continue its work on the development of guidance material, in cooperation with IOC, UNEP and IMO, as appropriate, and generally to provide technical support to Members in the implementation and operation of the trial MPERSS;

(*c*) Prepare a revised draft MPERSS, for the consideration of CMM-XII for inclusion in the *Manual on Marine Meteorological Services*;

(2) The Secretary-General to provide, as resources permit, appropriate Secretariat support in the further development, implementation and operation of the MPERSS and, in particular, to agree with Members concerned on their role and responsibilities in a future operational MPERSS;

INVITES IOC, UNEP and IMO to collaborate with WMO in the further development and operation, as necessary, of the MPERSS;

FURTHER INVITES the International Maritime Organization:

(1) To provide WMO with additional information on national and regional marine pollution combatting centres, for inclusion in the draft MPERSS plan, for the benefit of Members accepting responsibilities under the MPERSS;

(2) To inform national and regional marine pollution combatting authorities, as well as IMO national contact points, of the existence and details of the MPERSS.

Annex to Recommendation 2 (CMM-XI)

Marine meteorological support for marine pollution emergency response operations on the high seas

1. PRINCIPLES

The principles for marine meteorological support for marine pollution emergency response operations are as follows:

Principle 1

For the purpose of the efficient and effective provision of meteorological information for marine pollution emergency response operations on the high seas and in view of the international character of these operations, there is a requirement to provide an internationally coordinated system of meteorological support for such operations. For this purpose the oceans and seas are divided into areas for which National Meteorological Services assume responsibility. These areas, termed Marine Pollution Incident (MPI) areas, are the same areas as the METAREAs of the Global Maritime Distress and Safety System (GMDSS).

Principle 2

The areas of responsibility together provide complete coverage of oceans and seas by meteorological information contained in the products prepared and issued by the participating National Meteorological Services.

Principle 3

The preparation and issue of meteorological information for areas of responsibility is coordinated in accordance with the procedures mentioned in section 2.

Principle 4

The efficiency and effectiveness of the provision of meteorological information in support of marine pollution emergency response operations is monitored by obtaining opinions and reports from the users.

2. PROCEDURES

2.1 Definitions

2.1.1 An *Area Meteorological Coordinator (AMC)* is a National Meteorological Service which has accepted responsibility for ensuring that regional meteorological information is issued to support marine pollution emergency response operations in the designated area for which the Service has accepted responsibility. [These National Meteorological Services may eventually become designated Regional Specialized Meteorological Centres (RSMC) for Marine Pollution Emergency Support.] The support supplied by an AMC (or a Supporting Service) may include some or all of the following:

(*a*) Basic meteorological forecasts and warnings for the area(s) concerned;

(*b*) The observation, analysis and forecasting of the values of specific meteorological and oceanographic variables required as input to models describing the movement, dispersion, dissipation and dissolution of marine pollution;

(*c*) In some cases, the operation of these models;

(*d*) In some cases, access to national and international telecommunications facilities;

(*e*) Other operational support.

The issued information may have been prepared solely by the AMC, or by another Supporting Service(s), or a combination of both, on the basis of an agreement between the Services concerned. It is also the responsibility of the AMC to ascertain the location and contact (telex, telefax, etc.) details of any marine pollution emergency response operations authority (or authorities) responsible within the designated Marine Pollution Incident (MPI) area. This information should be made available by the AMC to Supporting Service(s) for the area.

2.1.2 A *Supporting Service* is a National Meteorological Service which has accepted responsibility to provide on request, either directly or to the AMC, meteorological (basic or enhanced) support for parts of, or an entire, designated MPI area. Depending on the location of the incident, Supporting Services may be requested by the emergency authority to provide the meteorological support directly to that authority. In such cases, the AMC should be so advised by the Supporting Service. A Supporting Service should advise the AMC of the facilities it has available to fulfil its role.

2.2 Areas of responsibility

2.2.1 **Areas of responsibility (Marine Pollution Incident (MPI) areas) and the responsible Services for AMCs and Supporting Service(s) shall be as given in Appendix I.**

NOTES: (1) The areas of responsibility given in Appendix I are reviewed by the Commission for Marine Meteorology to ensure complete area coverage and adequacy of services.

(2) An MPI area has, in some cases, been sub-divided to meet the requirements of National Meteorological Services.

(3) The areas of responsibility defined in Appendix I represent a minimum requirement for AMC and Supporting Services. Both AMCs and Supporting Services may extend the area of coverage for the issue of meteorological support information beyond these areas of responsibility, if they so wish, to meet national requirements. In this case, the area of coverage should be specified in the text of each communication to the marine pollution emergency response operations authority.

2.2.2 **Any amendments to the area of responsibility or proposal for the introduction of a change in National Meteorological Services' responsibilities for an area, shall have the approval of the Executive Council based on a recommendation by the Commission for Marine Meteorology.**

2.2.2.1 **Before drawing up any recommendation on the proposed amendment for submission to the Executive Council, the Commission for Marine Meteorology shall receive the comments of the National Meteorological Services directly concerned with the proposed amendment as well as the comments of the president(s) of the regional association(s) concerned.**

NOTE: All correspondence relating to the areas of responsibility is addressed to the Secretary-General.

2.2.3 Whenever a National Meteorological Service responsible for the issue of meteorological support data to an MPI area is no longer able to provide this service, the National Meteorological Service should inform the Secretary-General at least six months in advance of the intended termination date.

2.3 Meteorological support to marine pollution emergency response operations on the high seas

2.3.1 Support to these emergency operations may, as stated in paragraph 2.1.1, include a variety of elements, such as:

(*a*) *Basic meteorological forecasts and warnings for the area(s) concerned*. Special attention should be given to the early provision of actual and forecast surface conditions in the area of the pollution incident. This may be the initial requirement following a pollution incident;

(*b*) *The observation, analysis and forecasting of the values of specific meteorological and oceanographic variables* required as input to models describing the

movement, dispersion, dissipation and dissolution of marine pollution. AMC and Supporting Service should, if possible, ascertain from the relevant marine pollution emergency response operations authority the specific meteorological and oceanographic variables required for a particular model, also the location of the model operator and access details. If information regarding specific required variables for a model is not available, general guidelines for the type of data which will be required are given in Appendix II;

(*c*) *The operation of the models by the National Meteorological Service*. If an AMC or Supporting Service has this facility and it can be used in the MPI area, the existence of this facility should be made known to the relevant marine pollution emergency response operations authority at an early stage, and ideally prior to an actual pollution incident in the MPI area. [AMCs should give consideration to conducting periodic trials of their pollution models and cooperating with the pollution emergency authorities in their MPI area to assess the efficiency and effectiveness of the output data from their models.]

(*d*) *Access to national and international telecommunications facilities*. Effective and efficient communications is an essential element in an emergency situation and AMCs and Supporting Services must ensure that they have access to reliable communication links between all parties involved in a marine pollution incident within their MPI area. The AMC should ascertain from the marine pollution emergency response operations authority the method by which the transfer of the required meteorological support shall be effected. **This information shall be relayed to the Supporting Service(s) for the MPI area concerned.** The use of the International SafetyNET service (of INMARSAT) should be considered if the meteorological support is required at the location of the pollution incident, e.g. by the on-scene dispersal craft. Similarly, use of the Global Telecommunication System (GTS) by a marine pollution emergency response operations authority via a regional telecommunication hub (RTH) of the Global Telecommunication System (GTS) may also be a consideration in cases of a major pollution incident;

(*e*) *Other operational support*. **AMCs shall, at an early stage of a marine pollution incident affecting their area of responsibility, ascertain from the relevant marine pollution emergency response operations authority details of the incident and the nature of the support required. It shall be the responsibility of the AMC to advise the marine pollution emergency response operations authority of the support facilities which the AMC and/or the Supporting Service(s) can provide. [This shall be undertaken whether or not a pollution incident occurs in an MPI area, and this information shall be updated to the marine pollution emergency response operations authorities at regular intervals, and immediately should there be a change in the support facilities available from the AMC or Supporting Service.** It is the responsiblity of the Supporting Service(s) to advise the AMC of any change to its support facilities.] It should be noted that operations at sea in response to marine pollution emergencies are fundamentally dependent on the support of Meteorological Services. It is thus essential that AMCs and Supporting Services offer as full a range of operational support as possible and practicable to marine pollution emergency response operations.

2.3.2 A permanent record of all communications should be maintained, showing the times of origin, transmission and reception of the information provided.

2.4 IMO regional marine pollution combatting centres. Marine pollution research and monitoring programmes of IOC/UNEP

2.4.1 IMO and UNEP have established regional marine pollution combatting centres in a few locations throughout the world. These centres have been incorporated in the coordinated meteorological support plan in Appendix I. Full details of these centres are given in Appendix III. The majority of these centres are non-operational and have an advisory capacity only. The nature of the centre, whether advisory or operational, is indicated in Appendix III. It should be noted that it is the responsibility of the participating National Meteorological Service(s) to ascertain the location of any marine pollution emergency response operations authority relevant to the MPI area and/or to each marine pollution incident.

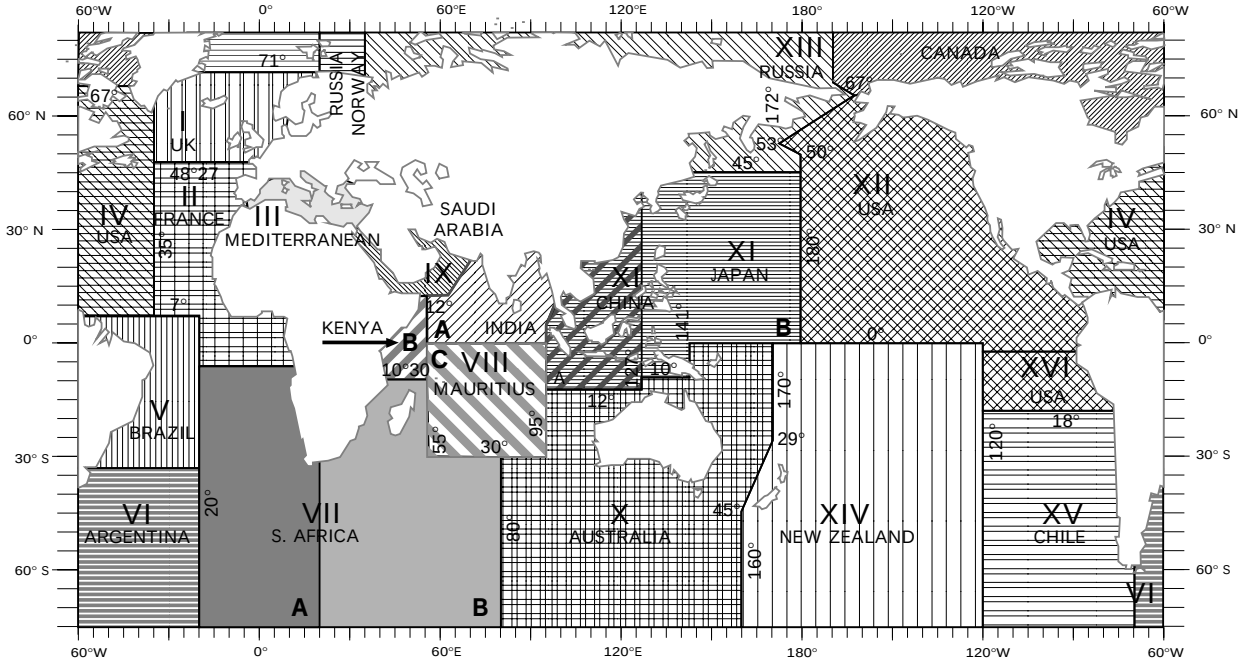
2.4.2 The objectives and activities of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea and its role in the case of emergency are given in Appendix IV.

2.4.3 The International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC Convention), in Article 12 — Institutional Arrangements identified the International Maritime Organization Secretariat as having specific responsibilities with regard to the provision of information and technical services under the Convention. Contact information for the IMO Secretariat is also given in Appendix III and information on activities in Appendix V. It is the responsibility of the WMO Secretariat to keep the IMO Secretariat informed of all international dispositions and arrangements made under the WMO meteorological support system. At the same time, AMCs may wish to contact the IMO Secretariat directly to obtain information on specific arrangements which may exist for combatting oil and other pollution incidents in their MPI area(s) of responsibility.

2.4.4 IOC and UNEP co-sponsor the programme on Global Investigation of Pollution in the Marine Environment (GIPME).

Appendix I

Areas of responsibility and National Meteorological Services designated as area meteorological coordinators for issuing of meteorological data for support to marine pollution emergency response operations on the high seas



Coordinated meteorological support to marine pollution incident (MPI) area

Recipient of meteorological data

MPI area	*Area Meteorological Coordinator*	*Supporting Service*	*IMO regional marine pollution combatting centres Suggested additional centres*	*Remarks*
I	United Kingdom	Norway Iceland Ireland France	Relevant Coast Guard Authority/Pollution Control Centre	Norway responsible forArctic watersnorth of 71°N
II	France	Portugal Spain	Relevant Coast Guard Authority/Pollution Control Centre	
III	Italy	Greece Malta France	REMPEC (Malta Centre). Relevant Coast Guard Authority	
IV	USA	Canada	Relevant Coast Guard Authority. IMO Regional Consultant, Santurce, Puerto Rico (Wider Caribbean)	Canada responsible for Arctic waters north of 67°N
V	Brazil		Relevant Coast Guard/Pollution Control Centre	
VI	Argentina		Relevant Coast Guard/Pollution Control Centre	
VII (A)	South Africa*		Relevant Coast Guard/Pollution Control Centre	West of 20°E
VII (B)	South Africa*	Réunion	Relevant Coast Guard/Pollution Control Centre	East of 20°E
VIII (A)	India		Relevant Coast Guard/Pollution Control Centre	VIII (A): Area VIII-(B)+(C). Indian Ocean north of the equator, west of 95°E, east of 55°E excluding Area IX
VIII (B)	Kenya	United Republic of Tanzania	Relevant Coast Guard/Pollution Control Centre	VIII (B): 12°N – 10°30'S 55°E to East African Coast
VIII (C)	Mauritius	Réunion	Relevant Coast Guard/Pollution Control Centre	VIII (C): 0° – 30°S 55°E – 95°E
IX	Saudi Arabia	Bahrain	Relevant Coast Guard/Pollution Control Centre	
X	Australia		Relevant Coast Guard/Pollution Control Centre	
XI (A)	China	Hong Kong	Relevant Coast Guard/Pollution Control Centre	XI (A) 125°E – Mainland China to west boundary of area XI (95°E) (excluding Philippine waters)
XI (B)	Japan	Philippines	Relevant Coast Guard/Pollution Control Centre	East of 125°E – 180° including Philippine waters
XII & XVI	USA	Canada	Relevant Coast Guard/Pollution Control Centre	Canada responsible for Arctic waters north of 67°N
XIII	Russian Federation		Relevant Coast Guard/Pollution Control Centre	
XIV	New Zealand		Relevant Coast Guard/Pollution Control Centre	
XV	Chile		Relevant Coast Guard/Pollution Control Centre	

* The Government of the Republic of South Africa has been suspended by Resolution 38 (Cg-VII) from exercising its rights and enjoying its privileges as a Member of WMO.

Appendix II

Input data requirements for marine pollution transport and dispersion models

Simple local models	*Simple regional models*	*Hydrological local models*	*Hydrological regional models*	*Expert local systems*	*Expert regional systems*
Surface wind (local)	Surface wind field	Surface wind (local)	Surface wind field	Surface wind	Surface wind field
Water temperature	Water temperature	Water temperature	Water temperature	Water temperature	Water temperature field
Air temperature	Air temperature	Air temperature	Air temperature	Air temperature	Air temperature
Waves	Waves	Waves	Waves	Waves	Waves
(Rain)	Currents	Rain	Rain	Rain	Rain
Currents		Currents	Stratification	Pollutant properties	Pollutant properties
		Tides	Constant information	Surface and sub-surface currents	Surface and sub-surface currents
			Ice	Tides	Tides
			Tides	Stratification	Stratification
				Technical information	Technical information
					Regional information
					Ice

Local systems	*Regional systems*	
Surface wind	Surface wind field	Grid point data
Water temperature	Air temperature field	
Air temperature	Water temperature field	
Rain or not	Rain or not	
Waves	Stratification	
	Ice information	

Appendix III

IMO regional marine pollution combatting centres and marine pollution research and monitoring programmes of IOC/UNEP (as of March 1992)

1. Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) of IMO/UNEP (also known as the Malta Centre)
   Manoel Island
   Malta
   tel +356 337296 or 337297 or 337298; fax +356 339951; telex 2464 UNROCC MW; 1396 UNROCC MW

   Status: Information and advisory centre.

2. Office of IMO Regional Consultant on Marine Pollution (Wider Caribbean)
   P.O. Box 3037
   Ceiba, Puerto Rico 00735
   USA
   tel +1809 8654343 (24 hrs); fax +1809 8651785

   Status: Advisory services.

3. Marine Emergency Mutual Aid Centre (MEMAC)
   P.O. Box 10112, Bahrain
   tel (973) 274554; fax (973) 274551; telex 9890 MEMAC BN

4. Oil Pollution Coordination Centre
   Pollution Preparedness and Response Section
   International Maritime Organization
   4 Albert Embankment
   London SE1 7SR, United Kingdom
   tel +44 71 7357611; fax +44 71 5873210; telex 23588

   Status: Information and advisory centre.

Appendix IV

Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)

Objectives

The objectives of the Centre are the following:

(*a*) To strengthen the capacities of the coastal States in the Mediterranean and to facilitate cooperation among them in case of a major marine pollution accident;

(*b*) To assist coastal States of the Mediterranean region, which so request, in the development of their own capabilities for response to accidents;

(*c*) To facilitate information exchange, technological cooperation and training;

(*d*) To provide a framework for the exchange of information on operational, technical, scientific, legal and financial matters.

Activities

In conformity with these objectives and with the decisions of the meetings of the Contracting Parties to the Barcelona Convention, the Centre is developing its activities in the following areas:

(*a*) Informing the coastal states — regional information system (oil and hazardous substances)

The Centre is developing and keeping up-to-date a regional information system made up of four parts:

(i) Basic documents;

(ii) Lists and inventories;

(iii) Data banks, simulation models and decision support system;

(iv) Operational guides and technical documents.

(*b*) Assistance in the preparation of contingency plans

The Centre provides assistance to those countries which so request for:

(i) The preparation or adaptation of national contingency plans;

(ii) The preparation and the development of operational bilaterial or multilateral agreements between neighbouring Coastal States.

(*c*) Training

The Centre annually organizes the following regional training courses:

(i) A general training course;

(ii) A specialized and practical training course.

The Centre provides, to countries which so request, assistance in organizing national training courses.

(*d*) Cooperation and mutal assistance in cases of emergency

The Centre:

(i) Develops and keeps up-to-date a regional communications network;

(ii) Organizes periodically communication exercises;

(iii) Provides, at the request of the Mediterranean Coastal States in case of an accident, technical advice and facilitates and coordinates mutal assistance between them.

Role of the Centre in case of emergency

In the case of a marine pollution accident, REMPEC, at the request of States, in accordance with its objectives and functions and taking into account the means at its disposal shall:

(*a*) By using the regional information system developed and updated by the Centre, provide advice and technical expertise as well as other relevant information the States would need;

(*b*) Put into action once it will be operational the Mediterranean Task Force which will assist response to accidental marine pollution;

(*c*) Help to obtain international assistance and its coordination, whether the means (equipment, products, combatting equipment) come from Government or the private sector;

(*d*) Endeavour to help States affected by an accident in disseminating information.

The assistance that the Centre can thus give at the request of the States shall be decided on a case by case basis, between the competent national authorities and REMPEC. REMPEC shall endeavour to reply in the quickest and best possible way to all the requests of assistance supported by the Regional Information System.

Appendix V

Oil Pollution Coordination Centre (OPCC)

Objectives

The objectives of the Coordination Centre are the following:

(*a*) To coordinate oil spill response activities, if requested;

(*b*) To monitor oil spill incidents;

(*c*) To facilitate information exchange on operational and institutional capacities to combat oil spills;

(*d*) To provide a framework for the collection and dissemination of information on operational and technical matters;

(*e*) To assist Governments in the development of their own capabilities for response to accidents;

(*f*) To facilitate the provision of technical assistance and advice upon request.

Activities

In conformity with the objectives mentioned above, the Coordination Centre is developing its activities in the following areas:

(*a*) Information services

The Centre is developing and keeping up-to-date information on:

(i) National focal points for Oil Pollution Preparedness and Response (OPRC);

(ii) The nature and extent of the type of assistance which is available with every State;

(iii) National Policy for Oil Pollution Preparedness and Response including

National Contingency Plan for oil pollution incidents;

(iv) Marine Pollution Preparedness and Response Database Systems.

In addition, the Centre will manage an already developed International Oil Pollution Research and Development Abstract Database. This database, developed by the United States Coast Guard, has information on research category, project description, R and D sponsor, researcher, funding, etc.

(*b*) Education and training

(i) To promote training in the field of oil pollution preparedness and response under the OPRC training strategy using IMO model courses;

(ii) To promote the holding of international symposia.

(*c*) Technical services

(i) To facilitate cooperation in research and development;

(ii) To provide advice to State(s) establishing national or regional response capabilities;

(iii) To analyse the information provided by Parties in case of an oil pollution incident and relevant information provided by other sources and provide advice or information to States.

(*d*) Technical assistance

(i) To facilitate the provision of technical assistance to States establishing national or regional respose capabilities;

(ii) To facilitate the provision of technical assistance and advice, upon the request of States faced with major oil pollution incidents.

Role of the Centre in case of an emergency

In the case of a marine pollution accident, OPCC, at the request of State(s), in accordance with its objectives and functions and taking into account the means at its disposal shall:

(*a*) Monitor and assess the situation by collecting information from various sources, e.g., Government, industry, etc. and keeping in touch with affected State(s);

(*b*) Provide technical advice, if requested, by affected State(s);

(*c*) Facilitate and coordinate, as appropriate, the provision of international assistance;

(*d*) Assist in the dissemination of spill information to affected State(s).

Recommendation 5 (CMM-XI) — Applications of the results of the VOS Special Observing Project North Atlantic (VOSP-NA)

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) The *Third WMO Long Term Plan*, Part II, Volume I — World Weather Watch Programme (WMO-No. 761) and Volume 4 — Applications of Meteorology Programme (WMO-No. 764),

(2) IOC Assembly Resolution XV-4 — Global Integrated Ocean Observing System Development,

(3) IOC Assembly Resolution XVI-8 — Global Ocean Observing System (GOOS),

(4) Resolution 9 (Cg-XI) — Global Climate Observing System,

(5) Resolution 21 (Cg-XI) — WMO's involvement in the development of a Global Ocean Observing System,

(6) Recommendation 6 (CMM-X) — The WMO Voluntary Observing Ships (VOS) scheme,

(7) Marine Meteorology and Related Oceanographic Activities Reports No. 25 (Ship Catalogue) and No. 26 (Results of the VSOP-NA),

(8) Recommendation 8 (CBS-IX) — Amendments to the *Manual on the Global Data-Processing System* — Monitoring the quality of observations,

CONSIDERING:

(1) That reports from the VOS will remain a primary source of surface meteorological and oceanographic data from all ocean areas for operational, research and climatological purposes for the foreseeable future,

(2) That improvements in the quality, quantity and timeliness of such reports need to be made if the full requirements of WMO Programmes for these data are to be met,

BEARING IN MIND that action on a number of recommendations of the VSOP-NA addressed to WMO has been taken under appropriate agenda items at the present session,

EXPRESSES ITS APPRECIATION:

(1) To all Members which operate VOS, which have appointed Port Meteorological Officers (PMOs), or which support coastal radio stations and INMARSAT Coast Earth Stations for the collection of ships' weather reports;

(2) Specifically to those Members, their PMOs and the ships' crews who participated in the VSOP-NA;

(3) To the United Kingdom Meteorological Office for acting as the lead centre for the real-time monitoring of the quality of surface marine data;

RECOMMENDS TO MEMBERS:

(1) To implement relevant recommendations of the VSOP-NA, as detailed in the annex to this recommendation, as a matter of priority;

(2) To follow-up the results of the real-time monitoring of the quality of VOS reports, which are prepared by the United Kingdom Meteorological Office as lead centre designated by CBS for this purpose and distributed regularly to Members concerned;

(3) Whenever possible, to increase automation in the collection and transmission of VOS reports;

REQUESTS the Secretary-General, the president and vice-president of the Commission and the chairmen of the relevant working groups to assist Members in the implementation of this recommendation.

Annex to Recommendation 5 (CMM-XI)

Recommendations of the VOS Special Observing Project North Atlantic (VSOP-NA) relevant to implementation by Members

Observing practices and equipment

The results of VSOP-NA demonstrate clearly the value of national observing fleets conforming to recognized standards of instrument exposure and observing practice. Additionally, for some variables, one method of measurement has been shown to be superior to others (e.g. SST by hull-contact sensor). For other variables, different methods have both advantages and disadvantages. Good exposure is often more important than choice of instrument type. It is therefore strongly recommended that Members take note of these findings and ensure that equipment, exposures and observing practices are chosen and maintained appropriately, with a view to achieving greater accuracy and consistency across the international VOS.

Real-time data monitoring

The existing real-time monitoring systems for VOS reports should be extended to cover all variables required for surface flux calculations. Specifically VOS databases maintained at each monitoring centre should include more detail for each ship, to facilitate identification of the appropriate corrections. Results of the real-time monitoring should be made available more frequently to Members and PMOs, ideally on a monthly basis.

Reduction in reporting errors

The results of VSOP-NA show that many errors were made in converting measured relative wind into true wind, and in deriving dewpoint from dry- and wet-bulb temperatures. Members are recommended to provide their VOS with dedicated calculators or computer programs for deriving these quantities, in order to achieve a significant decrease in the number of such errors.

Port Meteorological Officer system

The results of the VSOP-NA study demonstrate that an efficient Port Meteorological Officer system can have significant impact on the overall quality of data submitted by individual national fleets. It is recommended that appropriate funding and resources be made available to improve the organization, training and operation of the Port Meteorological Officer systems of Member countries. Members with existing, well-established and effective PMO systems should be encouraged to offer training and assistance facilities to other Members to enable them to upgrade their respective PMO services.

Applications of VOS data

Noting that model-derived ocean surface flux values will be increasingly used for forcing ocean models, and recognizing that the VSOP-NA project has shown that biases exist in model-derived data such that significant errors would exist in the predicted flux values, it is recommended that increased use be made of the VOS ship observations to verify model flux determinations.

It is recommended that, where VOS observations are used to construct sea surface temperature data sets, the observations should be classified according to measurement type and that greatest weight should be given to hull contact sensors, bucket measurements, and condenser or engine intake instruments, in that order. In particular it should be noted that there is evidence that intake measurements are of poorer quality and likely to be biased warm compared to the other methods.

Recognizing that ships' observations transmitted over the GTS at present contain a significant number of errors due to the incorrect calculation of true wind velocity and dewpoint, and that these errors can be reduced by the use of logbook data, the use of delayed-mode logbook-derived data for climate research is recommended.

Noting that the greatest accuracy requirements for VOS data are for the calculation of flux fields for climate research, and recognizing that the VSOP-NA project has demonstrated that the quality of ships' data depends on the efficiency of the PMO system, it is recommended that the climate research community supports measures designed to improve the PMO system.

Recommendation 8 (CMM-XI) — The collection of meteorological and oceanographic information using INMARSAT

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Abridged final report, CMM-X, sub-item 6.1,

(2) Resolution 19 (Cg-XI) — The collection and dissemination of marine meteorological and oceanographic information using INMARSAT,

CONSIDERING:

(1) The continuing rapid expansion in the use of the International Maritime Satellite Organization (INMARSAT) marine telecommunication system, particularly among the WMO Voluntary Observing Ships (VOS),

(2) That INMARSAT-C facilities are likely to be available on virtually all the VOS by the year 2000,

(3) The improvements being noted in the receipt of meteorological and oceanographic reports from ships at sea through the enhanced use of the INMARSAT system,

(4) The substantial reductions in communications costs to Members which occur for meteorological and oceanographic reports sent using the INMARSAT-C facility,

RECOGNIZING WITH APPRECIATION that a number of Members operating INMARSAT Coast Earth Stations (CES) have already arranged to accept ships' meteorological and oceanographic reports through their CES, free of charge to the ships, which are of general value to all Members of WMO,

BEING CONCERNED, however, that these reports are, at the present time, concentrated on a sub-set of the CES already in operation, and that problems continue to be

related to the timely redistribution to the countries closest to their geographical origin of reports collected through INMARSAT,

NOTING WITH APPRECIATION the agreement by the Netherlands to supply and maintain software for the compilation, encoding in SHIP code, storage and transmission through the INMARSAT-C facility of ships' meteorological reports,

RECOMMENDS:

(1) To those Members operating CES that have not yet done so to accept the ships' meteorological and oceanographic reports transmitted through their CES, free of charge to ships, using the special code 41 short code dialing procedure;
(2) To those Members in regions where the introduction of INMARSAT has produced recognized changes in patterns of data collection, to develop interregional, regional, subregional or bilateral agreements for cost-sharing, as appropriate;
(3) To all Members concerned to make every effort to ensure the timely redistribution of reports collected through INMARSAT to countries in the areas of the geographical origins of those reports, through the GTS and by other means such as MDD, as appropriate;
(4) To Members requiring ships' reports on the GTS to ensure that their telecommunications centres actually request receipt of all relevant GTS bulletins containing such reports;

REQUESTS THE SECRETARY-GENERAL:

(1) In consultation with the Secretary IOC, to investigate possibilities for one or more Members to supply and maintain software for the compilation, encoding in BATHY, TESAC or TRACKOB codes, storage and transmission through the INMARSAT-C facility of ships' oceanographic reports;
(2) In consultation with the Secretary of IOC, the presidents of CMM and CBS, the chairman of IGOSS and the chairmen of the relevant working groups of CMM, CBS and IGOSS, to continue discussions with INMARSAT and others on the expanded use of the INMARSAT system for the collection of ships' meteorological and oceanographic reports, including in particular the possible use of the INMARSAT-C signalling channel for transmitting such reports in binary format and, if appropriate, to establish a small WMO/INMARSAT liaison group for this purpose;
(3) To keep Members closely informed of any significant relevant new developments in this regard.

Recommendation 10 (CMM-XI) — Agenda 21 and implementation of GOOS and GCOS

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 9 (Cg-XI) — Global Climate Observing System,
(2) Resolution 21 (Cg-XI) — WMO's involvement in the development of a Global Ocean Observing System,
(3) UNCED Agenda 21, in particular Chapter 9 (Atmosphere) and Chapter 17 (Oceans, especially Section E — addressing critical uncertainties),

CONSIDERING:

(1) That existing marine meteorological and oceanogaphic observing system components, including the VOS, ocean data buoys, satellites and meteorological/oceanographic vessels already contribute data which are being used in analyses of global climate and climate change, and that these components will be essential to the future GOOS and GCOS,
(2) That the implementation of GOOS and GCOS will require the allocation of substantial resources by Governments to maintain and expand systematic long-term ocean monitoring,
(3) That the full implementation of GOOS and GCOS will also provide valuable new ocean data in support of the WWW, of marine meteorological services and of global climate studies,
(4) That the adoption by Governments of Agenda 21 implies a commitment on their part to implement the activities specifically mentioned therein, including GOOS and GCOS,

INSTRUCTS the Working Group on Marine Observing Systems, in coordination with the Data Buoy Cooperation Panel and with the appropriate subsidiary body of IGOSS, to prepare specific proposals to enhance marine observing systems to fulfil the requirements of GOOS and GCOS, once these requirements are established;

RECOMMENDS:

(1) To Members to make specific and clear reference to the activities agreed in Agenda 21, Chapter 17 (Oceans), when preparing submissions to their Governments for the additional resources required to implement GOOS and GCOS;
(2) To Members to maintain and expand recruitment of VOS and deployment of ocean data buoys;
(3) To Members operating marine meteorological/oceanographic vessels to maintain and, if possible, expand the use of such vessels, to provide comprehensive and reliable *in situ* data for global climate studies and the provision of marine services;
(4) To the operators of ocean observation satellites to make their data generally available for use by both meteorologial and oceanographic services, and also by the ocean and climate research community;

REQUESTS THE SECRETARY-GENERAL,

(1) To assist Members, as appropriate, in preparing resource submissions to Governments for implementation of relevant parts of GOOS and GCOS;
(2) To further assist Members in the preparation of project proposals relating to enhanced, long-term ocean monitoring, for submission to funding bodies such as the Global Environment Fund and the UNDP;
(3) To provide additional assistance, as required, and within the available budgetary resources, for the implementation of this recommendation.

Recommendation 12 (CMM-XI) — Use of Beaufort equivalent scale of wind force

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) The *Manual on Marine Meteorological Services* (WMO-No.558), Volume I, Part I, Appendix I.3 — Beaufort scale of wind force,

(2) The final report of the sixth session of the CMM Sub-group on Marine Climatology,

NOTING FURTHER various papers published in the scientific literature in recent years which analyse the consequences of the use of various Beaufort equivalent scales for determining sea surface wind speeds for scientific studies of marine climate and climate change,

RECALLING the extensive discussions on this subject which had taken place at previous sessions of the Commission,

BEARING IN MIND the likely difficulties for global climate studies resulting from variations in observing practices for surface wind speeds from ships as well as from the use of different Beaufort equivalent scales for deriving such wind speeds,

CONSIDERING, however,

(1) The need to maintain continuity and consistency in data archives of marine surface winds and to avoid complications for marine observers,

(2) That the existing Beaufort equivalent scale is sufficiently accurate for operational observation purposes,

(3) That no international agreement yet exists on an appropriate Beaufort equivalent scale for scientific study applications,

AGREES that the existing Beaufort equivalent scale, as given in the *Manual on Marine Meteorological Services*, should be retained for operational observation and data archival purposes;

RECOMMENDS:

(1) To Members to standardize shipboard observing practices for marine surface winds, according to guidelines given in the *Manual on Marine Meteorological Services* and the *Guide to Marine Meteorological Services*;

(2) To those involved in climate research to take into account the difficulties and differences noted with the official WMO Beaufort equivalent scale and also with other "scientific Beaufort equivalent scales", as well as various environmental ship factors, when using archived ship wind data in studies of marine climate and climate change;

REQUESTS:

(1) The Secretary-General to bring this recommendation to the attention of all concerned;

(2) The Sub-group on Marine Climatology to continue to review the development and application of Beaufort equivalent scales for climate study purposes, to report any significant developments to the Commission and to Members, as appropriate, and also to examine the possibility of developing an extended Beaufort equivalent scale for marine forecast presentation purposes.

Recommendation 4 (CMM-XII) — Wave forecast verification scheme

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 4 (CMM-XI) — WMO wave programme 1993–1997,

(2) The report to CMM-XII by the chairman of the Subgroup on Wave Modelling and Forecasting,

RECOGNIZING that formal verification systems for operational numerical weather prediction models have led directly to general and specific improvements in these models,

NOTING with interest the informal wind wave forecast verification scheme already adopted by a number of centres operating operational global or basin-scale models,

CONSIDERING:

(1) The potential improvements which might be expected in operational wind wave models through a more generalized and formal approach to wave model forecast verification,

(2) That for a verification scheme to be most effective, all National Meteorological Services operating global or basin-scale models should, if possible, participate,

RECOMMENDS:

(1) That the wind wave model forecast verification scheme outlined in the annex to this recommendation should be further developed and formally implemented;

(2) That all Members operating global or basin-scale wave forecast models should be urged to participate;

REQUESTS the Subgroup on Wave Modelling and Forecasting:

(1) To develop further details of the scheme, for eventual consideration and adoption, on a trial basis, by interested Members;

(2) To review the implementation and operation of the trial scheme and to report on progress to CMM-XIII;

REQUESTS the Secretary-General to provide assistance to Members in the implementation of the scheme, as appropriate, and within the available budgetary resources.

Annex to Recommendation 4 (CMM-XII)

Wind wave forecast verification scheme

1. A scheme for exchanging verification statistics for operational wave models

Reliable wave observations are available only from around 40 to 50 moored buoys, and there are only a few parameters for which observations are available. A subset of the available moored buoys has been used, choosing those buoys in deep water, away from coasts, and ensuring that all possible regions are adequately represented.

Model values are extracted at six-hourly intervals both at t+00 (analysis) and for forecast periods of t+24, 48, 72, 96 and 120 hours (if available). Each month the

data files are transmitted to the anonymous ftp server at the UKMO, where a file is produced containing the observations and model values from all centres. These files are placed on the UKMO anonymous ftp server for retrieval by participants.

Tables of statistics based on this data are calculated at ECMWF, and the summary files are transmitted to the UKMO ftp server for retrieval by participants. Thus, the workload involved in running the exchange is shared. All the files of data, statistics and any postscript files for the current month are freely available via anonymous ftp from the UKMO server.

The exchange has grown to now compare data from five participating centres, at 36 moored buoys, and for six separate forecast periods. Early results showed the impact at t+00 of assimilating ERS-1 altimeter data: those models that assimilated ERS-1 data had a wave height bias of some –0.2 m, and showed a rapid increase in model wave height during the first 24 hours of the forecast, compared to those centres not assimilating. Further, the immediate benefit of the switch early in 1996 to using ERS-2 data was readily seen. The t+00 bias of –0.2 m was removed, and the spin up of wave height was reduced.

The data exchange, by comparing both instantaneous observations and six-hourly averaged observations, revealed some ongoing problems with wave reports from the UKMO buoys west of Ireland. This was communicated to those responsible for maintaining the instruments, and a program to replace the communication units, already in hand, was seen to cure the problems.

Examination of time-series of model and observed wave heights, particularly in November 1995, showed a systematic failure of the WAM model at ECMWF to reach the highest wave heights observed during extreme storms in the west Atlantic. The WAM model run at FNMOC was closer to the observations. This illustrates that WAM model results may depend on details of the implementation (model grid and spectral resolution), and the wind data used.

2. Wider benefits from adopting an international verification of wave models

Many National Meteorological Services engaged in wave forecasting may benefit from this activity, in the same way in which many countries benefit from the exchange of internationally-accepted weather forecast verification scores. Until now, model validation has been carried out with special case studies, rather than using routinely available forecast model results.

Widespread access to information on wave model performance may also stimulate those Meteorological or Hydrographic centres that at present do not place their buoy observations on the GTS to consider doing so, and so allow a verification of wave models in the areas of local interest to these centres.

Several centres already make use of the third generation WAM model, and the UKMO is planning to implement a version of WAM in the near future. Yet already the exchange has revealed differences between different operational implementations of WAM — using winds from different models, with differing grid and spectral resolutions, assimilating altimeter data, or not. Even with most operational wave models based on WAM, a formally-adopted verification exchange will lead to improvements in wave model forecast systems.

A better understanding of the quality of surface winds from NWP models may lead to improvements in the modelling of the marine boundary layer. This may, through improved modelling of surface fluxes of heat, moisture and momentum, lead to improved NWP forecasts of surface winds.

Improvements in global wave modelling will also lead to improvements in regional wave modelling, through a better specification of boundary forcing and incoming swell, and improvements in model formulation. Many smaller, regional Meteorological Centres, although not running a global wave model, may still wish to run a regional wave model to provide local forecasts of sea state. Making available information on global wave model verification will assist with this.

Recommendation 6 (CMM-XII) — Data buoys in support of meteorological and oceanographic operations and research

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 9 (EC-XLV) — Data Buoy Cooperation Panel,

(2) Recommendation 6 (CMM-XI) — Drifting buoys in support of meteorological and oceanographic operations and research,

(3) The *Fourth WMO Long-term Plan*, Part II, Volume 1 (WMO/TD-No. 700) — The WWW Programme — and Volume 4 (WMO/TD-No. 703) — The Applications of Meteorology Programme,

(4) The final report of the Ocean Observing System Development Panel — *An Ocean Observing System for Climate*,

(5) Annual reports of the DBCP for 1995 and 1996,

(6) DBCP Technical Document No. 4 (1995) — *WOCE Surface Velocity Programme Barometer Drifter Construction Manual*,

NOTING with appreciation the efforts of the DBCP, in conjunction with GCOS and global research programmes, to expand cooperative buoy deployments worldwide through the creation of new regional action groups such as those in the South Atlantic and Indian Oceans,

RECOGNIZING nevertheless:

(1) That not all drifting buoys carry sensors for atmospheric pressure and/or sea-surface temperature,

(2) That a large number of drifting buoy deployments now taking place or planned over the next few years are funded through research programmes and that these deployments may cease with the termination of the specific research programmes,

CONSIDERING:
(1) That drifting buoys represent a very cost-effective means for acquiring surface meteorological and oceanographic data from remote ocean areas,
(2) The stated requirements for operational buoy data in support of the WWW, marine meteorological services and global climate studies,

CONSIDERING further that the success of the DBCP was critically dependent on the activities of, and the coordination provided by, its technical coordinator, and that increasing difficulties for Members in maintaining voluntary financial contributions were threatening the continuance of the position,

RECOMMENDS:
(1) That agencies, institutions, and organizations involved in the acquisition and deployment of drifting buoys be urged to equip these buoys with at least atmospheric pressure, SST and, if possible, air temperature sensors so as to enhance their potential value to a wide variety of WMO programmes, in particular making use of the low-cost SVP-B drifter whenever practicable;
(2) That the international research community also be urged to continue to make the data from their drifting buoys available for real-time distribution over the GTS and for later permanent archival;
(3) That Members and the Data Buoy Cooperation Panel continue their efforts to ensure funding of drifting buoy deployments on a long-term, operational basis following the termination of the specific research programmes;
(4) That as many additional Members as possible contribute to the DBCP Trust Fund, to reduce the burden on existing contributors and ensure the maintenance of the essential technical coordinator position, which benefitted all Members of WMO;
(5) That the DBCP and the Executive Council consider the possibilities for new and innovative ways of funding and maintaining the technical coordinator position;

REQUESTS the Secretary-General and the Data Buoy Cooperation Panel to bring this recommendation to the attention of Members and others concerned and to assist whenever possible in the implementation of the recommendation.

Recommendation 11 (CMM-XII) — United Nations *Atlas of the Oceans*

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:
(1) Resolution 17 (Cg-XII) — WMO's involvement in the International Year of the Ocean 1998,
(2) The *Abridged Final Report with Resolutions of the Twelfth World Meteorological Congress* (WMO-No. 827), paragraph 3.2.1.5 concerning the document *The Climate of the Twentieth Century*,
(3) The agreement by the fifth session of the ACC Subcommittee on Oceans and Coastal Areas (Washington, D.C., January 1997) to proceed with the preparation of a joint United Nations *Atlas of the Oceans*, to be presented in prototype form during Expo 98, Lisbon,

CONSIDERING:
(1) That the proposed *Atlas*, to be developed in electronic format accessible via both CD-ROM and Internet, is intended to provide a cross-sectoral view of the world's oceans in the form of strategic analyses based on data and products developed in the context of projects and programmes of various United Nations ocean-related agencies,
(2) That marine meteorological and physical oceanographic climate-related products and analyses are potentially important contributions to the *Atlas*, both in their own right and as components of cross-sectoral ocean analyses (e.g. *El Niño* and fish stocks),

RECOGNIZING:
(1) That a number of National Meteorological Services regularly produce a variety of climate-related marine meteorological and physical oceanographic products and analyses relevant to the future *Atlas of the Oceans*,
(2) That these products and analyses are in many cases already published in a variety of media,
(3) That some of these products may also eventually form part of the WMO *Climate of the Twentieth Century* project,
(4) That all products and analyses eventually forming part of the United Nations *Atlas of the Oceans* will remain the copyright property of the producing centres/agencies,
(5) That the *Atlas* will be developed and implemented primarily through externally-generated funding,

BEARING in mind the magnitude of the task involved and the effort which will be required by National Meteorological Services to present products in the required format in the time available,

RECOMMENDS:
(1) That WMO should participate in, and contribute to, the preparation and publication of the United Nations *Atlas of the Oceans*, within the available budgetary resources;
(2) That National Meteorological Services should make available, as far as resources permit and in a mutually acceptable format, various marine meteorological and physical oceanographic climate-related products proposed by the editorial committee for inclusion in the *Atlas*;

REQUESTS the president of the Commission and the Advisory Working Group to assist the Secretariat in identifying and accessing appropriate potential products for inclusion in the *Atlas*.

Recommendation 1 (JWC-IGOSS-IV) — Maintenance and implementation of ship-of-opportunity programmes

THE JOINT IOC/WMO WORKING COMMITTEE FOR IGOSS,

NOTING:

(1) The report of the Joint IOC/WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes (Seattle, September 1985) regarding the evaluation of existing and proposed XBT ship-of-opportunity programmes in support of the World Climate Research Programme (with particular reference to TOGA), fisheries' operations and research and marine transportation and safety,

(2) The recent IOC/WMO missions to, and surveys of, regional bodies (WESTPAC countries, West African countries, South-eastern Pacific countries and IGOSS/TEMA coordinator surveys) that documented needs and opportunities for ship-of-opportunity programmes,

RECOGNIZING the cost-effectiveness of gathering sub-surface oceanographic data via ship-of-opportunity programmes over wide ocean areas,

CONSIDERING that the timely flow of sub-surface data to analysis centres is vital for operational purposes and for seasonal and interannual climate prediction purposes,

RECOMMENDS that Member States be urged to:

(1) Maintain or enhance existing ship-of-opportunity programmes and ensure that oceanographic data so collected are reported through IGOSS,

(2) Implement new ship-of-opportunity programmes in data deficient areas through national, bilateral or multilateral efforts designed to meet client needs,

REQUESTS the Secretariats to assist Member States in these activities.

Recommendation 1 (JWC-IGOSS-V) — Data monitoring

THE JOINT IOC/WMO WORKING COMMITTEE FOR IGOSS,

NOTING the importance to the quality and quantity of data exchange within IGOSS to national efforts in detecting and correcting data transmission problems within the IGOSS Telecommunication Arrangements,

REQUESTS: (i) All Member States to submit to the Secretariats, if possible on monthly basis, accurate statistics on messages submitted to and received from the Global Telecommunication System in a timely fashion, in accordance with the already approved format (*Guide to Operational Procedures for the Collection and Exchange of IGOSS Data*, Annex VIII); (ii) that reporting Member States list the bulletin headers used to submit their data and the data types (BATHY, TESAC, TRACKOB, DRIBU) submitted under these headers;

RECOMMENDS: (i) that the Secretariats provide feedback to all Member States on these statistics in order to help them to detect possible data transmission problems; (ii) that the statistics and the feedback be published in the IGOSS Products Bulletin;

FURTHER REQUESTS Member States who wish to do so to produce, on a regular basis but at least once every three months, dot plots of messages received to be distributed to all parties concerned as an aid in determining where data losses might be occurring in the IGOSS data transmission system.

Recommendation 2 (JWC-IGOSS-V) — Real-time distribution and archiving of oceanographic data

THE JOINT IOC/WMO WORKING COMMITTEE FOR IGOSS,

NOTING: (i) the requirements of IGOSS for real-time oceanographic data in support of both operational and research users, (ii) the value of long-term series of oceanograhic data for climatological studies, (iii) Recommendation 2 (DBCP-III) — Real-time Distribution and Archiving of Oceanographic Data from Drifting Buoys,

CONSIDERING: (i) that many oceanographers make both surface and sub-surface measurements of oceanographic variables of great potential value to IGOSS, (ii) that many of these measurements are not presently being made available in real-time over the GTS,

RECOMMENDS: (i) that oceanographers and others involved in the collection of both surface and sub-surface oceanographic data make every effort to ensure the distribution of these data in real time over the GTS, (ii) that oceanographic data be also made available to the RNODCs for permanent global archival,

REQUESTS the Secretariats, the IGOSS Operational Coordinator, the Chairman of the Joint Working Committee and Member States, in liaison with the Drifting Buoy Cooperation Panel, to bring this recommendation to the attention of those concerned.

RECOMMENDATIONS ADOPTED BY THE SESSION

RECOMMENDATION 1 (JCOMM-I)

OCEAN DATA ACQUISITION SYSTEM (ODAS) METADATA FORMAT

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The *Abridged Final Report with Resolutions and Recommendations of the Twelfth Session of the Commission for Marine Meteorology* (WMO-No. 860), general summary paragraph 7.3.9,

(2) The final report of the JCOMM Subgroup on Marine Climatology, eighth session (Asheville, April 2000), paragraphs 6.1.1–6.1.3 and annex VIII,

(3) The summary report of the DBCP-XVI (Victoria, October 2000), paragraphs 95–99,

CONSIDERING:

(1) That a comprehensive ODAS metadatabase would allow a full and accurate interpretation of the observational data from ODAS which are available in climatological archives,

(2) That observational data and associated metadata from ODAS are of importance to global climate studies as well as for a range of marine climate applications,

RECOMMENDS that the format given in the annex to this recommendation be used as the global format for the assembly, exchange and archival of metadata from all types of ODAS, including, in particular, drifting and moored buoys and fixed platforms;

INVITES:

(1) One or more Members/Member States to agree to host an ODAS metadatabase;

(2) Members/Member States operating ODAS to arrange for the assembly of the metadata from these platforms in the agreed format and for their eventual submission to the ODAS metadata archival centre(s);

REQUESTS the Secretary-General of WMO and the Executive Secretary IOC, with the assistance of the co-presidents of JCOMM and the chairperson of the DBCP, to consult with Members/Member States, with a view to establishing the metadata archival centre(s), and to otherwise assist Members/Member States, as necessary, in the submission of metadata to these centre(s).

ANNEX TO RECOMMENDATION 1 (JCOMM-I)

OCEAN DATA ACQUISITION SYSTEM (ODAS) INGEST FORMAT

The two basic metadata record types (header and data) are listed. Within the data record type, there are different subsidiary record types defined for the different sensor types that are presently defined (the data record list could be expanded in the future). The descriptions of the fields that make up each record type are listed in the table.

1. **Header record** (HR is the identifier for the metadata header record)
   HR; ts; WMOn; stn; Ain; ind; oed; cnty; ragy; Idum; DA; Lat; Lon; WC; lngth; brth; diam; hult; huln; mtyp; cmsy; Stt; foo; dfmt; wdpth; plt; DI; WebA; footnote # 1; footnote # 2; footnote # 3; footnote # 4; footnote # 5
2. **Data records** (DR is the identifier for the sensor information record, thus designated data record) the first six elements will link the data record to the header record. A data record will only exist when there is an actual sensor on the platform and it can be repeated for every sensor of a given type.
   "Sno" in the eighth element represents the sequence number of sensors located on the platform, e.g. if two anemometer sensors were on the platform there would be two data records for anemometers indicated in elements 7 and 8 as AN 1 and AN 2.
   The "ind" field is a critical part in linking records in the case where a platform was moved or totally re-equipped or redesigned. This will allow the correct data records to be linked to the proper header record especially in cases where the same identifier was reissued at a later date.
   AN metadata record: **Anemometer** sensor (AN in 7th element).
   DR; ts; WMOn; stn; AIn; ind; AN; Sno; anmI; aMS; anmL; anDB; anDC; hwl; ouAN; sfWD; sfWS; apWD; apWS; amWS; cmpT; apWG; amWG; amScd; amID; amSD; footnote # 1
   AT metadata record: **Air temperature** sensor (AT in 7th element).

DR; ts; WMOn; stn; AIn; ind; AT; Sno; ats; atsMS; atsL; atsDB; atsC; atswl; ouAT; sfAT; apAT; atScd; atID; atSD; footnote # 1; footnote # 2

WT metadata record: **Water temperature** sensor (WT in 7th element).

DR; ts; WMOn; stn; AIn; ind; WT; Sno; wts; wtsMS; wtsL; wtsDB; wtsC; dws; ouWT; sfWT; apWT; wtScd; wtID; wtSD; footnote # 1

SA metadata record: **Salinity** sensor (SA in 7th element).

DR; ts; WMOn; stn; AIn; ind; SA; Sno; Sstp, Ssm; SsL; SsDB; SsC; dss; ouSs; sfSs; apSs; mSs; SsScd; SsID; SsSD; footnote # 1

BP metadata record: **Barometric pressure** (BP in 7th element).

DR; ts; WMOn; stn; AIn; ind; BP; Sno; bps; bpsMS; bpsL; bpsDB; bpsC; bpswl; ouBP; sfBP; apBP; bpScd; bpsID; bpsSD

RH metadata record: **Relative humidity** (wet bulb/dew point) sensor (RH in 7th element).

DR; ts; WMOn; stn; AIn; ind; RH; Sno; hs; hsMS; hsL; hsDB; hsC; hswl; ouHS; sfHS; apHS; hsScd; hsID; hsSD

PG metadata record: **Precipitation gauge** (PG in 7th element).

DR; ts; WMOn; stn; AIn; ind; PG; Sno; pg; pgMS; pgL; pgDB; pgC; pgwl; pupg; sfPG; apPG; pgScd; pgID; pgSD

RD metadata record: **Radiation** sensor (RD in 7th element).

DR; ts; WMOn; stn; AIn; ind; RD; Sno; srs; rMS; rsL; rsDB; rsC; srwl; ours; sfSR; apSR; srScd; rsID; rsSD

CR metadata record: **Ocean current** sensor (CR in 7th element).

DR; ts; WMOn; stn; AIn; ind; CR; Sno; OC; Tsmoc; dmOC; ouOC; sfOC; apOC; ocScd; ocID; ocSD

WS metadata record: **Wave spectra** (WS in 7th element).

DR; ts; WMOn; stn; AIn; ind; WS; Sno; wasp; Digf; Nblks; Npts; spAT; sfWAS, apWAS

HV metadata record: **Horizontal visibility** (HV in 7th element).

DR; ts; WMOn; stn; AIn; ind; HV; Sno; hvm; hvit; hvl; hvDB; hvC; hvwl; hvou; hvsf; hvap; hvScd; hvID; hvSD

Table
ODAS metadatabase contents

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
HEADER RECORD (HR)				
HR	1	ts	MB DB ID FP IS AL CM PF OT	Type of station Moored buoy Drifting buoy Ice drifter Fixed platform (oil rig, etc.) Island station Automatic light station Coastal marine automated station Profiling floats (e.g. ARGO — a global array of profiling floats) Other (specify in footnote # 1 Header record)
	2	WMOn		WMO number — 5-digit identifier
	3	stn		Unique call sign if available; otherwise, station name (C-MAN, platforms, etc.)
	4	AIn		Additional identifier number; define in footnote # 2 (e.g. ARGOS = up to 7 digits, GOES no., others)
	5	ind		Period of validity/beginning of historical record (initiation date — year, month, day, e.g. 19950321) date of mooring, launching, or platform instrumentation (date the platform began collecting weather observations under its current ID and location). If the platform is moved or assigned a new ID then a new period of validity should be initiated
	6	oed		Operational end date of platform operations (year, month, day e.g. 20000127). This item is associated with the entry above which shows the beginning date and this item the ending date when a platform closed operations. If for example a moored buoy was placed in the Great Lakes each spring and withdrawn each winter the beginning date would not change unless the identifier, ownership, or location changed at some point. When one of these change, a new beginning date should be entered "ind" above and an operational end date entered in this field
	7	cnty	see list	Country of ownership — International Organization for Standardization (ISO) country code (Alpha-2; two character alpha code)
	8	ragy		Responsible agency/organization within a country responsible for the platform's operations, launch, and metadata [e.g. in the United States it could be the National Ocean Service (NOS) NOAA, National Data Buoy Center (NDBC) NOAA, Woods Hole Institute, etc.] List the full name of the organization or agency responsible. There should be a link between the responsible agency/organization and the Web address listed in item 114
	9	ldmu		Last date metadata updated (year, month, day e.g. 20000527 representing 27 May 2000)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
HEADER RECORD (HR) (*continued*)				
HR	10	DA		Degree of automation
			1	Fully automated
			2	Always supplemented with manual input
			3	Occasionally supplemented with manual input
			4	Fully manual (no automation)
			5	Unknown
	11	Lat		Latitude — degrees, up to three decimal places if available (e.g. 50.985 N/S)
	12	Lon		Longitude — degrees, up to three decimal places if available (e.g. 124.976 E/W)
	13	WC		Watch circle — nearest whole metre (e.g. 346.5 = 347 m). The maximum distance a moored buoy can be located from its central position related to the length and type of mooring. Outside the watch circle and the moored buoy is likely adrift
	14	lngth		Length — the length of the platform (if rectangular or boat shape hull). See code “diam” below if the platform is a discus. Metres to tenths (e.g. 26.9 m)
	15	Brth		Breath — the breath (width) of the platform (if rectangular or boat shaped hull). Metres to tenths (e.g. 12.6 m)
	16	Diam		Diameter — platform dimension for discus type hulls. Diameter in metres to tenths (e.g. 6.0 m)
	17	Hult		Hull type
			DS	Discus (cylinders)
			BS	Boat shaped hull
			RS	Rectangular shape
			SP	Spars
			OD	ODAS 30 series
			NM	NOMAD
			TR	Torus
			CN	Conic
			OR	Omnidirectional wave-rider
			DR	Directional wave-rider
			OT	Other (specify in footnote # 3 Header record)
	18	Huln		Hull or platform number — enter as assigned (a combination of numeric and alpha characters if required)
	19	Mtyp		Mooring type — mooring type if a moored buoy or drouge type if drifting buoy
			AC	All chain (shallow depths generally up to 90 m)
			ST	Semitaut (intermediated depths generally 60 to 600 m — generally nylon cable)
			FC	Float inverse catenary (deep ocean generally 600 to 6 000 m — generally nylon with glass floats)
			PC	Poly-nylon inverse catenary (deep ocean generally 1 200 to 6 000 m)
				Drogue type
			HS	Holey sock drogue
			TS	Tristar
			WS	Window shade
			PA	Parachute
			NL	Non-Lagrangian sea anchor
				Use for either mooring or drogue as needed
			OT	Other (specify in footnote # 4 Header record)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
HEADER RECORD (HR) (*continued*)				
HR	20	Cmsy		Satellite data-collection system — system used to transmit the observations
			GO	GOES DCP
			AR	ARGOS PTT
			GA	GOES primary ARGOS backup
			RF	RF
			OT	Other (specify in footnote # 5 Header record)
	21	Stt		Satellite transmission time — time slot assigned for observation transmission. Hours and minutes UTC (e.g. 1230) or for example, on the hour, on the half-hour, two orbits per day, etc.
	22	Foo		Frequency of observations — hours and minutes (e.g. every hour = 1.0, every 6 hours = 6.0, or every half hour 0.5, etc., I = irregular)
	23	dfmt		Data format — data format (*Manual on Codes* (WMO-No. 306)) the observations was transmitted or digitized (i.e. observational form). BUOY — FM 18-X SHIP — FM 13-X TESAC — FM 64-IX WAVEOB — FM 65-IX BUFR — FM 94-XI Other WMO codes added as needed NOTE: Use actual WMO code designator as the abbreviation (e.g. FM 18-X)
	24	wdpth		Water depth (nearest whole metre)
	25	plt		Payload type (e.g. DACT, VEEP, GSBP, ZENO, ODAS33, etc.) Details should be provided regarding each type of payload (payload description)
	26	DI		Digital image — a photograph or schematic of the platform and equipment
			AV	Available in digital file
			NA	Not available
	27	WebA		Web address (URL) where additional information can be obtained
ANEMOMETER (AN)				
DR	1	anmI		Anemometer instrument type
			P	Propeller/vane
			TC	Three cup
			FC	Four cup
			S	Sonic
			WT	WOTAN (wind observation through ambient noise)
			OT	Other (define in footnote)
	2	aMS		Anemometer — model (manufacturer/series no.)
	3	anmL		Anemometer — location
			FM	Foremast
			AM	Aftmast
			CM	Centremast (mainmast)
			RY	Right yardarm
			LY	Left yardarm
			OT	Other (define in footnote)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
ANEMOMETER (AN) (*continued*)				
DR	4	anDB		Anemometer — distance from the bow or front of platform (metres to tenths)
	5	anDC		Anemometer — distance from centre line or from centre of discus (metres to tenths)
	6	hwl		Anemometer — height above water line (metres to tenths). Value can be negative for WOTAN
	7	ouAN		Anemometer — operational range and units of measurement (e.g. 0 to 60 m s^{-1}; 000 to 360°)
	8	sfWD		Sampling frequency (Hz) — wind direction (e.g. 1.28 Hz)
	9	sfWS		Sampling frequency (Hz) — wind speed (e.g. 1.28 Hz)
	10	apWD		Averaging period (minutes to tenths) — wind direction (e.g. 8.0 minutes)
	11	apWS		Averaging period (minutes to tenths) — wind speed (e.g. 8.0 minutes)
	12	amWS		Averaging method — wind speed
			S	Scalar
			V	Vector
	13	cmpT		Compass type/model no. — anemometer
	14	apWG		Averaging period (seconds) — wind gust (e.g. 5 seconds)
	15	amWG		Averaging method — wind gust
			S	Scalar
			V	Vector
	16	amScd		Calibration date — anemometer sensor no. Date sensor was last calibrated (year, month, day, e.g. 20000723)
	17	amID		Anemometer sensor installation date (year, month, day, e.g. 19950228). If the direction sensor and speed sensor are separate instruments then use footnote # 1 in the anemometer data record to enter the dates for speed sensor and this position for direction sensor
	18	amSD		Anemometer out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known these dates should be entered anytime either the direction, speed, or both is unavailable due to equipment outage (non-reporting or invalid reports)
AIR TEMPERATURE (AT)				
DR	1	ats		Air temperature sensor — instrument type
			ER	Electrical resistance thermometer
			M	Mercury-in-glass thermometer
			MS	Screen shelter — mercury thermometer
			A	Alcohol-in-glass thermometer
			AS	Screen shelter — alcohol thermometer
			OT	Other (specify in footnote # 1 in the air temperature data record)
	2	atsMS		Air temperature sensor — model (manufacturer/series no.)
	3	atsL		Air temperature sensor — location
			FM	Foremast
			AM	Aftmast
			CM	Centremast (mainmast)
			RY	Right yardarm
			LY	Left yardarm
			OT	Other (specify in footnote # 2 in the air temperature data record)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
AIR TEMPERATURE (AT) (*continued*)				
DR	4	atsDB		Air temperature sensor — distance (metres to tenths) from bow or front of platform NOTE: Leave this field blank if platform is a discus
	5	atsC		Air temperature sensor — distance (metres to tenths) from centre line or centre of discus
	6	atswl		Air temperature sensor — height (metres to tenths) above water line
	7	ouAT		Air temperature sensor — operational range and units of measurement (e.g. — 40°C to + 50°C)
	8	sfAT		Sampling frequency (Hz) — air temperature sensor (e.g. 1.28 Hz)
	9	apAT		Averaging period (minutes to tenths) — air temperature sensor (e.g. 8.0 minutes)
	10	atScd		Calibration date — air temperature sensor no. Date sensor was last calibrated (year, month, day, e.g. 20000723)
	11	atID		Air temperature sensor installation date (year, month, day, e.g. 19950228)
	12	atSD		Air temperature sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known these dates should be entered anytime the air temperature is unavailable due to equipment outage (non-reporting or invalid reports)
WATER TEMPERATURE (WT)				
DR	1	wts		Water temperature sensor — instrument type
			HC	Hull contact sensor
			HT	"Through hull" sensor
			RT	Radiation thermometer
			ER	Electrical resistance thermometer
			TT	Trailing thermistor
			BU	Bucket thermometer
			CTD	CTD (conductivity-temperature-depth)
			STD	STD (salinity-temperature-depth)
			RM	Refractometer
			XC	XCTD (expendable CTD probe)
			NS	Nansen cast
			AL	ALACE (autonomus Lagrangian circulation explorer)
			XBT	Expendable bathythermograph
			OT	Other (specify in footnote # 1 in the water temperature data record)
	2	wtsMS		Water (sea) temperature sensor — model (manufacturer/series no.)
	3	wtsL		Water temperature sensor — location (e.g. port bow, bottom of discus, etc.)
	4	wtsDB		Water temperature sensor — distance (metres to tenths) from the bow or front of platform NOTE: Left blank for discus hulls and subsurface temperatures
	5	wtsC		Water temperature sensor — distance (metres to tenths) from centre line or centre of discus
	6	dws		Depth of water temperature sensor; tenths of metres (e.g. 10.3 m) below the water line
	7	ouWT		Operational range and units of measurement — water temperature sensor (e.g. range — 4°C to + 40°C)
	8	sfWT		Sample frequency (Hz) — water temperature sensor (e.g. 1.28 Hz)
	9	apWT		Averaging period (minutes to tenths) — water temperature sensor (e.g. 8.0 minutes)
	10	wtScd		Calibration date — water temperature sensor no. Date sensor was last calibrated (year, month, day, e.g. 20000723)
	11	wtID		Water temperature sensor installation date (year, month, day, e.g. 19950228)
	12	wtSD		Water temperature sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known these dates should be entered anytime the water temperature is unavailable due to equipment outage (non-reporting or invalid reports)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
SALINITY (SA)				
DR	1	Sstp		Salinity – sensor type
			CTD	CTD (conductivity-temperature-depth)
			STD	STD (salinity-temperature-depth)
			RM	Refractometer
			XC	XCTD (expendable CTD probe)
			NS	Nansen cast
			AL	ALACE (autonomous Lagrangian circulation explorer)
			OT	Other (specify in footnote # 1 in the salinity data record)
	2	Ssm		Salinity sensor (model/manufacturer/series no.)
	3	SsL		Salinity sensor no. — location [NOTE: To be used only for those sensors attached to a platform]
	4	SsDB		Salinity sensor no. — distance from bow or front of platform NOTE: To be used only when sensor is attached to a platform (same as location above)
	5	SsC		Salinity sensor no. — distance from centre line or centre of discus
	6	dss		Depth of salinity sensor no. — metres to tenths (e.g. 10.7 m) of salinity sensor below the water line (surface of the water)
	7	ouSs		Salinity sensor — operational range and units of measurement (e.g. 25 to 45 parts per thousand. Salinity is calculated based on the measurement of chlorinity)
	8	sfSs		Sample frequency — available only for automated digital sensors
	9	apSs		Averaging period — available only for automated digital sensors
	10	mSs		Method used to compute the salinity (e.g. chlorinity, electrical conductivity, refractive index, etc.)
	11	SsScd		Calibration date — salinity sensor no. Date the sensor was last calibrated (year, month, day, e.g. 20000207)
	12	SsID		Salinity sensor installation date (year, month, day, e.g. 19950228)
	13	SsSD		Salinity sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known these dates should be entered anytime the salinity is unavailable due to equipment outage (non-reporting or invalid reports)
BAROMETRIC PRESSURE (BP)				
DR	1	bps		Barometric pressure sensor — instrument type
	2	bpsMS		Barometric pressure sensor — model (manufacturer/series no.)
	3	bpsL		Barometric pressure sensor — location (e.g. centremast)
	4	bpsDB		Barometric pressure sensor — distance (metres to tenths) from the bow or front of platform NOTE: Leave this field blank if platform is a discus
	5	bpsC		Barometric pressure sensor — distance (metres to tenths) from centre line or centre of discus
	6	bpswl		Barometric pressure sensor — height (metres to tenths) above water line
	7	ouBP		Barometric pressure sensor — operational range and units of measurement (e.g. 900–1 100 hPa)
	8	sfBP		Sampling frequency (Hz) — barometric pressure sensor (e.g. 1.28 Hz)
	9	apBP		Averaging period (minutes to tenths) — barometric pressure sensor (e.g. 8.0 minutes)
	10	bpScd		Calibration date — barometric pressure sensor no. Latest date of calibration (year, month, day, e.g. 20000207)
	11	bpsID		Barometric pressure sensor installation date (year, month, day, e.g. 19950228)
	12	bpsSD		Barometric pressure sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known these dates should be entered anytime the barometric pressure is unavailable due to equipment outage (non-reporting or invalid reports)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
RELATIVE HUMIDITY (RH)				
DR	1	hs		Relative humidity (wet bulb/dew point) sensor — instrument type
	2	hsMS		Relative humidity (wet bulb/dew point) sensor — model (manufacturer/series no.)
	3	hsL		Relative humidity (wet bulb/dew point) sensor — location (left yardarm mast)
	4	hsDB		Relative humidity sensor — distance (metres to tenths) from the bow or front of platform NOTE: Leave this field blank if platform is a discus
	5	hsC		Relative humidity sensor — distance (metres to tenths) from centre line or centre of discus
	6	hswl		Relative humidity sensor — height (metres to tenths) above water line
	7	ouhs		Relative humidity (wet bulb/dew point) sensor — operational range and units of measurement (e.g. range 0–100 per cent)
	8	sfhs		Sampling frequency (Hz) — relative humidity (wet bulb/dew point) sensor (e.g. 1 Hz)
	9	aphs		Averaging period (minutes) — relative humidity (wet bulb/dew point) sensor (e.g.1 min.)
	10	hsScd		Calibration date — relative humidity (wet bulb/dew point) sensor no. Latest date the sensor was calibrated (year, month, day, e.g. 20000207)
	11	hsID		Relative humidity (wet bulb/dew point) sensor installation date (year, month, day, e.g. 19950228)
	12	hsSD		Relative humidity (wet bulb/dew point) sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known, these dates should be entered anytime the relative humidity (wet bulb/dew point) is unavailable due to equipment outage (non-reporting or invalid reports)
PRECIPITATION (PG)				
DR	1	pg		Precipitation gauge — instrument type (e. g. weighing bucket, tipping bucket, etc.)
	2	pgMS		Precipitation gauge — model (manufacturer/series no.)
	3	pgL		Precipitation gauge — location
	4	pgDB		Precipitation gauge — distance (metres to tenths) from the bow or front of platform
	5	pgC		Precipitation gauge — distance (metres to tenths) from centre line or off centre of a discus
	6	pgwl		Precipitation gauge — height (metres to tenths) above water line
	7	oupg		Precipitation gauge — operational range and units of measurement (e.g. 0 to 25 cm per hour)
	8	sfPG		Sampling frequency — precipitation gauge (e.g. continuous)
	9	apPG		Averaging period — precipitation gauge (e.g. 6 hours; then reset)
	10	pgScd		Calibration date — precipitation gauge no. Latest date sensor/gauge was calibrated (year, month, day, e.g. 20000207)
	11	pgID		Precipitation gauge installation date (year, month, day, e.g. 19950228)
	12	pgSD		Precipitation gauge out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known, these dates should be entered anytime the precipitation measurement is unavailable due to equipment outage (non-reporting or invalid reports)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
RADIATION (RD)				
DR	1	srs		Solar radiation sensor — instrument type
	2	rMS		Radiation sensor — model (manufacturer/series no.)
	3	rsL		Radiation sensor — location (e.g. foremast)
	4	rsDB		Radiation sensor — distance (metres to tenths) from the bow or front of platform NOTE: Leave this field blank if platform is a discus
	5	rsC		Radiation sensor — distance (metres to tenths) from centre line or centre of discus
	6	srwl		Solar radiation sensor — height (metres to tenths) above water line
	7	ours		Radiation sensor — operational range and units of measurement (e.g. 0.07–1.65 cal cm^{-2} min^{-1})
	8	sfSR		Sampling frequency (Hz) — solar radiation sensor (e.g. 1 Hz)
	9	apSR		Averaging period (minutes to tenths) — solar radiation sensor (e.g. 8.0 minutes)
	10	srScd		Calibration date — solar radiation sensor no. Latest date the sensor was calibrated (year, month, day, e.g. 20000207)
	11	rsID		Radiation sensor installation date (year, month, day, e.g. 19950228)
	12	rsSD		Radiation sensor out of service dates (beginning and ending dates: year, month, day, e.g. 19960123–19960212). If known, these dates should be entered anytime the radiation measurement is unavailable due to equipment outage (non-reporting or invalid reports)
OCEAN CURRENTS (CR)				
DR	1	OC	 C M E	Ocean current speed reported Calculated Measured Estimated
	2	TSmoc		Type sensor measuring ocean currents (type/model/manufacturer)
	3	dmOC		Depth of measurement (in metres, e.g. 10 m) of the ocean current
	4	ouOC		Ocean currents — operational range and units of measurement (range, e.g. — 10 m s^{-1} to +10 m s^{-1})
	5	sfOC		Sampling frequency (Hz) — ocean currents (e.g. 0.667 Hz)
	6	apOC		Averaging period (minutes to tenths) — ocean currents (e.g. 20.0 minutes)
	7	ocScd		Calibration date — ocean current sensor (year, month, day, e.g. 20000208)
	8	ocID		Ocean current sensor installation date (year, month, day, e.g. 19950228)
	9	ocSD		Ocean current sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known, these dates should be entered anytime the ocean current measurement is unavailable due to equipment outage (non-reporting or invalid reports)
WAVE SPECTRA (WS)				
DR	1	wasp		Wave spectra — type of surface elevation sensor (from which wave spectra is derived)
	2	Digf		Digital filter used — wave spectra
	3	Nblks		Number of blocks used for averaging — wave spectra
	4	Npts		Number of points in each block — wave spectra
	5	spAT		Spectral analysis technique (e.g. FFT, MEM, etc.)
	6	sfWAS		Sampling frequency — wave spectra (e.g. 2.56 Hz)
	7	apWAS		Averaging period — length of record for averaging period — wave spectra (e.g. 20 minutes)

Record type and sequence number		*Field abbreviation*	*Input codes*	*Description of fields*
HORIZONTAL VISIBILITY (HV)				
DR	1	hvm	 MAN ATM	Horizontal visibility Manual Automated
	2	hvit		Instrument type (automated sensor) — model/manufacturer/series no.
	3	hvl		Location — horizontal visibility sensor no.
	4	hvDB		Horizontal visibility sensor — distance (metres to tenths) from the bow or front of platform NOTE: Leave this field blank if platform is a discus
	5	hvC		Horizontal visibility sensor — distance (metres to tenths) from centre line or centre of discus
	6	hvwl		Horizontal visibility sensor — height (metres to tenths) above water line
	7	hvou		Horizontal visibility sensor — operational range and units of measurement (e.g. 0000 to 9 999 m or < 0.1 km –10 km)
	8	hvsf		Sampling frequency — horizontal visibility sensor no.
	9	hvap		Averaging period — horizontal visibility sensor no.
	10	hvScd		Calibration date — horizontal visibility sensor no. Latest date sensor was calibrated (year, month, day, e.g. 20000208)
	11	hvID		Horizontal visibility sensor installation date (year, month, day, e.g. 19950228)
	12	hvSD		Horizontal visibility sensor out of service dates (beginning and ending dates; year, month, day, e.g. 19960123–19960212). If known, these dates should be entered anytime the visibility measurement is unavailable due to equipment outage (non-reporting or invalid reports)

RECOMMENDATION 2 (JCOMM-I)

RESOURCES FOR SHIP-BASED OBSERVATIONS

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY ON MARINE METEOROLOGY,

NOTING:

(1) The SOOPIP chairperson's report to JCOMM and final report of SOOPIP-III (La Jolla, March 2000),

(2) The ASAP Panel chairperson's report to JCOMM and final report of ASAP Panel-XII (Reading, September 2000),

(3) Final report of the Subgroup on the VOS, first session (Athens, March 1998),

(4) Expressed WWW, GOOS/GCOS and CLIVAR requirements for upper ocean thermal data and the conclusions from the Global Upper Ocean Thermal Review,

CONSIDERING:

(1) That ship-based observation programmes have been faced with decreased resources, coupled with increases in the costs of instruments and expendables (e.g. XBTs and radiosondes),

(2) That this situation could potentially adversely affect the data, products and services provided through JCOMM, GOOS and CLIVAR, in support of operational meteorology and oceanography, marine scientific research and global climate studies,

(3) That *in situ* ocean observing systems are complementary to space-based systems and supply the ground truth data on which the space-based systems depend,

(4) That there are many data-sparse ocean areas where ship-based observing systems can offer a unique contribution,

(5) That the PMO network provides the essential link to ship management and crew for the operations of the VOS, SOOP and ASAP and is critical to the maintenance of the quantity and quality of the observations,

(6) The importance attached to integrated, high-quality data streams from ship observations,

(7) That the SOOP Coordinator's position is essential for the implementation and operation of the SOOP programme,

(8) That the VOS scheme and ASAP would also greatly benefit from similar international coordination support,

RECOMMENDS strongly that Members/Member States recognize the continued importance of long-term commitment to ship-based observational programmes and, in particular:

(1) Emphasize a ship observations network that recognizes the benefits of a unified approach for meteorological, oceanographic and climate applications, and the heightened importance attached to integration of the former separate networks and higher quality and more timely data streams;
(2) Address the increasing need for ship deployment of autonomous observational platforms and expendables, and automated shipboard meteorological observation and data transmission systems;
(3) Increase the resources committed to supplying expendables for ship observations in support of international implementation plans;
(4) Make concerted efforts to maintain the level of recruitment of ships to the ship observations programme at the present level or above;
(5) Ensure maintenance and expansion of the PMO network;
(6) Increase the resources committed to support the activities of JCOMMOPS;

REQUESTS the Secretary General of WMO and the Executive Secretary IOC, with the assistance of the co-presidents of JCOMM and the chairpersons of the VOS, ASAP and SOOP Panels, to consult with Members/Member States, with a view to increasing the resources committed to ship-based observation programmes.

RECOMMENDATION 3 (JCOMM-I)

INTERNATIONAL SEAKEEPERS SOCIETY

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The reports of the chairpersons of the Working Group on Marine Observing Systems and the SOOP Implementation Panel to JCOMM-I,
(2) The presentation to JCOMM-I on the work of the International SeaKeepers Society,
(3) The report of the first JCOMM Transition Planning Meeting (St Petersburg, July 1999), JCOMM Meeting Report No. 1,

RECOGNIZING:

(1) That extensive scientific evaluation and quality assessment of the SeaKeepers module had taken place over a number of years,
(2) That observational data from the SeaKeepers module installed on a number of vessels were already being distributed in real time on the GTS,

CONSIDERING:

(1) That SeaKeepers vessels were distributed worldwide and often sailed in data-sparse ocean areas away from commercial shipping lanes,
(2) That meteorological and oceanographic observations from SeaKeepers vessels, if made freely and openly available to users in both real time and delayed mode, through the GTS and other communication channels, would be of substantial value to the WWW, GOOS, GCOS and other major programmes of WMO and IOC,

RECOMMENDS:

(1) That vessels equipped with the SeaKeepers module (members of the International Seakeepers Society) whose meteorological and physical oceanographic data are made freely available to all users, in both real time and delayed mode, in support of the major programmes of WMO and IOC, should be formally recognized as a component of the integrated ship observations programme;
(2) That the International SeaKeepers Society should participate actively in the work of the Ship Observations Team;
(3) That the Ship Observations Team includes observational data from SeaKeepers vessels in its overall monitoring and evaluation of the quality, integrity, timeliness and value of meteorological and oceanographic observations from ship-based platforms, to ensure that SeaKeepers data conform with the requirements of JCOMM programmes;

REQUESTS:

(1) GOOS, through its Coastal Ocean Observations Panel, to review and assess the quality and value of non-physical oceanographic data collected through the SeaKeepers module and, as appropriate, recommend on their inclusion as part of an integrated operational ocean monitoring system;
(2) The Secretary-General of WMO and the Executive Secretary IOC to bring the work of the International SeaKeepers Society to the attention of Members/Member States, and otherwise to assist in the implementation of this recommendation.

RECOMMENDATION 4 (JCOMM-I)

VANDALISM OF OCEAN DATA BUOYS

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The final report of DBCP-XVI (Victoria, October 2000), paragraph 9.2.4,

(2) The "hydrogram"* dated 5 August 2000 and issued by the International hydrographic Organization to bring the problem of vandalism of buoys, both deliberate or inadvertent, to the attention of the maritime community,

(3) The text of the hydrogram, available via the DBCP Web site at http://dbcp.nos.noaa.gov/dbcp/vandalism.html,

CONSIDERING:

(1) That the acts of vandalism that seriously damaged buoys were very detrimental to the ocean observing networks of which these buoys were an important part,

(2) That the collection or inadvertent damage to buoys by fishing vessels or mariners was similarly a substantial problem in some areas,

(3) The need to alert mariners and fishermen to the importance of data buoy programmes to maritime safety, maritime operations, climate research and prediction and other marine applications,

RECOMMENDS to Members/Member States:

(1) To contact their respective Hydrographic Services to reinforce the message in the hydrogram and to ensure that it is reissued as often as possible;

(2) To develop, if possible, tamper-proof designs for buoy systems;

(3) To design a warning system in the event that any data buoys were intentionally damaged;

(4) To take legal steps nationally to limit acts of vandalism within their territorial seas and Exclusive Economic Zones;

REQUESTS the Secretary-General of WMO and the Executive Secretary IOC to provide assistance, as required, to Members/Member States in the implementation of this recommendation.

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* Hydrogram: A message to bring to the attention of the mariner important and significant maritime safety information not normally contained in the weekly Notice to mariners.

RECOMMENDATION 5 (JCOMM-I)

THE GLOBAL SEA-LEVEL OBSERVING SYSTEM (GLOSS)

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The considerable achievements of GLOSS in establishing a global system to monitor sea-level variability and changes,

(2) That over two thirds of the GLOSS Core Network stations, as defined in accordance with the 1997 Implementation Plan for GLOSS, are operational and that this number has remained essentially unchanged over the past few years,

CONSIDERING:

(1) The importance of long-term sea-level measurements to many WMO Programmes concerned with climate change, hydrology, storm surges and tropical cyclones,

(2) The importance of sea-level measurements for operational oceanography, marine meteorology coastal engineering and defence applications and in the wider implementation of GOOS,

(3) The potential for station sharing and use of tide gauge data transmission platforms for delivery of other data types,

RECOMMENDS to Members/Member States and national agencies to:

(1) Continue and strengthen the support for GLOSS: (*a*) at the national level through maintenance of GLOSS-designated tide gauges; and (*b*) at the international level through support to the IOC Trust Fund or through bilateral and/or multilateral assistance for GLOSS activities by, for example, collaborative support for maintaining/upgrading GLOSS gauges in accordance with the GLOSS Implementation Plan;

(2) Provide *in situ* sea-level data from GLOSS stations to the international data centres without delay in accordance with the provisions of the Implementation Plan;

(3) Consider local and regional observation platform sharing for data acquisition of other important parameters at GLOSS sites, especially by providing the necessary upgrades for real-time data acquisition;

RECOMMENDS further that the products of GLOSS-related Sea-level Centres (such as the Permanent Service for Mean Sea Level in the United Kingdom and the Hawaii

Sea-level Center in the United States) should be made more widely known to the WMO/IOC communities through existing WMO information services, in order to promote enhanced knowledge and understanding in this important field;

REQUESTS the Secretary-General of WMO and the Executive Secretary IOC to provide assistance to Members/Member States, as appropriate, and within the available budgetary resources, in the implementation of this recommendation.

RECOMMENDATION 6 (JCOMM-I)

ESTABLISHMENT OF A JCOMM *IN SITU* OBSERVING PLATFORM SUPPORT CENTRE (JCOMMOPS)

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY ON MARINE METEOROLOGY,

NOTING:

(1) The JCOMM terms of reference and especially those related to the development of observing networks,

(2) The final report of the second transition planning meeting for JCOMM (Paris, 14–16 June 2000), paragraph 3.3,

(3) The final report of the sixteenth session of the DBCP (Victoria, Canada, 16–20 October 2000), paragraph 8.3,

CONSIDERING:

(1) The requirement for JCOMM to initiate a process in which oceanography and marine meteorology would transition from the existing largely unconnected set of monitoring, data management and services activities to a fully integrated system,

(2) The need for integrating at the international level a number of activities regarding operations and implementation of *in situ* marine observing systems (e.g. deployment opportunities, status information),

(3) That facilities already exist within the DBCP, SOOP, and Argo programmes for such integrated activities thanks to resources provided by Members/Member States through the DBCP, SOOPIP and Argo,

(4) That these activities could be extended to the VOS scheme and ASAP provided additional resources were available,

RECOMMENDS:

(1) To establish formally a JCOMM *In Situ* Observing Platform Support Centre, based initially upon existing DBCP, SOOP and Argo international coordination mechanisms established in Toulouse, France, and under the day-to-day supervision of the WMO and IOC Secretariats;

(2) That JCOMMOPS activities should initially deal with surface drifting and moored buoys in the high seas, floats and the SOO programme;

(3) That the JCOMMOPS terms of reference should be as given in the annex to this recommendation;

REQUESTS Members/Member States, where possible, to commit the resources required to support JCOMMOPS.

ANNEX TO RECOMMENDATION 6 (JCOMM-I)

TERMS OF REFERENCE FOR THE JCOMM *IN SITU* OBSERVING PLATFORM SUPPORT CENTRE (JCOMMOPS)

Under the overall guidance and coordination of the JCOMM Observations Coordination Group, following the direction of the Data Buoy Cooperation Panel, the Ship-of-Opportunity Programme Implementation Panel and the Argo Science Team, JCOMMOPS shall:

(*a*) Facilitate the implementation of operational *in situ* ocean observing systems associated with the above panels. Such systems, referred to below as relevant observing platforms, presently include drifting buoys, moored buoys on the high seas, floats, and surface and measurements from ships of opportunity;

(*b*) Act as a focal point on all aspects of implementation and operation of relevant observing platforms;

(*c*) Maintain information on relevant data requirements in support of GOOS, GCOS and the WWW, as provided by the appropriate scientific panels and JCOMM Expert Teams and Groups;

(*d*) Provide information on the status of networks of relevant observing platforms as compared with the above requirements;

(*e*) Assist, as appropriate, with the development of cooperative arrangements for buoys and float deployments and for the servicing of moored buoys in the high seas. Provide a single point of entry for information on deployment opportunities;

(*f*) Assist, as appropriate, in relaying quality control information produced by relevant data centres to the responsible observing platforms managers;

(*g*) Assist in the implementation of standard formats;

(*h*) Make available to operators information on telecommunication systems which can potentially be used for real-time transmission of data from relevant observing platforms;

(*i*) Assist in the clarification and resolution of issues between platform operators and telecommunications system operators;
(*j*) Assist in promoting the insertion of all available and appropriate data into the Global Telecommunications System;
(*k*) Monitor and encourage the flow of real-time data into appropriate permanent archives;
(*l*) Provide information, as required, on the functional status of relevant observing platforms.

RECOMMENDATION 7 (JCOMM-I)

AMENDMENTS TO THE WMO GMDSS MARINE BROADCAST SYSTEM

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:
(1) The International Convention for the Safety of Life at Sea (SOLAS), 1974, in particular Chapter V (Safety of navigation), Regulation 5 (Meteorological services and warnings) of the 2001 amendments,
(2) The 1988 amendments to SOLAS for the Global Maritime Distress and Safety System,
(3) Recommendation 3 (CMM-XI) — New WMO GMDSS marine broadcast system,
(4) Recommendation 2 (CMM-XII) — Amendments to the WMO GMDSS marine broadcast system,
(5) The final report of the second session of the ad hoc Group on the GMDSS,
(6) The *Manual on Marine Meteorological Services* (WMO-No. 558),

RECOGNIZING:
(1) The importance of meteorological warnings and forecasts to the safety of life and property at sea,
(2) The obligations of countries which are signatories to SOLAS to provide meteorological services for shipping as specified in the Convention, including its 1988 amendments,
(3) That the WMO GMDSS marine broadcast system needs to be constantly reviewed and updated so as to best meet the requirements of users and the internationally-agreed commitments under SOLAS,
(4) That the WMO GMDSS marine broadcast system also needs to be fully in harmony with navigational warning services for the GMDSS coordinated by the International Hydrograhic Organization and to respond to requirements for maritime safety services expressed by the International Maritime Organization,

RECOMMENDS:
(1) That the amendments to the WMO GMDSS marine broadcast system as incorporated in the annex to this resolution be adopted;
(2) That the *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I, Part I bis, Sections 1 to 3 be amended accordingly;

URGES WMO Members with forecast and warning preparation and broadcast responsibilities under the WMO GMDSS marine broadcast system:
(1) To continue to implement their responsibilities in full, in accordance with the specifications in the *Manual*;
(2) To keep the WMO Secretariat closely informed of developments and changes in their operation of the system, including any changes in broadcast schedules;
(3) To liaise closely with users regarding their requirements for, and response to, meteorological forecast and warning services under the GMDSS;

REQUESTS the Expert Team on Maritime Safety Services to keep the implementation of, and user response to, the WMO GMDSS marine broadcast system under review, and to develop proposals for amendments, as necessary;
REQUESTS the Secretary-General of WMO:
(1) To provide appropriate technical advisory assistance to WMO Members concerned in the implementation of the WMO GMDSS marine broadcasts system;
(2) To bring this recommendation to the attention of the International Maritime Organization, IHO, the International Chamber of Shipping, the International Mobile Satellite Organization, Inmarsat Ltd. and other organizations and bodies concerned and to continue to liaise closely with them in the operation of the system.

ANNEX TO RECOMMENDATION 7 (JCOMM-I)

AMENDMENTS TO THE *MANUAL ON MARINE METEOROLOGICAL SERVICES* (WMO-No. 558)

PART I BIS

SERVICES FOR THE HIGH SEAS

1. GENERAL

Marine meteorological services for the high seas shall include:

(*a*) Provision of warnings and weather and sea bulletins;
(*b*) Marine meteorological support for maritime search and rescue;
(*c*) Provision of information by radio facsimile;
(*d*) Marine climatological summaries scheme;
(*e*) Provision of special marine climatological information;
(*f*) Provision of marine meteorological information and expert advice.

2. PROVISION OF WARNINGS AND WEATHER AND SEA BULLETINS (GMDSS APPLICATION)

(The Global Maritime Distress and Safety System (GMDSS) application is compatible with, and required by, the radiocommunication provisions of the 1988 SOLAS amendments via the NAVTEX, International SafetyNET and high frequency Maritime Safety Information (MSI) Services. See Appendix I-1 bis for glossary of terms.)

2.1 Principles

The principles for the preparation and issue of warnings and weather and sea bulletins are as follows:

Principle 1

For the purpose of the preparation and issue of meteorological warnings and the regular preparation and issue of weather and sea bulletins, the oceans and seas are divided into areas for which National Meteorological Services assume responsibility.

Principle 2

The areas of responsibility together provide complete coverage of oceans and seas by meteorological information contained in warnings and weather and sea bulletins for the high seas.

Principle 3

The issue of meteorological warnings and routine weather and sea bulletins for areas not covered by NAVTEX shall be by the International SafetyNET Service for the reception of MSI in compliance with SOLAS, Chapter IV — Radiocommunications.

NOTE: In addition, National Meteorological Services may have to prepare and/or issue warnings and routine forecasts for transmission by an a high frequency direct-printing telegraphy maritime safety information service for areas where such a service is provided for ships engaged exclusively on voyages in such areas.

Principle 4

The preparation and issue of warnings and weather and sea bulletins for areas of responsibility are coordinated in accordance with the procedures mentioned in section 2.2.

Principle 5

The efficiency and effectiveness of the provision of warnings and of weather and sea bulletins are monitored by obtaining opinions and reports from marine users.

Principle 6

Maritime safety information broadcasts are monitored by the originating issuing service to ensure the accuracy and integrity of the broadcast.

2.2 Procedures

2.2.1 ***Definitions***

2.2.1.1 A preparation service is a National Meteorological Service which has accepted responsibility for the preparation of forecasts and warnings for parts of, or an entire, designated area (Metarea) in the WMO system for the dissemination of meteorological forecasts and warnings to shipping under the GMDSS and for their transfer to the relevant issuing service for broadcast.

2.2.1.2 An issuing service is a National Meteorological Service which has accepted responsibility for ensuring that meteorological forecasts and warnings for shipping are disseminated through the Inmarsat SafetyNET service to the designated area for which the Service has accepted responsibility under the broadcast requirements of the GMDSS. The forecasts and warnings for broadcasts may have been prepared solely by the issuing service, or by another preparation service, or a combination of both, on the basis of negotiations between the services concerned, or otherwise, as appropriate. The issuing service is responsible for composing a complete broadcast bulletin on the basis of information input from the relevant preparation services and for inserting the appropriate enhanced group call (EGC) header, as specified in Appendices I-4 and I-5 of the *Manual on Marine Meteorological Services* and Annex 4(*b*) of the *International SafetyNET Manual*. Procedures for any modifications by issuing services to information provided by preparation services, and for the choice of appropriate C_1, C_2 and C_3 codes for the

broadcast of this information, should be developed by bilateral agreement between the services concerned. The issuing service is also responsible for monitoring the broadcasts of information to its designated area of responsibility.

NOTES: (1) For some Metareas there may be only one preparation service, which will be the same National Meteorological Service as the issuing service (e.g. United Kingdom for area I, Argentina for area VI and Australia for area X).

(2) An appropriate format for the attribution of the origins of the forecast and warning information contained in a broadcast bulletin may be developed on the basis of negotiations among the services concerned.

(3) In situations where appropriate information, data or advice from other designated preparation services for a given Metarea is not available, it is the responsibility of the issuing service for that area to ensure that complete broadcast coverage for the area is maintained.

2.2.2 ***Areas of responsibility****

2.2.2.1 Areas of responsibility and the responsible services for the preparation and issue of warnings, weather and sea bulletins through the International SafetyNET service for the high seas shall be as given in Appendix I-2 bis.

NOTES: (1) The areas of responsibility given in Appendix I-2 bis are reviewed by the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) to ensure complete area coverage and adequacy of services.

(2) A broadcast area may be subdivided in the text of the EGC message into subareas to meet the requirements of the National Meteorological Services concerned.

(3) The areas of responsibility defined in Appendix I-2 bis represent a minimum requirement for issuing and preparation services. Both issuing and preparation services may extend the area of coverage for the preparation and issue of warnings, weather and sea bulletins beyond these areas of responsibility, if they so wish, to meet national requirements. In this case, the area of coverage should be specified in the text of each broadcast.

(4) In the case where there is overlapping of forecast areas between adjacent Metareas, the respective issuing services are strongly encouraged to:

(*a*) Initiate the redefinition of the subareas used by countries serving adjacent Metareas, in order to conform to the limits of the Metareas;

(*b*) Coordinate their forecasts and warnings in these overlapping areas;

to ensure as far as possible that non-conflicting information is provided to the user.

* All correspondence relating to areas of responsibility is addressed to the Secretary-General.

2.2.2.2 Any amendments to the area of responsibility, or proposal for the introduction of a change in National Meteorological Services' responsibility for an area, shall have the approval of the Executive Council based on a recommendation by JCOMM.

2.2.2.2.1 Before drawing up any recommendation on the proposed amendment for submission to the Executive Council, JCOMM shall receive the comments of the National Meteorological Services directly concerned with the proposed amendment as well as the comments of the president(s) of the regional association(s) concerned.

2.2.2.3 Whenever a National Meteorological Service responsible for the preparation and/or issue of warnings and weather and sea bulletins for a given area is no longer able to provide this service, the National Meteorological Service should inform the Secretary-General at least six months in advance of the intended termination date.

2.2.3 ***Preparation and issue of weather and sea bulletins for the high seas***

2.2.3.1 Weather and sea bulletins for the high seas shall include, in the order given hereafter:

Part I – Warnings;

Part II – Synopsis of major features of the surface weather chart and, to the extent possible, significant characteristics of corresponding sea-surface conditions;

Part III – Forecasts.

2.2.3.2 Weather and sea bulletins for the high seas may, in addition, include the following parts:

Part IV – Analyses and/or prognoses in IAC FLEET code form;

Part V – Selection of reports from sea stations;

Part VI – Selection of reports from land stations.

NOTES: (1) The reports included in Part VI should be for a fixed selection of stations in a fixed order.

(2) Parts IV, V and VI may be issued at a separate, scheduled time.

2.2.3.3 Major changes in form and content of warnings, synopses and forecasts should be announced at least six months prior to the effective date of the change.

2.2.3.4 Information on broadcast schedules for routine forecasts and contents of bulletins shall be notified to the WMO Secretariat for inclusion in *Weather Reporting* (WMO-No. 9), Volume D — Information for shipping.

2.2.3.5 For area(s) for which an issuing service has assumed responsibility, the Service shall select the appropriate land Earth station (LES) to service that area.

NOTES: (1) As there are several LESs which can serve an ocean region and hence an area of broadcast responsibility, issuing services may negotiate directly with the various LES operators to obtain the most favourable tariff (and service) considerations.

(2) In order to ensure reception of unscheduled broadcasts by shipping in an area which is served by more than one satellite and recognizing that National

Meteorological Services will not know to which of these satellites the ship's equipment is tuned, the following procedures shall be adopted by issuing services. For unscheduled broadcasts, these shall be issued for broadcast under the SafetyNET service through all Inmarsat ocean region satellites covering the issuing service's area of responsibility. (NOTE: The broadcast requirement for unscheduled broadcasts has been determined by IMO Resolution A.701(17).) For scheduled forecasts, these shall be issued for broadcast over at least a single nominated satellite, in accordance with a pre-arranged schedule, coordinated by WMO.

2.2.3.6 The issuing service shall select the method by which the transfer of information to the LES shall be effected.

NOTE: The transfer of information may be accomplished in several ways. See Appendix I-3 bis for details.

2.2.3.7 Weather and sea bulletins shall be prepared and issued at least twice daily.

2.2.3.7.1 The issue of the weather and sea bulletins shall be at a scheduled time and in the following sequence: Part I to be followed immediately by Part II and then Part III. A schedule of transmission start times for these bulletins has been compiled for all Metareas and the LESs which serve the areas and takes into consideration, *inter alia*, the existing WMO synoptic times for observations, data analysis and forecast production. Additionally, as these broadcast schedules for the International SafetyNET Service have to be coordinated, under the aegis of WMO, with other Organizations such as IHO, issuing services should not independently change or request WMO to arrange frequent alterations to these coordinated and published schedules (see also paragraph 2.2.3.4).

2.2.3.7.2 All weather and sea bulletins shall be preceded by the word "SECURITE", except urgent warnings (Beaufort force 12 and above), which shall be preceded by "PAN PAN".

2.2.3.7.3 Issuing services must ensure that the correct EGC message addressing formats are adhered to for all warning and forecast messages intended for broadcast by an LES (see Appendix I-4 bis message addressing and Appendix I-5 bis operational guidance).

2.2.3.7.4 All weather and sea bulletins shall include, following the words "SECURITE" or "PAN PAN", clear information on the Metarea being addressed and the issuing service, e.g.:

SECURITE
Marine weather bulletin for Metarea II issued by Météo-France

2.2.3.8 Warnings, synopses and forecasts shall be given in plain language.

2.2.3.8.1 Warnings, synopses and forecasts intended for the International SafetyNET Service shall be broadcast in English.

NOTE: Additionally, if a National Meteorological Services wishes to issue warnings and forecasts to meet national obligations under SOLAS, broadcasts may be made in other languages. These broadcasts will be part of a National SafetyNET Service.

2.2.3.8.2 In order to ensure the integrity of the warnings and forecasts being received by mariners, it is essential that issuing services monitor the broadcasts which they originate. Monitoring is especially important in a highly automated system which is dependent on careful adherence to procedure and format. This may be accomplished by the installation of an EGC receive-capability at the issuing service's facility.

NOTE: Each issuing service may use the EGC receiver to check the following:

(*a*) That the message has been broadcast;
(*b*) That the message is received correctly;
(*c*) That cancellation messages are properly executed;
(*d*) Any unexplained delay in the message being broadcast.

2.2.3.8.3 The language of the synopsis should be as free as possible from technical phraseology.

2.2.3.8.4 The terminology in weather and sea bulletins should be in accordance with the multilingual list of terms used in weather and sea bulletins, which is given in Annex 2.B of the *Guide to Marine Meteorological Services* (WMO-No. 471) and in Appendix I-2 in the *Manual on Marine Meteorological Services*.

2.2.3.9 Wind direction shall be given in points of the compass and not in degrees.

2.2.3.9.1 Wind force shall be given in Beaufort notation or wind speed in metres per second or in knots. If metres per second or knots are used, the words "metres per second" or "knots" shall be included in the text of the message.

NOTE: The criteria of the Beaufort notation of wind force are given in a Beaufort scale table.

2.2.4 *Warnings*

2.2.4.1 Warnings shall be given for gales (Beaufort force 8 or 9) and storms (Beaufort force 10 or over), and for tropical cyclones (hurricanes in the North Atlantic and eastern North Pacific, typhoons in the Western Pacific, cyclones in the Indian Ocean and cyclones of similar nature in other regions).

NOTES: (1) Warnings to circular areas require a specific address code, C_2 code = 24 (see Appendix I-4 bis.)

(2) Warnings may be addressed for reception by shipping in a circular area within the main Metarea (C_2 code = 24), or addressed for reception by shipping within the entire Metarea (C_2 code = 31) this is at the discretion of the issuing services in consultation with the preparation service responsible for the warning. If a circular area address (C_2 code = 24) is chosen, only ships within that area, as defined by the C_3 circular address, will receive the warning.

(3) Definition of a tropical cyclone is contained in the *International Meteorological Vocabulary* (WMO-No. 182) and classification of tropical cyclones is left to the Regions concerned.

2.2.4.2 The issue of warnings for near gales (Beaufort force 7) is optional.

2.2.4.3 Warnings for gales, storms and tropical cyclones should have the following content and order of items:

(*a*) Type of warning;
(*b*) Date and time of reference in UTC;
(*c*) Type of disturbance (e.g. low, hurricane, etc.) with a statement of central pressure in hectopascals;
(*d*) Location of disturbance in terms of latitude and longitude or with reference to well-known landmarks;
(*e*) Direction and speed of movement of disturbances;
(*f*) Extent of affected area;
(*g*) Wind speed or force and direction in the affected areas;
(*h*) Sea and swell conditions in the affected area;
(*i*) Other appropriate information such as future positions of disturbances.

2.2.4.3.1 Items (*a*), (*b*), (*d*), (*f*) and (*g*) listed in paragraph 2.2.4.3 shall always be included in the warnings.

2.2.4.4 In addition to indicating the positions of pressure disturbances in terms of latitude and longitude, or with reference to well-known landmarks, the boundaries of the existing and forecast storm-wind area or areas of high waves (including swell) should be indicated.

NOTE: The usual practice in warnings is to indicate boundaries with reference to the centre of the pressure disturbance, or to divide the disturbance (low, tropical cyclone) into sectors for which prevailing and forecast conditions are described.

2.2.4.4.1 When warnings are included for more than one pressure disturbance or system, the systems should be described in descending order of threat.

2.2.4.4.2 Warnings shall be as brief as possible and, at the same time, clear and complete.

2.2.4.5 The time of the last location of each tropical cyclone or extratropical storm shall be indicated in the warning.

2.2.4.6 A warning shall be issued immediately after the need becomes apparent and broadcast immediately on receipt, followed by a repeat after six minutes (repetition code 11), when issued as an unscheduled broadcast.

2.2.4.6.1 When no warnings for gales, storms or tropical cyclones are to be issued, that fact shall be positively stated in Part I of each weather and sea bulletin.

2.2.4.6.2 Warnings shall be updated whenever necessary and then issued immediately.

2.2.4.6.3 Warnings shall remain in force until amended or cancelled.

2.2.4.6.4 Warnings issued as Part I of a scheduled bulletin do not need to be repeated after six minutes.

2.2.4.7 Warnings for other severe conditions such as poor visibility, severe swell, ice accretion, etc., shall also be issued, as necessary.

2.2.5 *Synopses*

2.2.5.1 The synopses given in Part II of weather and sea bulletins shall have the following content and order of items:

(*a*) Date and time of reference in UTC;
(*b*) Synopsis of major features of the surface weather chart;
(*c*) Direction and speed of movement of significant pressure systems and tropical disturbances.

2.2.5.1.1 Significant characteristics of corresponding wave conditions (sea and swell) should be included in the synopsis whenever this information is available, as well as characteristics of other sea-surface conditions (drifting ice, currents, etc.) if feasible and significant.

2.2.5.2 Significant low-pressure systems and tropical disturbances which affect or are expected to affect the area within or near the valid period of the forecast should be described. The central pressure and/or intensity, location, movement and changes of intensity should be given for each system. Significant fronts, high-pressure centres, troughs and ridges should be included whenever this helps to clarify the weather situation.

2.2.5.3 Direction and speed of movement of significant pressure systems and tropical disturbances should be indicated in compass points and metres per second or knots, respectively.

2.2.5.3.1 Units used for speed of movement of systems shall be indicated.

2.2.6 *Forecasts*

2.2.6.1 The forecasts given in Part III of weather and sea bulletins shall have the following content and order of items:

(*a*) The valid period of forecast;
(*b*) Name or designation of forecast area(s) within the main MSI area;
(*c*) A description of:
  (i) Wind speed or force and direction;
  (ii) Visibility when forecast is less than six nautical miles (10 kilometres);
  (iii) Ice accretion, where applicable.

2.2.6.1.1 The forecasts should include expected significant changes during the forecast period, significant meteors such as freezing precipitation, snowfall or rainfall, and an outlook for a period beyond that normally covered by the forecast.

2.2.6.1.2 The forecasts should also include waves (wind sea and/or swell) where possible.

2.2.6.2 The valid period shall be indicated either in terms of number of hours from the time of issue of forecast or in terms of dates and times in UTC of the beginning and end of the period.

2.2.6.3 Visibility shall be indicated in nautical miles or kilometres or given in descriptive terms.

2.2.6.3.1 Units used for visibility shall be indicated.

2.2.7 *Selection of reports from sea stations*

2.2.7.1 When included in weather and sea bulletins for the high seas, reports from ships and other sea stations should be selected to give a reasonable geographical distribution, taking into account the important synoptic features.

2.2.7.2 The information should include the position of ships and other sea stations, time of observation, wind, visibility, atmospheric pressure and, if possible, cloudiness, present and past weather, air and sea-surface temperatures and waves.

2.2.8 ***Selection of reports from land stations***

2.2.8.1 Reports included should be for selected land stations in a fixed order.

2.2.8.2 The reports should include the same elements as those listed in paragraph 2.2.7.2, as applicable.

2.2.9 ***Issue of sea-ice information***

Sea-ice terminology shall be in accordance with the WMO *Sea-Ice Nomenclature* (WMO-No. 259. TP.145).

3. MARINE METEOROLOGICAL SUPPORT FOR MARITIME SEARCH AND RESCUE

3.1 Principles

The principle for marine meteorological support for maritime search and rescue (SAR) is as follows:

Principle

For the purpose of maritime search and rescue (SAR), a meteorological forecast centre may serve more than one Rescue Coordination Centre (RCC). Likewise, an RCC may make requests for information from more than one meteorological forecast centre depending on the nature of the maritime SAR operation.

3.2 Procedures

3.2.1 Marine meteorological services for SAR shall be provided in accordance with the national overall coordination procedures for SAR and taking into account the international recommendations and the requirements in force.

NOTES: (1) Requirements for SAR services including meteorology are contained in the ICAO Regional Air Navigation Plans.

(2) Additional requirements for maritime SAR services are contained in the Joint *IMO/ICAO Search and Rescue Manual*.

3.2.1.1 Requests from RCCs shall be dealt with as expeditiously as possible and shall be given highest priority when an SAR operation is in progress.

3.2.1.2 On receiving formal notification from an RCC that a ship or aircraft or survival craft thereof is in distress, every effort shall be made to meet the requirements of the RCC.

3.2.2 Information on the following parameters and phenomena, as may be requested by or be of value to an RCC, should be provided:

(*a*) Atmospheric pressure;
(*b*) Surface winds;
(*c*) Sea and swell;
(*d*) Surface visibility;
(*e*) Ice accretion;
(*f*) Sea ice;
(*g*) Icebergs;
(*h*) Precipitation and cloud cover, including height of cloud base;
(*i*) Air temperature;
(*j*) Humidity;
(*k*) Sea-surface temperature;
(*l*) Surface currents;
(*m*) Tidal current deviation;
(*n*) Bar conditions;
(*o*) Surf and breakers;
(*p*) Storm surge;
(*q*) Water discolouration.

NOTES: (1) Special weather forecasts covering periods of up to 24 hours and possibly beyond may be required for maritime SAR operations on a continental shelf and slightly beyond. Ships of all sizes, helicopters and fixed-wing aircraft may be involved in these operations.

(2) Medium-range forecasts may be required in the event of SAR operations taking place over large ocean areas where ocean-going ships and fixed-wing aircraft may be involved for considerable periods of time and possibly searching for relatively small objects on the sea surface.

(3) Some of the information to be provided may be the responsibility of more than one authority and should be coordinated nationally.

3.2.3 Notification of SAR operations and all subsequent communications between the RCC and weather forecast centre should be by telephone, telex or other medium designed for rapid transmission or reception.

3.2.3.1 When communicating with RCCs or when providing weather forecasts the terminology should be similar to that used in weather bulletins and warnings to shipping.

3.2.3.2 A permanent record of all communications should be maintained, showing the times of origin, transmission and reception of the information provided.

3.2.3.3 Weather forecast centres should not attempt to communicate directly, or through coastal radio stations, with ships or aircraft involved in the SAR operation unless specifically requested by the RCC.

3.2.3.4 Meteorological Services should encourage ships operating under their national flag, when taking part in any medium- or long-term SAR operation or in the vicinity of a SAR operation but not necessarily participating, to make weather observations at main and intermediate standard times for surface synoptic observations and to transmit them, in the international SHIP code form or plain language, immediately to the appropriate coastal radio station for onward transmission, or through an LES directly to a Meteorological Service.

APPENDIX I-1 BIS

GLOSSARY

In 1973, the International Maritime Organization (IMO) Assembly adopted a recommendation on the development of the maritime distress systems which laid down the IMO policy for improved distress and safety communications at sea based on the most up-to-date techniques. This policy foresaw, as an essential element, the advent of satellite and automatic terrestrial communications. To achieve the former, IMO in 1976 adopted an international convention establishing the Inmarsat organization. The terrestrial element was achieved by the development of the necessary techniques for digital selective calling and direct-printing telegraphy. This was accomplished with the assistance of the International Telecommunication Union's (ITU) International Radio Consultative Committee (CCIR) and the World Administrative Radio Conference (WARC).

In 1983 and 1987 the necessary frequencies were allocated to test and prove the equipment and this facilitated the establishment of the GMDSS. The 1988 GMDSS Conference adopted amendments to the 1974 International Convention for the Safety of Life at Sea (SOLAS) to introduce GMDSS. SafetyNET provides shipping with navigational and meteorological warnings, meteorological forecasts, shore-to-ship alerts and other urgent information in accordance with the requirements of SOLAS 1974. It is suitable for use in all sizes and types of surface craft. SafetyNET is a service of Inmarsat's enhanced group call (EGC) system and was specifically designed for promulgation of maritime safety information (MSI) as part of GMDSS. SafetyNET meets international requirements for broadcasting area, regional or local navigational warnings, meteorological warnings and forecasts and shore-to-ship distress alerts. It is designed with the capacity to provide services within the coverage areas of geostationary maritime communications satellites, that is in sea area A3 of the GMDSS. In addition to providing service to ships operating in sea area A3, it also provides the means of disseminating MSI to coastal waters not covered by NAVTEX. SafetyNET messages can be originated by a registered provider (e.g. a WMO Member) anywhere in the world and broadcast to the appropriate ocean area via an Inmarsat-C land Earth station (LES). Messages are broadcast according to priority, i.e. distress, urgent, safety and routine.

Atlantic Ocean Region (west) (AOR(W)), Atlantic Ocean Region (east) (AOR(E)), Indian Ocean Region (IOR), Pacific Ocean Region (POR): Ocean areas within the footprints (0 elevation) of the Inmarsat satellites located at 55.5°W, 18.5°W, 63°E and 180°E, respectively.

Land Earth Station (LES): A land station in the Inmarsat satellite communications system which provides inter-connection between the satellite and shore systems such as telex and telephone.

Enhanced Group Call (EGC): The system for broadcasting messages via the mobile satellite communications system operated by Inmarsat. EGC is a part of the Inmarsat-C system and currently supports two services: "SafetyNET" and "FleetNET". (FleetNET: A commercial service for the broadcast and automatic receipt of fleet management and general public information by means of direct-printing through Inmarsat's Enhanced Group Call system.)

International NAVTEX Service: The system for the broadcast and automatic reception of maritime safety information by means of narrow-band direct-printing on 518 kHz, using the English language. (NAVTEX receiving capability is part of the mandatory equipment which is required to be carried in certain vessels under the provisions of the revised Chapter IV of the International Convention for the Safety of Life at Sea (SOLAS), 1974).

International SafetyNET Services: The coordinated broadcast and automated reception of Maritime Safety Information via the Inmarsat EGC system using the English language to meet the requirements of the SOLAS Convention.

Maritime Safety Information (MSI): Navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships.

National SafetyNET Services: The broadcast and automated reception of Maritime Safety Information via the Inmarsat EGC system using languages as decided by the administration concerned.

Network Coordination Station (NCS): A land station in the Inmarsat mobile satellite communications system which controls channel assignments and other communications functions through a satellite for an entire ocean region.

Registered Provider: An authorized MSI provider which has an agreement with one or more LES for providing SafetyNET broadcast information.

Rescue Coordination Centre (RCC): A unit responsible for promoting efficient organization of search and rescue services for coordinating the conduct of search and rescue operations within a search and rescue region.

SafetyNET: A service for the broadcast and automatic reception of maritime safety information by means of direct-printing through Inmarsat's EGC system.

Scheduled Broadcasts: The regular single transmission of weather and sea bulletins for the high seas, including gale and storm warnings as necessary. Each bulletin broadcasts at least twice daily, in accordance with a pre-arranged and published schedule coordinated by WMO and in the prescribed high seas bulletin format, as described in the *Manual on Marine Meteorological Services*. The EGC priority code (C_1) for

messages intended for scheduled broadcast is $C_1 = 1$ — Safety, and repetition code (C_4) is $C_4 = 01$ — Broadcast once only. Scheduled broadcasts should be made within 15 minutes of the published schedule. If this is not possible, a repetition should be used to ensure maximum receipt.

Sea Area A1: An area within the radiotelephone coverage of at least one very high frequency coast station in which continuous digital selective calling (DSC) alerting is available, as may be defined by a SOLAS Contracting Government.

Sea Area A2: An area, excluding sea area A1, within the radiotelephone coverage of at least one medium frequency coast station in which continuous DSC alerting is available, as may be defined by a Contracting Government.

Sea Area A3: An area, excluding sea areas A1 and A2, within the coverage of an Inmarsat geostationary satellite in which continuous alerting is available.

Sea Area A4: An area outside sea areas A1, A2 and A3.

Ship Earth Station (SES): A mobile Earth station in the maritime mobile-satellite service located aboard a ship, or elsewhere.

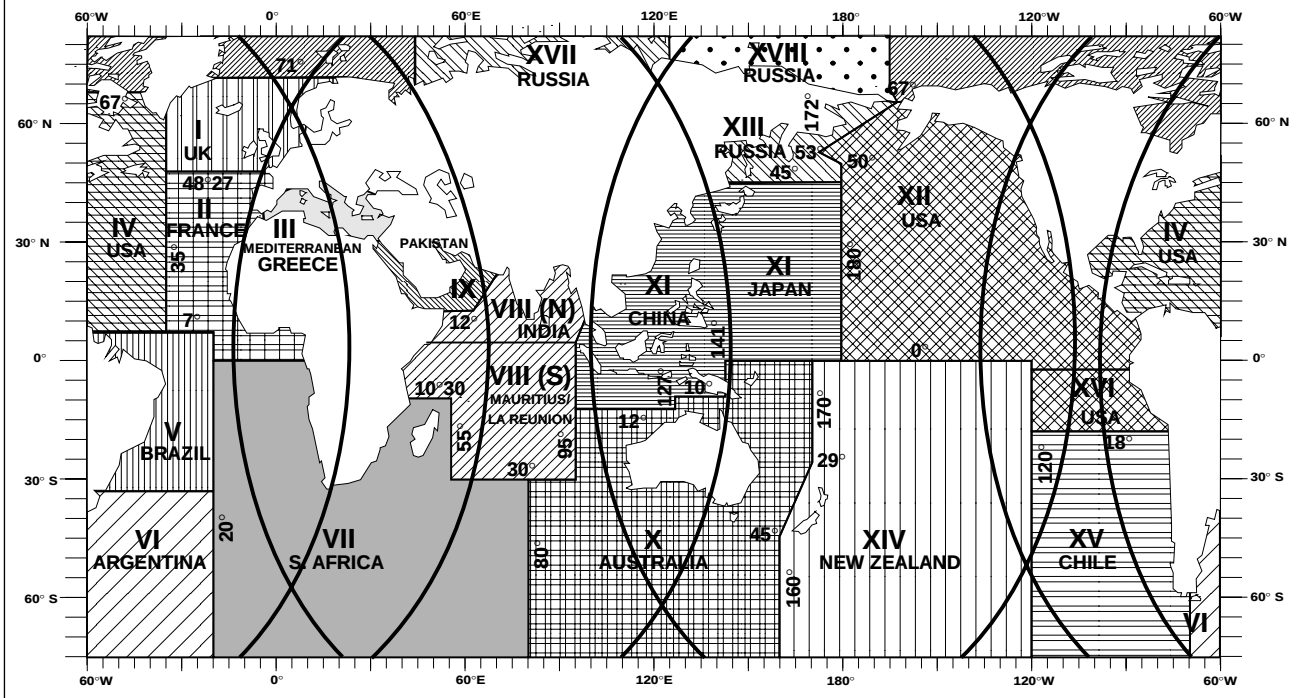
Inmarsat-A: A satellite communications system for transmission of voice, telex, facsimile or data using directional antennae in the Inmarsat satellite system.

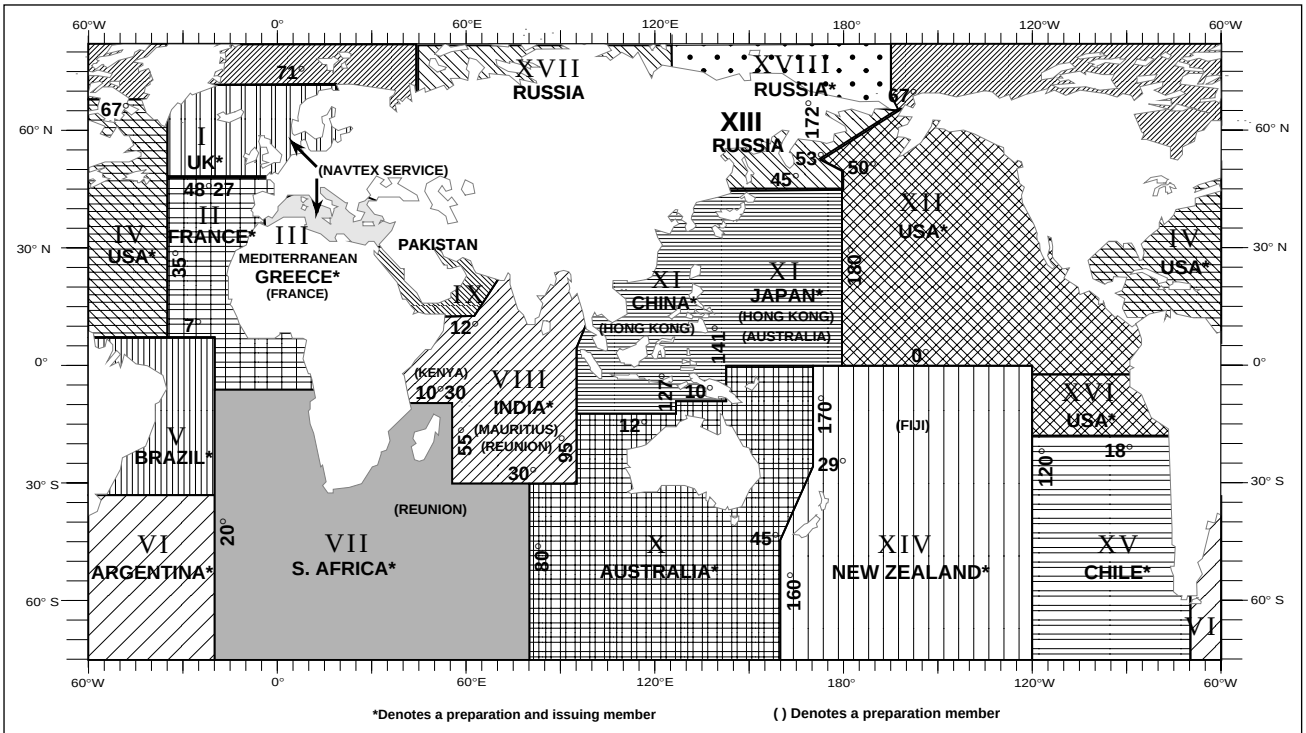
Inmarsat-C: A satellite communications system for telex or data messaging using small terminals and omni-directional antennae in the Inmarsat satellite system.

Unscheduled Broadcasts: The contingent broadcast, with a six-minute repetition, of urgent meteorological information which is intended for immediate delivery to shipping. When such urgent meteorological information comprises or includes tropical cyclone warnings, the EGC priority code (C_1) is $C_1 = 2$ — URGENT and repetition code (C_4) is $C_4 = 11$ — Repeat six minutes after the initial transmission. All other warnings (e.g. gale and storm) will have $C_1 = 1$ — SAFETY and $C_4 = 11$ — Repeat after six minutes.

APPENDIX I-2 BIS

AREAS OF RESPONSIBILITY AND DESIGNATED NATIONAL METEOROLOGICAL SERVICES FOR THE ISSUE OF WARNINGS AND WEATHER AND SEA BULLETINS FOR THE GMDSS





AREAS OF RESPONSIBILITY FOR HIGH SEAS (GMDSS)

TABLE 1

Metarea	*Issuing service*	*Area LES for the issue of scheduled broadcasts (see paragraph 2.2.3.5)*
I	United Kingdom	Goonhilly
II	France	Aussaguel (AOR (E))
		Aussaguel (AOR (W))
III	Greece	Thermopylae (AOR(E))
IV	United States	Southbury (AOR (W))
V	Brazil	Tangua
VI	Argentina	Southbury (AOR (W))
VII-Atlantic Ocean Region	South Africa	Burum (AOR (E))
VII-Indian Ocean Region	South Africa	Burum (IOR)
VIII (N)	India	Aussaguel
VIII (S)	Mauritius/La Réunion*	Aussaguel
IX	Pakistan	Perth
X-Indian Ocean Region	Australia	Perth (IOR)
X-Pacific Ocean Region	Australia	Perth (POR)
XI-Indian Ocean Region	China	Beijing
XI-Pacific Ocean Region	Japan	Yamaguchi
XII-Pacific Ocean Region	United States	Santa Paula (POR)
XII-Atlantic Ocean Region	United States	Southbury (AOR (W))
XIII	Russian Federation	Perth (POR)
XIV	New Zealand	Albany (POR)
XV	Chile	Southbury (AOR (W))
XVI	United States	Southbury (AOR (W))
XVII	Russian Federation	Perth (IOR)
XVIII	Russian Federation	Perth (POR)

* Tropical cyclone warnings prepared and issued by RSMC La Réunion are also included in the regular bulletins issued by Mauritius.

Coordinates for GMDSS Metareas

Area I	The North Atlantic Ocean east of 35°W, from 48°27'N to 71°N including the North Sea and Baltic Sea sub-area.
Area II	Atlantic waters east of 35°W, from 7°N to 48°27'N, and east of 20°W from 7°N to 6°S, including the Strait of Gibraltar.
Area III	The Mediterranean and Black Seas, east of the Strait of Gibraltar.
Area IV	The western part of the North Atlantic Ocean eastwards of the North American coast to 35°W, from 7°N to 67°N, including the Gulf of Mexico and Caribbean Sea.
Area V	Atlantic waters west of 20°W from 35°50'S to 7°N, narrowing in the coastal strips at the extremities to the Uruguay/ Brazil frontier in 33°45'S and the French Guyana/Brazil frontier in 4°30'N.
Area VI	The South Atlantic and Southern Oceans south of 35°50'S, from 20°W to the longitude of Cape Horn, 67°16'W.
Area VII	The South Atlantic and Southern Oceans south of 6°S from 20°W to the coast of Africa, thence south to the Cape of Good Hope; the South Indian and Southern Oceans south of 10°30'S from the Cape to 55°E, thence south of 30°S to 80°E.
Area VIII (N)	The area of the Indian Ocean enclosed by lines from the Indo-Pakistan frontier in 23°45'N 68°E to 12°N 63°E, thence to Cape Gardafui; the east African coast south to the Equator, thence to 95°E, to 6°N, thence NE'wards to the Myanmar/ Thailand frontier in 10N 98°30'E.
Area VIII (S)	The east African coast from the Equator south to 10°30'S, thence to 55°E, to 30°S, to 95°E, to the Equator, to the east African coast.
Area IX	The Red Sea, Gulf of Aden, Arabian Sea and Persian Gulf, north of Area VIII.
Area X	The South Indian and Southern Oceans east of 80°E and south of 30°S to 95°E, to 12°S, to 127°E; thence the Timor Sea, South Pacific and Southern Oceans south of 10°S to 141°E to the Equator, to 170°E, to 29°S, thence SW'wards to 45°S in 160°E, then the 160°E meridian.
Area XI	The Indian Ocean, China Sea and North Pacific Ocean northward of Area X and on the Equator to longitude 180°, eastward of Area VIII and the Asian continent to the North Korea/ Russian Federation frontier in 42°30'N 130°E, thence to 135°E, NE'wards to 45°N 138°E, to 45°N 180°.
Area XII	The eastern part of the Pacific Ocean, west of the North and South American coast and east of 120°W, from 3°24'S to the Equator, thence to 180°, to 50°N thence NW'wards to 53°N 172°E, NE'wards following the marine frontier between the United States and Russian Federation waters to 67°N.
Area XIII	Sea areas enclosed north of Area XI and west of Area XII; also all Arctic waters from 170°W westwards to 20°E.
Area XIV	The South Pacific and Southern Oceans south of the Equator, bounded by Area X to the west, the Equator to the north and 120°W to the east.
Area XV	The South Pacific and Southern Oceans south of 18°21'S following the coast of Chile to the longitude of Cape Horn in 67°16'W, and 120°W.
Area XVI	The South Pacific Ocean between 18°21'S and 3°24'S bounded by the coast of Peru and 120°W.
Area XVII	The Arctic Ocean from south-west corner 67°N, 44°E to north-east corner 83°N, 125°E.
Area XVIII	The Arctic Ocean from south-west corner 63°30°N, 125°E to north-east corner 80°N, 165°W.

TABLE 2

Metarea	*Issuing service**	*Preparation service*	*Area LES of issuing service* *(a) For scheduled broadcasts* *(b) For unscheduled broadcasts*	*Remarks*
I	United Kingdom	United Kingdom, Norway	(a) Goonhilly (For AOR (W)) (b) Goonhilly (For AOR (W), AOR (E))	1, 3
II	France	France	(a) Aussaguel (For AOR (E)), Aussaguel (For AOR (W)) (b) Aussaguel (For AOR (E)), Aussaguel (For AOR (W))	1, 3
III	Greece	Greece, France	(a) Thermopylae (For AOR(E)) (b) Thermopylae (For AOR(E)), Goonhilly (For AOR (W), AOR (E))	1, 3
IV	United States	United States	(a) Southbury (For AOR (W)) (b) Southbury (For AOR (W)), Southbury (For AOR (E))	1, 3
V	Brazil	Brazil	(a) Tangua (For AOR (E)) (b) Tangua(For AOR (W)) Tangua (For AOR (E))	1, 3
VI	Argentina	Argentina	(a) Southbury (For AOR (W)) (b) Southbury (For AOR (W)),	1, 3
VII-AOR	South Africa	South Africa	(a) Burum (For AOR (E)) (b) Burum (For AOR (E) and (W))	1, 3
VII-IOR	South Africa	South Africa, La Réunion	(a) Brum (For IOR) (b) Burum (For AOR (E) and IOR))	1, 3
VIII (N)	India	India	(a) Arvi (For IOR) (b) Arvi (For IOR)	1, 3
VIII (S)	Mauritius,** La Réunion	Mauritius, La Réunion	(a) Aussaguel (For IOR) (b) Aussaguel (For IOR)	2
IX	Pakistan	Pakistan	(a) Perth (For IOR) (b) Perth (For IOR)	2
X-IOR	Australia	Australia, Mauritius, La Réunion	(a) Perth (For IOR) (b) Perth (For IOR and POR)	2
X-POR	Australia	Australia, Fiji, New Zealand	(a) Perth (For POR) (b) Perth (For POR and IOR)	2
XI-IOR	China	China, Hong Kong	(a) and (b) Beijing (For IOR)	1, 3
XI-POR	Japan	Japan, Hong Kong, Australia	(a) and (b) Yamaguchi (For POR)	1, 3
XII	United States	United States	(a) Santa Paula (For POR), Southbury (For AOR (W)) (b) Southbury (For AOR (W)), Southbury (For AOR (E)), Santa Paula (For POR)	1, 3
XIII	Russian Federation	Russian Federation	(a) and (b) Perth (For POR)	3
XIV	New Zealand	Fiji New Zealand	(a) Albany (For POR) (b) Southbury (For AOR (W)), Albany (For POR)	2

XV	Chile	Chile	(a) Southbury (For AOR (W)) (b) Southbury (For AOR (W)),	1, 3
XVI	United States	United States	(a) Southbury (For AOR (W)) (b) Southbury (For AOR (W)), Southbury (For AOR (E)), Santa Paula (For POR)	4
XVII	Russian Federation	Russian Federation	(a) and (b) Perth (For IOR)	
XVIII	Russian Federation	Russian Federation	(a) and (b) Perth (For POR)	

* It is the responsibility of the issuing service to ensure that data are available to provide input for its entire areas of broadcast responsibility and to develop appropriate procedures to rectify and data deficiency.

** Tropical cyclone warnings prepared by RSMC La Réunion are included in the regular bulletins issued by Mauritius.

1 = Full coverage via SafetyNET for areas not covered by NAVTEX.

2 = No NAVTEX coverage.

3 = Partial NAVTEX coverage.

4 = Full coastal coverage via SafetyNET.

APPENDIX I-3 BIS

TRANSFER OF INFORMATION FROM AN ISSUING SERVICE TO A LAND EARTH STATION (LES) PROVIDING Inmarsat-C SERVICES*

The transfer of warnings and forecasts by the issuing service to an LES may be accomplished by:

(1) Telex link from the issuing service directly to the LES;

(2) X.25 packet switching networks;**

(3) A dedicated landline;

(4) The GTS to another National Meteorological Service whose country hosts the relevant LES, thence by either (1) or (2) above by the cooperating National Meteorological Services to the LES;

(5) At Inmarsat-C ship Earth station (SES) direct to the LES. [The approval of the national licensing authority has to be obtained for this method.] Such an approach to message transfer could prove particularly attractive to those issuing services located in countries without a LES, as potential delays and problems in the international terrestrial telecommunications networks could be avoided. It could also serve as an emergency back-up to normal terrestrial communications systems for urgent messages;

(6) Other means, as appropriate, to national requirements and facilities.

* Access to the SafetyNET service for the broadcast of meteorological data will be granted only to message originators authorized by WMO and registered with one or more Inmarsat-C LES operators.

** Such networks, which operate at transmission speeds higher than telex, may attract lower charges for the land-line portion of the transmission.

APPENDIX I-4 BIS

MESSAGE ADDRESSING

INTRODUCTION

Messages for transmission via the SafetyNET service are received and processed automatically. Because the system is automatic, it depends on accurate preparation of the traffic.

Messages are not reviewed for corruption or accuracy at the LES. Therefore, the originator must take special care to adhere to the specified format as detailed in this appendix. It is for this reason that issuing services shall arrange for monitoring the broadcasts that they originate.

Participating LES transmit SafetyNET messages over an interstation signalling link to the Ocean Region network coordination station (NCS) for transmission over the broadcast channel.

Messages will be queued at the LES according to priority and scheduled for retransmission according to instructions contained in the special address headers (C_1 and C_4). Messages with the highest priority will be transmitted first. Shore-to-ship distress alerts will be broadcast first followed by urgency, safety and then routine traffic. The originator of each message will

specify in the message parameters the desired number of repetitions and the interval between transmissions.

1. WARNING AND FORECAST ADDRESSING FOR EGC MESSAGES

1.1 Introduction

This appendix describes the methods by which EGC messages are transmitted to LES and subsequently transmitted over the Inmarsat satellite system. The format in which they are transmitted is also described. It is the responsibility of issuing services to ensure that the correct C codes are used, irrespective of the procedures employed for routeing to the LES.

1.2 Routeing of messages to the LES by an issuing service

(see Appendix I.3 bis for methods)

1.3 Addressing of EGC packets

After having gained access to the LES, the issuing service must give EGC packet address information so that the ships in the right areas receive the EGC messages. The EGC packet address information is sent by the issuing service by means of a special message header at the beginning of messages that are required to be transmitted. These message headers will consist of five special codes called C codes. The five codes may be prefixed by additional characters to indicate that the message is an EGC transmission. [A C_0 code, to identify the ocean region, may be necessary when addressing EGC messages to LES which operate in more than one ocean region.]

The following generalized message header format using C codes shall be adopted by all issuing services. C codes transmitted to the LES are: C_1: C_2: C_3: C_4: C_5, where:

C_1 is the priority code – 1 digit
C_2 is the service code – 2 digits
C_3 is the address – up to 12 digits
C_4 is the repetition rate – 2 digits
C_5 is the presentation code – 2 digits

A digit in this context means an alphanumeric character received from the terrestrial network. The meaning of the C codes is explained later in this appendix, but for illustration purposes an example follows:

An incoming (to the LES) EGC "warning" telex would appear as:

1:31:01:11:00 (the C code message header)
SECURITE
MARINE WEATHER WARNING FOR METAREA I ISSUED BY UK MET OFFICE
0245 UTC
STORM WARNING. AT 190600 UTC, LOW 970 57N 20W MOVING NE 15KT. WINDS STORM 10 WITHIN 150 MILES RADIUS OF CENTRE
NNNN

This example is for "SAFETY" priority (C_1 = 1) EGC call containing a meteorological warning (C_2 = 31) to Metarea 01, which will be repeated six minutes (C_4 = 11) after the initial transmission. The text of the storm warning is transmitted in International Alphabet 5 (C_5 = 00).

1.3.1 Priority codes (C_1)

Format as received at the LES — 1 digit. The C_1 code is used to indicate to the LES the level of priority needed for the message's transmission. The priority number is given in ascending order as follows:

0 ROUTINE
1 SAFETY
2 URGENCY
3 DISTRESS

Meteorological messages will be either SAFETY (C_1 = 1) or URGENCY (C_1 = 2)

NOTE: Priority URGENCY (C_1 = 2) to be used for tropical cyclone warnings only. All other meteorological warnings to be classified as SAFETY (C_1 = 1).

1.3.2 Service codes (C_2)

Format as received at the LES — two digits. A C_2 code is adopted that will explicitly indicate to the EGC receiver the length of the address it will need to decode during message processing. The service codes allocated for WMO use are described below together with the number of digits in the C_3 code:

(*a*) 13 – Coastal warnings and forecasts
C_3 code – 4 digits
24 – Meteorological and navigational warnings and search and rescue information to circular areas
C_3 code – 10 digits;

(*b*) 31 – Meteorological and Navarea warnings and meteorological forecasts to pre-defined Metareas
C_3 code – 2 digits

1.3.3 Addresses (C_3)

The method that issuing services will use to transmit the EGC packet addresses is given below for each service type described in paragraph 1.3.2 of this appendix.

1.3.3.1 *Service code 13 — Coastal warnings and forecasts*

Coastal warnings and forecasts — $C_3 = X_1 X_2$ to identify the Metarea and $B_1 B_2$ to emulate NAVTEX. Note that B_1 codes will be allocated by IMO in accordance with the procedure for allocating NAVTEX transmitter identities laid down in the *IMO NAVTEX Manual* (IMO Publication 951 88.08). B_2 will always be B for warnings and E for forecasts. The Metarea $X_1 X_2$ code and the NAVTEX B_1 and B_2 are sent to the LES as a four-character group, in the order $X_1 X_2 B_1 B_2$.

1.3.3.2 *Service code 24 — Meteorological and navigational warnings and search and rescue information to circular areas*

The circular address consists of 10 characters as follows:

$D_1 D_2 L_a D_3 D_4 D_5 L_o M_1 M_2 M_3$, where

$D_1 D_2$ is latitude of centre in degrees with leading zero if required;
L_a is hemisphere N or S;

D_3 D_4 D_5 is longitude of centre in degrees with leading zero, if required;
L_o is longitude E or W;
M_1 M_2 M_3 is radius of circle in nautical miles (up to 999);
A circle with a radius of 10 nautical miles is coded as 56N034W010

1.3.3.3 *Service code 31 — Meteorological and Navarea warnings and meteorological forecasts to predefined Metareas*

Meteorological and Navarea warnings and meteorological forecasts are addressed to the areas described in Appendix I-2 bis using the two digits N_1N_2 where N_1N_2 is the numerical designation of the area.

1.3.4 **Repetition codes (C_4)**

Format as received at LES — two digits. The C_4 repetition codes are for messages that are required to be repeated at specified intervals until cancelled by the issuing Member and incorporate the needs of MSI providers for the SafetyNET service.

1.3.4.1 *Repetition codes*

A repetition code allows a message to be broadcast once only on receipt (C_4 =01) or broadcast on receipt and repeated six minutes later (C_4 =11). Many other types of repetition are possible, but are not relevant to meteorological broadcasts.

1.3.4.2 *Cancel facility*

A cancellation facility for messages transmitted to an LES with repetition codes is necessary. An example of a cancel instruction is as follows:

Cancel messages: message reference number at time; where message reference number is the number given to the message provider by the LES on receipt of the initial message and time is of the form:

DDHHMMZ space MMM space YY e.g. 211430Z FEB 88

If the cancel instruction accompanies a broadcast message it will appear between the NNNN and ++++ characters as follows:

C_1: C_2: C_3: C_4: C_5
SECURITE
"text"
NNNN
CANCEL (message reference number) at (date/time group)
++++

NOTES: (1) Only SECURITE plus "text" is for transmission.

(2) When included with a message for broadcasting, the LES message cancellation instructions will appear between the NNNN and the ++++ characters. There will only be one instruction to each line, but the facility to provide for more than one line of instructions is desirable.

(3) If the cancellation instruction terminates after the message reference number, i.e. the (time/date) is not included, then the instruction should be executed immediately.

(4) It should also be possible for a cancel instruction to be sent to the LES Store and Forward Unit.

1.3.5 **Presentation codes (C_5)**

The current allocation of presentation codes is as follows PQ173:

00 IA number 5 (IR.V version) odd parity
01 Katakana odd parity
02 Devnagiri odd parity
03 Arabic odd parity
04 Cyrillic odd parity
05 Greek odd parity
06 ITA 2
07 Data

For maritime safety information, C_5 is always 00.

APPENDIX I-5 BIS

INTERNATIONAL SAFETYNET MANUAL
ANNEX 4 — Operational guidance

This annex contains operational guidance for the benefit of Registered Information Providers who are responsible for preparing messages for broadcast via the International SafetyNET Service. Use of the codes given in this annex is mandatory for all messages in the system.

Examples of the various types of messages and message formats are detailed in the subsections of this annex:

(*a*) Navigational warning services;
(*b*) Meteorological services;
(*c*) Search and rescue services;
(*d*) Chart correction services (to be developed);
(*e*) Piracy counter-measures broadcast messages.

The broadcast parameters are controlled by the use of 5 "C" codes which are combined into a generalized message header format as follows:

C_1: C_2: C_3: C_4:C_5

(Spaces, colons or other delimiters between these fields will be required, depending on the LES addressed).

Each "C" code controls a different broadcast parameter and is assigned a numerical value according to the available options which are fully tabulated in Annex 6.

Because distortion of the header format of a message may prevent its being released, MSI providers must install an Inmarsat SafetyNET receiver and monitor broadcasts of messages which they originate.

ANNEX 4*b* — Meteorological services

1. The following sets out the arrangements to be used for the broadcast of meteorological forecasts and warnings via SafetyNET for the GMDSS. They are mandatory for broadcasts in the International SafetyNET Service.
2. These guidelines are to be read in conjunction with the WMO *Manual on Marine Meteorological Services* (WMO-No. 558), as revised for the GMDSS.
3. In order to ensure uniformity of the broadcast of meteorological bulletins and warnings globally, the following standard "C" codes should be used for meteorological forecasts and warnings issued via SafetyNET for the GMDSS.

C_1 — Message priority

Always C_1 = 2 URGENCY for tropical cyclone warnings only

Always C_1 = 1 SAFETY for forecasts and for warnings other than tropical cyclone warnings

C_2 — Service code

Meteorological warnings (C_1 = 1 or 2) to circular area — C_2 = 24

Meteorological warnings or forecasts (C_1 = 1 or 2) to coastal area — C_2 = 13

Meteorological warnings or forecasts to Metarea — C_2 = 31.

C_3 — Address code

Meteorological warnings (C_1 = 1 or 2) to circular area (Service code C_2 = 24) C_3 = 10 characters. Address code for circular areas is fully described in Annex 6, paragraph 1.3.3.5, but repeated here for ease of reference. Circular address will consist of 10 numbers as follows:

$D_1\ D_2\ L_a D_3\ D_4\ D_5\ L_o R_1\ R_2\ R_3$, where

$D_1\ D_2\ L_a$ (three characters) is latitude of centre in degrees and L_a whether north (N) or south (S). A leading zero should be used for latitudes less than 10;

$D_3\ D_4\ D_5\ L_o$ (four characters) is longitude of centre in degrees and L_o whether east (E) or west (W) of the prime meridian. A leading zero should be used for longitudes less than 100;

$R_1\ R_2\ R_3$ (three characters) is radius of circle in nautical miles, up to 999.

Example: A circle centred at latitude 56°N longitude 34°W with radius of 10°NM is coded as 56N034W010

Meteorological warnings (Service code 31) C_3 = the two digits denoting the area of broadcast responsibility (the Metarea) with a leading zero where necessary, e.g. 01, 06, 13.

C_4 — Repetition code

Meteorological warning (category (a) repetition code)

C_4 = 11 On receipt followed by repeat six minutes later. Note a six-minute repeat is used to ensure that the warning is received by the maximum number of ships.

Meteorological forecast (category (a) repetition code)

C_4 = 01 Transmit once on receipt

C_5 — Presentation code

Always C_5 = 00, international alphabet number 5.

Examples:

Meteorological warning (to main broadcast area (Metarea))
1:31:01:11:00
SECURITE
(text) storm warning. At 190600 UTC low 970 57N 20W moving NE 15kts. Wind storm force 10 within 150 miles radius of centre
NNNN.

Tropical cyclone warning (to circular area i.e. only intended to be received by ships within the area of the address)
2:24:20N065W500:11:00
PAN PAN (text) At 161200 UTC Hurricane Betty located 15 nm north of San Juan, Puerto Rico, moving NW 15 knots with hurricane force winds 75 miles from centre NW and NE quadrants and within 30 miles SW and SE quadrants.
NNNN

Meteorological forecast
1:31:08:01:00
SECURITE
(text) forecast text as *Manual on Marine Meteorological Services*
NNNN

RECOMMENDATION 8 (JCOMM-I)

MODIFICATIONS TO THE INTERNATIONAL MARITIME METEOROLOGICAL TAPE (IMMT) FORMAT

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The *Manual on Marine Meteorological Services* (WMO-No. 558) Volume I, Appendix I.13,

(2) The final report of the eighth session of the JCOMM Subgroup on Marine Climatology (JCOMM Meeting Report No. 2, Asheville, April 2000),

(3) The final report of the second meeting on the VOSClim Project (JCOMM Meeting Report No. 7, Asheville, November 2000),

RECOGNIZING:

(1) That it was essential for the VOSClim Project that additional observational and metadata should be included with each observational report submitted in IMMT to the Global Collecting Centres and subsequently to the Data Assembly Centre,

(2) That these data were already being collected and submitted within the context of this project,

CONSIDERING:

(1) That these additional data and metadata would also be of general value to the MCSS, to global climate studies and to marine climate data applications,

(2) That it would simplify the work of Contributing Members, the Global Collecting Centres and Responsible Members alike if the revised IMMT format with the additional entries (IMMT-2) were to completely replace the existing IMMT-1 format,

RECOMMENDS:

(1) That the amendments to the *Manual on Marine Meteorological Services* (WMO-No. 558) and the *Guide to Marine Meteorological Services* (WMO-No. 471), as detailed in the annex to this recommendation be approved;

(2) That the new version (IMMT-2) of the format be implemented generally for all data collected as from 1 January 2003;

REQUESTS the Expert Team on Marine Climatology to continue to review the implementation and value of the revised format, to provide technical assistance to the WMO Members concerned, as required, and to propose further amendments to the format as necessary;

REQUESTS the Secretary-General of WMO to provide appropriate technical advisory assistance to WMO Members concerned, as required, in the implementation of the revised format.

ANNEX TO RECOMMENDATION 8 (JCOMM-I)

LAYOUT FOR THE INTERNATIONAL MARITIME METEOROLOGICAL TAPE (IMMT) [VERSION IMMT-2]

Additional requirements for the VOSCLIM Project

Element number	*Character number*	*Code*	*Element*	*Coding procedure*
65	111		IMMT version	0 = IMMT version just prior to version number being included 1 = IMMT-1 (previous version) 2 = IMMT-2 (this version) 3 = IMMT-3 (next version), etc.
86	132	Q21	Minimum quality control (MQC) standards version identification	1 = MQC-I (Original version) 2 = MQC-II (Version 2, May 1996) 3 = MQC-III (Version 3, May 2000) 4 = MQC-IV (Version 4, June 2001)
87	133–135	HDG	Ship's heading; the direction to which the bow is pointing, referenced to true North	(000–360); e.g. 360 = North 000 = No movement 090 = East
88	136–138	COG	Ship's ground course; the direction the vessel actually moves over the fixed Earth and referenced to true North	(000–360); e.g. 360 = North 000 = No movement 090 = East
89	139–140	SOG	Ship's ground speed; the speed the vessel actually moves over the fixed Earth	(00–99); Round to nearest whole knot
90	141–142	SLL	Maximum height in metres of deck cargo above summer maximum load line	(00–99); Report to nearest whole metre

Element number	*Character number*	*Code*	*Element*	*Coding procedure*
91	143–145	$s_L$hh	Departure of reference level (summer maximum load line) from actual sea level. Consider the difference positive when the summer maximum load line is above the level of the sea and negative if below the water line	Position 143 (s_L) sign position; 0 = positive or zero, 1 = negative Positions 144–145 (hh); (00–99) is the difference to the nearest whole metre between the summer maximum load line and the sea level
92	146–148	RWD	Relative wind direction in degrees off the bow	Relative wind direction; e.g. 000 = no apparent relative wind speed (calm conditions on deck). Reported direction for relative wind = 001–360 degrees in a clockwise direction off the bow of the ship. When directly on the bow, RWD = 360
93	149–151	RWS	Relative wind speed reported in units indicated by i_W (knots or m s^{-1})	Reported in either whole knots or whole metres per second (e.g. 010 knots or 005 m s^{-1}). Units established by iW as indicated in character number 27

NOTES:

(1) Since the relative wind speed can be greater than the true wind speed, e.g., i_W indicates knots and ff = 98, the relative wind speed may be 101 knots; therefore, three positions must be allocated since i_W cannot be adjusted and the relative wind speed converted to metres per second as is done in element 15.

(2) Most of the codes (groups of letters) in the IMMT format with the exception of those added for the VOSClim Project are defined in the *Manual on Codes* (WMO-No. 306) as they basically mirror the code groups used in the FM 13-X SHIP code. Because CBS did not agree to expand the FM 13-X SHIP code for the VOSClim Project, the additional observed elements (selected codes) will not appear in the WMO *Manual on Codes*. Therefore an effort was made to select unique codes (groups of letters) not defined in the WMO *Manual on Codes* for the elements added to the IMMT-2 format version modified for the VOSClim Project. This was deliberately done to try and prevent a difference in meaning for a given code group (identical symbolic letters) in the WMO *Manual on Codes* versus that in IMMT.

RECOMMENDATION 9 (JCOMM-I)

FURTHER AMENDMENTS TO THE *MANUAL ON MARINE METEOROLOGICAL SERVICES* (WMO-No. 558)

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The *Manual on Marine Meteorological Services* (WMO-No. 558), Volume I, Part I, Section 5 and Appendix I.15,

(2) The final report of the eighth session of the JCOMM Subgroup on Marine Climatology (JCOMM Meeting Report No. 2, Asheville, April 2000),

(3) Recommendation 10 (JCOMM-I) — Amendments to the *Guide to Marine Meteorological Services* (WMO-No. 471),

CONSIDERING:

(1) The importance of the minimum quality control standards to the quality of the data contained in the MCSS data archives,

(2) That no ocean current data obtained from ship's set and drift had been submitted to the International Surface Current Data Centre (ISCDC, Bracknell, United Kingdom) for more than 10 years and that no requests had been made to the Centre for such data in the same period,

RECOMMENDS:

(1) That the amendments as detailed in Annex 1 to this recommendation be included in the *Manual on Marine Meteorological Services* (WMO-No. 558) and in the *Guide to Marine Meteorological Services* (WMO-No. 471);

(2) That the revised minimum quality control standards as given in Annex 2 to this recommendation be included in Volume I, Part I, Appendix I.15 of the *Manual on Marine Meteorological Services* (WMO-No. 558).

ANNEX 1 TO RECOMMENDATION 9 (JCOMM-I)

AMENDMENTS TO THE *MANUAL ON MARINE METEOROLOGICAL SERVICES* (WMO-No. 558)

Delete entirely Section 6.2.2 — Exchange of sea-surface current data obtained from a ship's set and drift.	Maintain Appendix I.17 as documented metadata of the procedures previously used.

ANNEX 2 TO RECOMMENDATION 9 (JCOMM-I)

MINIMUM QUALITY CONTROL STANDARDS (VERSION 4, JUNE 2001)

NOTE: See specification for quality control indicators Q_1 to Q_{20} at the end of this appendix. Δ = space (ASCII 32)

Element	*Error*	*Action*
1	$i_T \neq 3–5$	Correct manually otherwise = Δ
2	AAAA ≠ valid year	Correct manually otherwise reject
3	MM ≠ 01–12	Correct manually otherwise reject
4	YY ≠ valid day of month	Correct manually otherwise reject
5	GG ≠ 00–23	Correct manually otherwise reject
6	Q ≠ 1, 3, 5, 7	Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$
	Q = Δ	$Q_{20} = 2$
7	$L_aL_aL_a \neq 000–900$	Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$
	$L_aL_aL_a = Δ Δ Δ$	$Q_{20} = 2$
8	$L_oL_oL_oL_o \neq 0000–1800$	Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$
	$L_oL_oL_oL_o = Δ Δ Δ Δ$	$Q_{20} = 2$
	$L_aL_aL_a = L_oL_oL_oL_o = Δ Δ Δ (Δ)$	Correct manually otherwise reject
Time sequence checks		
	Change in latitude > 0.7°/hr	Correct manually otherwise $Q_{20} = 3$
	Change in longitude > 0.7°/hr when latitude 00–39.9	Correct manually otherwise $Q_{20} = 3$
	Change in longitude > 1.0°/hr when latitude 40–49.9	Correct manually otherwise $Q_{20} = 3$
	Change in longitude > 1.4°/hr when latitude 50–59.9	Correct manually otherwise $Q_{20} = 3$
	Change in longitude > 2.0°/hr when latitude 60–69.9	Correct manually otherwise $Q_{20} = 3$
	Change in longitude > 2.7°/hr when latitude 70–79.9	Correct manually otherwise $Q_{20} = 3$
9		No checking
10	h ≠ 0–9, Δ	Correct manually and $Q_1 = 5$, otherwise Q1 = 4
	h = Δ	$Q_1 = 9$
11	VV ≠ 90–99, Δ Δ	Correct manually and $Q_2 = 5$, otherwise $Q_2 = 4$
	VV = Δ Δ	$Q_2 = 9$
12	N ≠ 0–9, Δ, /	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 4$
	N < Nh	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
13	dd ≠ 00–36, 99	Correct manually and $Q_4 = 5$, otherwise $Q_4 = 4$
	dd = ΔΔ, //	$Q_4 = 9$
	dd versus ff	
	dd = 00, ff ≠ 00	Correct manually and Q_4 or $Q_5 = 5$ otherwise $Q_4 = Q_5 = 2$
	dd ≠ 00, ff = 00	Correct manually and Q_4 or $Q_5 = 5$ otherwise $Q_4 = Q_5 = 2$
14	$i_W \neq 0, 1, 3, 4$	Correct manually, otherwise $Q_5 = 4$

Element	*Error*	*Action*
15	ff > 80 knots	Correct manually and $Q_5 = 5$, otherwise $Q_5 = 3$
	ff = Δ Δ, //	$Q_5 = 9$
16	$s_n \neq 0, 1$	Correct manually, otherwise $Q_6 = 4$
17	TTT = Δ Δ Δ, ///	$Q_6 = 9$
	If –25 > TTT >40 then	
	when latitude < 45.0	
	TTT < –25	$Q_6 = 4$
	TTT > 40	$Q_6 = 3$
	when latitude ≥ 45.0	
	TTT < –25	$Q_6 = 3$
	TTT > 40	$Q_6 = 4$
TTT versus humidity parameters		
	TTT < WB (wet bulb)	Correct manually and $Q_6 = 5$, otherwise $Q_6 = Q_{19} = 2$
	TTT < DP (dew point)	Correct manually and $Q_6 = Q_7 = 5$, otherwise $Q_6 = Q_7 = 2$
18	$s_t \neq 0, 1, 2, 5, 6, 7, 9$	Correct manually, otherwise $Q_7 = 4$
19	DP > WB	Correct manually and $Q_7 = 5$, otherwise $Q_7 = Q_{19} = 2$
	DP > TTT	Correct manually and $Q_7 = 5$, otherwise $Q_7 = Q_6 = 2$
	WB = DP = Δ Δ Δ	$Q_7 = 9$
20	930 > PPPP > 1050 hPa	Correct manually and $Q_8 = 5$, otherwise $Q_8 = 3$
	870 > PPPP > 1070 hPa	Correct manually and $Q_8 = 5$, otherwise $Q_8 = 4$
	PPPP = Δ Δ Δ Δ	$Q_8 = 9$
21	ww = 22–24, 26, 36–39, 48, 49, 56, 57, 66–79, 83–88, 93–94 and latitude <20°	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
	ww = Δ Δ, //	$Q_9 = 9$
22, 23	W_1 or W_2 = 7 and latitude <20°	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
	$W_1 < W_2$	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 2$
	$W_1 = W_2$ = Δ, /	$Q_9 = 9$
24–27	N = 0 and $N_h C_L C_M C_H \neq 0$	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
	N = Δ and $N_h C_L C_M C_H \neq$ Δ	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
	N = 9 and not (N_h = 9 and $C_L C_M C_H$ = Δ)	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$
	N=Δ,/ and $N_h C_L C_M C_H$ = Δ,/	$Q_3 = 9$
28	$s_n \neq 0, 1$	Correct manually otherwise $Q_{10} = 4$
29	$T_w T_w T_w$ = Δ , ///	$Q_{10} = 9$
	if –2.0 > $T_w T_w T_w$ > 37.0 then	
	when latitude < 45.0	
	$T_w T_w T_w$ < –2.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$
	$T_w T_w T_w$ > 37.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$
	when latitude ≥ 45.0	
	$T_w T_w T_w$ < –2.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$
	$T_w T_w T_w$ > 37.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$
30	Indicator ≠ 0–7, Δ	Correct manually, make it Δ if not correctable
31	Indicator ≠ 0–9, Δ	Correct manually, make it Δ if not correctable
32	20 < $P_w P_w$ < 30	$Q_{11} = 3$
	$P_w P_w \geq 30$ and ≠ 99	$Q_{11} = 4$
	$P_w P_w$ = Δ Δ, //	$Q_{11} = 9$
33	35< $H_w H_w$ < 50	$Q_{12} = 3$
	$H_w H_w \geq 50$	$Q_{12} = 4$
	$H_w H_w$ = Δ Δ, //	$Q_{12} = 9$
34	d_{w1} $d_{w1} \neq$ 00–36, 99, Δ Δ	Correct manually and $Q_{13} = 5$, otherwise $Q_{13} = 4$
	$swell_1 = swell_2$ = Δ	$Q_{13} = 9$
35	25 < $P_{w1} P_{w1}$ < 30	$Q_{13} = 3$
	$P_{w1} P_{w1} \geq 30$ and ≠ 99	$Q_{13} = 4$

Element	*Error*	*Action*
36	$35 < H_{w1}H_{w1} < 50$	$Q_{13} = 3$
	$H_{w1}H_{w1} \geq 50$	$Q_{13} = 4$
37	$I_s \neq 1–5, \Delta$	Correct manually, otherwise Δ
38	$E_sE_s \neq 00–99, \Delta\Delta$	Correct manually, otherwise ΔΔ
39	$R_s \neq 0–4, \Delta$	Correct manually, otherwise Δ
40	Source ≠ 0–6	Correct manually, otherwise Δ
41	Platform ≠ 0–9	Correct manually, otherwise Δ
42	No call sign	Insert manually, mandatory entry
43	No country code	Insert manually
44		No quality control
45	Q ≠ 0–6, 9	Correct manually, otherwise Δ
46	$i_x \neq 1–7$	Correct manually, otherwise Δ
47	i_R = 0–2 and RRR = 000, ///, ΔΔΔ	Correct manually, otherwise $Q_{14} = 4$
	i_R = 3 and RRR ≠ 000, ///, ΔΔΔ	Correct manually, otherwise $Q_{14} = 2$
	i_R = 4 and RRR ≠ ///, ΔΔΔ	Correct manually, otherwise $Q_{14} = 2$
	$i_R \neq 0–4$	Correct manually, otherwise $Q_{14} = 4$
48	RRR ≠ 001–999 and i_R = 1, 2	Correct manually and $Q_{14} = 5$, otherwise $Q_{14} = 2$
49	$t_R \neq 0–9$	Correct manually and $Q_{14} = 5$, otherwise $Q_{14} = 4$
50	$s_w \neq 0, 1, 2, 5, 6, 7, 9$	Correct manually, otherwise $Q_{19} = 4$
51	WB < DP	Correct manually and $Q_{19} = 5$, otherwise $Q_{19} = Q_7 = 2$
	WB = ///, ΔΔΔ	$Q_{19} = 9$
	WB > TTT	Correct manually and $Q_{19} = 5$, otherwise $Q_{19} = Q_6 = 2$
52	a ≠ 0–8, Δ	Correct manually and $Q_{15} = 5$, otherwise $Q_{15} = 4$
	a = 4 and ppp ≠ 000	Correct manually and Q_{15} or $Q_{16} = 5$, otherwise $Q_{15} = Q_{16} = 2$
	a = 1, 2, 3, 6, 7, 8 and ppp = 0	Correct manually and Q_{15} or $Q_{16} = 5$, otherwise $Q_{15} = Q_{16} = 2$
	a = Δ	$Q_{15} = 9$
53	250 ≥ ppp > 150	Correct manually and $Q_{16} = 5$, otherwise $Q_{16} = 3$
	ppp > 250	Correct manually and $Q_{16} = 5$ otherwise $Q_{16} = 4$
	ppp = ΔΔΔ	$Q_{16} = 9$
54	$D_s \neq 0–9, \Delta, /$	Correct manually and $Q_{17} = 5$, otherwise $Q_{17} = 4$
	$D_s = \Delta, /$	$Q_{17} = 9$
55	$V_s \neq 0–9, \Delta, /$	Correct manually and $Q_{18} = 5$, otherwise $Q_{18} = 4$
	$V_s = \Delta , /$	$Q_{18} = 9$
56	$d_{w2}d_{w2} \neq 00–36, 99$	Correct manually and $Q_{13} = 5$, otherwise $Q_{13} = 4$
57	$25 < P_{w2}P_{w2} < 30$	$Q_{13} = 3$
	$P_{w2}P_{w2} \geq 30$ and ≠ 99	$Q_{13} = 4$
58	$35 < H_{w2}H_{w2} < 50$	$Q_{13} = 3$
	$H_{w2}H_{w2} \geq 50$	$Q_{13} = 4$
59	$c_i \neq 0–9, \Delta, /$	Correct manually, otherwise Δ
60	$S_i \neq 0–9, \Delta, /$	Correct manually, otherwise Δ
61	$b_i \neq 0–9, \Delta, /$	Correct manually, otherwise Δ
62	$D_i \neq 0–9, \Delta, /$	Correct manually, otherwise Δ
63	$z_i \neq 0–9, \Delta, /$	Correct manually, otherwise Δ
86	Minimum quality control (MQC) standards version identification	1 = MQC-I (Original version) 2 = MQC-II (Version 2, May 1996) 3 = MQC-III (Version 3, May 2000) 4 = Present version

Specifications for quality control indicators Q_1 to Q_{20}

0	No quality control (QC) has been performed on this element
1	QC has been performed; element appears to be correct
2	QC has been performed; element appears to be inconsistent with other elements
3	QC has been performed; element appears to be doubtful
4	QC has been performed; element appears to be erroneous
5	The value has been changed as a result of QC
6	Reserved for GCC
7	Reserved for GCC
8	Reserve
9	The value of the element is missing

RECOMMENDATION 10 (JCOMM-I)

AMENDMENTS TO THE *GUIDE TO MARINE METEOROLOGICAL SERVICES* (WMO-No. 471)

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) Recommendation 20 (CMM-VII) — Exchanges, for climatological purposes, of sea-surface current data obtained from ship's drift,

(2) Recommendation 10 (CMM-XII) — *Guide to Marine Meteorological Services* (WMO-No. 471),

(3) The final report of the eighth session of the JCOMM Subgroup on Marine Climatology (Asheville, April 2000), item 7,

CONSIDERING:

(1) That no ocean current data obtained from ship's drift had been submitted to the International Surface Current Data Centre (ISCDC, Bracknell, United Kingdom) for more than 10 years and that no requests had been made to the Centre for such data in the same period,

(2) That changes in shipping practices had lead to the effective discontinuation of such observations on-board the VOS,

(3) The need to keep the *Guide to Marine Meteorological Services* fully up-to-date,

EXPRESSES ITS APPRECIATION to the Met Office (United Kingdom) for having created the ISCDC and for having maintained the database for more that 20 years;

RECOMMENDS:

(1) That the amendments as detailed in the annex to this recommendation be included in the *Guide to Marine Meteorological Services* (WMO-No. 471);

(2) That the data in the ISCDC archive be copied to the World Data Centres for Oceanography.

ANNEX TO RECOMMENDATION 10 (JCOMM-I)

AMENDMENTS TO THE *GUIDE TO MARINE METEOROLOGICAL SERVICES* (WMO-No. 471)

Add at the end of the first paragraph of Section 3.2.9.2 — Minimum quality control: Nevertheless, it is stressed that, while flagging data as doubtful is an accepted procedure, all efforts should first be made to correct those data.	Delete entirely Section 3.3.2 — Exchange of sea surface current data obtained from ships' set and drift. Maintain Annex 6.D of the *Guide* associated with Section 3.3.2, as documented metadata of the procedures previously used.

RECOMMENDATION 11 (JCOMM-I)

DYNAMIC PART OF THE *GUIDE TO THE APPLICATIONS OF MARINE CLIMATOLOGY* (WMO-No. 781)

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) The *Guide to the Applications of Marine Climatology* (WMO-No. 781),

(2) General summary paragraphs 7.3.1–7.3.3 of the *Abridged Final Report with Resolutions and Recommendations of the Twelfth Session of the Commission for Marine Meteorology* (WMO-No. 860),

(3) The *Proceedings of the Workshop on Advances in Marine Climatology (CLIMAR99)* (JCOMM Technical Report No. 10, WMO/TD-No. 1062),

(4) The final report of the eighth session of the JCOMM Subgroup on Marine Climatology (Asheville, April 2000), general summary paragraphs 8.1.1–8.1.6 and Annex XI,

CONSIDERING:

(1) The value to Members/Member States of the *Guide to the Applications of Marine Climatology* and the importance of maintaining it up-to-date,

(2) The rapid, ongoing changes in aspects of the subject such as technologies for data management and understanding of climate change,

(3) The proposal of JCOMM to commemorate in some substantive way the 150th anniversary in 2003 of the Brussels Conference of 1853,

EXPRESSES ITS APPLICATION to the Meteorological Service of Canada and the Office of Global Programmes and the National Weather Service, NOAA (United States), for hosting and supporting CLIMAR99;

RECOMMENDS:

(1) That the *Guide to the Applications of Marine Climatology* should in the future comprise both static and dynamic parts;

(2) That the *Guide* as presently published should be maintained as the static part;

(3) That the dynamic part of the *Guide* should comprise those papers listed in the annex to this recommendation;

(4) That this part should be published primarily in electronic form, available through the WMO Web site, with the papers in the original languages only, with consideration being given to also making this part available to Members/Member States in printed form;

REQUESTS the co-presidents of JCOMM, in consultation with the Secretary-General of WMO and the Executive Secretary IOC, to develop a proposal for a conference, taking account of the wish to follow up CLIMAR99, to provide a further updating for the dynamic part of the *Guide*.

ANNEX TO RECOMMENDATION 11 (JCOMM-I)

PAPERS TO BE INCLUDED IN THE DYNAMIC PART OF THE *GUIDE TO THE APPLICATIONS OF MARINE CLIMATOLOGY* (WMO-No. 781)

1.3 COADS updates and the blend with the UK Meteorological Office marine data bank
S. D. Woodruff, H. F. Diaz, S. J. Lubker, NOAA/ERL Climate Diagnostics Center, Boulder, Colorado, United States;
S. J. Worley, National Center for Atmospheric Research, Boulder, Colorado, United States;
J. A. Arnott, M. Jackson, D. E. Parker, Hadley Centre, UK Met Office, Bracknell, United Kingdom;
J. D. Elms, NOAA/NCDC, Asheville, North Carolina, United States.

1.4 The Kobe collection (newly digitized Japanese historical surface marine meteorological observations)
Teruko Manabe, Maritime Meteorological Division, Japan Meteorological Agency, Tokyo, Japan.

1.5 An archive of underway surface meteorology data from WOCE
David M. Legler, Shawn R. Smith, James J. O'Brien, Center for Ocean Atmospheric Prediction Studies (COAPS), Florida State University, Tallahassee, Florida, United States.

2.1 The accuracy of marine surface winds from ships and buoys
Peter K. Taylor, Elizabeth C. Kent, Margaret J. Yelland, Ben I. Moat, Southampton Oceanography Centre, Southampton, United Kingdom.

3.1 An intercomparison of *in situ*, voluntary observing, satellite data, and modelling wind and wave climatologies
P. David Cotton, Satellite Observing Systems, Godalming, Surrey, United Kingdom;
Peter G. Challenor, Lisa Redbourn-Marsh, Southampton Oceanography Centre, Southampton, United Kingdom;
Sergey K. Gulev, P. Shirshov Institute of Oceanology, Moscow, Russia;
Andreas Sterl, Royal Netherlands Meteorological Institute, De Bilt, The Netherlands;
Roman S. Bortkovskii, Main Geophysical Observatory, St Petersburg, Russia.

3.2 The joint calibration of altimeter and *in situ* wave heights
P. G. Challenor, Southampton Oceanography Centre, Southampton, United Kingdom;
P. D. Cotton, Satellite Observing Systems Ltd., Surrey, United Kingdom.

3.3 On the use of *in situ* and satellite wave measurements for evaluation of wave hindcasts
Andrew T. Cox, Vincent J. Cardone, Oceanweather Inc. — Cos Cob, Connecticut, United States;
Val R. Swail, Environment Canada, Toronto, Ontario, Canada.

3.4 Scatterometry datasets: high quality winds over water
Mark A. Bourassa, David M. Legler, James J. O'Brien, Center for Ocean Atmospheric Prediction Studies (COAPS), Florida State University, Tallahassee, Florida, United States.

4.1 Evaluation of ocean wind and wind wave fields from COADS
Sergey Gulev, Institut fur Meereskunde, Dusternbrooker Weg, Kiel, Germany;
Konstantin Selemenov, P. P. Shirshov, Institute of Oceanology, RAS, Moscow, Russia.

5.1 Evaluation of NCEP reanalysis surface marine wind fields for ocean wave hindcasts
Vincent J. Cardone, Andrew T. Cox, Oceanweather Inc., Cos Cob, Connecticut, United States;
Val R. Swail, Environment Canada, Toronto, Ontario, Canada.

6.4 Analysis of wave climate trends and variability
Val R. Swail, Environment Canada, Toronto, Ontario, Canada;
Andrew T. Cox, Vincent J. Cardone, Oceanweather Inc., Cos Cob, Connecticut, United States.

7.1 Outlier detection in gridded ship's datasets
Pascal Terray, Laboratoire d'océanographie dynamique et de climatologie, Université de Paris 7, Paris, France.

7.2 A methodology for integrating wave data from different sources permitting a multiscale description of wave climate variability
G. A. Athanassoulis, Ch. N. Stefanakos, National Technical University of Athens, Department of Naval Architecture and Marine Engineering, Athens, Greece;
S. F. Barstow, OCEANOR, Oceanographic Company of Norway, Trondheim, Norway.

7.3 Reduced space approach to the optimal analysis of historical marine observations: accomplishments, difficulties, and prospects
A. Kaplan, M. A. Cane, Y. Kushnir, Lamont Doherty Earth Observatory of Columbia University, Palisades, New York, United States.

8.1 Improving global flux climatology: the role of metadata
Elizabeth C. Kent, Peter K. Taylor, Simon A. Josey, Southampton Oceanography Centre, Southampton, United Kingdom.

8.2 Establishing more truth in true winds
Shawn R. Smith, Mark A. Bourassa, Ryan J. Sharp, Center for Ocean Atmospheric Prediction Studies, Florida State University, Tallahassee, Florida, United States.

8.4 Quality control in recent and pending COADS releases
Klaus Wolter, S. J. Lubker and Scott Woodruff, NOAA/ERL Climate Diagnostics Center, Boulder, Colorado, United States.

9.1 Offshore industry requirements and recent metocean technology developments
C. J. Shaw, Chairperson of the OGP Metocean Committee, and Shell EP Technology, The Netherlands.

9.2 Specific contributions to the observing system: sea-surface temperatures;
Richard W. Reynolds, National Climate Data Center, NESDIS, Camp Springs, Maryland, United States.

10.1 Importance of marine data to seasonal forecasting in Australia
Scott Power, Australian National Climate Centre, Melbourne, Australia.

Developments in the Beaufort equivalent scale
Ralf Lindau, Kiel University, Kiel, Germany.

RECOMMENDATION 12 (JCOMM-I)

WORKING ARRANGEMENTS BETWEEN WMO AND THE INTERNATIONAL MOBILE SATELLITE ORGANIZATION (IMSO)

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING:

(1) Resolution 19 (Cg-XI) — The collection and dissemination of marine meteorological and oceanographic information using INMARSAT,

(2) Recommendation 8 (CMM-XI) — The collection of meteorological and oceanographic information using INMARSAT,

(3) The Convention of the International Mobile Satellite Organization, as amended,

CONSIDERING:

(1) That the INMARSAT system is now the primary mechanism for the collection of meteorological and oceanographic reports from ships at sea, as well as for providing a major facility for the dissemination of meteorological and oceanographic information to maritime users under the GMDSS,

(2) That IMSO is the intergovernmental organization charged with providing the necessary oversight for the provision of satellite services for the GMDSS,

RECOGNIZING that WMO will need to continue to interact closely in the future with IMSO on many issues relating to the use of the INMARSAT system for the dissemination of meteorological and oceanographic information essential to the safety of life and property at sea,

RECOMMENDS that WMO establish formal working arrangements with IMSO to facilitate this interaction;

REQUESTS the Secretary-General of WMO, in consultation with the Secretary-General of IMSO, to prepare appropriate draft working arrangements, for the consideration of the WMO Executive Council and the IMSO Assembly.

RECOMMENDATION 13 (JCOMM-I)

REVISION OF RESOLUTIONS OF THE WMO AND IOC GOVERNING BODIES BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR MARINE METEOROLOGY AND OF THE JOINT IOC/WMO COMMITTEE FOR IGOSS

THE JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY,

NOTING with satisfaction the action taken by the WMO and IOC governing bodies on the previous recommendations of the Commission for Marine Meteorology and of the Joint IOC/WMO Committee for IGOSS, as well as on other matters related to the work of those two bodies,

CONSIDERING that many of these recommendations have become redundant in the meantime,

RECOMMENDS:

(1) That WMO Resolutions 2 (EC-XLVIII), 8 (EC-XLIX) and 10 (EC-XLI), and IOC Resolution EC-XXIX.3 be no longer considered necessary;

(2) That WMO Resolutions 15 (EC-XXI), 12 (EC-XXV) and 3 (EC-XLVIII) be kept in force.

ANNEXES

ANNEX I

Annex to paragraph 6.6.4 of the general summary

SUMMARY ANALYSIS OF THE RESULTS OF THE MMS MONITORING SURVEY

Narrative summary of questionnaire, comments and suggestions

The overwhelming majority of comments concerning marine meteorological services were positive. All mariners recognize the importance of weather to their operations and have a keen appreciation of accurate, up-to-date meteorological data and products. These products and data, used in conjunction with *in situ* shipboard weather observations, are essential to ships' officers in developing their local forecast.

Global Maritime Distress and Safety System (GMDSS) information: The reception of GMDSS information via Inmarsat SafetyNet has been judged to be excellent whereas the reception via NAVTEX was seen to require some improvement. While many near-shore ocean areas are covered by reliable, well-spaced NAVTEX transmission facilities, many locations need considerable improvement or, indeed, initial installation. An examination of the specific comments indicates geographic areas where improvements would have a significant beneficial effect for mariners. Suggested items requiring attention are concentrated in the areas of: (*a*) additional coverage in neglected marine areas; and (*b*) improved transmission reliability for stations that already exist.

Storm and gale warnings: In this area the comments concerned primarily the quality, rather than the reception, of the product. Clarity, accuracy and timeliness of warnings were judged to be quite good. Suggested improvements were related to a desire for more accurate geographic positioning for warnings and forecast movement of storms, and an increase in the lead time for predicting this movement. These areas of accuracy and timeliness are well known to marine forecasters who are constantly striving to improve both fields. It should be noted that continued support for the Voluntary Observing Ship programme for reporting synoptic marine weather will have a direct impact on improved forecast capabilities.

Weather bulletins: Comments in this area are a direct reflection of those mentioned in the previous topic of storm and gale warnings: a desire for improved positional information and lead-time in forecasting movement. The areas of clarity, accuracy and timeliness were judged to be quite good, as was the additional area of terminology.

Radiofacsimile broadcasts: The usefulness of the radiofacsimile broadcast received the highest positive response of any field reported (96.48 per cent "yes"). Conversely, in the areas of quality of reception and readability, it received the lowest percentage of good responses, between good and fair. The agreed consensus among mariners is that radiofacsimile broadcasts are extremely useful, but need the most improvement. It is recognized that this technology is based on high frequency radio communications and must deal with all inherent problems associated with this technology, i.e. atmospheric disruptions, frequency fade and path distortion, etc. This service is slowly being phased out in many countries, often without sufficient notification to the mariner. Satellite capability for delivery of these products is being developed but is not yet available globally on a cost-effective basis.

Coast Earth stations: Establishment of contact and delivery of data through the CES's was found to be good, with some problems in the willingness of a few CESs to accept marine meteorological observations.

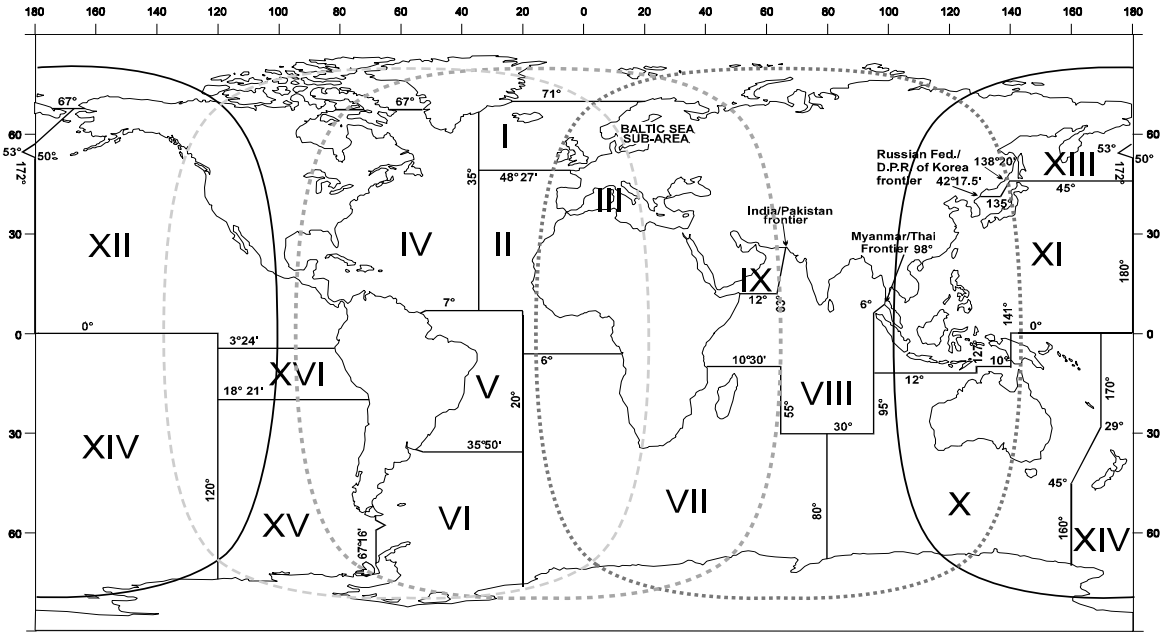
General summation of problems and suggestions for improvements provided by ships' masters

	Good	*Fair*	*Poor*	*Totals*
1. Reception of GMDSS information				
(*a*) via INMARSAT SafetyNet	519 (94.36%)	28 (5.09%)	3 (0.55%)	550
(*b*) via Navtex	393 (74.86%)	107 (20.38%)	25 (4.76%)	525
2. Storm and gale warnings				
(*a*) Clarity of information	540 (89.26%)	59 (9.75%)	6 (0.99%)	605
(*b*) Accuracy of information	465 (76.99%)	136 (22.52%)	3 (0.49%)	604
(*c*) Timeliness	481 (80.57%)	109 (18.26%)	7 (1.17%)	597
3. Weather bulletins				
(*a*) Clarity of information	515 (85.69%)	79 (13.14%)	7 (1.16%)	601
(*b*) Accuracy of information	452 (74.96%)	147 (24.38%)	4 (0.66%)	603
(*c*) Timeliness	482 (81.14%)	104 (17.51%)	8 (1.35%)	594
(*d*) Terminology used	500 (85.03%)	79 (13.44%)	9 (1.53%)	588
4. Radiofacsimile broadcasts				
(*a*) Maintaining schedules	356 (77.22%)	79 (17.14%)	26 (5.64%)	461
(*b*) Accuracy of information	369 (80.22%)	79 (17.17%)	12 (2.61%)	460
(*c*) Readability	296 (64.63%)	139 (30.35%)	23 (5.02%)	458
(*d*) Symbology	318 (70.82%)	113 (25.17%)	18 (4.01%)	449
(*e*) Quality of reception	234 (52.94%)	178 (40.27%)	30 (6.79%)	442
(*f*) Useful service?	Yes 439 (96.48%)	No 16 (3.52%)		455
5. Coast Earth stations (CES)				
(*a*) Establishing contact with receiving CES	300 (87.98%)	37 (10.85%)	4 (1.17%)	341
(*b*) Delays of obs messages	Yes 38 (9.82%)	No 349 (90.18%)		387
(*c*) CES refusal to accept obs messages	Yes 33			

ANNEX II

Annex to paragraph 7.4.13 of the general summary

STATUS OF INMARSAT SATELLITE COVERAGE



ANNEX III

Annex to paragraph 8.4.3 of the general summary

GLOSS CORE NETWORK (GCN) STATUS FROM THE VIEWPOINT OF THE PERMANENT SERVICE FOR MEAN SEA LEVEL (PSMSL)

1. For several years, the Permanent Service for Mean Sea Level (PSMSL) has provided a regular summary of the status of each of the 287 sites in the GLOSS Core Network (GCN), based on data and information provided by GLOSS contacts. A review of the status of the GCN as of October 2000 can be found at:

http://www.pol.ac.uk/psmsl/programmes/gloss.info.html

2. The figure shows the status of the GCN, which has been essentially unchanged for several years. Approximately two-thirds of the stations in the GCN can be considered to be operational, using data receipts by the PSMSL as a guide to operational status, or somewhat better if additional factors are considered. These factors include the fact that, at some locations, the gauges take the form of simple pressure transducers, which provide useful information for oceanography, even if they do not provide MSL data for the PSMSL. However, the status summary hides major problems in several regions. On the plus side, there has been expenditure on new tide gauge equipment in a number of countries, which has improved the network. On the negative side, this has to be balanced against the fact that many GLOSS stations in other countries either have been terminated, are being terminated, or require major upgrades. In addition, the investments made in tide gauges for international programmes (notably WOCE) are unlikely to be repeated in future. Consequently, it is possible that GLOSS status, measured in terms of data received by the PSMSL, may have reached a plateau.

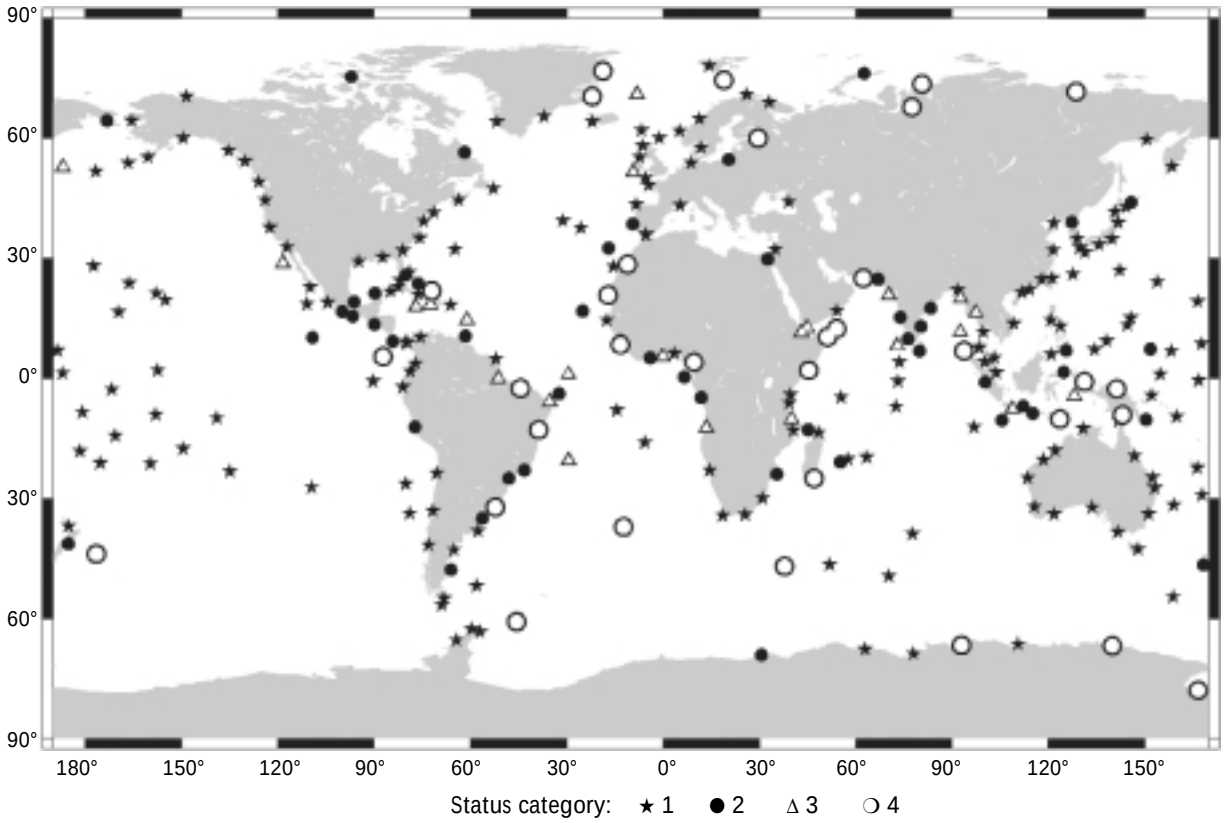
3. Improvements in the GCN may occur in future as a result of an increase in demand for coastal tide gauges to meet the anticipated requirements for investment in these devices by, for example, the Coastal Ocean Observations Panel of GOOS. An 'operational' station from a PSMSL viewpoint means that recent MSL monthly and annual values have been received at Bidston, have been checked as far as possible and have been included in the data bank. For each of the GLOSS stations we have used the year of the last data entered into the data bank, if any, to place the station into one of four categories:

Category 1: 'Operational' stations for which the latest data is 1996 or later;

Category 2: 'Probably operational' stations for which the latest data is within the period 1986–1995;

Category 3: 'Historical' stations for which the latest data is earlier than 1986;

Category 4: For which no PSMSL data exist.



GLOSS status within the PSMSL dataset, October 2000.

ANNEX IV

Annex to paragraph 10.4 of the general summary

IGOSS-RELATED TECHNICAL PUBLICATIONS

Code	*Title*	*Date*	*Comments*
IOC M and G #1	*Guide to IGOSS Data Archives and Exchange (BATHY & TESAC)* — Second revised edition	1993	Under IODE responsibility
IOC M and G #3	*Guide to Operational Procedures for the Collection and Exchange of JCOMM Oceanographic Data* — Third revised edition	1999	Being criticized by some GSC members. To be reviewed. **Action:** Observations Coordination Group/GSC
IOC M and G #4	*Guide to Oceanographic and Marine Meteorological Instruments and Observing Practices*	1975	Obsolete. To define: (*a*) need for such a *Guide*; (*b*) what to include in the *Guide*; (*c*) possibility of merging with another. **Action:** Observations Coordination Group
IOC M and G #19	*Guide to IGOSS Specialized Oceanographic Centres (SOCs)*	1988	Still valid. To be reviewed from JCOMM standpoint to determine requirement for, and responsibilities of, centres. **Action:** Management Committee
IOC M and G #20	*Guide to Drifting Data Buoys*	1988	Probably out of date. Request DBCP to review and decide on action. **Action:** DBCP

Code	*Title*	*Date*	*Comments*
IOC M and G #22	*GTSPP Real-time Quality Control Manual*	1990	MEDS is updating the *Guide* on-line*
IOC M and G #24	*Guide to Satellite Remote Sensing of the Marine Environment*	1992	May need some updating. Entrust satellite expert to check. **Action:** Observations Coordination Group
WMO-No. 623	*Guide to the IGOSS Data Processing and Services System*	1983	Discontinued for the time being by IGOSS-VII (1995). May be "revived" at any time, should the need arise. **Action:** Services Coordination Group
Information Service Bulletins	on Oceanographic Products issued by National Centres	since late 1970s	To be transferred on the Web and updated in near-real-time
	on non-drifting ODAS		
	IGOSS Glossary	1987	Never published. To be reviewed for possible future publication. **Action:** Management Committee

* http://www.meds-sdmm.dfo-mpo.gc.ca/ALPHAPRO/gtspp/qcmans/MG22/guide22_e.htm

ANNEX V

Annex to paragraph 10.15 of the general summary

LIST OF WEB SITE ADDRESSES

The First International Conference on Ocean Observations for Climate.
http://www.bom.gov.au/OceanObs99/Papers/Statement.pdf

The Strategic Plan for the Global Ocean Data Assimilation Experiment (GODAE)
http://www.bom.gov.au/bmrc/mrlr/nrs/oopc/godae/strategic_plan.pdf

The Global Digital Sea-ice Data Bank (GDSIDB)
http://www.aari.nw.ru/gdsidb/gdsidb_2.html (AARI, St.Petersburg, Russia)
http://www.dmi.dk/pub/gdsidb_mirror/content.html (mirror of AARI site at DMI)
http://www-nsidc.colorado.edu/NOAA/index.html (NSIDC, Boulder, Colorado, USA)

The Data Buoy Cooperation Panel (DBCP)
http://dbcp.nos.noaa.gov/dbcp/

DBCP vandalism
http://dbcp.nos.noaa.gov/dbcp/vandalism.html

DBCP Internet mailing lists
http://www.jcommops.org/mailing_lists.html#DBCP

DBCP an electronic forum
http://www-dbcp.cls.fr/

Argo Science Team (AST)
http://www.argo.ucsd.edu

Global Sea-level Observing System (GLOSS)

Core Network (GCN) of the Permanent Service for Mean Sea Level (PSMSL)
http://www.pol.ac.uk/psmsl/gloss.html

GLOSS Handbook
http://www.bodc.ac.uk/services/glosshb/

PSMSL training
http://www.pol.ac.uk/psmsl/training/training.html

Global Ocean Observing System (GOOS)
http://ioc.unesco.org/goos/doclist.htm.

Basic GOOS documents
http://ioc.unesco.org/goos/key1.htm

Marine Environmental Data Information Referral Catalogue (MEDI)
http://www.aodc.gov.au/iode/medi.

JCOMM Electronic Products Bulletin
http://iri.ldeo.columbia.edu/climate/monitoring/ipb/
http://iri.ldeo.columbia.edu/climate/cid/Dec2000/

Voluntary Observing Ships (VOS) Climate Subset Project (VOSClim)
http://www.ncdc.noaa.gov/VOSClim.html/

Ship-of-Opportunity Programme
http://www.brest.ird.fr/soopip

WMO home page
http://www.wmo.ch

WMO Marine Programme
http://www.wmo.ch/web/aom/marprog/

WMO ftp server
ftp://www.wmo.ch/documents/lpc

Data flow monitoring reports
http://www.meds-sdmm.dfo-mpo.gc.ca/meds/Prog_Int/GTSPP/GTSPP_e.htm
http://www.nodc.noaa.gov/GTSPP/gtspp-home.html

Marine climate data
http://www.dwd.de/research/gcc/gcc.html
http://www.ncdc.noaa.gov/

ANNEX VI

Annex to paragraph 11.2.2 of the general summary

JCOMM CAPACITY BUILDING STRATEGY

Executive summary

Introduction

The increasing population of the world imposes new challenges on society to manage the finite resources of the planet in a sustainable and environmentally-responsible manner. The WMO/IOC Joint Technical Commission on Oceanography and Marine Meteorology (JCOMM) is committed to improving and expanding the availability of operational marine data necessary for monitoring, understanding and forecasting both short- and long-term meteorological variations. JCOMM also needs to respond, within the limits of its own responsibilities, to assist in bringing accurate and dependable information to all countries of the world.

It will be the vision of the JCOMM Capacity Building programme to understand the needs of Member States and to address these deficiencies through the dedication and mutual cooperation of all countries, under the guidance of a global plan for JCOMM.

General principles

The JCOMM is jointly sponsored by WMO and IOC and therefore its capacity building programme must operate within, and draw upon, the overall principles of its governing bodies. The programme must also cooperate with other programmes, such as WWW, GOOS and GCOS and seek partnerships with funding agencies to pursue mutual objectives.

Following along the lines of the goals and objectives of the capacity building programmes of the two governing bodies, the general principles for JCOMM, include the following:

(*a*) The programme will have, as its prime directive, a focus on increasing the national participation in JCOMM activities and on the improvement of operational ocean and meteorological services to the users and peoples of all countries;

(*b*) The programme will maintain consistent goals over a long term;

(*c*) Emphasis will be laid on the development of local expertise, so as to provide sound advice to policy makers for the sustainable development of marine resources and the preservation of the marine environment;

(*d*) For a sustainable capacity building programme, a partnership must be forged between the donor and the recipient organization(s) or country(ies);

(*e*) Programmes must be tailored to the requirements of the targeted country or region. In all cases, the active involvement of the community in the recipient country is essential;

(*f*) Clear methods must be used to measure how effective each mission is in meeting its goals;

(*g*) For all programmes, attention must be paid to the interaction among local, regional and global systems, without which the full benefits of JCOMM cannot be achieved;

(*h*) Where possible, regional cooperation should be used to maximize resources, to encourage mutually beneficial activities among countries with similar requirements and to establish robust regional systems;

(*i*) Every effort shall be made to entrain the support of Governments, international organizations, the private sector and other donors;

(*j*) Creation of awareness in the minds of the public and policy makers in different sectors is essential for raising national and international support.

Programme considerations

Capacity building programmes come in a huge variety of forms and it will be up to JCOMM to choose the most effective forms of delivery. Priority must be given to those programmes that are aimed at the expansion and improvement of activities and projects under JCOMM. For example, JCOMM can identify, but not respond to, basic educational deficiencies in any country. It should, however, provide oversight for the preparation and provision of documents directly related to JCOMM activities and for identifying relevant bibliographies.

In many ways, training courses are the easiest way to address capacity building efforts, but success is difficult to assess. The JCOMM capacity building programme must pay attention to the expected outcomes from each course. The electronic age may revolutionize training methods over the next decade and produce new challenges.

Capacity building programmes must not ignore the need for the transfer of knowledge so that scientists from all countries can be involved in the planning and execution of global and regional programmes. Equally important is the more practical requirement of technical assistance to set up and operate observational and predictive systems, including the provision of hardware. For the latter, JCOMM itself has no access to such equipment and requests must be channelled to other potential donor sources.

Access to regional and global data, especially those that could have the potential to save life and property or prevent hardship is essential. Of particular importance are satellite data, which have universal coverage and have no jurisdictional problems other than ownership and the access to the output from computer models. The maximum use should be made of the new WMO Virtual Laboratory for Training in Satellite Meteorology, expanded, as necessary, to also include satellite oceanography.

Infrastructure is needed in all countries, but putting it in place is a type of programme best addressed by bilateral aid, within the framework of regional cooperation.

A consistent failure of most capacity building programmes in intergovernmental organizations is in addressing the accountability and results of the activities. Successful programmes must be recognized and failures must be noted and used to amend approaches. It should be assumed that all assistance programmes would have specific objectives that could be used, in retrospect, to judge the relative success of projects and programmes and it should be the responsibility of the recipients to comment on whether the results met or failed to meet expectations.

To oversee the capacity building programme, JCOMM should establish a panel of experts drawn appropriately from both recipient and donor communities.

Priorities and actions

The JCOMM Capacity Building Strategy outlines a set of principles and actions to guide the JCOMM capacity building efforts. The priorities and actions that should provide the initial focus for the programme are outlined below.

National organizations and Governments must take responsibilities for capacity building actions whether they are donor or recipient countries. Technically advanced countries must agree to capacity building objectives and consider actively ways of contributing. Commitments must be made by the receiving Governments and institutions to develop and maintain an infrastructure that will continue to participate in the JCOMM activities over the long term.

The regional subsidiary bodies of WMO and IOC should be informed of JCOMM activities at every meeting and actions should be requested or recommendations received. JCOMM members, under JCOMM guidance and/or through regional WMO and IOC bodies, should address how regional observational and information resources can be best used to mutual advantage. They should investigate how resources may be made available through collective regional submissions to funding agencies. The efficiency and effectiveness of using regional bodies to coordinate and facilitate common requirements in a region from training through operational systems must be emphasized.

At the global level, JCOMM itself must provide the necessary guidance through the identification of global objectives and the overall deficiencies in the programme. These must be spelt out clearly, as must the potential benefits to the programme and to the recipient nations from capacity building efforts. JCOMM must oversee the preparation of suitable standards, *Manuals* and *Guides* against which the national and regional programmes can be judged and deficiencies recognized. It must also prepare brochures and assist in the development of proposals, on potential benefits from the JCOMM programme, in particular how these relate to the overall aim of raising the social and economic well-being of developing countries.

JCOMM must provide a clear outline of how capacity building programmes are monitored and audited for success and failures. There must also be a mechanism for updating the programme based on what is seen to be happening. The task for the JCOMM Panel of Experts is to maximize the available resources by ensuring that the JCOMM capacity building principles are adhered to, that priorities are addressed and that the results are audited. JCOMM can work with Governments and space agencies to increase the timely availability and use of remotely-sensed data. Finally the JCOMM Secretariat and elected officers must take advantage of partnering opportunities where these can further the JCOMM objectives.

ANNEX VII

Annex to agenda item 17 of the general summary

WORK PLAN FOR JCOMM FOR THE PERIOD 2001–2005

Priority	*Reference*	*Task*	*By whom*	*Target*
Organizational				
High priority	Paragraph 5.2.1	Set in process mechanisms to assess user requirements and the satisfaction of users with the products available.	Co-presidents, Management Committee	Inter-sessional
	Paragraph 5.2.3	Appoint expert(s) to participate in CBS Rolling Requirements Review process with appropriate CBS expert teams.	Co-presidents in consultation with Management Committee and GOOS officers	ASAP
	Paragraph 7.4.24	Review former IGOSS SOC's system and make concrete proposals for its restructuring in context of agreed JCOMM requirements, role and operations.	Data Management Coodinating Group	JCOMM-II
	Paragraph 13.3.2	Plan and oversee relevant JCOMM implementation activities in consultation with the GOOS Steering Committee.	Management Committee, Observations Coordination Group	Continuing
	Paragraph 14.1	Keep the WMO 5LTP constantly under review and contribute to the first report on the evaluation of the impacts of activities within the WMO Marine Programme performed under the Plan, covering the first two years (2000–2001).	Management Committee	Before WMO EC 2002
	Paragraph 14.4	Develop the input of the marine component to the preparation of the WMO 6LTP to be eventually presented to Fourteenth Congress in 2003 for adoption.	Co-presidents with Management Committee	Inter-sessional
	Paragraph 15.2	Prepare a set of scientific lectures for JCOMM-II.	Management Committee	Before JCOMM-II
	Resolution 1	Identify and develop a way of mobilizing resources for the implementation of the work programme.	Management Committee	Inter-sessional
	Resolution 1	Review and, if necessary, develop proposals for modification of the internal structure and working methods of JCOMM including its relationship to other bodies.	Management Committee	JCOMM-II
Medium priority	Paragraph 3.4	Develop some guideline to assist Members/Member States in developing national coordination and integration.	Management Committee	Inter-sessional
	Paragraph 3.6	(*a*) Assist the Secretary-General of WMO and the Executive Secretary IOC to develop a specific proposal for involvement in the 150th anniversary, in 2003, of the Brussels Conference of 1853;	Co-presidents	WMO/IOC EC 2002
		(*b*) Establish an interim Organizing Committee for a conference on the 150th anniversary.	Management Committee	ASAP

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 5.1.4	Coordinate the implementation of significant issues arising from the work of the OOPC and referred to JCOMM by the OOPC.	Management Committee	Inter-sessional
	Paragraph 9.3	Review possibilities for the preparation of a set of IOC technical regulations relating to the provision of oceanographic services, with a view to developing some draft technical regulations for further consideration by the JCOMM Management Committee, JCOMM-II and eventually the IOC Governing Bodies.	Services Coordination Group	Inter-sessional
	Paragraph 12.1.16	(*a*) Develop a position paper on the strategy that JCOMM should adopt for new activities beyond those in the present work programme and in particular those of the GOOS COOP and other non-physical requirements;	Rapporteur on the New Strategy	Before the first meeting of the Management Committee
		(*b*) Review the report by the Rapporteur on the new JCOMM strategy for non-physical, data and plan follow-up.	Management Committee	Inter-sessional
	Paragraph 13.4.1	Ensure that the experience and monitoring work undertaken under the conventions relevant to JCOMM, including ICES, HELCOM, OSPAR and the Barcelona Convention, are properly taken into account and used in the implementation of JCOMM programme activities.	Management Committee	Continuing
	Paragraph 13.5.1	Identify potential additional partners within industry and commerce and ensure that they are involved to the extent possible in the future work of JCOMM.	Management Committee	Inter-sessional
Services				
High priority	Paragraph 6.1.5	Develop a facility within SafetyNET for transmission of graphical information in digital form via Inmarsat-C and for its reconstitution on-board ships.	ET on MSS	ASAP
	Paragraph 6.1.12	Review the matter on the designation of the Kenya Meteorological Department as a GMDSS Preparation Services and make an appropriate recommendation for the consideration of the co-presidents and the Management Committee on behalf of JCOMM.	ET on MSS	ASAP
	Paragraph 6.2.14	Cooperate with the WMO Tropical Cyclone Programme and provide expert assistance for the IOC/IHP/WMO project on storm-surge disaster reduction in the northern India Ocean area.	ET on WS	Inter-sessional
	Paragraph 6.3.9	Review a draft-revised version of the *WMO Sea-ice Nomenclature* (WMO-No. 259.TP.145), prior to submission to co-presidents for formal approval on behalf of JCOMM and publication by WMO.	ET on SI	ASAP
	Paragraph 12.2.6	Ascertain the requirements of the maritime community regarding the continuance of high frequency broadcasts and to provide this information to future CBS and RA II sessions (see also action below from paragraph 6.1.6).	ET on MSS	Prior to future CBS and RA II sessions

Priority	*Reference*	*Task*	*By whom*	*Target*
	Resolution 2	Review effectiveness of the Services work programme.	Services Coordination Group	Inter-sessional
Medium priority	Paragraph 6.1.4	Consider the possibilities for designating additional Metareas to cover the remaining Arctic waters.	ET on MSS in consultation with Canada, Russia, the United States, IHO and IMO	Inter-sessional
	Paragraph 6.1.6	Develop a new text relating to non-GMDSS marine broadcast services for inclusion in the *Manual on Marine Meteorological Services* (WMO-No. 558).	ET on MSS	Inter-sessional
	Paragraph 6.1.13	Keep under review the possibility of designation of a new issuing service for the WMO marine broadcast system for the GMDSS within Merarea VIII.	ET on MSS	Continuing
	Paragraph 6.2.6 Resolution 2	Develop technical advice on wave and storm surge modelling, forecasting and service provision and prepare an outline for guidance material on storm surge prediction, as well as for its preparation, for consideration and future action by the Management Committee.	ET on WS	Inter-sessional
	Paragraph 6.2.10 Resolution 16/2	Monitor projects for verification of operational wind wave and storm surge model output and develop procedures for the distribution of information on the wave forecast verification scheme.	ET on WS	Inter-sessional
	Paragraph 6.2.15	Review the requirements for, and if necessary develop, related programmes encompassing modelling, product preparation and service provision for ocean processes depending largely on atmospheric forcing.	Management Committee, Services Coordination Group	Inter-sessional
	Paragraph 6.3.8	Develop appropriate amendments to the *WMO Sea-ice Nomenclature* for coding sea ice decay from radar backscatter.	ET on SI	Inter-sessional
	Paragraph 6.3.15	(*a*) Develop and revise the *WMO Sea-ice Nomenclature*, terminology, data formats and software codes; (*b*) Prepare historical sea ice datasets for sea ice covered areas; (*c*) Develop cooperation and coordination with climate oriented programmes such as WCRP, WCP and CLIC; (*d*) Develop techniques and capabilities to measure systematically ice thickness; (*e*) Provide support to southern hemisphere countries to enhance Antarctic sea-ice service.	ET on SI	Inter-sessional
	Paragraph 6.3.19	Continue collaboration between ET on SI and BSIM, IICWG and ECDIS.	ET on SI	Continuing
	Paragraph 6.4.4	Prepare specific proposals based on the appropriate recommendations of the MARPOLSER98 Workshop for consideration and agreement by Members/ Member States.	Services Coordination Group	Inter-sessional
	Paragraph 6.4.4	Prepare an update version of the system plan based on recommendations of the MARPOLSER98 for review by the Management Committee and eventual distribution to Members/Member States.	Services Coordinatiom Croup	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 6.4.6	Identify appropriate funding support for a second workshop on MPERSS.	Co-presidents, Services Coordination Group	By 2002
	Paragraph 6.4.6	Develop a mechanism to deal with technical and scientific issues related to implementation of MPERSS.	Service Coordination Group	Inter-sessional
	Paragraph 6.4.6	Develop appropriate technical guidance on MPERSS.	Service Coordination Group	Inter-sessional
	Paragraph 6.5.3	Develop a concrete proposal for a workshop on JCOMM products in support of operational oceanography.	Management Committee, Bulletin Editor	Inter-sessional (ASAP)
	Paragraph 6.5.4	Prepare a detailed proposal and implementation plan for the JCOMM Electronic Products Bulletin, including identification of the required resources for its long-term maintenance.	Management Committee Bulletin Editor	Inter-sessional
	Paragraph 6.6.6	(*a*) Review the questionnaire and response format for MMS monitoring prior to its distribution in 2004;	ET on MSS	By 2004
		(*b*) Consider the possibilities for disseminating the survey in future to ships' masters via SafetyNET.	ET on MSS	Inter-sessional
	Paragraph 6.6.9	Review requirements of all marine users for improved, expanded and new services and service types on an ongoing basis and coordinate the preparation of advice and guidance, as appropriate.	Services Coordination Group	Continuing
	Recommendation 7	Keep the implementation of, and user response to, the WMO GMDSS marine broadcast system under review and develop proposals for amendments, as necessary.	ET on MSS	Continuing
	Resolution 2	Assemble requirements and give advice on services to be implemented and discontinued.	Services Coordination Group	Inter-sessional
	Resolution 2	Review and catalogue the products and services required in sea-ice areas.	ET on SI	Inter-sessional
	Resolution 2	Keep under review and provide guidance on operation of the Global Digital Sea-ice Data Bank including appropriate quality control, error analysis and archiving mechanism. Make recommendation on quality control error analysis and archiving mechanisms.	ET on SI	Inter-sessional
Low priority	Paragraph 10.3	Review the contents of the *Guide to Wave Analysis and Forecasting* (WMO-No. 702) and advise on the need for future updating, as required.	ET on WS	Inter-sessional
Observations				
High priority	Paragraph 8.1.23	Make a concrete proposal regarding procedures for evaluating and accrediting instrumentation and develop a mechanism to ensure that data collected by observing system operators conform to agreed on basic standards, formats and levels of data quality.	Management Committee	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 8.5.6	Consider the benefit and efficiencies that could be realized by extending the terms of reference of JCOMMOPS to include support for VOS and ASAP.	Observations Coordination Group	JCOMM-II
	Paragraph 8.5.12	Review and advise JCOMM on the integration of new observing components into the overall operational system.	Management Committee	Continuing
	Paragraph 12.2.10	Consult with CIMO regarding the operation of RICs, with a view to preparing a more detailed proposal for JCOMM instrument evaluation and inter-comparison procedures, for consideration by the Management Committee.	Observations Coordination Group	JCOMM-II
	Resolution 3	Develop performance measurement against scientific requirements, delivery of raw data, measurement standards, logistics and resources.	Observations Coordination Group	Inter-sessional
Medium/ high priority	Resolution 3	Review requirements and give advice on possible solutions, regarding trade-offs and use of new technique/developments.	Observations Coordination Group Satellite Rapporteur	Inter-sessional
	Resolution 3	Support the development and maintenance of the VOSClim Project.	SOT	Continuing
Medium priority	Paragraph 8.1.2	Consider the possibilities for some form of international award scheme for VOS.	SOT	Inter-sessional
	Paragraph 8.1.18	Identify upper ocean temperature and salinity data obtained by research institutes, but not available on GTS and ensure their quality control and timely distribution on the GTS.	SOT and Technical Coordinator	Continuing
	Paragraph 8.1.22	Review the use of TRACKOB and advise on its continuation.	SOT/SOOPIP	Inter-sessional
	Paragraph 8.1.36	Arrange for appropriate cooperation and coordination with EUMETNET with regard to evaluation of all meteorological and oceanographic observations networks in Europe and surrounding ocean area.	SOT	Inter-sessional
	Paragraph 8.2.8	Address the funding of DBCP and SOOP Coordinator and make relevant proposals to the Observations Coordination Group for long-term funding.	DBCP, SOOPIP	Inter-sessional
	Paragraph 8.2.21	Review the progress of the Argo project with a view towards a full integration into the JCOMM overall observing system at an appropriate time.	Observations Coordination Group in consultation with the Argo Data Management Subcommittee and ET on DMP	Inter-sessional
	Paragraph 8.3.22	Consider eventually preparing a comprehensive report on the EuroROSE project, for publication in the JCOMM technical report series.	EuroROSE participants	Inter-sessional
	Paragraph 8.3.24	(*a*) Identify a suitable expert to liaise with relevant ROSE groups worldwide; (*b*) Review on an ongoing basis the status of such systems and prepare appropriate technical guidance.	Observations Coordination Group	ASAP Inter-sessional
	Paragraph 8.4.10	Provide advice to, and coordinate with, the GLOSS Technical Secretariat at IOC with regard to obtaining funding necessary to modernize and extend the GLOSS programme.	Management Committee	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 10.9	Continue preparing Technical Documents series and making them available both on the Web site and as printed documents.	DBCP	Continuing
	Paragraph 10.10	Continue publishing GLOSS training course reports and making a GLOSS brochure available on the Web.	GLOSS community	Continuing
	Paragraph 10.11	Prepare additional technical information relating to ASAP and its benefit for distribution to Members/Member States.	SOT/ASAPP	Continuing
	Paragraph 13.1.4	Keep the matter of vandalism under review and suggest possible remedial actions, as and when feasible.	Observations CoordinationGroup	Continuing
	Resolution 3	Review and analyse requirements for ship-board observational data and coordinate actions to implement and maintain the network.	SOT	Continuing
	Resolution 3	Review marine telecommunications facilities and procedures for observational data collection, processing and transmission and propose actions for improvements.	SOT	Continuing
	Resolution 3	Implement specific terms of reference.	SOT/SOOPIP	Continuing
	Resolution 3	Coordinate the overall implementation of the ASAP, including recommending routes and expand where possible.	SOT/ASAPP	Continuing
	Resolution 3	Review and coordinate the implementation of new specialized shipboard instrumentation, siting and observing practices.	SOT	Continuing
Data management				
High priority	Paragraph 7.1.5	Finalize the International Maritime Meteorological Archive (IMMA) format with a view to eventual submission to the Commission for formal adoption.	ET on MC Co-presidents, chairpersons of	Within one year ASAP
	Paragraph 7.1.9	Identify a centre to host a metadata base for ODAS.	DBCP and Data Management Coordination Group	
	Paragraph 7.2.5	Develop procedures for, and coordinate JCOMM input to, the pilot project of surface salinity data management.	Data Management Coordination Group	ASAP
	Paragraph 7.2.6	(*a*) Consider the overall issue of end-to-end data management for ocean and meteorological measurements and develop a strategy for the Commission;	ET on DMP	ASAP
		(*b*) Recommend a mechanism for effective participation on the IODE sea surface salinity pilot project.	Data Management Coordination Group, ET on DMP	ASAP
	Paragraph 7.2.11	Review and assess the general requirements for end-to-end data management practices, with IODE.	Management Committee, Data Management Coordination Group	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 7.3.9	Review the development of Argo data management procedures and closely liaise with the Argo Data Management Group.	Data Management Coordination Group	Inter-sessional
	Paragraph 7.4.4	Keep under review the requirement for the exchange of new oceanographic data and initiate actions for BUFR encoding and GTS distribution of new oceanograophic data at the appropriate time.	Observation and Data Management Coordination Groups, Argo community	ASAP
	Paragraph 7.4.5	Develop an appropriate practical solution regarding the difficulties of the on-board manual encoding of CREX messages, in consultation with CBS.	SOT, Data Management Coordination Group	Inter-sessional
	Paragraph 7.4.11	Develop a common policy and approach to the application of Code 41, in particular which minimize restriction.	Management Committee, SOT, Data Management Coordination Group	Inter-sessional
	Paragraph 7.4.18	Ensure appropriate JCOMM participation in CBS activities related to data exchange.	Management Committee, Data Management Coordination Group	Continuing
	Paragraph 7.4.25	Develop an integrated strategy for monitoring of data flow and quality.	Management Committee	Inter-sessional
	Paragraph 7.4.25	Implement a mechanism to provide timely and accurate information on data and products.	Data Management Coordination Group	Continuing
	Paragraph 7.4.29	(*a*) Keep the work by the Inter-programme Task Team on Future WMO Information Systems under review and develop specific JCOMM requirements for input to the work by the Task Team;	Data Management Coordination Group	Inter-sessional
		(*b*) Assign an expert to represent JCOMM's interests about codes and formats in the Inter-programme Task Team on Future WMO Information Systems.	Data Management Coordination Group	ASAP
	Paragraph 7.4.34	Address the issue of an agreed standard marine metadata language for JCOMM activities, in particular, develop a strategy that takes account of the marine extensible markup language (XML) consortium, of the related activities of CBS, and of the many national activities related to standard marine metadata language.	Data Management Coordination Group	ASAP
	Paragraph 7.4.43	Work with the proponents of the Ocean and Marine Meteorology Data and Information Technology initiative to explore opportunities for the Commission to collaborate.	Data Management Coordination Group, ET on DMP	ASAP
	Paragraph 7.5.1	Review existing operations and procedures, with the aim of developing a detailed plan for end-to-end, integrated JCOMM data management, for consideration by the Management Committee, eventually by JCOMM-II.	Data Management Coordination Group	JCOMM-II
	Paragraph 7.5.2	Address concerns regarding integration between different geographic scales, and between different levels of scientific and administrative detail. Key factors could be summarized and presented effectively to JCOMM.	Management Committee	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 12.2.3	Provide support to CCl scientific and technical conference to be held immediately prior to the thirteenth session of CCl.	ET on MC, Data Management Coordination Group with appropriate CCl subsidiary body	Prior to November 2001
	Resolution 4	Develop the strategy, and initiate and oversee the implementation of the Data Management Programme Area and identify priorities and actions for the Data Management Programme Area.	Data Management Coordination Group	Inter-sessional
Medium/ high priority	Paragraph 7.1.6	Continue the study to verify the availability of documentation relating to the history of marine ship codes.	ET on MC	Inter-sessional
	Paragraph 7.1.8	Review the situation of oceanographic and marine meteorological data holdings in existence and propose appropriate follow up actions.	Data Management Coordination Group	Inter-sessional
	Paragraph 7.1.9 Paragraph 10.2 Recommendation 11	Establish an organizing committee for the proposed second WMO International Workshop on Advances in Marine Climatology and convene the Workshop (see also action regarding Brussels anniversary).	Co-presidents, Data Management Coordination Group	Prior to JCOMM-II
	Paragraph 7.1.13	Develop a mechanism for close collaboration with relevant bodies of GOOS and GCOS, such as AOPC.	ET on MC	Continuing
	Paragraph 7.1.14	Reactivate and finalize the compilation of a catalogue of global storm surge data holdings and work closely with IODE in this regard.	ET on MC	Inter-sessional
	Paragraph 7.2.7	Investigate eventually transmitting full-resolution XBT data in BUFR code through GTS on a real-time basis.	SOT	ASAP
	Paragraph 7.3.2	Address the matter of having several international data centres dealing with the same kinds of data and make appropriate recommendations to the Data Management Coordination Group.	DBCP	Inter-sessional
	Resolution 4	Keep under review, assess and coordinate the adoption of appropriate new information technology.	Data Management Coordination Group	Continuing
	Resolution 4	Recommend best data management practices, in particular for standards of metadata and formats, quality control and data assembly, and data and products flow.	ET on DMP	Inter-sessional
	Resolution 4	Review and assess the effectiveness of data management practices, including integration data management practices.	ET on DMP	Inter-sessional
	Resolution 4	Determine procedures and principles for the development and management of global and regional oceanographic and marine meteorological datasets.	ET on MC	Inter-sessional
	Resolution 4	Review and assess the climatological elements of the Commission, including the operation of the MCSS, and the development of required oceanographic and marine meteorological products.	ET on MC	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Resolution 4	Develop procedures and standards for data assembly and the creation of climatological datasets, including the establishment of dedicated facilities and centres.	ET on MC	Inter-sessional
Medium priority	Paragraph 6.2.3	Investigate the possibility to re-establish a global wave metadata archive centre.	ET on MC	Inter-sessional
	Paragraph 7.4.22/23	Extend the monitoring of the flow of marine data on the GTS, undertaken by *Météo-France*, to cover other marine variables, including subsurface.	JCOMMOPS, *Météo-France*	Inter-sessional
	Paragraph 12.2.2	Assign experts to assist CCl in preparing the revised *Guide to Climatological Practices* (WMO-No. 100).	Co-presidents, chairpersons of Data Management Coordination Group and ET on MC	Inter-sessional
	Resolution 4	Keep under review and propose procedures of the preparation and/or updating of relevant technical publications.	ET on MC	Continuing
Low priority	Paragraph 7.1.6	Continue with the digitization of non-electronic earlier versions of the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47).	ET on MC	Continuing
High priority	Paragraph 11.1.4	Investigate new sources for funding JCOMM training activities.	Task Team on Resources	Inter-sessional
Capacity building (Specialized training, cooperation development projects)				
	Paragraph 11.1.8	Review as a matter of urgency the entry on “Marine Meteorology” in the preliminary version of the *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology* (WMO-No. 258), fourth edition, Volume 1, Meteorology.	Capacity Building Coordination Group	October 2001
	Resolution 5	Implement the JCOMM Capacity Building Strategy.	Capacity Building Coordination Group	Inter-sessional
Medium priority	Paragraph 11.2.9	Discuss with IODE the possibility to expand the scope of OceanTeacher to cater for JCOMM training requirements.	Capacity Building Coordination Group	Inter-sessional
	Paragraph 11.3.5	Review the requirements for cooperative projects in ocean regions and subregions and assist in the development of detailed proposals, as appropriate.	Capacity Building Coordination Group	Inter-sessional
	Paragraph 11.3.5	Develop close links with all GOOS regional alliances, with a view to implementing mutually-supportive capacity building projects.	Capacity Building Coordination Group	Continuing
	Paragraph 11.3.9	Investigate with IODE the possibilities to use the ODINAFRICA (and other existing or planned ODIN networks) network as a mechanism for relevant aspects of JCOMM regional capacity building.	Capacity Building Coordination Group	Inter-sessional

Priority	*Reference*	*Task*	*By whom*	*Target*
	Paragraph 12.1.7	Work with the GCOS, GOOS and the JCOMM Secretariats in organizing regional workshops so that ocean observations and related services are included to the extent possible.	Capacity Building Coordination Group	Inter-sessional
	Resolution 2	Develop technical guidance material, software exchange, specialized training and other capacity building support with regard to sea-ice observations and services.	ET on SI with Capacity Building Coordination Group	Continuing
	Resolution 5	Develop a plan for obtaining resources for the JCOMM capacity building in collaboration with GOOS and GCOS.	Task Team on Resources	Inter-sessional
	Resolution 5	Keep under review existing training and guidance material and advise on updating and on the development of new material.	Capacity Building Coordination Group	Inter-sessional
	Resolution 5	Review and assess the resources needed for capacity building actions in light of the resources plan of the Task Team on Resources.	Capacity Building Coordination Group	Inter-sessional

APPENDIX A

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APPENDIX B
AGENDA

	Agenda item	*Document Nos.*	*PINK Nos. and person submitting*	*Resolutions and recommendations adopted*
1.	OPENING OF THE SESSION		1, co-president of JCOMM	
2.	ORGANIZATION OF THE SESSION		2, co-president of JCOMM	
2.1	Consideration of the report on credentials			
2.2	Adoption of the agenda	2.2(1); 2.2(2)		
2.3	Establishment of committees			
2.4	Other organizational matters			
3.	REPORT BY THE INTERIM CO-PRESIDENTS OF THE COMMISSION	3	3, chairperson, Committee of the Whole	
4.	REPORTS BY THE CHAIRPERSONS OF THE MAJOR SUBSIDIARY AND REPORTING BODIES	4(1); 4(2); 4(3); 4(4); 4(5); 4(6)	4, chairperson, Committee of the Whole	
5.	SCIENTIFIC INPUT AND REQUIREMENTS		5, chairperson, Committee A	
5.1	Climate research and prediction	5.1		
5.2	Operational users	5.2 and 5.3		
5.3	Other	5.2 and 5.3		
6.	MARINE METEOROLOGICAL AND OCEANOGRAPHIC SERVICES			
6.1	Maritime safety services	6.1; 6.1, ADD. 1;	6.1, chairperson, Committee A	
6.2	Wind waves and storm surges	6.2	6.2, chairperson, Committee A	
6.3	Sea ice	6.3	6.3, vice-chairperson, Committee A	
6.4	Marine pollution related services	6.4	6.4, chairperson, Committee A	
6.5	JCOMM Products Bulletin	6.5	6.5, vice-chairperson, Committee A	
6.6	Other service issues	6.6	6.6, chairperson, Committee A	
7.	DATA MANAGEMENT			
7.1	Marine climatology	7.1	7.1, vice-chairperson, Committee B	
7.2	Ocean data	7.2	7.2, vice-chairperson, Committee B	
7.3	Buoys and floats	7.3	7.3, vice-chairperson, Committee B	
7.4	Infrastructure	7.4; 7.4, ADD. 1; 7.4, ADD. 2; 7.4, ADD. 3	7.4, vice-chairperson, Committee B	Rec. 1
7.5	Integration issues	7.5 and 8.5	7.5, vice-chairperson, Committee B	
8.	OBSERVING SYSTEMS			
8.1	Ship-based observations	8.1; 8.1, ADD. 1	8.1, chairperson, Committee B	Rec. 2; 3

	Agenda item	*Document Nos.*	*PINK Nos. and person submitting*	*Resolutions and recommendations adopted*
8.2	Buoys and floats	8.2	8.2, chairperson, Committee B	Rec. 4
8.3	Remote sensing	8.3	8.3, chairperson, Committee B	
8.4	Sea level	8.4	8.4, chairperson, Committee B	Rec. 5
8.5	Integration issues	7.5 and 8.5	8.5, vice-chairperson, Committee B	Rec. 6
9.	REVIEW OF TECHNICAL REGULATIONS OF INTEREST TO THE COMMISSION	9; 9, CORR. 1; 9, ADD. 1;	9, co-president of JCOMM	Rec. 7; 8; 9
10.	*GUIDES* AND OTHER TECHNICAL PUBLICATIONS	10	10, co-president of JCOMM	Rec. 10; 11
11.	EDUCATION AND TRAINING, TECHNOLOGY TRANSFER AND IMPLEMENTATION SUPPORT	11	11, chairperson, Committee of the Whole	
11.1	Specialized education and training			
11.2	Technology transfer and implementation support			
11.3	Regional development			
11.4	Resources			
12.	RELATIONSHIP WITH OTHER PROGRAMMES/BODIES OF WMO/IOC			
12.1	Global Ocean Observing System and Global Climate Observing System	12.1(1); 12.1(2); 12.1(2), ADD. 1	12.1, chairperson, Committee A	
12.2	Other WMO and joint WMO/IOC Programmes	12.2	12.2, co-president of JCOMM	
12.3	Other IOC Programmes	12.3	12.3, co-president of JCOMM	
13.	RELATIONSHIP WITH OTHER ORGANIZATIONS AND BODIES	13	13, co-president of JCOMM	
13.1	United Nations sytem agencies (Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography, Advisory Committee on Coordination/Subcommitttee on Oceans and Coastal Areas)			
13.2	United Nations Conference on Environment and Development follow-up, Commission on Sustainable Development and the Conventions			
13.3	Integrated Global Observing Strategy Partnership			
13.4	Non-United Nations system organizations and programmes			Rec. 12
13.5	Industry and commerce			
14.	LONG-TERM PLANNING	14	14, chairperson, Committee of the Whole	
15.	SCIENTIFIC LECTURES	15	15, co-president of JCOMM	
16.	ESTABLISHMENT OF WORKING GROUPS AND NOMINATION OF RAPPORTEURS	16; 16, REV. 1	16, chairperson, Committee of the Whole	Res. 1; 2; 3; 4; 5
17.	INTER-SESSIONAL WORK PROGRAMME	17	17, chairperson, Committee of the Whole	

	Agenda item	*Document Nos.*	*PINK Nos. and person submitting*	*Resolutions and recommendations adopted*
18.	REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF CMM AND IGOSS AND OF RELEVANT RESOLUTIONS OF THE GOVERNING BODIES WMO AND IOC	18	18, co-president of JCOMM	Res. 6; Rec. 13
19.	ELECTION OF OFFICERS		19(1), chairperson, Nomination Committee 19(2), co-president of JCOMM	
20.	DATE AND PLACE OF THE SECOND SESSION		20, co-president of JCOMM	
21.	CLOSURE OF THE SESSION		21, co-president of JCOMM	

APPENDIX C

LIST OF ABBREVIATIONS

AARI	Arctic and Antarctic Research Institute
ACC	Advisory Committee on Coordination
AIC	Argo Information Centre
AMC	Area Meteorological Coordinator
AOPC	Atmospheric Observation Panel for Climate
ASAP	Automated Shipboard Aerological Programme
ASEAN	Association of South-East Asian Nations
ASPeCT	Antarctic Sea-ice Processes, Ecosystems and Climate
BSIM	Baltic Sea-ice Meeting
CAS	Commission for Atmospheric Sciences
CBS	Commission for Basic Systems
CCl	Commission for Climatology
CEOS	Committee on Earth Observation Satellites
CES	Coast Earth Station
CGMS	Coordination Group for Meteorological Satellites
CIMO	Commission for Instruments and Methods of Observation
CIWG	Canadian Ice Working Group
CLIC	Climate and Cryosphere
CLIMAR	Workshop on Advances in Marine Climatology
CLIPS	Climate Information and Prediction Services
CLIVAR	Climate Variability and Predictability
CLS	Collection, Location, Satellites
CMM	Commission for Marine Meteorology
CNES	National Centre for Space Studies
COADS	Comprehensive Ocean Atmosphere Dataset
COMET	Cooperative Programme for Operational Meteorology Education and Training
COOP	CLIVAR Ocean Observations Panel
COOP	Coastal Ocean Observations Panel (GOOS)
COP	Conference of the Parties
COST	European Cooperation in the Field of Scientific and Technical Research
CRS	Coastal Radio Station
CSD	United Nations Commission on Sustainable Development
CTD	Conductivity-temperature-depth
DBCP	Data Buoy Cooperation Panel
DNA	Delegated National Agency
DSC	Digital Selection Calling
ECDIS	Electronic Chart Display Information System
ECMWF	European Centre for Medium-range Weather Forecasts
EGC	Enhanced Group Call
ESA	European Space Agency
ESCAP	Economic and Social Commission for Asia and the Pacific
EUMETNET	European Meteorological Network
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EuroGOOS	European GOOS
5LTP	Fifth WMO Long-term Plan
FAO	Food and Agriculture Organization of the United Nations
GCC	Global Collecting Centre
GCMD	Global Change Master Directory
GCN	GLOSS Core Network

GCOS	Global Climate Observing System
GDSIDB	Global Digital Sea-ice Data Bank
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GLOSS	Global Sea-level Observing System
GMDSS	Global Maritime Distress and Safety System
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GPS	Global Positioning System
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunication System
GTSPP	Global Temperature Salinity Profile Programme
HELCOM	Baltic Marine Environment Protection Commission
IAEA	International Atomic Energy Agency
ICES	International Council for the Exploration of the Sea
ICS	International Chamber of Shipping
ICSPRO	Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography
ICSU	International Council for Science
IDCS	International Data Collection System
IDNDR	International Decade for Natural Disaster Reduction
IFSMA	International Federation of Shipmasters' Associations
IGBP	International Geosphere-Biosphere Programme
IGOS	Integrated Global Observing Strategy
IGOSS	Integrated Global Ocean Services System
IHO	International Hydrographic Organization
IHP	International Hydrological Programme
IICWG	International Ice Charting Working Group
IMMA	International Maritime Meteorological Archive
IMMT	International Maritime Meteorological Tape
IMSO	International Mobile Satellite Organization
IMO	International Maritime Organization
INFOCLIMA	World Climate Data Information Referral Service
IOC	Intergovernmental Oceanographic Commission
IOCINCWIO	IOC Regional Committee for the Cooperative Investigation in the North and Central Western Indian Ocean
IODE	International Data and Information Exchange
IOI	International Ocean Institute
IPCC	Intergovernmental Panel on Climate Change
ISCDC	International Surface Current Data Centre
ISRO	Indian Space Research Organization
ITSU	International Coordination Group for the Tsunami Warning System in the Pacific
JCOMM	Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM *In Situ* Observing Platform Support Centre
JCOMMTRAN	JCOMM Transition Planning Meeting
KEWL	Knowledge Environment for Web-based Learning
KMD	Kenya Meteorological Department
LES	Land Earth Station
MARPOLSER	International Seminar/Workshop on the Marine Pollution Emergency Response Support System
MCSS	Marine Climatological Summaries Scheme
MEDI	Marine Environmental Data and Information Referral System
MEDS	Marine Environmental Data Service
MMS	Marine Meteorological Services
MPERSS	Marine Pollution Emergency Response Support System
MPI	Marine Pollution Incident

MQC	Minimum Quality Control
MSI	Maritime Safety Information
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency
NCDC	National Climatic Data Center
NCS	Network Coordination Station
NEAR-GOOS	North East Asian Regional GOOS
NMS	National Meteorological or Hydrometeorological Service
NOAA	National Oceanic and Atmospheric Administration
NSIDC	National Snow and Ice Data Center
OceanObs	International Conference on the Ocean Observing System for Climate
ODAS	Ocean Data Acquisition System
ODINAFRICA	Ocean Data and Information Network for Africa
ODINEA	Ocean Data and Information Network for East Africa
ODINLAC	Ocean Data and Information Network for the Latin American and Caribbean Regions
OOPC	Ocean Observations Panel for Climate
OSPAR	Marine Environment of the North-East Atlantic
PIRATA	Pilot Research Moored Array in the Tropical Atlantic
PLANETA	Scientific and Research Centre on Space Hydrometeorology
PMO	Port Meteorological Officer
POGO	Partnership for Observations of the Global Ocean
PSMSL	Permanent Service for Mean Sea Level
RA	Regional Association
RCC	Rescue Coordination Centre
RIC	Regional Instrument Centre
RMTC	Regional Meteorological Training Centre
ROSE	Radar Ocean Sensing
ROSHYDROMET	Russian Federal Service for Hydrometeorology and Environmental Monitoring
RSMC	Regional Specialized Meteorological Centre
6LTP	Sixth WMO Long-term Plan
SAR	Search and Rescue
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCOR	Scientific Committee on Oceanic Research
SEACAMP	South-East Asian Centre for Atmospheric and Marine Prediction
SES	Ship Earth Station
SIGRID	Format for the Archival of Sea-ice Data in Digital Form
SOC	Specialized Oceanographic Centre
SOCA	Subcommittee on Oceans and Coastal Areas
SOLAS	International Convention for the Safety of Life at Sea
SOOP	Ship-of-Opportunity Programme
SOOPIP	Ship-of-Opportunity Programme Implementation Panel
TAO	Tropical Atmosphere Ocean
TCP	Tropical Cyclone Programme
TIP	Tropical Moored Buoy Implementation Panel
TRITON	Triangle Trans-ocean Buoy Network
UCAR	University Cooperation for Atmospheric Research
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICPOLOS	United Nations Informal Consultative Process on Oceans and Law of the Sea

VCP	Voluntary Cooperation Programme
VOS	Voluntary Observing Ship
VSOP	VOS Special Observing Project
VSOP-NA	VOS Special Observing Project – North Atlantic
VTS	Vessel Traffic Service
WCP	World Climate Programme
WCRP	World Climate Research Programme
WDC	World Data Centre
WHO	World Health Organization
WIOMAP	Western Indian Ocean Marine Applications Project
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
WWW	World Weather Watch
XBT	Expendable Bathythermograph
XCTD	Expendable Conductivity-temperature-depth Probe
XML	Extensible Mark-up Language