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TWELFTH SESSION

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. OPENING OF THE SESSION (agenda item 1)

1.1 The twelfth session of the Commission for Marine Meteorology (CMM) was opened by the president of the Commission, Mr R. Shearman (United Kingdom) at 9 a.m. on Monday, 10 March 1997, in the International Conference Centre in Havana, Cuba.

1.2 On behalf of the World Meteorological Organization (WMO), Professor G. O. P. Obasi, Secretary-General, welcomed the delegates to the twelfth session of CMM. He expressed his appreciation to the Government of Cuba, as well as to the Cuban Meteorological Institute, 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 over the past decade in the marine field within WMO, in which CMM had played a leading role, Professor Obasi paid a particular tribute to the Commission's president, Mr Shearman, and vice-president, Mr Lim Joo Tick (Malaysia), for their personal contributions to that successful work. He noted further that both would be retiring from the Commission at the end of the session, after eight years of distinguished service, and wished them every success in their continuing careers.

1.4 Professor Obasi congratulated the Commission on its great success in fully implementing the new WMO marine broadcast system for the global maritime distress and safety system (GMDSS) of the International Maritime Organization (IMO), which reflected very well the continuing concern of WMO and of national Meteorological Services (NMSs) for the safety of life and property at sea. Professor Obasi also noted with satisfaction the concern expressed by the Commission for the protection of the marine environment, manifest through the ongoing trials of the new marine pollution emergency response support system (MPERSS). He further stressed the importance of the joint WMO/ Intergovernmental Oceanographic Commission (IOC) South East Asian Centre for Atmospheric and Marine Prediction (SEACAMP) project in enhancing marine services on a regional basis, and hoped that similar initiatives could be developed in other parts of the world.

1.5 In addition to its work in support of maritime safety, the service requirements of marine users, and marine environmental protection, Professor Obasi noted that CMM had a major, continuing role to play in the collection and management of marine meteorological and oceanographic data, in support of operational meteorology, of the provision of marine services, and, increasingly, of global climate studies. The operations and management of both the voluntary observing ships (VOSs) and the marine climatological summaries scheme (MCSS) were highly successful and important examples of the work of CMM in that field. He pointed out that both the Global Climate Observing System (GCOS) and the Global Ocean Observing System (GOOS) were now developing specific and detailed requirements for marine observations, in particular through the joint ocean climate module, and were looking to the Commission to play a leading role in implementing and maintaining operational ocean observation and data management systems to satisfy those requirements. In that context, Professor Obasi urged strict adherence to the letter and spirit of 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, and stressed the importance of enhancing the capacities of NMSs in developing countries regarding marine meteorology and physical oceanography.

1.6 Professor Obasi then noted the recent proposal made to the Executive Council of both WMO and IOC for enhanced cooperation between the two organizations, including through the possible future cosponsorship of CMM by IOC. He recognized the complexity of the issues raised by the proposal, but at the same time underlined the potential advantages which might accrue to both organizations through the pooling of expertise and resources at both the international and national levels. He, therefore, urged the Commission to study carefully the preliminary report on the subject, to discuss the issues in depth, and to provide further advice and guidance to the Executive Council and, eventually, to Congress.

1.7 The Secretary-General further urged the Commission to give consideration to ways of enhancing the participation of developing countries in its work, as well as of expanding coordination and interaction with the regional associations (RAs). In concluding, he assured the Commission of the full support of the WMO Secretariat, wished it every success in its work, and finally wished delegates an enjoyable stay in Havana.

1.8 On behalf of the Cuban Meteorological Institute, the Permanent Representative of Cuba with WMO, Mr T. Gutiérrez Pérez, welcomed the delegates to Cuba and to Havana, and expressed his pleasure at being able to host the twelfth session of CMM. Mr Gutiérrez also welcomed particularly the presence of Ms R. E. Simeón, Minister of Science, Technology and Environment, of Mr F. Fajardo, president of the Cuban Environmental Agency, and of the Secretary-General of WMO, Professor G. O. P. Obasi, at the opening of the session.

1.9 Mr Gutiérrez then noted the great importance that meteorology had as a scientific discipline in Cuba, because of its influence on the social and economic well-being of the population, on protection of human life, and on many other activities relevant to a country surrounded by ocean, including fisheries, trade, and tourism. He recalled that the first observatory was established in December 1860, later officially named as the Havana Physical and Meteorological Observatory under

the father of Cuban meteorology, Mr Andrés Poey y Aguirre. Another milestone was the establishment, in 1889, of the Navy Observatory, and finally that of the National Observatory in 1908. The Meteorological Institute was created in 1965. In the last 30 years, there had been a considerable improvement in the observation network, several meteorological radars were installed and specialized training was started at the Meteorological School. In 1972, following the establishment of the present Institute, several developments took place, particularly with regard to the support of marine activities, such as the evaluation of the impact of marine-generated meteorological phenomena on coastal buildings, ship routeing and warnings. He also recalled that following the success in obtaining automated air- and sea-surface temperature data, forecasts had significantly improved and a better knowledge of the Cuban climate had been achieved. All those advances had been put to the test during 1995, a year considered as the most active for tropical cyclones since 1934, and he mentioned that, thanks to the appropriate warnings and meteorological forecasts, hurricane Lily, while causing great economic losses, produced no loss of life. He closed his statement by wishing the Commission a very successful meeting, and a pleasant stay in Havana.

1.10 On behalf of the Government of Cuba, the President of the Cuban Environmental Agency, Mr F. Fajardo, also welcomed all delegates to his country. He recalled the disastrous results of hurricane Lily and the economic damage, while fortunately there was no loss of life. Meteorology had become a very important subject in Cuba because of its influence on activities such as maritime transport, oil prospecting, fisheries, and tourism. The Government was giving high priority to all those activities. Mr Fajardo mentioned the importance that was being given to climate change in view of the considerable impact that its effects could have in the future through sea-level rise, which could produce grave results, including the disappearance of hundreds of kilometres of beaches. He informed the delegates that the Ministry was giving all those subjects a high priority.

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

(*a*) Mr D. Linforth (Australia) in recognition of his outstanding contribution over more than 20 years to the development, expansion and enhancement of marine meteorological services globally, and to the provision of expert technical advice in that field;

(*b*) Mr D. Painting (United Kingdom) in recognition of his outstanding contribution to the standardization of meteorological instruments and method of observation, to the expansion of marine climatological databases and, to the enhancement of marine observing systems, including ocean data buoys.

1.12 There were 83 participants in the session. Those included representatives of 39 Members of WMO and of five 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 presented brief reports on delegations whose credentials had been found valid. Those 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, 7, 8 and the relevant parts of 4, 9, 10 and 16. Mr J. Guddal (Norway) was elected chairman and Ms T. Pierce (United States) vice-chairman;

(*b*) Committee B to deal with agenda item 6 and the relevant parts of 4, 9, 10 and 16. Mr S. Ragoonaden (Mauritius) was elected chairman and Mr K. Nagasaka (Japan) vice-chairman.

The session decided to deal with agenda items 11, 12, 13, 14 and part of 3 as a Committee of the Whole, chaired by the president of the Commission.

COORDINATION COMMITTEE

2.3.2 In accordance with General Regulation 28, a Coordination Committee was established consisting of the president, the vice-president, the chairmen of the working committees, and the representative of the Secretary-General.

NOMINATIONS COMMITTEE

2.3.3 To facilitate the election of the officers of the Commission, and the appointment of the chairmen of working groups and subgroups, a Nominations Committee was established consisting of the principal delegates of Canada, Ghana, Greece, Hong Kong, Malaysia, and the Russian Federation.

2.4 OTHER ORGANIZATIONAL MATTERS (agenda item 2.4)

Under this item, the Commission decided on its working hours for the duration of the session. It was agreed that, in accordance with 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 C to this report.

3. REPORT BY THE PRESIDENT OF THE COMMISSION (agenda item 3)

3.1 In his report, Mr R. Shearman, president of the Commission, gave a brief account of the activities of the Commission since its eleventh session. Over the previous four years, the Commission membership had grown to 192 members out of 101 Members of WMO at the time of CMM-XI to 198 members out of 112 Members of WMO in February 1997. The eleventh session had established four main working groups, as well as a number of task-oriented subgroups, and that structure had been generally effective in implementing the work plan of the Commission.

3.2 The president pointed out that the past inter-sessional period had been primarily one of consolidation of the major decisions taken and projects initiated at the eleventh session. In that context, it had been highly successful, with the new broadcast system for the GMDSS now well-established and effectively globally implemented; the MPERSS trials slowly taking shape and demonstrating the potential value of the system worldwide; the SEACAMP project fully designed and awaiting decisions on funding; the global digital sea-ice data bank (GDSIDB) and the revised MCSS fully operational and demonstrating increased benefits to users, including in particular the World Climate Programme (WCP); the VOS, data buoys and ASAP all increasing both the quantity and quality of *in situ* data available to users; new satellite and ground-based ocean remote sensing systems becoming operational; and a number of specialized training courses and technical publications having provided directed assistance to Members in their efforts to improve their own marine service activities.

3.3 Mr Shearman then noted that many of the activities and projects of CMM had been undertaken in, and derived their success from, close cooperation with other international organizations, in particular IOC, IMO, the International Maritime Satellite Organization (Inmarsat) and the International Hydrographic Organization (IHO). He considered that such cooperation, especially between the meteorological and oceanographic communities, should and must increase even further in the future and, in that context, referred to a proposal which he had made to the Executive Council to give effect to such enhanced cooperation. Further details and discussion concerning that proposal are recorded later under this agenda item. The president then thanked all members of the Commission, the vice-president, the chairmen and members of working groups and subgroups, and the rapporteurs, for their major contributions to the work of the Commission over the past four years. Finally, he expressed his appreciation to the Secretary-General and his staff in the World Weather Watch (WWW) Department for their valuable assistance during the eight years of his presidency.

3.4 The Commission expressed its satisfaction with the report of the president and with the activities of the Commission since its eleventh session, and paid a special tribute to the president and vice-president for their leadership during the past eight years. During the general discussion of the presidential report and of the reports of the chairmen of the working groups many comments and suggestions were made by delegates. Some of the more important subjects touched on are noted in the following paragraphs.

3.5 The Commission expressed its satisfaction with the considerable achievements which had occurred during the past inter-sessional period, despite continuing contraints in personnel and finances, both in NMSs and at WMO. It also recognized that many national Services were contributing much to the work of the Commission and to WMO in general through work undertaken at the national level, which was ultimately of benefit to a much larger community. At the same time, the Commission supported the suggestion of the president to develop a more structured approach to the management of projects which it agreed to undertake within its workplan. It also requested the Secretary-General to specify clearly the amount of time and effort expected and the skills required for working group tasks when seeking nominations to those groups from Permanent Representatives.

3.6 The Commission strongly supported the SEACAMP initiative and expressed the wish that the concept should be extended to other regions. In that context, it was recognized that efforts should be made to develop clear priorities and themes in the general area of training and implementation support, in order to better direct assistance in the further development and expansion of marine services worldwide. The Commission also urged that further work should be done to revitalize and possibly restructure the proposed Nairobi course, in order to facilitate its implementation as soon as possible. Finally, the Commission reiterated the need for continuing close coordination with the RAs, in particular through the regional rapporteurs on marine meteorological services.

3.7 The Commission recognized that there was a need to re-establish the CMM Advisory Working Group (AWG), in order to assist and advise the president on a variety of substantive issues. Specific action in that regard was taken under agenda item 15. It also considered its work plan for the coming inter-sessional period in the light of general policy and priority guidance outlined by Twelfth Congress, of specific objectives and tasks for the marine programme as detailed in the Fourth WMO Long-term Plan, and of decisions taken during the present session. It adopted the work plan for the period 1997–2001, which is given in the annex to this report.

CLOSER COOPERATION WITH THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)

3.8 The Commission noted the proposal which had been presented by the president of CMM to the forty-eighth session of the Executive Council concerning a possible cosponsorship of CMM by the IOC. Following agreements by the Executive Council of both WMO and IOC that the issue of closer cooperation between the two organizations, including a possible cosponsorship of CMM by IOC, should be studied in more depth, a preliminary study on such cooperation had been prepared by a WMO consultant, Mr D. Linforth (Australia). The preliminary study was undertaken in the light of the new terms

of reference for CMM as agreed upon by Twelfth Congress; the Commission recognized that a parallel study of the issues involved was also being undertaken by an IOC consultant, Mr R. Wilson (Canada). The Commission noted the WMO study, and expressed its appreciation to Mr Linforth for highlighting many of the issues involved.

3.9 The Commission recognized the potential value of even closer cooperation with IOC on relevant issues and through relevant mechanisms, and noted:

(*a*) That the work of CMM and NMSs had been expanding into the area of physical oceanography for many years, with regard to observation systems, data management, and services and in response to user requirements;

(*b*) That many NMSs already had close association with the oceanographic community and with IOC, which both aided and necessitated closer cooperation at the international level; in many cases, the same people were involved with both organizations;

(*c*) That CMM had a constitutional responsibility within WMO to develop regulatory material in the areas of marine observations, data management, and services;

(*d*) That CMM and NMSs had a long experience and considerable expertise in managing operational ocean observing systems, in ocean data management and data processing, and in the provision of services to users;

(*e*) That there was a requirement for a mechanism to implement, regulate and maintain a coordinated operational ocean observing system for climate;

(*f*) That there were a number of existing WMO and IOC bodies dealing with different aspects of physical oceanographic observing systems, and that benefits in terms of costs and coordination could derive from a more coherent and consolidated approach to ocean monitoring;

(*g*) That the IOC could contribute substantial oceanographic expertise in ocean observations and observing techniques, and could also stimulate participation by oceanographic institutions and agencies worldwide.

3.10 At the same time, a number of other issues and factors were noted as relevant to that cooperation:

(*a*) Resolution 40 (Cg-XII), concerning the WMO policy and practice for the exchange of meteorological data and products, had taken many years to develop and was very important for Members and the Organization; its application to the exchange of oceanographic data and products would also have to be taken into account in the study;

(*b*) Many regulatory, constitutional and financial matters remained to be addressed in detail;

(*c*) The role of IOC national focal points, equivalent to the WMO Permanent Representatives, would have to be considered;

(*d*) Close cooperation between CMM and IOC should probably be limited to marine meteorology, physical oceanography, and pollution of the marine environment, but the limits of those disciplines would be difficult to define;

(*e*) Examples of cosponsored bodies already existed (e.g. the Integrated Global Ocean Services System (IGOSS) and GCOS), and could be used as examples of possible mechanisms for closer cooperation.

3.11 On the basis of those considerations, and bearing in mind:

(*a*) The recommendations of the Joint Scientific and Technical Committee (JSTC) for GCOS with regard to the implementation of the common GCOS/GOOS ocean climate module;

(*b*) The various constitutional and financial issues still to be fully addressed;

(*c*) The broader study on the WMO technical commission structure being undertaken by the Executive Council;

(*d*) That, regrettably, the results of the study by the IOC consultant had not been available at the session,

the Commission recognized the potential value of closer cooperation between CMM and the IOC and agreed that the issue was worthy of further examination. It, therefore, recommended that the detailed study of the question be continued, with a view to presenting a full proposal to the governing bodies of WMO and IOC for their consideration. Recommendation 1 (CMM-XII) was adopted.

4. REPORT BY THE CHAIRMEN OF WORKING GROUPS AND BY RAPPORTEURS (agenda item 4)

The Commission noted the reports of the chairmen of the working groups and expressed its appreciation for their excellent work and for the time and effort spent in carrying out their tasks. Those reports are discussed in detail under the relevant agenda items.

5. MARINE METEOROLOGICAL SERVICES (agenda item 5)

5.0.1 Under this agenda item, the Commission considered the report of Ms T. Pierce (United States), chairman of the Working Group on Marine Meteorological Services, as well as those of the chairmen of the Ad hoc Group on GMDSS Implementation and of the Subgroup on Wave Modelling and Forecasting, the Rapporteur on NAVTEX Services in the Baltic Sea Region, and the special report on southern hemisphere marine services presented by the chairman of the RA III Working Group on Regional Marine Meteorological Services (MMS). It expressed its appreciation to those chairmen and to their groups for the excellent work accomplished during the inter-sessional period. The discussion on specific items and topics addressed by the groups is recorded under subsequent paragraphs and also under the relevant agenda items.

5.0.2 In a general sense, the Commission recognized that there were continuing and important requirements for further work to coordinate, monitor and develop both basic and specialized marine meteorological services, including, in particular, their relation to the GMDSS, the wave programme, marine climatology, and sea ice. It, therefore, agreed to maintain the overall Working Group on Marine Meteorological Services; specific action in that regard is taken under agenda iten 15. In addition, it recognized the importance of expanding its activities in that

area to include also the assessment of user requirements for marine data and services; the provision of technical guidance on the application of marine model output to marine services; the possible development of software packages to run marine forecast models on PCs; and the future use of Inmarsat-C to transmit graphic products to ships at sea. It, therefore, agreed that those specific topics should be added to the work programme of the working group, and requested the president of the Commission, the chairman of the working group, and the Secretariat to identify specific rapporteurs to undertake them.

5.1 BASIC AND SPECIALIZED MARINE METEOROLOGICAL SERVICES (agenda item 5.1)

MARINE OBSERVATIONS AND SERVICES IN THE SOUTHERN HEMISPHERE

5.1.1 The Commission noted with interest and appreciation the report and proposal prepared by Mr H. Sosa (Argentina), chairman of the RA III Working Group on Marine Meteorological Services for actions to enhance marine observing systems and marine services in the southern hemisphere. It noted particularly the effort made to formulate recommendations that were realistic and could generally be implemented within a reasonable period of time.

5.1.2 The Commission considered many of the actions proposed for the implementation of the recommendations under the relevant agenda items. It noted that some actions had already been taken within the normal activities of the Commission and the Secretariat. It requested the Working Group on Education, Training and Implementation Support to act as a focal point for implementing the recommendations in general, with the first step being the formulation of a concrete implementation plan and the designation of specific responsibilities to members of the working group and to other CMM working groups and subgroups.

5.1.3 The Commission felt that the proposed recommendations should also be presented to the respective working groups and rapporteurs of those RAs with ocean areas in the southern hemisphere, as those proposals would also increase the awareness, interest and motivation at the national level. The Commission requested the Secretary-General to ensure that that occurred.

MARINE METEOROLOGICAL SERVICES MONITORING PROGRAMME

5.1.4 The Commission recalled that it had initiated development of a marine meteorological services monitoring programme at its eighth session (Hamburg, September 1981), as a means of obtaining feedback from the users on the quality, timeliness and value of those services, with a view to effecting continuing improvements in support of user requirements. The outline of a monitoring programme was adopted by CMM-IX (Geneva, October 1984) and subsequently distributed to Members for action. CMM-X (Paris, February 1989) requested the Subgroup of Experts on Warning and Forecast Preparations to evaluate the results of monitoring of marine meteorological services and to advise on development of services. That evaluation was considered at its eleventh session on the basis of the summary responses from 21 Members, which had in turn been prepared from 1 625 individual questionnaires completed by ships' masters. The Commission also invited Members to review carefully the results of the survey and to take appropriate measures to correct any identified deficiencies and requested the WMO Secretariat to coordinate another monitoring survey and to prepare an analysis of the results.

5.1.5 In that context, the Commission noted with interest the comprehensive report prepared by the Secretariat on the basis of the answers of 22 Members, which had in turn been prepared from 1 209 individual questionnaires completed by ships' masters during 1996. The Commission expressed its appreciation to the Members concerned, to the ships' masters, and to the Secretariat for their efforts in preparing that very valuable analysis. At the same time, the Commission noted that several of the comments or questions made by the ships' masters were not always clear or showed some misunderstanding of the question or objective of the survey.

5.1.6 The Commission noted and agreed with the main conclusions of the analysis. The Commission noted further that several of the suggestions made for improvements in the previous survey had been implemented by Members, and that those suggestions had disappeared from the list of problems encountered by ships' masters. The list, however, was long and the Commission accepted that there was still a need for improvement in several matters including the coverage and services for some oceanic regions. The Commission reiterated that:

(*a*) High quality, reliable and readily-accessible marine meteorological services continued to be of great importance to mariners;

(*b*) Charts and other pictorial information, transmitted to ships at sea by facsimile or otherwise, were highly regarded by mariners and should be continued;

(*c*) The response of users to existing services was generally favourable, although there was evident room for improvement in certain geographical areas as well as in aspects of service delivery;

(*d*) The priority which CMM gave to marine meteorological services, as well as to the communications and related systems for their preparation and delivery, continued to be fully justified by user responses to those services;

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

5.1.7 As a direct follow-up to those conclusions, the Commission agreed on the need to continue maintaining a systematic long-term global marine meteorological services monitoring programme based on a questionnaire modified in accordance with the experience gained, so as to avoid, if possible, misunderstandings which had occurred in previous surveys. The Commission accepted with appreciation the offer made by the United Kingdom to have the next questionnaire prepared by appropriate professionals on the basis of feedback from Members on

the type of information required from the survey. It further agreed both that another monitoring survey should be undertaken by Members during the next inter-sessional period as well as to keep in force Recommendation 1 (CMM-XI) — Marine Meteorological Services Monitoring Programme, on that subject. In doing so, the Commission requested the Secretary-General to ensure that the monitoring results were distributed as quickly as possible to Members, to marine forecasters, to port meteorological officers (PMOs), and to users, in order to obtain their feedback.

5.1.8 The Commission invited Members to review carefully the results of the survey, including the detailed criticisms and suggestions made by users, particularly those that had been repeated from the previous survey, and to take appropriate measures to correct those identified deficiencies in marine meteorological services within their respective areas of concern. The Commission was pleased to note that several Members had already taken corrective action in answering some of the remarks made by the ships' masters. In view of the value placed by mariners on chart and other pictorial information presently transmitted by facsimile, the Commission noted with interest and appreciation the information provided by the representative of Inmarsat, regarding work which had recently begun to develop a possible future capability for the transmission of graphical information through Inmarsat-C, as a part of the SafetyNET service. It acknowledged the potential importance of such a capability to many Members, in allowing them to continue to disseminate safety-related meteorological information to mariners in chart form, even though radiofacsimile broadcasts were now being discontinued in many countries. At the same time, the Commission recognized that some Members already had experience with both the software and the techniques required for digital chart transmissions through Inmarsat-C. It, therefore, requested the chairman of the Working Group on Marine Meteorologial Services to identify a rapporteur who could work with both Inmarsat and Members concerned on the development of that capability, as a matter of priority.

5.1.9 As a means to increase the awareness of ships' masters on the services available in different geographical areas, the Commission recognized the value of brochures already prepared by different Members, both in their national language and in English. It considered that those brochures could usefully be exchanged among NMSs and could also be provided to selected PMOs. It, therefore, requested the Secretary-General to make appropriate arrangements with Members to that effect.

5.2 MARINE POLLUTION EMERGENCY RESPONSE SUPPORT SYSTEM (MPERSS) (agenda item 5.2)

5.2.1 The Commission recalled that the MPERSS was adopted at its eleventh session and was approved by the forty-fourth session of the Executive Council for implementation on a trial basis as from 1 January 1994. The primary objective of the MPERSS was to put in place a coordinated, global system for the provision of meteorological and oceanographic information, as required and on request, for marine pollution emergency response operations outside waters under national jurisdiction. In that context, the trials were intended to facilitate the establishment of the necessary contacts and communication links in each marine pollution incident (MPI) area and to test and refine the system in either simulated or real emergency situations.

5.2.2 The Commission noted with interest the results of a survey undertaken by the Secretariat in 1996 to assess the status of MPERSS implementation and trials. It expressed disappointment that, from the information available, actions to develop MPERSS had been initiated in only six of the 16 MPI areas, with either simulated or real incidents having been dealt with in four of those areas. It recognized, nevertheless, that the MPERSS had proved to be of value in those incidents, which had also facilitated various system improvements.

5.2.3 The Commission further noted with appreciation the interest and support for the MPERSS concept provided by the IMO Working Group on the 1990 International Convention for Oil Pollution Preparedness, Response and Cooperation (OPRC), as well as the willingness of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC) to participate in joint trials of MPERSS in MPI area III.

5.2.4 On the basis of results of the trials undertaken so far and of the support expressed by IMO and REMPEC, the Commission agreed to continue the MPERSS trials during the coming inter-sessional period, and to that effect decided to keep in force Recommendation 2 (CMM-XI) — Marine Pollution Emergency Response Support System (MPERSS) for the high seas. It urged Members having accepted responsibilities under MPERSS to undertake implementation and trials as proposed and to report on those to its thirteenth session. It also requested the Secretary-General to enhance its liaison with IMO regarding MPERSS, in particular to assist area meteorological coordinators (AMCs) through the identification of relevant pollution response authorities, whether natonal or international, within their respective incident areas. In that context, the Commission noted with appreciation the establishment of the Regional Marine Pollution Emergency Information and Training Centre (REMPEITC) in Curaçao, Netherlands Antilles. The centre could be contacted on the Internet through: rayseebald@aol. com; or the homepage: http://www.curbiz.com/rempeitc.

5.2.5 The Commission recognized the potential value to Members concerned of participating in a seminar/workshop on MPERSS, at which all aspects of the system could be reviewed, discussed, and clarified. It, therefore, requested the Secretary-General to consider the possibility of convening such a seminar/workshop in 1998, as a contribution to the International Year of the Ocean, and to investigate possible cosponsorship by IMO, IOC and the United Nations Environment Programme (UNEP). It noted with appreciation the provisional offers made by Australia and France to consider hosting the seminar/workshop, and requested its president to discuss with the Secretary-General and the Members concerned to establish the venue.

5.3 MARINE TELECOMMUNICATON ARRANGEMENTS FOR PRODUCT DISSEMINATION (agenda item 5.3)

5.3.1 The Commission recalled that, at its eleventh session (Lisbon, April 1993), in reviewing the implementation status of the new WMO GMDSS marine broadcast system, it had revised slightly the new system and had agreed that it should be incorporated into the *Manual on Marine Meteorological Services* (WMO-No. 558), and that the new WMO GMDSS system should operate in parallel with the existing system until 1 February 1999. After 1 February 1999 the existing system, which was based on conventional terrestrial broadcast facilities, would no longer be mandatory, provided that the GMDSS would indeed be fully and formally implemented from that date.

5.3.2 The eleventh session of CMM, noting that the operation of the new WMO GMDSS system should be kept under close review during the transition period, with the system being revised as necessary in the light of experience, requested its Working Group on Marine Meteorological Services to undertake that review, through an ad hoc group on the GMDSS. It further charged the working group to prepare a final revised version of the new system for consideration at its twelfth session. That was undertaken by a session of the ad hoc group in Geneva in September 1996, which included the participation of representatives from the 16 meteorological areas as well as from other international organizations directly concerned (IMO, IHO, the International Chamber of Shipping (ICS), and Inmarsat).

5.3.3 The Commission noted with satisfaction that the implementation of the WMO GMDSS system was well advanced and would certainly be finalized well before 1999. At the same time, however, it was informed that the fitting of GMDSS equipment by existing ships was not advancing rapidly, to the extent that it was likely that not all ships would be so equipped by the final GMDSS implementation date. That, in turn, might lead to pressure within IMO to extend the GMDSS transition period beyond 1 February 1999. The Commission noted that fact with concern, due to the possible financial implications for Meteorological Services in having to continue dual broadcasts of forecasts and warnings for a longer period than initially foreseen. It requested IMO to take that view into account, in the event that the question of possibly extending the GMDSS implementation period was addressed in an appropriate forum.

5.3.4 The Commission noted with satisfaction the work of the ad hoc group and expressed its considerable appreciation to Captain Gordon V. Mackie, chairman of the group, to members of the group, to the Issuing and Preparation Services for their major efforts in implementing the WMO GMDSS marine broadcast system, and to those Members who were still operating the interim urgent warning service. The Commission also offered its thanks to IMO, IHO, ICS and Inmarsat for their cooperation and assistance in implementing the system and expressed satisfaction with the close liaison which existed between WMO and those other international organizations.

5.3.5 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*. Recommendation 2 (CMM-XII) was adopted to that effect. The Commission noted that the operation of the system should be kept under close review, certainly until the end of the full implementation period of the GMDSS, with the system being revised as necessary in the light of further operational experience. Action in that regard is taken under agenda item 15. The Commission recognized that accurate broadcast schedules were essential to users and, therefore, urged Issuing Services to keep the Secretariat fully and rapidly informed of any modifications, if possible well in advance. While recognizing that continuing changes might be required in the lead-up to 1999, the Commission nevertheless requested that such changes should be kept to a minimum as much as possible.

NAVTEX SERVICES

5.3.6 The Commission recalled that at its eleventh session, it had recognized that a requirement might exist in some ocean areas for the international coordination of meteorological broadcasts through the international NAVTEX service, which was an integral part of the GMDSS. In that regard, it had appointed a rapporteur to develop such coordination for the Baltic Sea region (see paragraph 5.3.8).

5.3.7 In reviewing the work of that rapporteur, the first session of the Ad Hoc Group on the GMDSS considered that it would be valuable for Members to have included in the *Manual on Marine Meteorological Services* a brief description of general procedures and principles for the international coordination of meteorological broadcasts through NAVTEX, which might then be used to develop detailed coordination arrangements in specific regions, as required. The Commission agreed with that view and adopted Recommendation 3 (CMM-XII) to effect an appropriate addition to the *Manual*. It further agreed that that addition should be to Volume I, Part II, since NAVTEX services were essentially directed to coastal and near-shore waters. Specific regional arrangements might then be included in relevant sections of Volume II.

5.3.8 The Commission noted with interest the comprehensive report by the Rapporteur on NAVTEX Services in the Baltic Sea region, Mr M. Ziemiaski (Poland), and expressed its considerable appreciation to him and his ad hoc group of national focal points for the substantial progress made on that complex question. It noted, in particular, the draft guidelines which had been prepared on the coordination of meteorological information for shipping in the Baltic Sea. It supported those draft guidelines. The Commission recommended that, following acceptance of the guidelines by the Permanent Representatives concerned, and their trial implementation over a certain period, they should also be submitted to a future session of RA VI for adoption for inclusion in the *Manual on Marine Meteorological Services*, Volume II.

5.4 WMO WAVE PROGRAMME (agenda item 5.4)

5.4.1 The Commission noted with interest the report of the chairman of the Subgroup on Wave Modelling and Forecasting, Mr V. E. Ryabinin (Russian Federation) and expressed its appreciation to him and to all the members of his subgroup for the excellent inter-sessional work achieved on the implementation of the WMO wave programme. The Commission noted in particular:

(*a*) Preparations for the publication of the revised version of the WMO *Guide to Wave Analysis and Forecasting* (WMO-No. 702);

(*b*) Preparations for the publication of the second edition of the *WMO Wave Programme: National Reports for 1984 on Wave Monitoring Techniques, Numerical Wave Models and Intercomparisons* (Marine Meteorology and Related Oceanographic Activities Report No. 12), which would include information on storm surge prediction;

(*c*) The publication of a review on tropical and extratropical storm surge prediction in the Marine Meteorology and Related Oceanographic Report Series;

(*d*) The successful conduct of a training Workshop on Numerical Wave Analysis and Forecasting (Boulder, Colorado, December 1995) and the ongoing preparations for a second workshop to be conducted in Miami, Florida in May 1997;

(*e*) The advice/consultations provided by the members of the Subgroup on Wave Modelling and Forecasting to facilitate the development of national wave analysis/forecasting capabilities.

5.4.2 The Commission expressed its appreciation to the United States for putting the real-time wind and wave analyses/forecasts of the United States National Center for Environmental Prediction on an Internet home page, thus making the information available for use by many Members.

5.4.3 The Commission noted with interest the information on operational wave analysis/forecast verification activities conducted by several major forecasting centres, which was coordinated by Mr M. Holt (United Kingdom). The Commission emphasized that that activity was highly relevant to the wave programme and that it would eventually lead to considerable improvements in wind wave analysis/forecast quality. The Commission, therefore, agreed that the wind wave analysis/forecast verification activity would be a key element of the wave programme during 1997–2001 and strongly encouraged Members operating global- or basin-scale wave models to participate. Recommendation 4 (CMM-XII) on the subject was adopted.

5.4.4 The Commission reconfirmed its general support to the WMO wave programme. It recognized that considerable progress was being achieved in many areas of marine services related to the provision of basic and specialized wave and marine surface wind information and that the coordination of such efforts, in the framework of the WMO wave programme, had already proven very fruitful. It also recognized the very important technology transfer aspects of the programme, as well as the fact that it was a programme for Members and the Commission as a whole, and was therefore implemented in many different ways and through several mechanisms, including all the Commission's working groups.

5.4.5 Taking into consideration the above, the Commission adopted Recommendation 5 (CMM-XII) on the WMO wave programme for the next inter-sessional period.

5.4.6 The Commission then discussed at length the role and future of the Subgroup on Wave Modelling and Forecasting. It recognized that the subgroup had been very successful during the past inter-sessional period in fulfilling its terms of reference. It also acknowledged the many priority tasks which remained to be undertaken in that important field to Members, especially in aspects related to technology transfer, including making available wave and storm surge modelling and forecasting software for use on a PC platform. At the same time, the Commission was very conscious of the limited resources available to undertake a very large and important range of activities under the WMO marine programme in general, and the need to focus and prioritize carefully all aspects of the marine programme. After detailed consideration, and bearing in mind the above factors, the Commission agreed to re-establish the subgroup, but stressed that it should be open and continue to work essentially by correspondence. It also agreed that the work programme of the group should be carefully focussed, and emphasized technology transfer in particular. Further action in that regard is taken under agenda item 15. It requested the AWG to examine carefully the requirements for the continuation of the subgroup at its next session, taking into account the activities of other Commission groups relative to the wave programme, and to advise its thirteen session accordingly. It further requested the chairman of the subgroup to prepare a specific proposal for focussing and prioritizing the work of the subgroup, for consideration at the next session of the AWG.

6. SYSTEMS AND TECHNIQUES FOR MARINE OBSERVATION AND DATA COLLECTION (agenda item 6)

6.1 OBSERVATIONAL DATA REQUIREMENTS (agenda item 6.1)

6.1.1 The Commission reviewed the WWW requirements for marine observational data as specified in Part II, Volume 1 of the *Fourth WMO Long-term Plan* (WMO/TD-No. 700). It also reviewed the present status of availability of specific important marine meteorological variables in comparison with those requirements. It agreed that, despite substantial improvements in data reports, in particular from drifting and moored buoys in recent years, there remained considerable gaps in certain ocean areas, especially in the southern hemisphere.

6.1.2 The Commission reviewed a consolidated set of requirements for satellite-derived marine data, which had been compiled on the basis of input from various sources, including the AWG, GCOS, the World Climate Research Programme (WCRP) and the IOC, and reviewed by the CMM/IGOSS/International Oceanographic Data Exchange (IODE) Subgroup on Ocean Satellites and

Remote Sensing. It recognized that that set of requirements was regarded as important input to planning future satellite missions and noted with satisfaction the major input to the work made by the Commission and recorded under agenda item 6.4. It requested the rapporteur on ocean satellites to continue to review requirements for satellite-derived marine data on its behalf during the coming inter-sessional period.

6.1.3 The Commission noted with interest that detailed requirements of GOOS and GCOS for ocean data to support global climate monitoring and prediction were now emerging from the work of the GOOS/GCOS/WCRP Ocean Observations Panel for Climate, building on the final report of the Ocean Observing System Development Panel, which had become available in 1995. It was informed that the Data Buoy Cooperation Panel (DBCP) and IGOSS were already dealing with those requirements relating to drifting buoys and ship-of-opportunity (SOO) programmes, respectively. It requested its Working Group on Marine Observing Systems, and in particular the Subgroup on the Voluntary Observing Ships and the rapporteur on ocean satellites, to follow closely the work of the joint GOOS/GCOS/WCRP Ocean Observations Panel for Climate (OOPC), and to make every effort to respond to relevant elements of specific requirements to support global climate studies, as they became available.

6.1.4 The Commission noted with interest the work of the Coordinating Group (CGC) for the Composite Observing System for the North Atlantic (COSNA), and in particular the consolidated monitoring report for the COSNA area. It recognized that, in general, actions to implement recommendations of the CGC and to enhance marine observations from the North Atlantic were taken by specific implementation bodies such as the European Group of Ocean Stations and the automated shipboard aerological programme (ASAP) Coordinating Committee. At the same time, it considered that there were also areas in which CMM itself could assist, particularly with regard to the VOS. The Commission, therefore, instructed its newly established Subgroup on the VOS to monitor closely the requirements of COSNA for VOS data, in particular as expressed through recommendations of the CGC, and to take action as appropriate.

6.2 VOLUNTARY OBSERVING SHIPS (VOS) AND SHIP-OF-OPPORTUNITY (SOO) (agenda item 6.2)

6.2.1 The Commission noted that the collection of marine meteorological and surface oceanographic observations from ships at sea remained a vital activity in the provision of data from the world's oceans which supported both meteorological services and various research programmes. It re-iterated its belief that the importance of VOS data was increasing on account of its value as a key component of the Global Observing System (GOS) of the WWW, of GCOS, and of GOOS. The ocean monitoring requirement for the global climate programmes relied to a very high degree on VOS data. At the same time, the Commission concurred that improvements in the quality, quantity, and timeliness of reports available in real time over the Global Telecommunication System (GTS) and through the MCSS, as well as the availability from all oceans, were a continuing necessity.

6.2.2 In that context, the Commission reviewed carefully the various activities which had been undertaken, both within CMM and elsewhere, and which were directed towards improvements in the quality and availability of ships' meteorological reports. Those included, in particular:

(*a*) The remedial action taken as a result of the various monitoring programmes, particularly the monthly and six-monthly comprehensive monitoring reports from RSMC Bracknell (United Kingdom);

(*b*) The IMO Maritime Safety Committee circular to its Member Administrations and Shipowners/Operators encouraging participation in the WMO VOS scheme;

(*c*) The first international PMOs seminar/workshop, cosponsored by IMO, ICS and Inmarsat and held at the IMO Headquarters in London, September 1993, as well as the planned regional PMO seminars in the future.

6.2.3 The Commission noted with interest a table indicating the total and daily average number of SHIP reports received by *Météo-France* for the month of June during the three-year period from 1994 to 1996. The Commission expressed satisfaction that the number of SHIP reports received by *Météo-France* had increased by approximately 28 per cent as compared with the same period during the years from 1990 to 1992. While that increase in the quantity of VOS data was possibly due to improved cargo handling techniques, both in modern seaports worldwide and on board ships, which allowed the ships to spend more time at sea and thus provide more opportunity for meteorological observing, the Commission considered that it was unlikely that the total number of VOS would be increased substantially. The Commission, nevertheless, considered that the geographical coverage of the VOS might still be improved through selective recruitment of ships sailing on certain routes, an activity in which the PMOs would have a vital role. In that context, the Commission expressed its appreciation to both IMO and ICS for their efforts in encouraging their Members to become involved in the VOS scheme.

6.2.4 The Commission, again recalling that the ninth session of the Commission for Basic Systems (CBS) (Geneva, January/February 1988) had established procedures for monitoring the quality of real-time data on the GTS and that RSMC Bracknell (United Kingdom) had been nominated lead centre for monitoring marine surface data, noted with satisfaction that the monitoring procedures were continuing. Monthly and six-monthly comprehensive reports — giving full results of the monitoring and details of the ships identified as having consistently poor quality pressure and surface wind observations — were prepared and distributed by RSMC Bracknell. The Commission noted that the six-monthly reports were distributed by the WMO Secretariat to the national PMO focal points in those countries having recruited the ships identified in the monitoring reports. The Commission noted with appreciation that there had

been identifiable improvements in the quality of VOS data resulting from remedial action taken as a follow-up to the monitoring reports and encouraged Members to continue their efforts to follow-up the results of that most important real-time monitoring programme. The Commission further noted with appreciation the monitoring and follow-up actions taken by the Russian Federation with regard to VOS reports.

6.2.5 The Commission noted with interest that there were now a variety of different automated shipboard meteorological and oceanographic observing and data transfer systems in operation on board many VOS and SOO. The Commission re-affirmed its opinion that, in many cases, automation could assist in improving the quality and timeliness of ships' meteorological and oceanographic reports. When considering the operational deployment of automated systems on board ships, the Commission was of the opinion that consideration should be given to the following matters:

(*a*) Was there a decrease in the ship's crewing level to an extent that the WMO VOS programme was placing greater pressures on remaining crew members?

(*b*) Had changes in the recruitment patterns for the ship's officers resulted in some decrease in the training, awareness, and willingness of the officers in regard to meteorological reports?

(*c*) Was the deployment of the automated system cost effective and efficient in terms of quality, quantity, and timeliness of the reports when compared with the existing onboard methods for meteorological observing/transmission of the data?

(*d*) Did the Member have adequate shore-based technical and logistic resources to support the onboard automated system, taking into consideration the irregularity of ships' sailing schedules and the short in-port periods experienced by many ships at the present time?

6.2.6 In the context of automation, the Commission noted with appreciation the technical report on the automation of shipboard observations, which had been prepared by Mr M. Hontarrede (France), and which was to be published shortly, in both English and French, in the Marine Meteorology and Related Oceanographic Activities Report Series. It recognized that that report would be very valuable to Members in their efforts to increase automation and enhance data return from the VOS. At the same time, the Commission considered that there remained many other questions related to automation, both of observations and of data transmission, which needed to be addressed. Those included:

(*a*) Several Members had already developed software that was relevant to automated systems which they were willing to make available for use by other Members; work was required to coordinate the distribution and application of that software;

(*b*) New ships now being commissioned were being equiped with integrated automated systems for a variety of tasks, including meteorological observations; efforts would be required to enable the extraction and distribution on the GTS of the meteorological data transmitted by those systems;

(*c*) Guidance and assistance was required by developing countries to enable them to make use of, and maintain, automated systems;

(*d*) The requirements of numerical weather prediction (NWP) for VOS data, in terms of both variables and frequency;

(*e*) The importance for the marine climatological record of maintaining complete histories of observing instrumentation, including automated systems and relevant metadata;

(*f*) The need to keep under review the development of new automated systems and to provide appropriate guidance to Members.

It, therefore, requested the newly established Subgroup on the VOS to address those issues as a matter of priority.

6.2.7 The Commission, in re-affirming its belief that PMOs played an absolutely essential role in the recruitment and maintenance of the VOS, noted with interest and satisfaction that an international seminar/workshop for PMOs took place at IMO, London, in September 1993. It further noted with appreciation that the seminar/workshop was co-sponsored by WMO, IMO, ICS and Inmarsat. The Commission noted with satisfaction that the seminar had considered, *inter alia*, topics relating to enhancing PMO services worldwide, PMO training and guidance, observing practices, and VOS equipment. The Commission also noted with appreciation that the workshop had produced several recommendations which addressed the following:

(*a*) PMO activities;

(*b*) PMO training and guidance;

(*c*) VOS observing practices and equipment;

(*d*) SHIP reports on the GTS;

(*e*) Publications;

(*f*) Monitoring and services.

6.2.8 In addition and in accordance with the expressed wish of CMM-XI, the seminar/workshop for PMOs considered and recommended the following:

(*a*) The use of PMOs in support of the IGOSS ship-of-opportunity programme;

(*b*) The submission of a formal proposal by WMO to the IMO Maritime Safety Committee for joint encouragement to Governments and shipowners to participate in the VOS scheme;

(*c*) The preparation of a statistical analysis of the VOS as a proportion of total registered shipping.

In regard to the recommendations of the workshop, the Commission agreed that their implementation was critical to improving the quality of VOS data and to the services provided by the PMOs.

6.2.9 In view of the continuing and growing importance of the VOS and of PMOs, as noted above, the Commission agreed to maintain in force Recommendation 5 (CMM-XI) — Applications of the results of the VOS Special Observing Project North Atlantic (VSOP-NA). It also agreed to establish a subgroup on the VOS, within the Working Group on Marine Observing Systems, to provide the necessary technical support and coordination on a number of issues related to the VOS and PMOs. In addition to the subjects already recorded under this agenda item, the issues

included those regarded as high priority by its eleventh session and yet to be addressed, in particular the possible removal of some variables from ship reports and the preparation of a statistical analysis of the VOS as a proportion of total registered shipping. Further action on this topic is taken under agenda item 15.

6.2.10 The Commission noted with interest the status of the IGOSS ship-of-opportunity programme and the work of IGOSS in endeavouring to maintain the S00 XBT network established under the Tropical Ocean and Global Atmosphere Programme (TOGA) and the World Ocean Circulation Experiment (WOCE) on a long-term operational basis. It further noted the value of that network for the determination of upper-ocean heat content in support of global climate studies.

6.2.11 The Commission recognized the potential value of closer collaboration between the VOS and the SOO, noting that those were most often different ships, though recruited for related purposes. It also recognized the potential value of the PMOs to the future operational maintenance of SOO lines. The Commission, therefore, instructed its newly established Subgroup on the VOS to develop, in conjunction with the IGOSS Ship-of-Opportunity Implementation Panel, a concrete plan for collaboration in VOS and SOO activities, including joint use of the PMOs, where appropriate.

6.3 DRIFTING AND MOORED DATA BUOYS (agenda item 6.3)

6.3.1 The Commission reiterated its belief in the value of drifting and moored data buoys for the collection of essential meteorological and oceanographic data from remote ocean areas. It noted with interest and appreciation that both the numbers of buoy reports on the GTS as well as the quality of buoy data had continued to improve during the inter-sessional period, largely as a result of the work of the DBCP. The Commission further noted with appreciation the studies being undertaken by Japan and by Brazil, France and the United States, for the possible extension of tropical atmosphere/ocean moored buoy arrays in the western Pacific and tropical Atlantic Oceans, respectively. The Commission agreed that all those activities were contributing substantially to filling data gaps in many ocean areas, but recognized that much more work remained to be done if the requirements of WWW, GCOS and the research programmes for data from those areas were to be fully met.

6.3.2 The Commission noted with appreciation the impressive achievements of the DBCP over the past four years, including in particular:

(*a*) The establishment of new regional cooperative buoy programmes in the South Atlantic and Indian Oceans, with consequent increases in buoy data availability from those areas; and the ongoing important work of existing action groups, such as the European Group on Ocean Stations (EGOS), the International Arctic Buoy Programme (IABP), and the International Buoy Programme for the Antarctic (IBPA);

(*b*) The refinement and expanding operational use of the low-cost surface velocity programme — barometer (SVP-B) Lagrangian barometer drifter;

(*c*) The expansion of BUFR to include all buoy data types;

(*d*) The continued operation of the quality control guidelines, with consequent improvements in data quality;

(*e*) Maintaining a DBCP Internet home page, located at http://dbcp.nos.noaa.gov/.

6.3.3 The Commission expressed its thanks to the panel, its technical coordinator Mr E. Charpentier (France), its long-standing and recently retired chairman, Mr D. Painting (United Kingdom), and all Members which actively supported its work, for their very valuable efforts on behalf of all WMO Programmes. The Commission also thanked IOC for its continued valuable cosponsorship of, and support for, the panel and the technical coordinator, as well as *Météo-France* for providing the technical coordinator with an office and access to its computing system and data banks. It agreed that further efforts were required to maintain and expand buoy programmes globally, to make the best use of available technology, and to support the continued work of the DBCP and its technical coordinator. In particular, the Commission recognized the essential role played by the technical coordinator in coordinating buoy activities worldwide and in implementing decisions of the panel. At the same time, financial constraints experienced by existing contributing Members were likely to compromise the ability of the panel to maintain their position in the future unless additional funding sources were identified and/or other methods of support were found. The panel, therefore, strongly urged other Members to contribute to the DBCP trust fund to support the position where possible, and also recommended that efforts be made to find new and innovative approaches to funding and supporting the position. Recommendation 6 (CMM-XII) on that subject was adopted.

6.3.4 The Commission expressed its thanks to the IGOSS National Representative for Chile for preparing the Spanish version of the *Guide to Moored Buoys and other Ocean Data Acquisition Systems (ODAS)* (WMO-No. 750) and to Mr E. Meindl (United States) for his thorough revision of the English version of that *Guide*. The Commission noted with appreciation various other publications relating to drifting and moored buoys, including;

(*a*) The DBCP Technical Document series, including the annual reports;

(*b*) The IGOSS regular information service bulletin on non-drifting ODAS;

(*c*) The quarterly report on drifting buoys prepared by collection, location, satellites (CLS)/Service Argos and the DBCP;

(*d*) The *Guide to Drifting Buoys* published by IOC.

6.3.5 Finally on that topic, the Commission noted with appreciation the very valuable buoy data management activities undertaken by:

(*a*) The IGOSS Specialized Oceanographic Centre for Drifting Buoys maintained by *Météo-France*, in preparing and distributing various monthly analyses of buoy data on the GTS;

(*b*) The Responsible National Oceanographic Data Centre of Canada for the quality control and archival of buoy data from the GTS and other sources.

6.4 OCEANOGRAPHIC SATELLITES AND OTHER REMOTE SENSING (agenda item 6.4)

6.4.1 The Commission noted with interest the report of the chairman of the CMM/IGOSS/IODE Subgroup on Ocean Satellites and Remote Sensing, Mr J. W. Sherman, III (United States), and expressed its sincere appreciation to him and to all the members of his group for their considerable and valuable work during the inter-sessional period. In particular, the Commission noted with pleasure that the major report of the group, *Polar Orbiting Satellites and Applications to Marine Meteorology and Oceanography*, had recently been published, jointly by WMO and IOC, as Report No. 34 in the series Marine Meteorology and Related Oceanographic Activities. It commended that report and noted that it was a very valuable reference tool relating to satellite-based ocean remote sensing and recommended that it should be regularly updated.

6.4.2 The Commission expressed its appreciation for the successful WMO/IOC Technical Conference on Space-based Ocean Observations, held in Bergen in September 1993, as well as for the comprehensive proceedings of that conference, which had also been published jointly by WMO and IOC. It was particularly pleased to note that a large number of scientists from developing countries had been able to take part, and to present papers to the conference.

6.4.3 The Commission also expressed its considerable appreciation to the satellite operators, for their efforts in developing and maintaining oceanographic satellites and for making the data available to the user community. Those data were already vital for many applications and would be increasingly so in the future; it, therefore, urged the operators to continue to develop those satellites and to maintain them, where possible, on an operational basis.

6.4.4 The Commission reiterated its belief in the value to Members of data from the large number of oceanographic satellites now in operation or planned over the next decade, in support of both services and research. It noted with interest the work being undertaken by the CBS Working Group on Satellites and the WMO Secretariat, in collaboration with IOC and with other major programmes such as GOOS, GCOS and WCRP, in compiling a consolidated and consistent set of satellite-data requirements (including ocean data), for presentation to satellite operators through, *inter alia*, the Coordination Group for Meteorological Satellites (CGMS) and the Committee on Earth Observation Satellites (CEOS) (see also agenda item 6.1). It further noted with interest the existence of a joint GCOS/GOOS/GTOS Global Observing Systems Space Panel, which was developing joint satellite data requirements for the global observing systems.

6.4.5 At the same time, however, the Commission considered that there remained an important continuing role to be played within CMM, in particular in reviewing and updating satellite data requirements in support of marine services and in keeping Members fully informed on developments, applications and data acquisition aspects in that rapidly evolving field. It, therefore, agreed to appoint a rapporteur on that topic, within the Working Group on Marine Observing Systems, who would also provide the liaison between CMM and CBS on ocean satellites. Action in that regard is taken under agenda item 15. The Commission further agreed that Recommendation 7 (CMM-XI) — The application of remotely-sensed marine data to marine meteorological and ocanographic services, should remain in force, with the recommended actions therein being ongoing and important.

6.4.6 The Commission noted with interest that an international symposium entitled Monitoring the Oceans in the 2000s: An Integrated Approach would take place in Biarritz (France) from 15 to 17 October 1997, following a meeting of the Ocean Surface Topography Experiment (TOPEX/POSEIDON) Scientific Group which would be organized by the National Aeronautics and Space Administration (NASA) and the *Centre national d'études spatiales (CNES)*.

6.4.7 The Commission noted with interest the work undertaken during the past inter-sessional period relating to the use of ground-based radars for operational marine monitoring (waves, winds and surface currents), in particular in support of vessel traffic services (VTS) in operationally-dense sea areas. It further noted with interest the establishment of an ad hoc working group on the subject, including representatives of both users and manufacturers, and acknowledged with appreciation the support provided by the International Association of Lighthouse Authorities (IALA) for that activity. The Commission recognized the potential value to Members of the use of ground-based radars for marine monitoring and the provision of marine services, and considered that both the ad hoc group and WMO could benefit from a more formal association of the group with CMM. It therefore agreed that the group should become a subgroup of the Working Group on Marine Observing Systems on the understanding that it would be self-supporting. Action in that regard is taken under agenda item 15.

6.5 AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME (ASAP) (agenda item 6.5)

6.5.1 The Commission noted with interest and appreciation the Annual Report for 1995 on ASAP, which had been prepared and published by the ASAP Coordinating Committee (ACC). A total of 15 ASAP units were operated during the year by ACC Members, with the majority of soundings being from the North Atlantic Ocean and small percentages from the Indian, Pacific and South Atlantic Oceans. Communication efficiencies were improved, particularly when using Inmarsat-C, the cost of which was negligible compared with the cost of the sounding itself.

6.5.2 The Commission expressed its thanks to the ACC and to all ASAP operators for the substantial contribution which ASAP was making to WWW requirements for upper-air data over the oceans, in particular in the North Atlantic, and noted with appreciation the plans to continue and expand ASAP operations in the coming years. The Commission recognized that the capital and running costs of ASAP were comparable to, or even less

than, those for land-based soundings, and much less than for soundings from ocean weather ships. It, therefore, urged other Members, wherever possible, to undertake ASAP operations, perhaps as cooperative ventures such as those now in place involving Iceland/Sweden and Canada/United States, and requested the ACC to make every effort to encourage and support expanded operations, in particular outside the North Atlantic Ocean. In that connection, it noted with appreciation that both Japan and South Africa were already operating ASAP-type units on research vessels. It urged them to provide details of those operations for inclusion in the ASAP Annual Report, and also to consider participating in the work of the ACC.

6.6 MARINE TELECOMMUNICATION ARRANGEMENTS FOR DATA COLLECTION AND TRANSMISSION (agenda item 6.6)

6.6.1 The Commission recalled that there were now several marine telecommunication arrangements 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 HF/MF services through the coastal radio stations (CRS), while others made use of satellite technology. Those latter included the Inmarsat system; the Commission noted that almost all of the VOSs were now equipped with an Inmarsat ship-Earth-station (SES) because of the formal IMO requirement for the carriage by most ships of Inmarsat equipment as part of the GMDSS. The Commission further noted that other satellite-based systems, such as Argos and the international data-collection system (IDCS), were deployed on many ships of the voluntary observing fleet. The Commission recognized with appreciation that the Royal Netherlands Meteorological Institute (KNMI) had developed and provided WMO, for distribution, with a PC-based message compilation, archival and transmission software package (TURBO1) which had contributed to improving the quality of reports from the VOS. The original software package had subsequently been upgraded by KNMI, redistributed twice by WMO, and recently upgraded to a Windows 95 version. In that context, the Commission further noted with appreciation that other Members had also developed similar automated systems and software packages for marine report compilation, archival, and transmission, and were prepared to make the software available for use by other Members. Those included, in particular, the software for the Batos system (France); the OBS-JMA system in both English and Japanese (Japan); and the SEAS IV system, which also contained an AMVER capability (United States). The Commission expressed its sincere thanks to all those Members for their generous offers and support for enhanced and more cost-effective marine data collection. It urged other Members to take advantage of those offers wherever possible, recognizing in particular the assistance they could provide to the preparation and distribution of high quality ship reports for both operations and delayed-mode processing. It also requested the newly established Subgroup on the VOS to review all such available software packages and to propose an efficient and effective way to make them generally more widely available to Members.

6.6.2 The Commission noted with interest and appreciation a presentation made by the representative of Inmarsat on the Inmarsat system, in general, and on future developments relevant to meteorological applications in particular. It recognized that the Inmarsat-A and -C systems offered low-cost transmission media for relaying meteorological and oceanographic data. In the case of Inmarsat-A, reports were sent as telex messages, encoded in the WMO code forms SHIP, BATHY, or TESAC and addressed to NMSs using the code 41 dialing procedure. Charging for such reports was done on the basis of transmission time. The Commission recalled that Inmarsat-C formed the basis of the SafetyNET service under the IMO GMDSS and therefore would, within the next two years, be in use on virtually all ships adhering to the International Convention for the Safety of Life at Sea (SOLAS). Using the Inmarsat-C messaging channel, meteorological and oceanographic reports could be sent as a telex message in either character or binary form — similar to Inmarsat-A — but with charging being computed on the basis of the number of bits transmitted rather than time. In that situation, the cost per message was less than through Inmarsat-A.

6.6.3 The Commission, recalling the discussions held at its eleventh session regarding additional cost-savings which might be achievable through the use of a different reporting mode, together with a more sophisticated data handling technique in NMCs, noted that the option had been the subject of lengthy and detailed study by WMO, Inmarsat and Members. In particular, the National Oceanic and Atmospheric Administration (NOAA) of the United States had developed a system which used FM-94 BUFR as the binary format, for transmission through Inmarsat-C.

6.6.4 The Commission reiterated that the requirements and/or objectives of NMSs and WMO for data reporting in any form through the Inmarsat system remained as followed:

(*a*) The procedures should cover the transmission of both meteorological and oceanographic reports;

(*b*) Software for encoding and transmission of the reports from a SES should be as simple as possible to install, operate and modify; the ships' officers should be able to continue to use existing procedures and did not need to have any knowledge of actual transmission formats;

(*c*) Ideally, no special decoding software should be required at those NMSs receiving the reports from coast-Earth-stations (CESs), with the reports being encoded in standard WMO code forms suitable for transmission on the GTS; that implied the use of those code forms throughout the transmission process;

(*d*) Procedures should be capable of being applied uniformly, on ships recruited by any Member, at any CES and at national Meteorological Centres (NMCs), to facilitate the development, maintenance and distribution of software;

(*e*) As large cost savings as possible;
(*f*) Immediate installation on ships already equipped with Inmarsat-C SESs.

6.6.5 The Commission recognized that it might not be possible to meet all of those requirements fully. It, nevertheless, agreed that the transmission of data in binary code through Inmarsat-C resulted in considerable cost savings over conventional character-coded transmissions. It, therefore, encouraged the use of the software provided by the United States for transmission to shore of binary-encoded messages, through CES in the United States. At the same time, it urged that dialogue should continue among Members, Inmarsat and the Secretariat, leading towards the further development of enhanced capabilities for marine report transmission in binary format through Inmarsat-C.

6.6.6 The Commission noted that some Inmarsat-C equipped VOS were unable to use the two-digit code 41 service, either because of non-availability of that service at the CES or because the SES did not have the relevant software to accommodate the two-digit facility. The Commission noted further that the two-digit code facility could be retrofitted into the SES, but at an additional cost to the ship operators, who in some cases had shown reluctance to make that further financial investment. The Commission requested Members to urge CES operators, shipowners/operators and SES manufacturers to ensure that the code 41 service was made universally available. It also urged as many Members as possible having Inmarsat-C CES in their countries to make arrangements for those stations to receive marine reports using code 41, in view of the rapidly-expanding use of Inmarsat for report transmission and the consequent increasing cost burdens placed on existing Members offering that facility. In that regard, it noted with appreciation that CES Yamaguchi (Japan) would shortly have a code 41 capability with Inmarsat-C, in addition to its existing Inmarsat-A and B capabilities, and under the same conditions. The Commission additionally urged all Members offering Inmarsat data-collection facilities to keep the Secretariat fully informed of the details of those facilities, so that those could be included in the appropriate publications for users.

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

(*a*) Who received VOS reports through a CES to ensure that such reports were inserted onto the GTS;
(*b*) Who 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.

6.6.8 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 and Inmarsat, with a view to ensuring the full utilization of new developments in Inmarsat technology, including the possible future pre-installation of marine report compilation, encoding, and transmission software in Inmarsat-C SES.

6.6.9 The Commission noted with interest and appreciation a presentation made by the representative of Service Argos Inc. on the Argos system, in general, and on future developments and capabilities, in particular. It recognized that the use of Argos for the collection and location of environmental data from remote platforms had continued to expand. In addition to data collection and location from drifting and moored buoys, Argos also provided facilities for the collection of data from ships and remote land stations and for their encoding and GTS distribution in relevant WMO code forms such as SHIP, BATHY, TESAC, SYNOP, etc.

6.6.10 The Commission further noted with interest that the global tariff applicable to non-commercial users of the Argos system had been reduced in real terms over a number of years, and that that situation was likely to continue in the future, provided that system use remained high. At the same time, CLS/Service Argos was continuing to enhance its facilities, including having available within a few years the possibility of two-way communication with platforms, as well as improved satellite coverage and timeliness and higher data rates, thus allowing multiplexing of messages. The Commission, therefore, encouraged Members to make use of the Argos system, where appropriate, for the collection and GTS dissemination of meteorological and oceanographic data from remote platforms of all types.

6.6.11 The Commission noted with appreciation the continuing availability also 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 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.

6.7 Requirements for reporting codes (agenda item 6.7)

6.7.1 The Commission noted with interest and appreciation the following actions relating to new or modified codes for the exchange of marine data, which had been undertaken by CBS since CMM-XI:

(*a*) The implementation, on 2 November 1994, of the new FM 18-X BUOY code to replace DRIFTER;
(*b*) The implementation in 1994 of new or extended BUFR tables for, *inter alia*, WAVEOB code equivalences, storm surge and tide information and ERS-I data;

(*c*) The implementation, on 8 November 1995, of modifications to the FM 63-IX BATHY code to include various types of metadata relating to oceanographic probes and onboard equipment;
(*d*) The implementation, on 6 November 1996, of the completed code table 3872 for use with ASAP systems;
(*e*) Several small modifications to the FM 13-X SHIP and FM 36-X TEMP SHIP codes;
(*f*) The agreement by CBS-XI to the request made by the United States for the addition of an optional national section to FM 18-X BUOY.

6.7.2 The Commission also noted with interest the following ongoing code development work:

(*a*) Considerable progress, as a cooperative project between CBS and IOC/IODE for the development of a more comprehensive representation of oceanographic data in BUFR, through the eventual implementation of a new BUFR master table for oceanography;
(*b*) Specification by the DBCP, in cooperation with CBS, of new BUFR tables to cover all types of data likely to become available from both drifting and moored buoys, with the eventual aim of transmitting BUFR-encoded buoy reports directly from the two Argos global processing centres;
(*c*) Further development of the universal character code form CREX, which would have the capability of transmitting new oceanographic as well as meteorological data in character form and, therefore, replace the earlier IGOSS flexible code concept, recommended by IGOSS-VI.

6.7.3 The Commission expressed its appreciation to all concerned, in particular CBS, IGOSS, DBCP and IOC for those developments. At the same time, it urged that future amendments to marine reporting codes, in particular those now incorporated into automated shipboard report compilation software, should be minimized in view of the difficulties which such amendments caused for both NMSs and ship personnel. Any modifications which were introduced should be notified to NMSs well in advance of their formal implementation.

7. MARINE CLIMATOLOGY (agenda item 7)

7.1 CONTRIBUTION OF THE COMMISSION TO THE WORLD CLIMATE PROGRAMME (WCP) (agenda item 7.1)

7.1.1 The Commission noted with interest the developing links that existed between the WCP and other climate-related activities within the United Nations and other international organizations, in particular in the context of the overall *Climate Agenda*. It further noted with interest the projects on climate information and prediction services (CLIPS) and on climate change detection, which had been established within the WCP.

7.1.2 The Commission recognized that marine climatological data and products were of considerable importance to those and other activities within the WCP, as well as to global climate and climate change research studies and that its own activities in that field were of continuing and increasing value in support of the whole WCP. It, therefore, endorsed the specific actions taken by the Subgroup on Marine Climatology in that regard, including:

(*a*) Identifying experts on marine climate monitoring and ocean processes to serve on the Working Group on Climate Change Detection of the Commission for Climatology (CCl);
(*b*) Requesting possible contributions on marine climatology for inclusion in climate reviews such as the *Climate System Monitoring Monthly Bulletin* and the *Biennial Review of the Global Climate System*;
(*c*) Additional entries to the World Climate Data Information Referral Service (INFOCLIMA) catalogue relating to marine climatology.

The Commission further recognized that many other of its activities were also contributing, directly or indirectly, to the WCP, including:

(*a*) The further refinement and ongoing operation of the revised MCSS;
(*b*) SEACAMP and similar regional development projects;
(*c*) The *Guide to the Applications of Marine Climatology* (WMO-No. 781).

7.1.3 The Commission noted with interest and appreciation the current project in Japan to digitize marine meteorological data, over one million in number, mainly for 1890 to 1932, within the Kobe Collection, which in general covered observations primarily from the North Pacific during the period from 1890 to 1961. Those data would eventually be made available to other Members and to global datasets, as a very valuable contribution to global climate studies and the WCP.

7.1.4 The Commission recognized that, in addition to providing significant support to the WCP, much of its work in marine climatology, as well as in other fields, such as sea ice and the wave programme, was also of considerable potential value to the Intergovernmental Panel on Climate Change (IPCC), in relation to its work in assessing climate change and its impacts. It, therefore, requested the president of the Commission, together with the Secretary-General and with the assistance of the relevant working groups, to establish contact with the IPCC Secretariat, with a view to providing input to the work of the Panel in the areas of competence of the Commission.

7.2 MARINE CLIMATOLOGICAL SUMMARIES SCHEME (MCSS) (agenda item 7.2)

7.2.1 The Commission noted with interest that the modified MCSS, as adopted at its eleventh session and approved by the forty-fifth session of the Executive Council, had been implemented on 1 January 1994. Although initial implementation of the scheme among contributing Members had been rather slow, continuing improvements in data throughput had been achieved in 1995 and 1996, together with the correction of some non-standard working practices through action by the Global Collecting Centres (GCCs). The Commission expressed its considerable appreciation to contributing Members, responsible Members 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 (i.e. Members operating VOS) to make every

effort to digitize their ship reports and to submit them to the GCCs in the IMMT-1 format, according to the agreed procedures, and with minimum quality control applied. It also reiterated that the long-standing functions of responsible Members remained unchanged, and urged those Members to continue to exercise those functions.

7.2.2 The Commission endorsed the proposal made by the GCCs, supported by the Subgroup on Marine Climatology, for some revisions and clarifications to the set of minimum quality control standards, to be applied by contributing Members prior to data submission, and which were given in the *Manual on Marine Meteorological Services*. Recommendation 7 (CMM-XII) on that subject was adopted. At the same time, the Commission recognized that several Members had developed, and were applying internally, other valid quality control procedures for marine climatological data. It, therefore, requested the subgroup to undertake a thorough review of those different procedures, with a view to implementing the best possible set of minimum quality control standards and of harmonizing such standards worldwide.

7.2.3 The Commission noted with appreciation that the revisions to the contents of the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47) which had been agreed at its eleventh session had been implemented. In the light of advice received from the Secretariat, and in response to the request made by its eleventh session for a harmonization of the country codes used in that publication and in the IMMT format, the Commission endorsed the proposal made by the Subgroup on Marine Climatology that the internationally-accepted ISO Alpha-2 country or area codes should be used in both cases. Recommendation 8 (CMM-XII) was, therefore, adopted.

7.2.4 The Commission noted with interest the proposal made by the Subgroup on Marine Climatology for further additions to be made to the contents of that important WMO database in order to enhance its value to global climate studies. It recognized the difficulties likely to be experienced by Members operating VOS in collecting some of the new information but, nevertheless, considered that that information was of sufficient value to climate researchers to justify the effort required in the implementation. Recommendation 9 (CMM-XII) was, therefore, adopted. The Commission further recognized that the implementing the requirement for vessel digital image data would be a major and expensive project. It, therefore, recommended that that project should be initiated in the future by the subgroup and by the Secretariat, as resources permitted, and in close consultation with Members operating VOS, PMOs and other experts directly concerned.

7.2.5 The Commission noted and endorsed the following recommendations of the Subgroup on Marine Climatology related to the operations of the MCSS:

(*a*) The IMMT (updated as necessary, currently version IMMT-1) should be used as the MCSS data exchange format;

(*b*) Magnetic tapes and/or diskettes should be used for data submission to the GCCs, although other exchange media might be used on the basis of bilateral agreement between individual contributing Members and the GCCs;

(*c*) Logbooks remained the preferred source of MCSS data, since they were generally more complete and contained fewer errors than GTS reports; however, that situation should be kept under review in view of the increasing use of automated message compilation and transmission software;

(*d*) GTS reports were acceptable sources of MCSS data, provided minimum quality control was applied and the GTS flags were set in the IMMT;

(*e*) In that case, there was no requirement for contributing or responsible Members to maintain separate archives of GTS and logbook data, and the GCCs could distribute merged datasets to responsible Members.

7.2.6 The Commission recognized that the Internet and its World Wide Web provided powerful tools for delivering and accessing marine climatological data and services. It, therefore, supported the recommendation of the Subgroup on Marine Climatology that national web sites should provide, at a minimum, metadata on marine climatological data availability, means of access, and procedures costs. It requested the subgroup to prepare a small information document on that subject during the next inter-sessional period.

7.2.7 The Commission noted with appreciation the offer made by the GCCs to make available to contributing Members, on request, minimum quality control software packages, as well as copies of their IMMT/IMMT-1 and octant/quadrant conversion software. It recognized that the use of that software could greatly assist contributing Members in preparing their data for submission under the MCSS and also in ensuring conformity to formats and data quality standards. It, therefore, urged contributing Members to take advantage of the offer, where appropriate.

7.3 OTHER MATTERS RELATED TO MARINE CLIMATOLOGY (agenda item 7.3)

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

7.3.1 The Commission noted with satisfaction that the English language version of the *Guide* had been published in early 1995, with the other language versions to follow in due course. It expressed its considerable appreciation to the scientific editor, Mr A. Saulesleja (Canada), and to all the individual section and chapter authors and reviewers for their contributions to that valuable publication.

7.3.2 The Commission noted with interest the results of discussions held by the Subgroup on Marine Climatology on the best approach to updating the *Guide to the Applications of Marine Climatology*. It agreed with the plan provided by the subgroup that the *Guide* should, in future, be maintained in two parts:

(*a*) A static part should be maintained as hard copy and expected to remain valid over a long time-frame;

(*b*) A dynamic part covering issues such as new technologies and climate change should be maintained in electronic and, possibly, also in hard copy form.

7.3.3 The Commission supported the proposal made by the subgroup to convene, in 1999, a workshop to provide input for the dynamic part of the *Guide*. It requested the president of the Commission and the chairman of the Subgroup on Marine Climatology, in consultation with the Secretary-General, to take the necessary actions for convening the workshop, including, in particular, identifying a host country and potential external sponsors. In that context, it accepted the kind offer of Canada to provide an expert to coordinate preparations, in conjunction with the Secretariat, and invited other Members to nominate experts to an eventual organizing committee. It also noted with appreciation the offers made by several Members to provide expert presentations to the workshop, as well as proposals for additions to the scope of the workshop. Finally, it reiterated that, although the workshop would be cosponsored by WMO, it should nevertheless be financed through external sponsorship and not through the regular Secretariat budget.

BEAUFORT SCALE

7.3.4 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, therefore, strongly recommended to Members that:

(*a*) Observations should continue to be made using the WMO recommended scale (in the *Manual on Marine Meteorological Services*) and not with any other, newer, version, to ensure consistency in the climatological records;

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

(*c*) Storage formats which would allow such information to be retained should be implemented.

It decided to keep in force Recommendation 12 (CMM-XI) on that subject.

7.3.5 The Commission recalled that its eleventh session had appointed a rapporteur, Mr H.-J. Isemer (Germany), to prepare a technical report on Beaufort equivalent scales. It noted with regret that, because of pressures of other duties, it had not been possible for Mr Isemer to complete that work. It, therefore, accepted with appreciation the offer made by Germany to provide another expert to undertake that important study, to be completed prior to its thirteenth session, in consultation with the Subgroup on Marine Climatology.

7.3.6 The Commission recalled that its eleventh session had requested the Subgroup on Marine Climatology to examine the possibilities of preparing an extended Beaufort scale (beyond force 12) for marine forecast purposes. In that context, it noted and supported the following conclusions of the subgroup:

(*a*) The decision of its third session (Utrecht, August 1960) that the scale should not be extended beyond force 12 remained valid, for the reasons stated at that session;

(*b*) Forecasts in cases of expected extreme winds beyond force 12 could be adequately expressed by the formulation: Beaufort 12 plus specification (mean and gusts) in metres per second and/or knots.

CATALOGUE OF STORM SURGE DATA HOLDINGS

7.3.7 The Commission noted with interest the project being undertaken by the Subgroup on Marine Climatology, at the request of the president of the Commission, to compile a catalogue of global storm surge data holdings. It recognized the potential value of such a catalogue for both operational and climatological purposes, and expressed its appreciation to Mr E. Zaharchenko (Latvia) for his work in developing the catalogue. It supported the completion of the project, urged Members to contribute whenever possible, and agreed that the catalogue should eventually be associated in some way with INFOCLIMA. It accepted with appreciation the offer made by the Russian Federation for assistance of the World Data Centre–B (WDC-B) in that work.

POSSIBLE IMPLICATIONS OF GLOBAL CLIMATE CHANGE

7.3.8 The Commission recalled that its eleventh session had requested the Subgroup on Marine Climatology to consider the preparation of guidance material on the possible implications of global climate change for the climate records on which marine engineering designs were based. In that context, the Commission noted that climate change would be one of the issues to be addressed by the planned Workshop on the *Guide to the Applications of Marine Climatology*, and endorsed the proposal made by the subgroup to seek input to that workshop from the marine industry, relating to their concerns on the topic.

OCEAN DATA ACQUISITION SYSTEM (ODAS) METADATA BASE

7.3.9 The Commission noted with interest a proposal made by the United States that consideration be given to the compilation of a comprehensive metadata base for ODAS, including moored and drifting buoys, offshore platforms, etc. It recognized the potential value of such metadata in allowing a full and correct interpretation of the observational data from those platforms which were already stored in climatological archives. At the same time, it recognized the complexity of the task, in view of the multiplicity and uneven nature of sources of the required data. It, therefore, requested the Subgroup on Marine Climatology to undertake a feasibility study for the project and, if that proved to be satisfactory, to proceed to implement it, in cooperation with the Secretariat, the DBCP, the IOC and the interested Members.

FUTURE ACTIVITIES

7.3.10 The Commission expressed its appreciation to the chairman of the Subgroup on Marine Climatology, Mr L. Kaufeld (Germany) for his comprehensive report and for the substantive achievements of the subgroup during the inter-sessional period. It also thanked all members of the group for their contributions. It agreed that there remained to be addressed many ongoing and new topics of concern in that important field and, therefore, decided to re-establish the subgroup for the next inter-sessional period. Action in that regard is taken under agenda item 15.

8. SEA ICE (agenda item 8)

8.1 The Commission noted with interest the report of Mr I. Frolov (Russian Federation), chairman of the Subgroup on Sea Ice, and expressed its appreciation to him, to members of the subgroup, and to the Steering Group for the GDSIDB for the considerable and very valuable work accomplished during the inter-sessional period. The Commission particularly noted with satisfaction that the GDSIDB was now operational at the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, and at the Arctic and Antarctic Research Institute (AARI) in St. Petersburg, Russian Federation, and offered its special thanks to those two centres and to all Members contributing data to the data bank for their efforts in implementing, maintaining and expanding the GDSIDB. It recognized the direct value of the GDSIDB to the WCP and the WCRP, as well as to services and other sea-ice activities of Members concerned, including seasonal forecasting. It, therefore, strongly encouraged all Members having historical and/or current sea-ice data in chart and other forms to arrange for them to be digitized in either the complete SIGRID 1 or reduced SIGRID 2 format, and to submit them to either GDSIDB data centre, in order that the data bank could become as complete as possible, containing data from both north and south polar regions. In that connection, it noted with appreciation the offer made by Iceland to contribute data to the GDSIDB. The Commission recommended that WMO should continue to support the valuable work of the Steering Group for the GDSIDB during the coming inter-sessional period and agreed on the proposed project objectives for that period. Those were included in the overall work plan of the Commission (see the annex to this report).

8.2 The Commission noted with satisfaction that an abbreviated version of the handbook on *Sea Ice Navigation Conditions in the Southern Ocean* (WMO/TD-No. 783) had recently been published as report No. 35 in the series Marine Meteorology and Related Oceanographic Activities, and expressed its appreciation to the author, Professor A. A. Romanov (Russian Federation), as well as to all the experts involved in the review and editing process, for their substantial contributions to WMO. It considered that that publication was of considerable value to all countries, as well as their agencies and services concerned with marine operations in the Antarctic, and therefore recommended that the distribution should be undertaken as wide as possible, including IMO and IHO. The representative of IMO expressed the appreciation of his Organization for the report, and requested additional copies for distribution to the Safety of Navigation Subcommittee. With regard to the extended version of the publication, the Commission recognized that, while it was of substantial importance scientifically and technically, it was, nevertheless, likely to be of more limited operational interest to Members. It therefore requested the Secretary-General to review the possibilities and requirements for its eventual publication in an appropriate series, in the light of available resources, at the same time noting with appreciation the interest expressed by IHO in the extended report.

8.3 The Commission noted with satisfaction progress made in the preparation of the *Handbook on the Analysis and Forecasting of Sea Ice*, and expressed its appreciation to the major contributors of the handbook, Professors Y. Doronin and V. Gavrilo (Russian Federation) and Professor W. Weeks (United States). It urged that that valuable technical support document should be completed as soon as possible and published also by WMO in an appropriate series.

8.4 The Commission noted with interest the work now underway for the operational exchange of sea-ice data through the World Wide Web, including the establishment of home pages on historical sea-ice data by both AARI and NSIDC. It strongly supported that work and urged that work continue on standardizing and generalizing procedures for such data exchange among Members, AARI and NSIDC.

8.5 The Commission reiterated the continuing importance of its work on sea ice, and agreed that the subgroup should be re-established (see agenda item 15). It also recognized the importance of the work in that field of regional groups such as the Baltic Sea Ice Meeting. It, therefore, requested the chairman of the subgroup, and the Secretariat, to explore ways in which more formal links might be established between those regional groups and the subgroup, and to report on that matter to the next session of the AWG. The Commission further requested the subgroup to take the necessary measures to enhance the international exchange of sea-ice data, including those derived from satellites, in accordance with the provisions of 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.

8.6 The Commission noted with interest a proposal made by the WCRP Arctic System Climate Study (ACSYS) Scientific Steering Group that the Subgroup on Sea Ice, working through the Steering Group for the GDSIDB, should develop a project to prepare an optimally-merged northern hemisphere sea-ice product, making use of existing data subsets in the GDSIDB. It supported that proposal and requested the next session of the Steering Group to prepare a plan and timetable for the completion of the project.

8.7 Finally on that topic, the Commission noted with interest the information provided by the representative of IHO concerning the work of its Permanent Working Group on Cooperation in Antarctica. It welcomed the possibility of future collaboration with that group, and requested the chairman of the Subgroup on Sea-Ice, and the Secretariat, to undertake discussions with IHO on the modalities of such collaboration.

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

The Commission recalled that, under agenda item 5.3, it had adopted two amendments to the *Manual on Marine Meteorological Services*, in order to accommodate modifications to the new WMO marine broadcast system

for the GMDSS as well as the international coordination of NAVTEX services. No other modifications to the Technical Regulations were considered necessary to be proposed at that time.

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

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

10.1 The Commission recalled that its eleventh session had appointed a rapporteur, Mr D. Linforth (Australia), to review and revise the *Guide to Marine Meteorological Services*. It noted with interest the report of the rapporteur as well as the complete draft revised *Guide*, recognizing that that draft had resulted from considerable input from Members, as well as extensive review within CMM. It agreed on that revised edition to the *Guide* and adopted Recommendation 10 (CMM-XII). The Commission expressed its considerable appreciation to Mr Linforth for his excellent work, noting that the draft *Guide* in languages other than English would first be circulated to Commission members concerned for possible editorial amendments, prior to final editing and publication by WMO.

OTHER PUBLICATIONS

10.2 The Commission recalled its Recommendation 16 (CMM-XI) — Modifications to the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47), and noted with satisfaction that the latest (1995) edition of that publication now included the additional information proposed concerning type and location of instrumentation on board ships. The Commission agreed that such information was essential for an accurate interpretation of ships' meteorological and oceanographic observations for both operational and research purposes. The Commission was pleased to note that that publication was also available online for downloading from the WMO Internet home page and in other magnetic media, on request.

10.3 The Commission noted with appreciation that Part I of the new edition of the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8) had been published during 1996 and that it included a chapter on marine observations (Chapter 4 of Part II). The Commission noted further that CCl had undertaken a major revision of the *Guide to Climatological Practices* (WMO-No. 100) to be considered by CCl-XII later in 1997.

10.4 The Commission noted with appreciation the following technical publications which had been issued under the marine programme during the inter-sessional period:

(*a*) *WMO Wave Programme: National Reports for 1984 on Wave Measuring Techniques, Numerical Wave Models and Intercomparisons* (Marine Meteorology and Related Oceanographic Activities Report No. 12), supplement 4 and the following reports in the same series:
  (i) *Proceedings of the CMM Technical Conference on Ocean Remote Sensing*, No. 28;
  (ii) *Meteorological Requirement for Wave Modelling*, No. 29;
  (iii) *Proceedings of the International Seminar for Port Meteorological Officers*, No. 30;
  (iv) *Proceedings of the Workshop on Marine Meteorology*, No. 31;
  (v) *Proceedings of the WMO/IOC Workshop on Operational Ocean Monitoring Using Surface Based Radars*, No. 32;
  (vi) *Extratropical Storm Surges/Numerical Prediction of Storm Surges — A Review*, No. 33;
  (vii) *Polar Orbiting Satellites and Applications to Marine Meteorology and Oceanography*, No. 34;
  (viii) *Ice Navigation Conditions in the Southern Ocean*, No. 35;
(*b*) *Handbook on Marine Meteorological Services* (WMO/TD-No. 348) (1997 edition, under preparation);
(*c*) Twenty-two IGOSS-related publications (jointly with IOC).

10.5 In addition, the Commission noted with satisfaction that, through the *WMO Bulletin*, the international and the marine meteorology communities were being kept up-to-date on the activities being undertaken within WMO's marine programme and asked the Secretariat to continue producing those summaries. The Commission was informed of the proposed special issue of the *WMO Bulletin* during 1998 focussed on ocean-related topics and in support of the International Year of the Ocean 1998. The Commission gave its full support to all the activities which would be undertaken during that year and requested Members to provide the necessary supporting materials which might be required by the Secretariat for the preparation of the feature articles in the *WMO Bulletin*. It also recommended that consideration be given to the preparation of a publication highlighting the work of the Commission in relation to global issues, such as climate change, as a contribution to the International Year of the Ocean.

10.6 The Commission agreed that all those technical publications had provided very valuable support to Members 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 increasing concern that several of the required new publications could not be addressed during the inter-sessional period due to the continuing difficulties in locating rapporteurs who were willing to prepare the relevant technical documents. While appreciating those difficulties, the Commission insisted on the great need for guidance material in those important topics and requested Members and the Secretariat to continue their efforts to find the experts who could prepare publications in the following subjects:

(*a*) Coastal marine services (including forecasting techniques and automatic observing instrumentation);
(*b*) The weather routeing of ships;
(*c*) Services for ports, harbours and confined waterways;
(*d*) Capabilities and techniques for the transmission of graphical information to ships at sea;
(*e*) Techniques for determining precipitation at sea;
(*f*) Technical guidance on meteorological services for fisheries.

10.7 The Commission also requested Members to consider translating, free of charge to WMO, technical reports into languages other than the original (most often English), so as to increase their value to all Members.

10.8 The Commission was informed of the work of the Offshore Weather Panel including, in particular, the preparation of an *Offshore Weather Handbook*. It recognized that that could be a very valuable publication for many Members of WMO providing services for the offshore industry. It, therefore, requested the Secretary-General to consider eventually publishing that *Handbook* on behalf of the Panel in an appropriate series. The Commission was further informed of plans by the European Cooperation in the Field of Scientific and Technical Research (COST) to convene a conference in 1998 on the extraction and application of spectral wave data from synthetic aperture radar, and to seek WMO cosponsorship. It recognized that the proceedings of that Conference could again be of interest to many Members, and requested the Secretary-General to consider publishing those proceedings as WMO's cosponsorship contribution.

11. EDUCATION AND TRAINING, TECHNOLOGY TRANSFER AND IMPLEMENTATION SUPPORT ACTIVITIES IN THE FIELD OF THE COMMISSION (agenda item 11)

11.1 SPECIALIZED EDUCATION AND TRAINING ACTIVITIES (agenda item 11.1)

11.1.1 The Commission reviewed the activities of the Education and Training Programme which were of particular relevance to the Commission and which had taken place during the inter-sessional period, and expressed its particular appreciation to Mr S. Ragoonaden (Mauritius), chairman of the Working Group on Education, Training and Implementation Support, and to the members of the group for their efforts. The Commission agreed that, in general, the activities undertaken in that field 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 services and associated oceanographic activities in developing countries. The Commission noted with pleasure that Twelfth Congress had agreed that related seminars should continue in the future.

11.1.2 The Commission recalled its Recommendation 13 (CMM-X) — Specialized long-term education and training in marine meteorology and physical oceanography, and was concerned with the limited advancement achieved towards the implementation of a specialized diploma course in marine meteorology and physical oceanography at the Regional Meteorological Training Centre (RMTC) in Nairobi, Kenya. The Commission agreed that, in view of the earlier acceptance by national authorities for the establishment of the course, the efforts being made to reduce the course in length and to establish a more realistic programme, including the use of distance learning concepts, could well help in finding the appropriate funding so that the course could be initiated as soon as possible. The Commission reiterated that that programme should be used as a pilot project and that similar courses should be established, as soon as feasible, in other RMTCs.

11.1.3 The Commission felt that the series of regional seminars and workshops had very well achieved its purpose, and that the new orientation given by Eleventh Congress, namely, to plan and implement courses in more specific subjects, corresponded well with national and regional requirements. Taking into consideration that there were already four planned activities for the immediate future — the second International Workshop on Wave Analysis and Forecasting (Miami, Florida, April–May 1997), the international Workshop for PMOs for RA III and RA IV (tentatively scheduled in Valparaiso, Chile, October 1997), the Workshop on MPERSS (1998), and a Workshop for PMOs from RA I in 1999 — the Commission considered that other subjects which might be covered by seminars during the next inter-sessional period could include, in order of priority: a workshop on marine meteorological services in support of coastal area management; a workshop on marine meteorological services for fisheries; a workshop on NAVTEX coordination for the Mediterranean; a workshop on the role of the ocean in climate and climate change; and a workshop on services for offshore activities. The Commission requested the Secretary-General to follow-up both on possible offers to host those workshops and on sources of funding.

11.1.4 The Commission noted with pleasure that the publication of training materials for all levels had continued during the inter-sessional period and noted especially the publication of new editions of existing compendia as well as their publication in languages other than English. It requested the Secretary-General to maintain the effort to make available training publications in all the languages of the Organization.

11.1.5 The Commission also recalled its recommendation for the review and updating of the *Compendium of Meteorology for Use by Class I and II Meteorological Personnel* (WMO-No. 364), Volume II, Part 3, which dated from 1979. The Commission considered the proposed outline for that publication adopted by the AWG and accepted the kind offer of Mr S. K. Khodkin (Russian Federation) to review the outline further. The Commission expressed its appreciation to all those who had contributed to the preparation of the outline for the *Compendium* and requested that the revised outline be forwarded to the Executive Council Panel of Experts on Education and Training for further action.

11.2 TECHNOLOGY TRANSFER AND IMPLEMENTATION SUPPORT ACTIVITIES (agenda item 11.2)

11.2.1 The Commission noted with pleasure that the WMO training library had continued to strengthen and expand its audiovisual materials and included additional computer-aided learning (CAL) modules. The Commission expressed its thanks to those Members which had contributed to the modernization of the training material available and invited others which were developing such training aids to continue providing relevant material and

to share them with the WMO training library, for the benefit of all other Members who were in need of such newly developed aids.

11.2.2 The Commission expressed its thanks to all Members which had hosted seminars and training events during the inter-sessional period and especially to Australia, Norway, the United Kingdom and the United States.

11.2.3 The Commission was highly appreciative of the fellowships that had been awarded by WMO for studies related specifically to marine meteorology and physical oceanography. The Commission expressed the hope that fellowships would continue to be awarded to applicants in those fields. The Commission felt that in view of the increasing difficulties in obtaining funding for training activities from traditional sources, including the United Nations Development Programme (UNDP) and the WMO regular budget, some new sources for funding should be investigated. It invited both Members and the Secretary-General to seek new solutions in that regard.

11.2.4 The Commission noted the opinion of Twelfth Congress that continuing high priority should be given to assisting Members in the further implementation of marine meteorological services, within the context of the Fourth WMO Long-term Plan. Such implementation support was normally provided through the 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.

11.2.5 The Commission recalled that the Voluntary Cooperation Programme (VCP) had been established essentially to facilitate the global implementation of the WWW and that the programme could also be used in that context to enhance both marine observing systems and marine services. The Commission, therefore, urged maritime Members to consider the possibilities of formulating appropriate VCP requests, in line with established procedures, as a means for enhancing their marine observing systems in support of the WWW and also of marine meteorological services, GCOS and GOOS. The Commission also noted that there were some pending VCP requests and, therefore, urged possible donor Members to provide, to the extent possible, assistance to those Members which had formulated those requests.

11.2.6 The Commission noted the potential value of input and reports from the regional rapporteurs to many aspects of its work, including marine services, implementation support, and education and training. It recognized the difficulties for the rapporteurs on marine services to adequately cover all those areas and, therefore, requested that reports of rapporteurs to future Commission sessions should be invited also from regional rapporteurs on education and training. Finally on that topic, the Commission agreed on the very valuable role played by the Working Group on Education, Training and Implementation Support, and on the important work remaining to be done. It, therefore, agreed to re-establish the group; appropriate action is taken under agenda item 15.

11.3 Regional developments of interest to the Commission (agenda item 11.3)

11.3.1 The Commission recalled that, at its eleventh session, it had recognized the potential benefit to Members of a regionally-based cooperative approach to the development of marine services, and, in particular, it encouraged strongly the rapid implementation of a proposed South-east Asian subregional project. In that context, it noted with appreciation that, following the preparatory work by an expert from the region and two coordination meetings, project documents had been finalized for a joint WMO/IOC SEACAMP project. Those documents had been formally submitted by the Singapore Meteorological Service to the Subcommittee on Meteorology and Geophysics of the Association of South-East Asian Nations (ASEAN), for consideration by Member Governments and further follow-up action. The Commission expressed its gratitude to all concerned in the development of the proposal for their work, to the Singapore Meteorological Service for offering to host the centre, and to the IOC for its important input and continuing support. It urged NMSs in the countries concerned to support and participate in the project, and requested Members from developed countries and international donor agencies to give active consideration to providing the required external support.

11.3.2 The Commission noted with interest the planning now underway for a possible similar project in the western Indian Ocean area, for countries in eastern and southern Africa, again to be cosponsored by IOC. A first planning meeting for the project was tentatively planned to take place in Mauritius in May 1997, kindly hosted by the Mauritius Meteorological Services. The Commission strongly supported that new initiative, thanked the IOC for their valuable support, and urged that the project be brought to fruition as quickly as possible.

11.3.3 The Commission agreed with the idea of initiating regional cooperative projects for marine services development on a stepwise basis, to make best use of available resources. It, therefore, urged that the possible project it had proposed for western Africa should be initiated as soon as possible after the finalization of the project documents for the existing activities. With regard to other possible regional projects, the Commission considered that a project might be developed in the Black Sea region. In that regard, it noted with interest the cooperation that existed between France and Bulgaria, and suggested that the Secretariat could contact the IOC Secretariat to discuss the possibilities for a future coordinated marine project in the region.

11.3.4 The Commission noted with interest and appreciation the GOOS-related regional activities in Europe (EuroGOOS) and north-east Asia (NEAR-GOOS). Further discussion on those activities is recorded under agenda item 12.3. The Commission also recognized that both the SEACAMP and east/south African projects represented substantial contributions to GOOS implementation in those areas.

11.3.5 The Commission noted with interest the information provided by Cuba on an Ibero-American Climate

Project on climate change, which involved particularly the monitoring of hydrometeorological variables and specific studies related to hurricanes and global climate change in countries and seas of the region. The project was combining both national and international facilities and support. The Commission further noted with interest the development in Cuba of a masters degree programme which included marine meteorology and which addressed particularly the phenomena affecting tropical areas. It considered that the programme might be of interest to other maritime, Spanish-speaking countries in the Caribbean region.

12. Relationship with other WMO Programmes and those of other organizations and bodies (agenda item 12)

12.1 Other WMO Programmes (agenda item 12.1)

12.1.1 The Commission noted with interest and appreciation that CBS-Ext.(94) (Helsinki, August 1994) had considered the possibilities for the eventual designation of Area Meteorological Coordinators for MPERSS (see agenda item 5.2) and also certain global wave modelling centres as RSMCs. It recalled that formal designation procedures had been put in place by CBS for such centres, and recognized that both detailed statements of requirements and specification of services to be provided were necessary before further consideration could be given to potential RSMCs in those areas. The Commission, nevertheless, considered that there was both justification and potential value to Members in the future designation of such centres. It therefore:

(*a*) Requested the AWG to follow developments with MPERSS, with a view eventually to propose procedures for the development of specifications for potential future RSMCs for MPERSS;

(*b*) Requested the Subgroup on Wave Modelling and Forecasting to develop requirements and specification of services to be provided by potential RSMCs for ocean wave modelling and prediction, for consideration by its thirteenth session. In that regard, it accepted with appreciation the offer made by Japan to prepare an initial draft of those specifications.

The AWG was requested to advise the Commission further on both those questions, taking into account the recommendations of CBS.

12.1.2 The Commission noted with interest the results of the pilot GTS/main telecommunication network (MTN) monitoring, in particular with respect to SHIP and SHIP TEMP reports, which took place in May 1996. It was pleased to note that 92 per cent of SHIP reports and 71 per cent of SHIP TEMP reports were received within three hours after the time of observation at the three centres participating in the monitoring. At the same time, however, the Commission recognized that those figures did not indicate the proportion of observations actually transmitted to shore which were received by those centres, nor did they reveal the problems experiencedby centres further downstream on the GTS in receiving ship observations, particularly from their adjacent ocean areas.

12.1.3 Considering that, within two years, probably more than 90 per cent of ships' reports would be transmitted to shore via Inmarsat (see agenda item 6.6) and, thus, inserted in the GTS by a relatively small number of centres, the Commission requested CBS, in undertaking future GTS monitoring exercises for SHIP and SHIP TEMP reports, to consider:

(*a*) Monitoring GTS input as well as output of those reports;

(*b*) At least for particular bulletins, monitoring the downstream receipt of those by centres with specific interest in their contents.

12.1.4 The Commission noted with interest the proposals for a joint WMO, IOC, United Nations Education, Scientific and Cultural Organization (UNESCO), UNEP storm surge project for the Bay of Bengal and the northern part of the Indian Ocean, as well as the results of the IOC Storm Surge Workshop, which took place in India in December 1996. Recalling its own activities with regard to storm surges, including the publication of a technical report and the work of the Subgroup on Wave Modelling and Forecasting (see agenda item 5.4), and recognizing the crucial importance of accurate surge forecasts, the Commission strongly supported the further development of the project and offered to provide technical advice and expertise, as appropriate, through the subgroup. The Commission further noted that the RSMCs for tropical cyclones were developing standardized terminologies for tropical cyclone winds for marine and aviation purposes, for consideration eventually by CMM and the International Civil Aviation Organization (ICAO). The Commission agreed to examine and respond to any such proposals when it was formally requested to do so.

12.1.5 In connection with support provided to, or required by, the WCP, the Commission noted a number of new initiatives within the World Climate Data and Monitoring Programme (WCDMP) that were relevant to the work of CMM and to CCl, particularly: the preparation of a public information initiative, including a major report on the climate of the twentieth century; the establishment of a GCOS surface network (GSN), a global reference network of approximately 1 000 land-surface observation stations; an initiative to pursue the evolution of WMO climate database management systems for those WMO Members needing a more advanced system than climate computing (CLICOM); and the preparation of a publication entitled *Guidance on the Preservation and Management of Meteorological Data for Use in Climate Analyses, Studies and Services*. The Commission agreed that the Subgroup on Marine Climatology should consider ways to interact with CCl in the implementation of those and other related initiatives, perhaps through the designation of a rapporteur to serve as liaison with the CCl Working Group on Climate Data.

12.1.6 The Commission recognized that various ocean monitoring activities were being undertaken in support of the Global Atmosphere Watch (GAW) and, in that context, noted with appreciation the monitoring activities being carried out by Japan for many years now on board its oceanographic vessels, on a seasonal basis, of chemical components of both the atmosphere and sea water in the

western Pacific. It urged Members to continue and, where possible, to expand such observations, which were an extremely valuable contribution to the GAW.

12.1.7 The Commission noted with interest the work of the Global Runoff Data Centre (GRDC), operated by Germany under the auspices of WMO, in providing data on freshwater fluxes to the oceans. It recognized the potential value of such data in activities such as coastal marine services, the GOOS coastal module, and global climate studies. It, therefore, requested the Subgroup on Marine Climatology to develop contacts with the centre, through the Hydrology and Water Resources Programme, with a view to providing guidance to Members and other components of the WMO marine programme, as appropriate, on data availability and applications.

12.1.8 The Commission noted with interest the discussions and decisions by Twelfth Congress on future arrangements for the exchange of meteorological and related data and products including, in particular Resolution 40 (Cg-XII), stating WMO policy and practice for such exchange and providing guidelines for national Meteorological Services on the subject. The Commission was particularly pleased to note that the list of data and products to be exchanged without charge and with no conditions on use included, *inter alia*, all available *in situ* observations from the marine environment, recalling its own views on the importance of marine data exchange as expressed at its eleventh session.

12.1.9 The Commission noted further that Congress had requested it, along with all WMO technical commissions, regional associations, and other relevant bodies, to acquire and assess the views of its members on the technical impacts of the WMO policy and practice on data and product exchange. It considered that to be an important activity and, therefore, requested the vice-president of the Commission to act as coordinator for obtaining and analysing Members' views on the subject and for the preparation of a consolidated report for consideration of the AWG and eventual submission to the Secretary-General, as agreed by Congress.

12.2 Integrated Global Ocean Services System (IGOSS) (agenda item 12.2)

12.2.1 The Commission noted with interest the ongoing improvements in IGOSS implementation, including in particular:

(*a*) The continuing increases in the total numbers of BATHY reports exchanged over the GTS, despite the financial difficulties experienced in many countries, as well as improvements in codes and data transmission formats and facilities;

(*b*) The conversion of the successful IGOSS/IODE Global Temperature Salinity Pilot Project (GTSPP) into a permanent operational programme;

(*c*) The regular publication of the *IGOSS Products Bulletin* (IPB) in electronic form;

(*d*) The continuation of the successful IGOSS Sea Level Programme.

12.2.2 In addition to those ongoing aspects of IGOSS, the Commission noted with appreciation other major developments under IGOSS during the past four years, namely:

(*a*) The new IGOSS Plan and Implementation Programme, covering the period 1996–2003;

(*b*) The implementation of the international coordination and management, under IGOSS, of a long-term ship-of-opportunity programme (SOOP), in support of global climate studies and operational applications;

(*c*) The important studies on the fall-rate equation for XBT probes completed by the Task Team on Quality Control for Automated Systems;

(*d*) The development of an IGOSS/IODE Data Management Strategy and an IGOSS/IODE brochure.

12.2.3 The Commission agreed that IGOSS activities in marine observing systems and services were largely complementary to its own, and that together CMM and IGOSS had an essential role to play in providing operational support for GOOS and GCOS. At the same time, it recognized that that support could be further enhanced, and improved efficiencies and economies achieved in the operation of marine observing systems and the management and processing of marine data, through even closer collaboration between CMM and IGOSS activities. In addition to the work of the newly established Rapporteur on Ocean Satellites, the Commission therefore:

(*a*) Encouraged cross-representation on working groups and groups of experts of CMM and IGOSS, and suggested that consideration be given to holding joint or overlapping sessions of those groups, where appropriate;

(*b*) Agreed that mutual representation at sessions of the AWG and the IGOSS Bureau should be continued;

(*c*) Strongly encouraged closer interaction between VOS management and the IGOSS SOOP;

(*d*) Requested the AWG to consult with the IGOSS Bureau, with a view to preparing other specific proposals for future closer integration between the work of CMM and of IGOSS.

12.2.4 Finally on this item, the Commission noted with concern that the number of TRACKOB reports on the GTS containing surface current data was decreasing. It considered that such data were important for both operations and climate studies and urged Members to make every effort to encourage VOS to make and report current observations in that format, making use of the special software developed for that purpose by KNMI and the United Kingdom Meteorological Office and distributed by the Secretariat. The Commission also urged Members to encourage strongly research institutions in their countries to release their subsurface XBT/CTD data for GTS distribution in real time, in the appropriate code forms.

12.3 Global Ocean Observing System (GOOS) and Global Climate Observing System (GCOS) (agenda item 12.3)

Global Ocean Observing System

12.3.1 The Commission noted with appreciation that, following the recommendation made at its eleventh

session, WMO was now a full co-sponsor of both the Intergovernmental Committee for GOOS (I-GOOS) (with IOC and UNEP), and the Joint Scientific and Technical Committee for GOOS (J-GOOS) (with IOC and the International Council of Scientific Unions (ICSU)). The Commission further noted with interest the advances in GOOS planning and design during the past four years. Those had resulted primarily from the work of the I-GOOS Strategy Subcommittee, of J-GOOS and its panels, and of the Ocean Observing System Development Panel and its successor the GCOS/GOOS/WCRP Ocean Observations Panel for Climate. Planning documents included the GOOS Strategic Plan and an overarching document being prepared by J-GOOS to be published in 1998, *The Realization of GOOS*. Coordination among GOOS, GCOS and the Global Terrestrial Observing System (GTOS) was also being enhanced, with the implementation of joint panels for space and for data management as well as plans for a coordinated approach towards an integrated global observing strategy.

12.3.2 With regard to the GOOS modules, the Commission noted that planning for the climate module, in particular, was well advanced and that the OOPC was now working to translate the Ocean Observing System Development Programme (OOSDP) plan into specific requirements for ocean observations for climate which could be implemented by bodies such as CMM, IGOSS, the DBCP, IOC/global sea level observing system (GLOSS), etc. Development of the health of the oceans module was also reasonably well advanced, but planning for the living marine resources and coastal modules was necessarily slower, because of the nature and complexity of the issues involved. It was recognized that the implementation of the ocean services module would depend very much on the existing experience of bodies such as CMM and IGOSS, with GOOS providing input in terms of assessing requirements and developing modelling and data management techniques. In addition, the Commission noted that the provision of services was effectively the end product of all the other modules.

12.3.3 At the regional level, major developments had taken place in Europe with the initiation of EuroGOOS, and in the Western Pacific Experiment (WESTPAC) region with the north-east Asia regional NEAR-GOOS. Both were cooperative arrangements among agencies and institutions in the regions concerned, aimed at enhancing the exchange of oceanographic data, relevant ocean research, the provision of ocean services in support of user requirements, and the implementation of GOOS generally in those regions.

12.3.4 The Commission recognized that the emergence of specific and detailed GOOS data requirements, in particular for the GOOS/GCOS ocean climate module, necessitated urgent action to put in place appropriate mechanisms to coordinate, regulate and manage implementation of enhanced observing networks to meet those requirements. It noted with appreciation the actions already under way, in particular by IGOSS and the DBCP, to respond to expressed requirements for specific data types, and requested the newly established Subgroup on the VOS to take action, as necessary, to respond to GOOS/GCOS requirements for VOS observations. It also requested the newly established Subgroup on Radar Ocean Sensing and the rapporteur on ocean satellites to liaise closely with the relevant GOOS/GCOS bodies and with CBS concerning requirements for remotely-sensed data. With regard to the question of overall coordination and regulation of the marine meteorological and physical oceanographic observing network required for marine services, for climate, and for many coastal area activities, the Commission considered that it had the experience, expertise and authority to undertake such a role, in close coordination with IOC and with other relevant bodies such as IGOSS the DBCP.

Global Climate Observing System (GCOS)

12.3.5 The Commission was pleased to receive a brief report on progress within GCOS. It noted the extensive planning and supporting documentation that had been prepared by JSTC for GCOS, and in particular, the central role given to observations needed from the oceans. Members of the Commission agreed to participate, to the degree possible, in future planning and implementation efforts of the GCOS and GOOS programmes, and in particular, with the OOPC. The Commission invited the Joint Planning Office (JPO) for GCOS to continue to provide information on the development of GCOS, and specifically on activities related to its oceanographic components.

12.3.6 The Commission noted with appreciation the statement of the JSTC concerning the expanded remit and possible future joint sponsorship of CMM. It was pleased to receive the helpful and constructive comments. It agreed that, under its current or future terms of reference, it would continue to take an active and supportive role of ocean climate observations through both GCOS and GOOS. Specific actions which were agreed with regard to GCOS/GOOS implementation are recorded in paragraph 12.3.10 below.

12.3.7 The Commission agreed that a meeting of Members interested in participating in, and contributing to, GCOS would be beneficial, particularly in articulating the observational requirements for climate, but also in providing additional opportunities to discuss and evaluate the benefits that the participating countries would derive from an effective GCOS. It agreed to provide assistance, as appropriate, to the JSTC and the JPO in planning and conducting the meeting.

CMM actions

12.3.8 The Commission recognized that it comprised representatives from NMSs, which themselves had the expertise and capabilities to implement many parts of GOOS at the national level, and in many cases were already doing so. At the same time, the existing terms of reference of the Commission gave it the mandate within WMO to undertake the operational implementation of most parts of GOOS where detailed requirements were already available, working in collaboration with IOC.

12.3.9 The Commission further recognized that global climate change and its impact were issues with which many

international organizations and countries were very much concerned and anxious to take action, but as yet did not have enough information on which to base that action. It was, therefore, encumbent on bodies such as CMM to coordinate the implementation and operational maintenance of the observation networks and data management facilities required to provide that information, using the designs and requirements provided by GOOS and GCOS. In that connection, the existing MCSS and related databases already provided an important resource for the analysis of global climate and climate change.

12.3.10 In response to those urgent requirements, the Commission recognized that immediate action was necessary. It requested the president, chairmen of the Working Groups on Marine Meteorological Services and on Marine Observing Systems, and the Secretary-General to undertake consultations with the IOC Secretariat (especially the GOOS Support Office), the chairmen of IGOSS and the DBCP, the chairman of the OOPC, and other relevant experts from GOOS and GCOS, with a view to drafting a coordinated action plan for the implementation of relevant components of GOOS/ GCOS, based on already existing scientific designs. That plan should clearly specify actions to be taken by the various subsidiary bodies of CMM as well as by other bodies such as IGOSS and the DBCP, and should be made available, if possible, by the end of 1997 for further action.

12.3.11 Finally regarding the present agenda item, the Commission recognized the continuing importance of the link between the implementation of Agenda 21 and GCOS and GOOS. It, therefore, decided to keep in force Recommendation 10 (CMM-XI) — Agenda 21 and implementation of GOOS and GCOS.

12.4 Intersecretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) and other organizations and bodies (agenda item 12.4)

Intersecretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO)

12.4.1 The Commission noted with approval the fact that WMO had continued to participate in, and strongly support, intersecretariat coordination in marine affairs provided through ICSPRO. It recognized that the role of the Committee was changing, in the follow-up to the United Nations Conference on Environment and Development (UNCED) and in the light of the work of the ACC Subcommittee on Oceans and Coastal Areas (SCOCA) (see also the discussion under agenda item 12.5). The Commission agreed, nevertheless, that the work of ICSPRO was complementary to that of the ACC Subcommittee, and important to the effective coordination of marine-related activities among the organizations in the United Nations system most concerned with the oceans. It, therefore, supported the continuation of the Committee, perhaps with modified terms of reference.

Intergovernmental Oceanographic Commission (IOC)

12.4.2 In recalling the numerous references to cooperation with IOC already recorded during its present session, the Commission underlined the importance to WMO of maintaining and expanding that cooperation in the future. In that context, the Commission noted with approval the wide range of coordination issues and cooperative activities between WMO and IOC now being addressed at the intersecretariat level as well as by the governing bodies of both Organizations.

12.4.3 The Commission agreed that those activities augured well for the continued future cooperation between WMO and IOC at the international level. At the same time, however, it recognized that such cooperation could only be truly effective if reflected also at the national level. The Commission, therefore, urged its members to become actively involved within their own countries in fostering closer cooperation between NMSs and oceanographic institutions and agencies on matters of common interest, in particular in the context of meteorological/oceanographic activities undertaken under joint programmes such as those of GOOS, IGOSS and the DBCP. In that regard, it specifically requested the Secretary-General to write to Permanent Representatives.

Other organizations

12.4.4 The Commission recalled with satisfaction the close and fruitful cooperation that existed among IHO, IMO, Inmarsat and WMO in the implementation of the GMDSS marine broadcast system (see agenda item 5.3), as well as in many other aspects of the collection of data from, and the provision of services for, the marine environment. In addition, it noted with appreciation that WMO had continued to cooperate with a variety of other organizations and bodies during the inter-sessional period on marine-related matters, including the United Nations, UNEP, the Food and Agriculture Organization of the United Nations (FAO), the International Telecommunication Union (ITU), the Permanent Commission for the South Pacific (CPPS), ICS, IALA, the International Federation of Shipmasters' Associations (IFSMA), oil-related E&P Forum, ICSU/Scientific Committee on Oceanic Research (SCOR), the International Union for the Conservation of Nature and Natural Resources (IUCN), the Organization for Indian Ocean Marine Affairs Cooperation (IOMAC) and CLS/Service Argos. It agreed on the value to WMO and Members of that cooperation, and urged that it should be continued and further developed in the future. In that context, it particularly noted with pleasure the words of appreciation expressed by the representative of IMO for the existing high level of cooperation between IMO and CMM.

United Nations Convention on the Law of the Sea (UNCLOS)

12.4.5 The Commission recalled that UNCLOS had come into force on 16 November 1994, and it expressed its appreciation to the Secretary-General for the action he had taken to inform maritime Members of the status of the VOS and of related marine observing systems in the context of UNCLOS. It urged members of the Commission to make use of the information provided whenever possible in the context of national discussions and negotiations relating to the maintenance of marine observation networks. In doing so, the Commission emphasized:

(*a*) The indispensable nature of routine marine meteorological and oceanographic observations, including from the exclusive economic zone (EEZ) and territorial sea, to the provision of services in support of the safety of life and property at sea;
(*b*) The fact that those observations were made in the context of agreed, long-standing operational systems of the WWW and IGOSS, and that they were freely exchanged among, and were of general benefit to, all countries;
(*c*) That those observations were generally made, on a voluntary basis, by officers of merchant vessels engaged in normal trading activities who should be reassured, where necessary, of the continuing legality and importance of their work.

INTERNATIONAL YEAR OF THE OCEAN 1998

12.4.6 The Commission noted with interest that the United Nations General Assembly had designated 1998 as the International Year of the Ocean, that Twelfth Congress had considered that WMO should play an active role in planning for, and celebrating, that international year, and that the forty-eighth session of the Executive Council had designated the theme for World Meteorological Day (WMD) 1998 as weather, oceans and human activity. The Commission expressed its appreciation for the activities and documentary material already being planned within WMO as contributions to the International Year of the Ocean, including:

(*a*) Various material prepared for WWD 1998, covering subjects such as marine observations, forecasts, transportation, other economic activities, hazards, recreation, etc;
(*b*) An issue of the *WMO Bulletin* in 1998 with the primary theme of the oceans;
(*c*) Participation in ICSPRO joint activities including Expo 98 in Lisbon.

In addition to those, the Commission noted other activities which might be considered including, in particular, the publication of technical reports relating to marine pollution, such as the proceedings of the technical lectures presented at this session of the Commission.

12.4.7 Finally on that topic, the Commission invited all maritime Members to consider contributing to the celebrations of that important international year at the national level, and urged its Members, whenever possible, to provide input to national committees established for that purpose. In that regard, it noted with interest that the Mauritius Meteorological Services was planning to organize a three-day workshop on marine activities, involving all sectors of the marine community in Mauritius, in support of the International Year of the Ocean and as a means of raising public awareness in that field.

12.5 FOLLOW-UP TO THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED) (agenda item 12.5)

12.5.1 The Commission recalled that, in reviewing the results of UNCED, including the various conventions and in particular Chapter 17 of Agenda 21, it had recognized the importance of those results to the work of WMO, of NMSs, and of CMM itself, especially in relation to systematic ocean monitoring. It had, therefore, designated rapporteurs to review the work of the Commission in the context of Chapter 17, with a view to adjusting activities and projects to enhance support for the implementation of Agenda 21.

12.5.2 The Commission noted that Twelfth Congress had also reviewed and supported the follow-up action taken by WMO in response to UNCED, including inter-agency coordination and the work of the different technical commissions.

12.5.3 The Commission noted with interest the participation of the WMO Secretariat in the work of the ACC. SCOCA formed part of an inter-agency machinery designed to coordinate United Nations agency activities and projects relating to the environment and sustainable development and to report on that work and the implementation of Agenda 21 to the Commission on Sustainable Development (CSD).

12.5.4 The Commission supported the continued involvement of WMO in the work of SCOCA, and in particular supported its proposal to prepare, as an inter-agency project for the International Year of the Ocean 1998, a prototype for a United Nations *Atlas of the Ocean*. The Commission considered that that *Atlas*, which was to be presented in electronic form and contain multi-disciplinary products and analyses produced under different United Nations agency programmes, would benefit considerably from the inclusion of products, prepared by NMSs, relating to the oceans and climate. It, therefore, recommended to Members to consider contributing products to the *Atlas* if requested, and adopted Recommendation 11 (CMM-XII) in that regard.

12.5.5 The Commission noted with interest the report of the Rapporteurs on the Follow-up to UNCED, and expressed its appreciation to Mr W. Appleby (Canada) for the comprehensive and valuable analysis presented. It noted with satisfaction that CMM, through its various ongoing projects and activities being undertaken by its working groups, subgroups, rapporteurs or otherwise, was already addressing, in a comprehensive way, all the elements of Chapter 17 of Agenda 21 which fell within its terms of reference. It, therefore, decided that no further specific action was required on that matter for the time being, but requested the president and the AWG to keep the question of implementing Agenda 21 under review and to report, as necessary, to future Commission sessions.

13. WMO LONG-TERM PLAN (agenda item 13)

FOURTH WMO LONG-TERM PLAN (4LTP)

13.1 The Commission noted the adoption by Twelfth Congress of the 4LTP as well as the guidelines and directives developed by the Executive Council for its monitoring and evaluation. Since the 4LTP had been under implementation for only a year, the Commission made no attempt to review its implementation but requested the chairmen of the working groups to keep that constantly under review. The AWG was requested to advise on the first report on the evaluation of the impacts of activities performed under the Plan, to be submitted by the president of the Commission to the

Executive Council Working Group on Long-term Planning early in 1998.

FIFTH WMO LONG-TERM PLAN (5LTP)

13.2 The Commission noted that, although the optimal programme structure for the 5LTP had yet to be decided by the Executive Council, the preliminary version adopted by the forty-eighth session of the Executive Council for the purposes of the 5LTP did not contain any major changes from the current structure. The chairmen of the working groups of the Commission were requested to give consideration in the coming year to the development of the 5LTP for their respective activities for review by the AWG at its next session, tentatively scheduled for late 1998. In addition, the Commission recommended the following priority issues for inclusion in the draft of the marine programme for the 5LTP:

(*a*) Numerical model development;
(*b*) New observing technology, in particular ocean satellites and applications;
(*c*) New telecommunications and computing capabilites;
(*d*) Improving the interface between NMHS and users;
(*e*) Technology transfer.

14. SCIENTIFIC LECTURES (agenda item 14)

14.1 Following the decision of the AWG, scientific lectures at the session were arranged within the main technical part of the agenda on the theme of marine pollution. The lectures were intended to serve as a means of informing the members of the Commission on the present status of the health of the oceans in general, in response to both natural and anthropologial contaminants, and also of actions to reduce or mitigate the effects of those contaminants. They were also directly relevant to, and in support of, the implementation of the MPERSS.

14.2 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 agreed that the full texts of the lectures should be compiled by the Secretariat and published as a single report in the Marine Meteorology and Related Oceanographic Activities series. The Commission expressed regret that Mr I. Frolov (Russian Federation) had been unable to attend to present his lecture as planned, and requested that the text of that lecture should also be included in the published proceedings.

14.3 The Commission greatly appreciated the presentation of such technical lectures at each Commission session and requested the AWG to prepare a similar set of lectures for its thirteenth session.

15. ESTABLISHMENT OF WORKING GROUPS AND NOMINATION OF RAPPORTEURS (agenda item 15)

15.1 The Commission recalled that at its eleventh session it had undertaken a major revision of its working group structure to better adapt it to existing and developing requirements for marine services and marine observational data for the next decade. It recognized that the various working groups and subgroups established at that time had, in general, proved successful and had undertaken very valuable work during the past inter-sessional period.

15.2 The Commission noted with concern the difficulties reported by the chairman of the Working Group on Marine Observing Systems in activating nominated working group members to undertake various specific tasks allocated to the working group by its eleventh session. It recognized the problems being, faced now by NMSs in allowing individual staff members time within their normal national work programmes to undertake additional activities for CMM, but at the same time stressed that the work of the Commission in support of WMO and all Members could be effectively accomplished only through the collective effort of its working groups and their Members. The Commission, therefore, requested Members, when nominating experts to working groups or as rapporteurs, to ensure that they were fully motivated and qualified to undertake the specified tasks, and that they were also allowed sufficient time within their normal work programme to complete allocated tasks in support of the Commission. Recalling its discussions under agenda item 3 (see paragraph 3.5), it reiterated its request to the Secretary-General to provide all possible relevant information to Members when requesting them to nominate experts to working groups.

15.3 Bearing in mind the comments of the AWG on the subject, the Commission agreed that the general overall structure of working groups adopted at its eleventh session remained appropriate. It agreed further that two additional subgroups should be established within the Working Group on Marine Observing Systems, to focus on specific topics:

(*a*) A Subgroup on Radar Ocean Sensing, to give formal status to that already existing successful ad hoc group, and to function at no cost to WMO;
(*b*) A Subgroup on the Voluntary Observing Ships, to focus on the vital role of the VOS in support of both services and research and to enhance implementation of the recommendations of the VOS Special Observing Project-North Atlantic (VSOP-NA).

At the same time, it considered that its requirements in regard to ocean satellites, including liaison with CBS, GOOS and GCOS, could be satisfied through the appointment of a rapporteur only, rather than a full subgroup.

15.4 The Commission adopted Resolutions 1 (CMM-XII), 2 (CMM-XII), 3 (CMM-XII) and 4 (CMM-XII) to establish the working groups. Detailed terms of reference and membership (including rapporteurs for specific topics) are included as part of the respective resolutions.

16. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT RESOLUTIONS OF THE EXECUTIVE COUNCIL (agenda item 16)

16.1 In accordance with current practice, the Commission examined those resolutions and recommendations adopted prior to its twelfth session and which were still in force. It noted that the action on most of its previous recommendations had already been taken and completed, or their substance incorporated in the *Manual on Marine Meteorological Services* and the *Guide to Marine Meteorological Services*, as appropriate. Resolution 5 (CMM-XII) was adopted.

16.2 The Commission also examined the Executive Council resolutions within the field of the activities of CMM. Recommendation 12 (CMM-XII) was adopted.

17. ELECTION OF OFFICERS (agenda item 17)

The Commission elected Mr J. Guddal (Norway) as president and Mr S. Ragoonaden (Mauritius) as vice-president of the Commission.

18. DATE AND PLACE OF THE THIRTEENTH SESSION (agenda item 18)

The Commission was pleased to receive the tentative offer by Iceland to host its thirteenth session in the year 2001. It requested its president to consult with the Secretary-General and the Permanent Representative of Iceland with WMO, with a view to confirming the offer and determining the exact date and place, in accordance with General Regulation 186.

19. CLOSURE OF THE SESSION (agenda item 19)

19.1 The principal delegate of Finland, Ms M.-L. Komulainen, offered her sincere thanks to the Government of Cuba and, in particular, to the Cuban Meteorological Institute for hosting the session, for their very generous and warm hospitality, and for the excellent facilities which they had provided. She thanked the president and vice-president for their wise and active leadership during the inter-sessional period and for the excellent conduct of the session. She also thanked the Secretariat, including the interpreters, translators and secretaries, for their support. That expression of appreciation was supported by the delegates of Canada, Greece, Japan, Malaysia, the Russian Federation, the Socialist Republic of Viet Nam, and the United States.

19.2 The incoming president, Mr J. Guddal, also supported those expressions of appreciation. He stressed to members of the Commission that its officers and chairmen were available to assist them at any time, and urged members to seek such support as, and when, required. He also reiterated the importance of the education, training and technology transfer activities of CMM during the coming inter-sessional period.

19.3 The Permanent Representative of Cuba with WMO, Mr T. Gutiérrez Pérez, expressed the pleasure of his country and the Meteorological Institute at being able to host the session and to contribute to its success. He congratulated the outgoing president and vice-president for the excellent work of the Commission over the past eight years, noted that that work was very important and helpful for his country and for WMO in general, and expressed his confidence in the incoming officers and working groups for the next four years. Mr Gutiérrez Pérez then thanked the WMO Secretariat for their support throughout the session, and finished by reiterating the pleasure of his Service at being able to share the past two weeks with all delegates and expressed the wish to see everyone again in Cuba in the future.

19.4 On behalf of the WMO Secretariat, the representative of the Secretary-General, Mr R. Landis, thanked delegates for their kind words to the Secretariat. He noted that the meeting had run very smoothly, with few problems and excellent cooperation, and that that success had been the result of a real team effort, involving not just the WMO staff but also, very importantly, the local Secretariat, including the many people working behind the scenes over a long period of time. In that context, and on behalf of the Secretary-General and the WMO Secretariat, Mr Landis expressed his appreciation to Cuba, the Cuban Meteorological Institute, and all the local Secretariat for the outstanding venue and facilities and for the generous hospitality provided to the session. He recognized that the local arrangements and especially the communications facilities had been almost perfect, which had been a major factor in the success of the session. He concluded by expressing the thanks of WMO to the outgoing officers of the Commission for their hard work and wise guidance over the past eight years, and offered the continuing support of the Secretariat to the new president and vice-president for the coming inter-sessional period.

19.5 In closing the session, the retiring president, Mr R. Shearman, recognized that it had been very efficient, effective and successful, both within and outside the meeting. In noting the desire of the Executive Council to improve the efficiency and cost-effectiveness of the Organization as a whole, he considered that both the work programme and structure of the Commission were well- balanced and appropriate to the implementation of the WMO marine programme which, in turn, was very important to WMO and its Members in the support it provided to marine services, to the WWW, to GOOS, and to other major programme activities. He stressed that enhanced cooperation, both within and especially outside WMO, was essential to the future success of the Commission, and that it must and would evolve in that way in the future. He noted that technical cooperation and technology transfer would be priority areas for the Commission in the future, and urged all Commission members to enhance their participation and input during the coming inter-sessional period.

19.6 Mr Shearman then offered his thanks to the vice-president, members of the AWG, all members of the Commission, and the Secretariat for their support, hard work, and friendship over the eight years of his presidency. He expressed particular appreciation to the Cuban Government and the Cuban Meteorological Institute for hosting the meeting, for the wonderful hospitality, and for the excellent support and facilities throughout the session. He also thanked the WMO Secretariat for their efficient and smooth team support for the session. Mr Shearman concluded by offering his best wishes to the new officers and to all delegates and Commission members for the coming inter-sessional period.

19.7 The twelfth session of the Commission for Marine Meteorology closed at 10 a.m. on Thursday, 20 March 1997.

RESOLUTIONS ADOPTED BY THE SESSION

RESOLUTION 1 (CMM-XII)

ADVISORY WORKING GROUP OF THE COMMISSION FOR MARINE METEOROLOGY

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 2 (CMM-XI) — Advisory Working Group of the Commission for Marine Meteorology,

(2) Resolution 15 (Cg-XII) — Marine meteorology and associated oceanographic activities,

(3) Resolution 29 (Cg-XII) — Fourth WMO Long-term Plan,

CONSIDERING:

(1) The need of the Commission to promote marine meteorological and related oceanographic programmes and activities,

(2) The contributions of the Commission to the WWW, WCP, GCOS and GOOS,

(3) The need to coordinate the work of the Commission with that of IOC and 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 Council or Congress,

DECIDES:

(1) To establish an Advisory Working Group with the following terms of reference:

(*a*) To advise the president in the short- and long-term planning of the future work of the Commission, including preparation of the relevant section of the Fifth WMO Long-term Plan;

(*b*) To assist the president in the coordination of activities of working groups and rapporteurs of the Commission;

(*c*) To keep under review the internal structure and working methods of the Commission, including its relationship to other bodies, both internal and external to WMO;

(*d*) To advise on the methods of carrying out projects and activities referred to the Commission for action by WWW, WCP, IGOSS, GCOS, GOOS and other programmes;

(*e*) To advise the president on matters requiring coordination with IOC and other international organizations;

(*f*) To monitor the implementation of the Marine Meteorology and Associated Oceanographic Activities Programme within the Fourth WMO Long-term Plan;

(2) That the Advisory Working Group will be composed of:

(*a*) The president of the Commission;

(*b*) The vice-president of the Commission;

(*c*) The chairman of the Working Group on Marine Meteorological Services;

(*d*) The chairman of the Working Group on Marine Observing Systems;

(*e*) The chairman of the Working Group on Training, Education and Implementation Support;

(*f*) P. Parker (Australia);

(*g*) I. Frolov (Russian Federation);

(*h*) An expert from Argentina;

(*i*) A representative nominated by the Executive Secretary IOC;

(3) That additional experts may be invited by the president, in consultation with the Secretary-General, to participate in sessions of the working group, as appropriate;

INVITES the Executive Secretary IOC to nominate a representative on the group.

RESOLUTION 2 (CMM-XII)

WORKING GROUP ON MARINE METEOROLOGICAL SERVICES

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 3 (CMM-XI) — Working Group on Marine Meteorological Services,

(2) The *Fourth WMO Long-term Plan* (WMO/TD-No. 703), Part II, Volume 4, Section 4.4 — The Marine Meteorology and Associated Oceanographic Activities Programme,

(3) The report of the president of the Commission to CMM-XII,
(4) The report of the chairman of the Working Group on Marine Meteorological Services to CMM-XII,

CONSIDERING:

(1) The continuing and expanding user demand for marine meteorological services and information, including both basic services in support of the safety of life at sea as well as more specialized services for particular user groups,
(2) The need to monitor continuously marine meteorological services to ensure that these services fully meet user requirements,
(3) The need to keep under review the requirements of Members for guidance in the implementation of their obligations as specified in the *Manual on Marine Meteorological Services* (WMO-No. 558),
(4) The need to monitor closely the operation of the WMO marine broadcast system for the GMDSS as well as MPERSS, and to provide guidance and assistance to Members in this operation, as appropriate,
(5) The need to coordinate closely with other WMO Programmes (WWW, WCP), as well as with other organizations such as IOC, IMO, IHO and ICS in the provision of marine meteorological services and information,

DECIDES:

(1) To establish a Working Group on Marine Meteorological Services with the following terms of reference:
   (*a*) To monitor user response to existing services and requirements for new services, both basic and specialized;
   (*b*) To monitor and assist in the implementation of the marine broadcast system for the GMDSS, including NAVTEX services, as required;
   (*c*) To assist in, and evaluate, the trials of the MPERSS and to prepare a revised version for consideration by CMM-XIII;
   (*d*) To provide advice to Members on the development and implementation of marine meteorological services, in particular in areas such as fisheries, coastal zone management, wave forecasting, sea ice, etc;
   (*e*) To coordinate with CBS, IGOSS and the WCP, as well as with user organizations such as IMO, IHO and ICS, on the requirements for marine meteorological services;
   (*f*) To review and coordinate requirements for, and provision of, marine climatological data and services, including sea ice;
   (*g*) To review and update, as necessary, existing marine-related meteorological *Manuals* and *Guides*;
   (*h*) To undertake specific studies and prepare guidance material and technical reports on aspects of marine services, as necessary;
   (*i*) To coordinate and assist in the implementation of the WMO wave programme;
(2) That the working group will include:
   (*a*) A subgroup on marine climatology;
   (*b*) A subgroup on sea ice;
   (*c*) A subgroup on wave modelling and forecasting, to work by correspondence;
   (*d*) An ad hoc group on the global maritime distress and safety system;
   (*e*) Rapporteurs for specific topics as dictated by the work programme;
(3) That the specific terms of reference for the subgroups and ad hoc group should be as given in the annex to this resolution;
(4) That the working group will be essentially open, with additional membership as follows:
   (*a*) The Subgroup on Marine Climatology to include representatives of the eight Responsible Members and for the two Global Collecting Centres for the Marine Climatological Summaries Scheme;
   (*b*) The Subgroup on Wave Modelling and Forecasting to be open and to include an expert designated by the Executive Secretary IOC;
   (*c*) The Ad Hoc Group on the Global Maritime Distress and Safety System to include representatives of the 15 issuing services for the GMDSS and a rapporteur on NAVTEX services in the Baltic Sea region;
   (*d*) A rapporteur on:
      (i) MPERSS;
      (ii) Graphics transmission to ships;
      (iii) Beaufort equivalent scales;
      (iv) Fisheries services;
(5) To select, in accordance with General Regulation 32:
   (*a*) Ms T. Pierce (United States) as chairman of the working group;
   (*b*) I. Hunter (South Africa) as vice-chairman of the working group;
   (*c*) J. Elms (United States) as chairman of the Subgroup on Marine Climatology;
   (*d*) I. Frolov (Russian Federation) as chairman of the Subgroup on Sea Ice;
   (*e*) V. Ryabinin (Russian Federation) as chairman of the Subgroup on Wave Modelling and Forecasting;
   (*f*) H. Savina (France) as chairman of the Ad Hoc Group on the Global Maritime Distress and Safety System;
(6) To select, in accordance with General Regulation 32:
   (*a*) M. Ziemianski (Poland) as rapporteur on NAVTEX services in the Baltic Sea region;
   (*b*) P. Daniel (France) as rapporteur on MPERSS;
   (*c*) M. Hontarrède (France) as rapporteur on graphics transmission;
   (*d*) R. Lindau (Germany) as rapporteur on Beaufort equivalent scales;
   (*e*) Ms A. Calnick Gamboa (Cuba) as rapporteur on fisheries services;
   (*f*) Tuen Kwong Lum (Malaysia) as rapporteur on coastal monitoring and services;
   (*g*) P. Gelton (Netherlands) as rapporteur on services for offshore industry;

INVITES the presidents of CBS and CCl as well as the chairman of IGOSS to nominate rapporteurs to serve on the working group;

REQUESTS the Secretary-General to invite IOC, IMO, FAO, IHO, ICS, IFSMA and Inmarsat to participate in the work of the group.

ANNEX TO RESOLUTION 2 (CMM-XII)

TERMS OF REFERENCE OF SUBGROUPS AND AD HOC GROUP OF THE WORKING GROUP ON MARINE METEOROLOGICAL SERVICES

Terms of reference of the Subgroup on Marine Climatology

(*a*) To continue liaison with, and support for, the WCP and the Commission for Climatology;
(*b*) To maintain and update the *Guide to the Applications of Marine Climatology* (WMO-No. 781), and to prepare and convene a Workshop on Advances in Marine Climatology;
(*c*) To review and advise on requirements for the exchange of different types of marine climatological data;
(*d*) To review the operations of the marine climatological summaries scheme, including the work of the Global Collecting Centres, and to make recommendations for improvements as, necessary;
(*e*) To review and recommend on formats and quality-control procedures for marine climatological data and data exchange;
(*f*) To review and recommend on, as necessary, the format and contents of the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47);
(*g*) To keep under review developments with Beaufort equivalent scales;
(*h*) To take actions to encourage enhanced contributions to the marine climatological summaries scheme.

Terms of reference of the Subgroup on Sea Ice

(*a*) To provide support, as necessary, for the implementation and operation of the Global Digital Sea Ice Data Bank;
(*b*) To review and, as necessary, propose amendments to formats, nomenclatures and procedures for sea-ice data and information exchange;
(*c*) To review and, as necessary, propose procedures for the preparation and/or updating of technical publications on sea ice;
(*d*) To review the status of, and requirements for, sea-ice services and to propose improvements, as appropriate;
(*e*) To encourage and facilitate the operational exchange of sea-ice data;
(*f*) To encourage and facilitate the enhanced submission of sea-ice data to the Global Digital Sea Ice Data Bank;
(*g*) To maintain liaison with the WCP, the Commission for Climatology, the Intergovernmental Oceanographic Commission, the Baltic Sea Ice Meeting and other international programmes, organizations and groups on sea-ice matters.

Terms of reference of the Subgroup on Wave Modelling and Forecasting

(*a*) To keep under review the implementation of the WMO wave programme, to assist in its implementation, as required, and to propose amendments to the programme, as appropriate;
(*b*) To refine and assist in the implementation of the project for verification of operational wave model outputs;
(*c*) To keep under review and propose a methodology for future updating of the *Guide to Wave Analysis and Forecasting* (WMO-No. 702);
(*d*) To keep under review and provide technical advice, as necessary, on all aspects of wave modelling and forecasting;
(*e*) To provide support to Members, as required, on operational wave modelling and forecasting, including the possible preparation of appropriate software packages;
(*f*) To provide technical advice, as required, on storm surge modelling and forecasting;
(*g*) To liaise with IOC and other international bodies and programmes on matters within the terms of reference of the subgroup.

Terms of reference of the Ad Hoc Group on the Global Maritime Distress and Safety System

(*a*) To keep under review the implementation and operations of the WMO marine broadcast system for the GMDSS and propose improvements, as appropriate;
(*b*) To review user reactions to meteorological services provided under the GMDSS, including quality, timeliness, contents, etc.;
(*c*) To finalize proposals for the coordination of NAVTEX services for the Baltic Sea;
(*d*) To review requirements for the international coordination of NAVTEX services for other ocean areas;
(*e*) To liaise with IMO, IHO, Inmarsat, ICS and other concerned international organizations on GMDSS matters.

RESOLUTION 3 (CMM-XII)

WORKING GROUP ON MARINE OBSERVING SYSTEMS

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 4 (CMM-XI) — Working Group on Marine Observing Systems,

(2) The *Fourth WMO Long-term Plan* (WMO/TD-No. 703), Part II, Volume 4, Section 4.4 — Marine Meteorology and Associated Oceanographic Activities Programme,

(3) The report of the president of the Commission to CMM-XII,

(4) The report of the chairman of the Working Group on Marine Observing Systems to CMM-XII,

(5) Resolution 11 (Cg-XII) — Global Climate Observing System,

(6) Resolution 16 (Cg-XII) — WMO's involvement in operational oceanography,

(7) The proposals of the Joint IOC/WMO Committee for IGOSS and of the IOC Committee for IODE to continue to cosponsor the Subgroup on Ocean Satellites and Remote Sensing,

CONSIDERING:

(1) The need to maintain, coordinate and improve a variety of marine observing system components, including the VOS, moored and drifting buoys, and various ocean remote-sensing systems, in response to requirements for marine data to support the WWW, WCP, marine meteorological and oceanographic services, GCOS and GOOS,

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

(3) The need to review continuously marine telecommunications systems and procedures, as well as marine reporting codes, to ensure that they fully meet the requirements for the collection and exchange of marine data,

(4) The need to continue to provide guidance to Members on technical aspects of marine observing systems,

(5) The need to liaise and coordinate with appropriate bodies of CBS, the Commission for Instruments and Methods of Observation (CIMO), IGOSS, DBCP, GCOS and GOOS on marine instrumentation and observations networks as well as on requirements for marine data,

DECIDES:

(1) To establish a Working Group on Marine Observing Systems with the following terms of reference:
   (*a*) To monitor requirements for marine meteorological and ocenographic data for marine services, for global climate studies as expressed by GCOS and GOOS, and in support of other relevant programmes and activities;
   (*b*) To coordinate the implementation of operational marine observing system components to meet these expressed requirements;
   (*c*) To monitor the status of existing operational marine observing systems in the light of requirements and to develop proposals to overcome deficiencies;
   (*d*) To monitor the development of new observing techniques, including ground and satellite-based remote sensing, and to provide advice and guidance on incorporation of these into operational marine observing systems, on the applications of these data for the provision of marine services, and on the processing, formatting and archival of the data;
   (*e*) To review requirements for marine reporting codes and make proposals for additions or modifications, as necessary;
   (*f*) To review and advise on developments in marine telecommunications, in particular Inmarsat and other satellite-based systems;
   (*g*) To undertake specific studies and prepare technical reports on aspects of marine observing systems, as necessary;
   (*h*) To coordinate with CBS, CIMO, IGOSS, DBCP, GCOS and GOOS bodies, as appropriate, on marine instrumentation and observations, and on requirements for marine data;

(2) That the working group will include:
   (*a*) A Subgroup on Radar Ocean Sensing (ROSE), to function at no cost to WMO;
   (*b*) A Subgroup on the Voluntary Observing Ships (VOS) (including marine telecommunications);
   (*c*) A Rapporteur on Ocean Satellies;
   (*d*) Rapporteurs as appropriate on specific topics as dictated by the work programme;

(3) That the specific terms of reference for the subgroups should be as given in the annex to this resolution;

(4) That the working group will be essentially open, with additional membership as follows:
   (*a*) The Subgroup on Radar Ocean Sensing to be open and composed of experts working directly in the field;
   (*b*) The Subgroup on the Voluntary Observing Ships to be open, but with membership encouraged specifically from PMOs;
   (*c*) Rapporteurs to be nominated by CMM or by other WMO bodies;

(5) To select, in accordance with General Regulation 32:
   (*a*) K. Nagasaka (Japan) as chairman of the working group;
   (*b*) D. W. Jones (United Kingdom) as vice-chairman of the working group;

(*c*) W. Rosenthal (Germany) as chairman of the Subgroup on ROSE;
(*d*) G. Kassimidis (Greece) as chairman of the Subgroup on VOS;
(*e*) S. Viktorov (Russian Federation) as the Rapporteur on Ocean Satellites;

INVITES the presidents of CBS and CIMO, the chairmen of the Joint Working Gommittee for IGOSS, DBCP, Joint Scientific and Technical Committee for GCOS and Intergovernmental Committee for GOOS to nominate rapporteurs to serve on the working group;

INVITES further:

(1) Both IOC and IALA to co-sponsor the Subgroup on ROSE;
(2) IOC to support and participate in the work of the Rapporteur on Ocean Satellites.

ANNEX TO RESOLUTION 3 (CMM-XII)

TERMS OF REFERENCE OF SUBGROUPS AND RAPPORTEURS OF THE WORKING GROUP ON MARINE OBSERVING SYSTEMS

Terms of reference of the Rapporteur on Ocean Satellites

(*a*) Review and update the report on polar-orbiting oceanographic satellites and their applications to marine meteorology and physical oceanography;
(*b*) Review and report on other developments in satellite- or aircraft-based ocean remote sensing relating to marine meteorology and physical oceanography;
(*c*) Review and analyse requirements of marine meteorological and physical oceanographic services for remote-sensing data and information, and prepare assessments of current techniques to meet these requirements;
(*d*) Review requirements for, and provide technical advice on, the applications of remotely-sensed ocean data to the provision of marine services;
(*e*) Liaise with the CBS Working Group on Satellites, the GCOS/GOOS Space Panel and other bodies of WMO and IOC dealing with environmental satellites and remote sensing;
(*f*) Contribute to the development of training courses and training material on the remote sensing of the marine environment, through appropriate WMO and IOC mechanisms.

Terms of reference of the Subgroup on Radar Ocean Sensing

(*a*) Formulate demonstration monitoring projects in different regions and operational environments;
(*b*) Develop and make presentations, as appropriate, on operational capabilities of radar ocean sensing;
(*c*) Establish requirements for the standardization of data presentation, exchange and archival;
(*d*) Compile information on cost-benefits of ground-based radars.

Terms of reference of the Subgroup on Voluntary Observing Ships

(*a*) Propose and, as necessary, take specific actions to enhance implementation of the recommendations of the VSOP-NA relating to VOS operations;
(*b*) Review the status of the VOS worldwide and propose actions to enhance ship recruitment;
(*c*) Review and analyse requirements for VOS data as expressed by the WWW, WCP, GOOS, GCOS and in support of marine services;
(*d*) Review and recommed on shipboard instrumentation, siting and observing practices;
(*e*) Review, maintain and update, as necessary, technical guidance material relating to the VOS and PMOs;
(*f*) Propose actions to enhance PMO standards and operations and contribute, as required, to PMO training;
(*g*) Liaise with the Subgroup on Marine Climatology, the ad hoc Group on the GMDSS, and the IGOSS Ship-of-Opportunity Programme Implementation Panel on matters relating to VOS management and operations;
(*h*) Review marine telecommunications facilities and procedures for observational data collection and propose actions, as necessary, for improvements and/or enhanced applications.

RESOLUTION 4 (CMM-XII)

WORKING GROUP ON EDUCATION, TRAINING AND IMPLEMENTATION SUPPORT

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 5 (CMM-XI) — Working Group on Education, Training and Implementation Support,
(2) The *Fourth WMO Long-term Plan* (WMO/TD-No. 703), Part II, Volume 4, Section 4.4 — The Marine Meteorology and Associated Oceanographic Activities Programme,

(3) The report of the president of the Commission to CMM-XII,
(4) The report of the chairman of the Working Group on Education, Training and Implementation Support,
(5) The reports of the regional Rapporteurs on Marine Meteorological Services to CMM-XII,

CONSIDERING:

(1) The need to monitor closely Members' requirements and problems in the implementation of marine services and observing systems,
(2) The value of coordinating implementation support to Members in marine services and observing systems on a regional or subregional basis,
(3) The need for improved education and training in the field of marine meteorology and physical oceanography, including areas such as remote sensing, pollution and modelling,
(4) The important potential role of the regional rapporteurs or working groups in advising the Commission on regional requirements for implementation support and education and training,
(5) The need to provide Members with guidance on the development of relevant aspects of information technology,

DECIDES:

(1) To establish a Working Group on Training, Education and Implementation Support with the following terms of reference:
   (*a*) To monitor specific national and regional requirements and problems in the implementation of marine services and marine observing systems;
   (*b*) To advise the Commission on support required, nationally and regionally, to improve marine observing systems and services;
   (*c*) To develop appropriate technical guidance material for Members on aspects of information technology relevant to the processing, exchange and presentation of marine data and products;
   (*d*) To provide advice and guidance on requirements for specialized education and training in the field of marine meteorology and physical oceanography, including remote sensing, pollution control and numerical modelling;
   (*e*) To liaise, as necessary, with the Executive Council Panel of Experts on Education and Training and with the WMO Secretariat on relevant aspects of the WMO Education and Training Programme;
(2) That the working group will be composed of a chairman and vice-chairman selected by the Commission, together with members in their capacity as regional rapporteurs/chairmen of regional Working Groups on Marine Meteorological Services, selected by the six regional associations, and one member nominated by the Executive Secretary IOC;
(3) To select, in accordance with General Regulation 32, W. Appleby (Canada) as chairman of the working group, and Xiao Yongshen (China) as vice-chairman of the working group;

INVITES the regional associations, when appointing regional Rapporteurs on Marine Meteorological Services, to provide appropriate terms of reference to facilitate their participation in this working group;

INVITES further the Executive Secretary IOC to nominate a representative to serve on the working group.

RESOLUTION 5 (CMM-XII)

REVISION OF THE RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR MARINE METEOROLOGY

THE COMMISSION FOR MARINE METEOROLOGY,

CONSIDERING that all resolutions adopted prior to its twelfth session are now obsolete,

CONSIDERING further that all recommendations adopted prior to its twelfth session and still in force have been reconsidered,

NOTING the action taken on the recommendations adopted prior to its twelfth session,

DECIDES:

(1) Not to keep in force Resolutions 1 to 6 (CMM-XI);
(2) Not to keep in force Recommendations 3 (CMM-IX), 9, 10 (CMM-X), 3, 4, 6, 9, 11, 13-17 (CMM-XI);
(3) To keep in force Recommendations 13 (CMM-X), 1, 2, 5, 7, 8, 10, 12 (CMM-XI);
(4) To publish in the final report of the twelfth session the texts of the recommendations which are kept in force, as given in the annex to this resolution.

ANNEX TO RESOLUTION 5 (CMM-XII)

RECOMMENDATIONS OF THE COMMISSION FOR MARINE METEOROLOGY ADOPTED PRIOR TO ITS TWELFTH SESSION AND MAINTAINED IN FORCE

Recommendation 13 (CMM-X) — Specialized long-term education and training in marine meteorological 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 oceanography 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 appropriate 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 Subgroup 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 follow closely 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 subdivided 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 a 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 at 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.

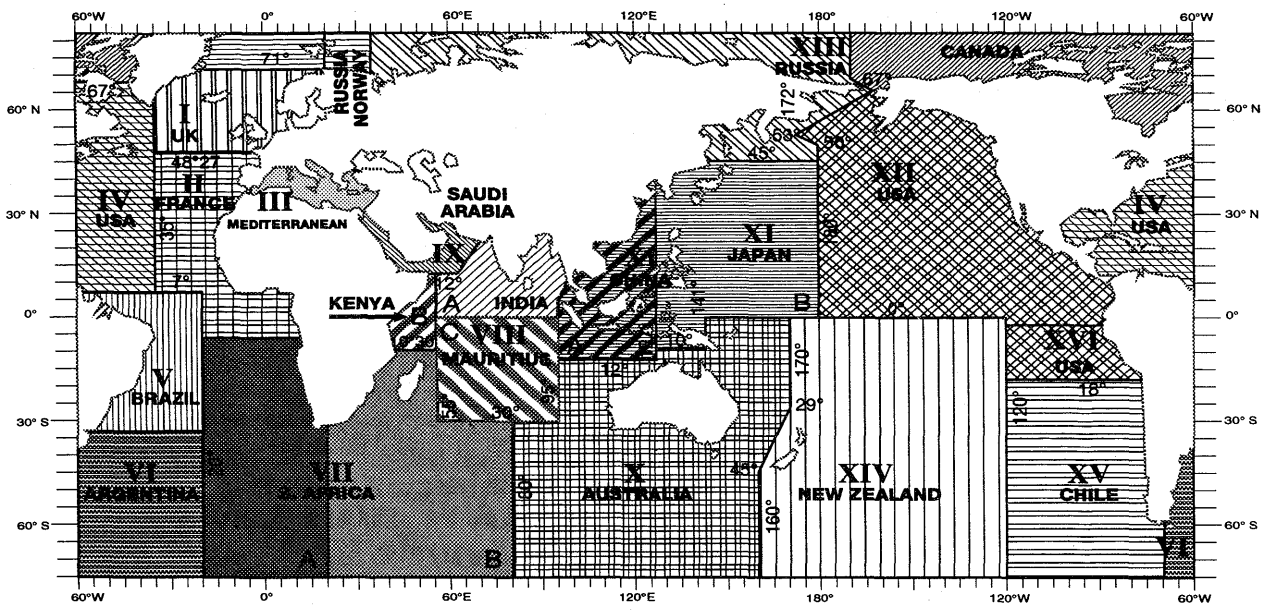
2.4.2 The objectives and activities of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea and its role in the case of emergency are given in Appendix IV.

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 Co-ordinator*	*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 for Arctic waters north 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 Malaysia Indonesia Singapore	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 Indonesia Guam (USA)	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; and
(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; and
(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; and
(*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 (VSOP-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 7 (CMM-XI) — The application of remotely-sensed marine data to marine meteorological and oceanographic services

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 5 (CMM-X) — The application of remotely-sensed marine data to marine meteorological and oceanographic services,

(2) Field Workshop on Intercalibration of Conventional and Remotely-Sensed Sea Surface Temperature Data, Marine Meteorology and Related Oceanographic Activities Report No.16,

(3) The *Third WMO Long-term Plan*, Part II, Volume 1 — World Weather Watch Programme (WMO-No. 761) and Volume 4 — Applications of Meteorology Programme (WMO-No. 764),

(4) The IGOSS plan and implementation programme 1989–1995,

(5) The final report of the sixth session of the Joint IOC/WMO Committee for IGOSS, Geneva, November 1991,

(6) The report to CMM-XI by the chairman of the *Ad Hoc* Group on Ocean Satellites and Remote Sensing,

(7) The scientific lectures at CMM-XI,

FURTHER noting that a number of ocean remote-sensing systems, both satellite and ground based, are likely to be operationally available within the next few years, or are in some cases already operationally available,

CONSIDERING:

(1) That marine meteorological and surface oceanographic data from remote-sensing systems are of great potential benefit to Members for both operational and research purposes,

(2) That procedures need to be developed to facilitate the timely availability of such data on time and space scales and in formats relevant to the Members' requirements,

(3) That intercomparison of marine data obtained by conventional and remote-sensing systems should be expanded with the development of procedures to enable a coherent use of combined data for operational and research purposes,

RECOMMENDS:

(1) That studies and workshops on remotely-sensed measurements of ocean variables using satellite, air and ground-based systems be continued and that these include in particular:

(*a*) The intercalibration of remotely-sensed data with conventional ocean data;

(*b*) The development of procedures to facilitate the availability of remotely-sensed data for operational and research purposes;

(*c*) Consideration of means to effect the appropriate transfer of technology to enable all Members to benefit fully from the new systems;

(2) That such studies be undertaken with the active collaboration of CIMO, CBS, the Joint IOC/WMO Committee for IGOSS, IOC and the satellite operating agencies, as appropriate;

(3) That Members and satellite operators be requested to consider the implementation of procedures for the operational dissemination of remotely-sensed data to national Meteorological Services and national oceanographic services;

REQUESTS the Secretary-General, in consultation with the president of the Commission, to arrange for or facilitate the conduct of such studies and workshops as resources permit, and to take the necessary measures to facilitate the incorporation of any operational procedures developed, into the overall WWW data exchange.

NOTE: This recommendation replaces Recommendation 5 (CMM-X) which is no longer in force.

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 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.

RECOMMENDATIONS ADOPTED BY THE SESSION

RECOMMENDATION 1 (CMM-XII)

CLOSER COOPERATION BETWEEN THE COMMISSION AND THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC)

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Resolution 39 (Cg-XII) — Terms of reference of the technical commissions,

(2) The *Abridged Final Report with Resolutions of the forty-eighth session of the Executive Concil* (WMO-No. 846), paragraph 6.4.4,

(3) The final report of IOC EC-XXIX (October 1996), paragraph 298,

(4) The final report of the sixth session of the JSTC for GCOS, Victoria, British Columbia, Canada, October 1996,

(5) The preliminary report of the WMO consultant on closer cooperation between WMO and IOC,

(6) The broader study being undertaken by the Executive Council on the WMO technical commission structure,

CONSIDERING:

(1) That the work of national Meteorological Services and of CMM already includes significant elements of physical oceanography in observations, data management and services,

(2) The constitutional responsibility of CMM within WMO for the preparation of regulatory and guidance material,

(3) The long and successful experience of CMM in managing operational ocean observing systems,

CONSIDERING further:

(1) The requirement for an international mechanism to implement, regulate and maintain a coordinated operational ocean observing system for climate,

(2) That the IOC has substantial expertise in ocean observing techniques and data management, and is the competent international organization to stimulate and coordinate participation in operational ocean observing systems by national oceanographic institutions and agencies,

RECOGNIZING the work in the ocean observation field of bodies such as IGOSS, DBCP, IOC/GLOSS and IOC/IODE, and the cooperation which already exists between these bodies and CMM;

BEARING in mind, nevertheless,

(1) The importance to WMO of 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, and the potential difficulties in its application also to the international exchange of oceanographic data and products,

(2) The many regulatory, constitutional and financial questions which must be addressed,

(3) The possible requirements for IOC focal points relevant to cooperation,

(4) The fields to be covered in the cooperation,

EXPRESSES its appreciation to IOC for the close cooperation and suport afforded in the past;

AGREES:

(1) On the desirability and value of closer cooperation between CMM and IOC in many fields in the future, in particular in areas relating to the role of the oceans in the global climate system and marine services;

(2) That, at the technical level, such closer cooperation would be of benefit to WMO, to national Meteorological Services and to major programmes such as WWW, GCOS and GOOS;

RECOMMENDS that the study on closer cooperation between CMM and IOC be continued, with a view to presenting a detailed proposal on the subject for consideration by the governing bodies of WMO and IOC, taking into account the various issues and points relevant to the question raised during CMM-XII;

REQUESTS the president and the Advisory Working Group of CMM to provide advice, assistance and general oversight for the study and the final proposal, to ensure that the existing interests and responsibilities of CMM and of national Meteorological Services are fully respected in the proposal.

RECOMMENDATION 2 (CMM-XII)

AMENDMENTS TO THE WMO GMDSS MARINE BROADCAST SYSTEM

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) The International Convention for the Safety of Life at Sea (SOLAS), 1974, in particular Chapter V (Safety of Navigation), Regulation 4 (Meteorological Services),

(2) The 1988 Amendments to SOLAS for the global maritime distress and safety system (GMDSS) which, *inter alia*, require meteorological broadcasts through SafetyNET to have commenced on 1 February 1992,

(3) *Abridged Final Report with Resolutions of the Twelfth World Meteorological Congress* (WMO-No. 827), general summary, paragraph 3.4.4.4,

(4) Resolution 8 (EC-XLIV) — Implementation of the new WMO GMDSS marine broadcast system,

(5) Recommendation 3 (CMM-XI) — New WMO GMDSS marine broadcast system,

(6) The final report of the first session of the CMM ad hoc Group on the GMDSS,

NOTING further:

(1) IMO Assembly Resolution A.705(17) — Promulgation of Maritime Safety Information;

(2) Annex VI to the WMO *Technical Regulations* (*Manual on Marine Meteorological Services*);

RECOGNIZING:

(1) The importance of meteorological warnings and forecasts to the safety of life and property at sea,

(2) The obligations for countries which are signatories to SOLAS to provide meteorological services for shipping as specified in the SOLAS Convention, including the 1988 amendments,

(3) That the WMO GMDSS marine broadcast system needs to be constantly reviewed and updated so as to best meet the needs of users and the internationally-agreed requirements of SOLAS,

RECOMMENDS that the amendments to the new WMO GMDSS marine broadcast system, as detailed in the annex to this recommendation, be adopted and that the *Manual on Marine Meteorological Services* (WMO-No. 558); Part I, Sections 1 to 3 bis be amended accordingly;

URGES Members with marine forecast and warning preparation and broadcast responsibilities under the WMO GMDSS system:

(1) To make every effort to implement their responsibilities in full at the earliest opportunity if they have not already done so;

(2) To endeavour to impress upon CES operators the importance of the efficient and effective operation of the International SafetyNET service, including the meteorological forecasts and warnings components of marine safety information;

(3) To keep the WMO Secretariat closely informed of developments and/or changes in their operation of the system;

REQUESTS the Working Group on Marine Meteorological Services to keep the implementation of the WMO GMDSS marine broadcast system under review;

REQUESTS the Secretary-General:

(1) To provide appropriate technical advisory assistance to Members concerned in the implementation of the WMO GMDSS marine broadcast system;

(2) To bring this recommendation to the attention of IMO, IHO, ICS and Inmarsat and other organizations and bodies directly concerned.

ANNEX TO RECOMMENDATION 2 (CMM-XII)

AMENDMENTS TO THE *MANUAL ON MARINE METEOROLOGICAL SERVICES*

PART I BIS

(Changes introduced appear in bold. Words deleted are struck out).

The system given in these amendments will:

(*a*) Operate parallel with the existing system as given now in Volume I, Part I, sections 1 to 3 of the *Manual on Marine Meteorological Servcies* between 1 February 1992 and 1 February 1999;

(*b*) In the final revised form, completely replace the existing system (and existing *Manual* text) as from 1 February 1999.

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)

(Global maritime distress and safety system (GMDSS) application which is compatible with, and required by, the radiocommunication provisions of the 1988 SOLAS amendments via the NAVTEX, International SafetyNET and HF 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 maritime safety information (MSI) in compliance with SOLAS, CH IV, "RADIOCOMMUNICATIONS".

NOTE: In addition, national Meteorological Services may have to prepare and/or issue warnings and routine forecasts for transmission by an HF-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 is 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 is 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~~ **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 braodcast may have been prepared solely by the issuing service, or by another preparation service, or a combinaton 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 amongst 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 Commission for Marine Meteorology 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.

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 the Commission for Marine Meteorology.

2.2.2.2.1 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 areas of responsibility is addressed to the Secretary-General.

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.

NOTE: Parts II and III may be combined where this is thought more appropriate.

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 coast Earth station (CES) to service that area.

NOTES: (1) As there are several CESs which can serve an Ocean Region and hence an area of broadcast responsibility, issuing services may negotiate directly with the various CES 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~~ **Inmarsat** ocean region satellites covering the issuing service's area of responsibility. [NOTE: The broadcast requirement for unscheduled broadcasts has been determined by IMO.] 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 CES 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 be 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 CESs 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 tropical cyclone warnings, which shall be preceded by "PAN PAN".

~~2.2.3.7.2~~ **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 a CES (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 I-2.A of the existing *Guide to Marine Meteorological Services* (WMO-No. 471) and in Appendix I-2 in the existing *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 under 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 a 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 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.
~~(iv) Waves (sea and swell).~~
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).

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 maritime search and rescue (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 IMO *Search and Rescue Manual*.
3.2.1.1 Requests from Rescue Coordination Centres (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 an 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 a coast Earth station (CES) 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~~ **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~~ **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~~ **Inmarsat**-C* coast Earth station (CES). 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 I~~NMARSAT~~ **Inmarsat** satellites located at 55.5°W, 18.5°W, 63°E and 180°E, respectively.

Coast Earth Station (CES): A land station in the ~~INMARSAT~~ **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~~ **Inmarsat**. EGC is a part of the ~~INMARSAT~~ **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 I~~NMARSAT~~ **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~~ **Inmarsat** Enhanced Group Call 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~~ **Inmarsat** Enhanced Group Call system using languages as decided by the administration concerned.

Network Coordination Station (NCS): A land station in the ~~INMARSAT~~ **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 CES 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~~ **Inmarsat's** Enhanced Group Call system.

Schedule 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 prearranged 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 VHF 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 MF 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~~ **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.

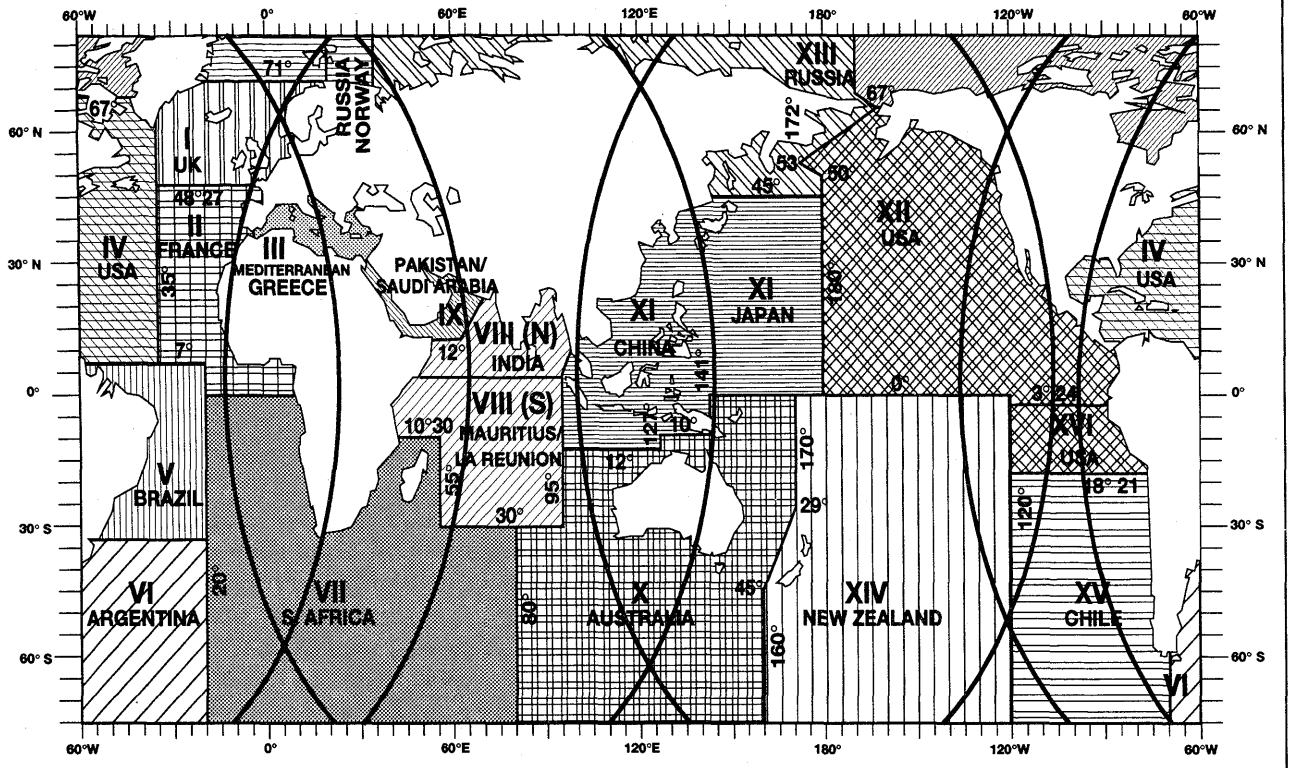
~~**INMARSAT**~~ **Inmarsat-A**: A satellite communications system for transmission of voice, telex, facsimile or data using directional antennas in the I~~NMARSAT~~ **Inmarsat** satellite system.

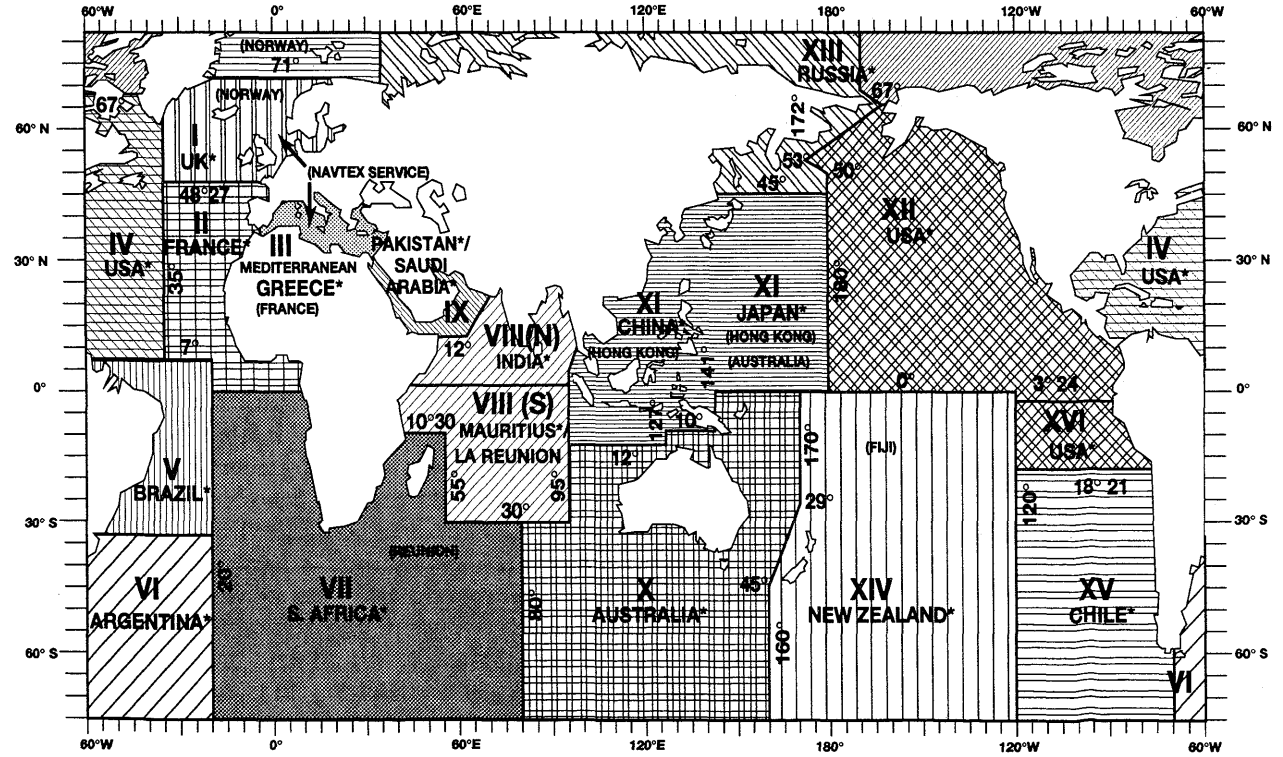
~~**INMARSAT**~~ **Inmarsat-C**: A satellite communications system for telex or data messaging using small terminals and omni-directional antennas in the ~~INMARSAT~~ **Inmarsat** satellite system.

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 urgent 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.

* ~~INMARSAT A and INMARSAT C, previously termed INMARSAT Standard A and Standard C.~~

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 CES for the issue of scheduled broadcasts (see paragraph 2.2.3.5)*
I	United Kingdom	Goonhilly
II	France	~~Pleumeur-Bodou~~ **Aussaguel (AOR (E))** **Goonhilly (AOR (W))**
III	Greece	Thermopylae
IV	United States	Southbury (AOR (W))
V	Brazil	Tangua
VI	Argentina	Southbury (AOR (W))
VII-Atlantic Ocean Region	South Africa	~~Goonhilly~~ **Burum** (AOR (E))
VII-Indian Ocean Region	South Africa	~~Perth~~ **Burum** (IOR)
VIII **(N)**	India	Arvi
VIII (S)	**Mauritius/La Réunion***	**Burum**
IX	Saudi Arabia/**Pakistan**	~~Jeddah (IOR)~~ **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	~~Perth~~ **Yamaguchi**
XII-Pacific Ocean Region	United States	Santa Paula (POR)
XII-Atlantic Ocean Region	United States	Southbury (AOR (W))
XIII	Russian Federation	Nakhodka (POR)
XIV	New Zealand	Perth (POR)
XV	Chile	Southbury (AOR (W))
XVI	United States	Southbury (AOR (W))

* Tropical cyclone warnings prepared by RSMC La Réunion are included in the regular bulletins issued by Mauritius.

Coordinates for GMDSS METAREAs ~~(IHO NAVAREAS)~~

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, ~~thence~~ **and** east of 20°W from ~~48°27'N~~ **7°N** to 6°S.

Area III The Mediterranean and Black Seas, east of the Straits 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 Guyane/Brazil frontier in 43°0'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 ~~10°30'S~~ **the equator**, thence to ~~55°E, to 30°S 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 XIII	Sea areas enclosed north of Area XI and west of Area XII; also all Arctic waters from 170W westwards to 20°E.
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 United States and Russian Federation waters to 67°N.	Area XIV	The South Pacific and Southern Oceans south of the equator, bounded by Area X to the west, Area XII to the north and Area XV 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.

TABLE 2

METAREA	*Issuing service**	*Preparation service*	*Area CES 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))	Forecasts and warnings for areas not covered by NAVTEX
II	France	France	(*a*) ~~Pleumeur-Bodou~~ **Assaguel** (For AOR (E)), **Goonhilly (For AOR (W))** (*b*) **Assaguel (For AOR (W))**, Goonhilly Bodou (For AOR (E))	Forecasts and warnings for areas not covered by NAVTEX
III	Greece	Greece, France	(*a*) Thermopylae (For IOR) (*b*) Thermopylae (For IOR), Goonhilly (For AOR (W), AOR (E))	Forecasts and warnings for areas not covered by NAVTEX
IV	United States	United States	(*a*) Southbury (For AOR (W)) (*b*) Southbury (For AOR (W)), ~~Goonhilly~~ **Southbury** (For AOR (E))	**Forecasts and warnings for areas not covered by NAVTEX**
V	Brazil	Brazil	(*a*) Tangua (For AOR (E)) (*b*) Southbury (For AOR (W)) Tangua (For AOR (E))	~~No NAVTEX services planned in this area~~ **Forecasts and warnings for areas not covered by NAVTEX**
VI	Argentina	Argentina	(*a*) Southbury (For AOR (W)) (*b*) Southbury (For AOR (W)), ~~Tangua (For AOR (E))~~	Forecasts and warnings ~~outside~~ for **areas not covered by NAVTEX** ~~coverage~~
VII-AOR	South Africa	South Africa	(*a*) ~~Goonhilly~~ **Burum** (For AOR (E)) (*b*) ~~Southbury (For AOR (W)), Goonhilly~~ **Burum** (For AOR (E) **and (W))**	**Forecasts and warnings for areas not covered by NAVTEX**
VII-IOR	South Africa	South Africa, La Réunion	(*a*) ~~Perth~~ **Burum (For** IOR) (*b*) ~~Goonhilly (For AOR (E)), Perth (For IOR)~~ **Burum (For AOR (E) and** IOR))	**Forecasts and warnings for areas not covered by NAVTEX**
VIII **(N)**	India	~~Kenya, Mauritius, La Réunion~~, India	(*a*) Arvi (For IOR) (*b*) ~~Pleumeur-Bodou (For AOR (E))~~ **Arvi (For IOR)**	Forecasts and warnings for areas not covered by NAVTEX
VIII (S)	**Mauritius,** La Réunion**	**Mauritius, La Réunion**	**(*a*) Burum (For IOR)** **(*b*) Burum (For IOR)**	**No NAVTEX service**
IX	Saudi Arabia, **Pakistan**	Saudi Arabia, **Pakistan**	(*a*) ~~Jeddah~~ **Perth (For IOR)** (*b*) ~~Pleumeur-Bodou (For AOR (E))~~ **Perth (For IOR)**	**Forecasts and warnings for areas not covered by NAVTEX**
X-IOR	Australia	Australia	(*a*) Perth (For IOR) (*b*) Perth (For IOR and POR)	No NAVTEX service
X-POR	Australia	Australia	(*a*) Perth (For POR) (*b*) Perth (For POR and IOR)	No NAVTEX service

* It is the responsibility of the issuing ~~member~~ **service** to ensure that data are available to provide input for its entire areas of broadcast responsibility and to develop appropriate procedures to rectify any data deficiency.

** Tropical cyclone warnings prepared by RSMC La Réunion are included in the regular bulletins issued by Mauritius.

METAREA	*Issuing service**	*Preparation service*	*Area CES of issuing service* *(a) For scheduled broadcasts* *(b) For unscheduled broadcasts*	*Remarks*
XI-IOR	China	China, Hong Kong	(*a*) and (*b*) Beijing (For IOR)	Forecasts and warnings for areas not covered by NAVTEX
XI-POR	Japan	Japan, Hong Kong, **Australia**	(*a*) and (*b*) ~~Perth~~ **Yamaguchi** (For POR)	
XII	United States	~~Australia~~, United States	(*a*) Santa Paula (For POR), Southbury (For AOR (W)) (*b*) Southbury (For AOR (W)), ~~Goonhilly~~ **Southbury** (For AOR (E)), Santa Paula (For POR)	Forecasts and warnings for areas not covered by NAVTEX
XIII	Russian Federation	Russian Federation	(*a*) and (*b*) Nakhodka (For POR)	~~Fully~~ **Partly** covered by NAVTEX ~~from 1996~~
XIV	New Zealand	Fiji, New Zealand	(*a*) Perth (For POR) (*b*) Southbury (For AOR (W)), Perth (For POR)	No NAVTEX service
XV	Chile	Chile	(*a*) Southbury (For AOR (W)) (*b*) Southbury (For AOR (W)), Tangua (For AOR (E))	~~Single CES can service satellite footprint overlaps~~ **Forecasts and warnings for areas not covered by NAVTEX**
XVI	United States	United States	(*a*) Southbury (For AOR (W)) (*b*) Southbury (For AOR (W)), ~~Goonhilly~~ **Southbury** (For AOR (E)), Santa Paula (For POR)	No NAVTEX service

APPENDIX I-3 BIS

TRANSFER OF INFORMATION FROM AN ISSUING SERVICE TO A COAST EARTH STATION (CES) PROVIDING ~~INMARSAT~~ Inmarsat-C SERVICES*

The transfer of warnings and forecasts by the issuing service to a CES may be accomplished by:

(1) Telex link from the issuing service directly to the CES;

(2) X.25 packet switching networks;**

(3) A dedicated landline;

(4) The GTS to another national Meteorological Service whose country hosts the relevant CES, thence by either (1) or (2) above by the cooperating national Meteorological Services to the CES;

(5) An ~~INMARSAT~~ **Inmarsat**-C SES direct to the CES. [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 CES, 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~~ **Inmarsat**-C CES operators.

** Such networks, which operate at transmission speeds higher than telex, may attract lower charges for the land-line portion of the transmissions.

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 CES. 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 ~~should monitor~~ **shall arrange for monitoring of** the broadcasts that they originate.

Participating CES 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 CES 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 CES ~~by issuing services for subsequent transmission~~ **and subsequently transmitted** over the ~~INMARSAT~~ **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 CES.**

1.2 Routeing of messages to the CES by an issuing service

(see Appendix I.3 bis for methods)

1.3 Addressing of EGC packets

After having gained access to the CES, 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 CES 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 CES 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 CES) 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 CES – 1 digit. The C_1 code is used to indicate to the CES the level of priority needed for the message's transmission. The priority number is given in ascending order as follows:

0	ROUTINE	Meteorological messages will be either SAFETY (C_1=1) or ~~URGENT~~ **URGENCY** (C_1=2)
1	SAFETY	
2	~~URGENT~~ **URGENCY**	
3	DISTRESS	

NOTE: Priority ~~URGENT~~ **URGENCY** (C_1=2) to be used for urgent 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 CES – 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 – $C_3 = X_1X_2$ to identify the METAREA and B_1B_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_1X_2 code and the NAVTEX B_1 and B_2 are sent to the CES as a four-character group, in the order $X_1X_2B_1B_2$.

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:

$D_1D_2L_aD_3D_4D_5L_oM_1M_2M_3$, where

D_1D_2 is latitude of centre in degrees with leading zero if required;
L_a is hemisphere N or S;
$D_3D_4D_5$ is longitude of centre in degrees with leading zero if required;
L_o is longitude E or W;
$M_1M_2M_3$ 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 pre-defined 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 CES – 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 a CES 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 CES 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 ~~the~~ **SECURITE plus** "text" is for transmission.
(2) When included with a message for broadcasting, the CES 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 CES 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 CES 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~~ **Inmarsat** SafetyNET receiver and monitor broadcasts of messages which they originate.

ANNEX 4b — 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*, 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 ~~URGENT~~ **URGENCY** for tropical cyclone warnings only

Always C_1 = 1 SAFETY for forecasts and for warnings other than urgent 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:

$D_1D_2L_aD_3D_4D_5L_oM_1M_2M_3$, where

$D_1D_2L_a$ (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;

$D_3D_4D_5L_o$ (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;

$R_1R_2R_3$ (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:

The following examples are to be replaced with examples of real messages:

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 3 (CMM-XII)

SERVICES FOR COASTAL AREAS USING THE INTERNATIONAL NAVTEX SERVICE

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) The International Convention for the Safety of Life at Sea (SOLAS), 1974, in particular Chapter V (Safety of Navigation), Regulation 4 (Meteorological Services),

(2) The 1988 Amendments to SOLAS for the Global Maritime Distress and Safety System (GMDSS) which, *inter alia*, require meteorological broadcasts through NAVTEX to have commenced before 1 August 1993,

(3) The final report of the first session of the CMM ad hoc Group on the GMDSS,

(4) The *NAVTEX Manual*, IMO Publication Sales Number IMO-951E,

CONSIDERING:

(1) That the international coordination of meteorological broadcasts through NAVTEX may be required in some regions,

(2) That general guidance on procedures and principles for such coordination will be valuable to the Members concerned in developing specific regional arrangements,

(3) That NAVTEX broadcasts are directed essentially to coastal or near-shore waters,

RECOMMENDS that the amendments to the *Manual on Marine Meteorological Services*, as detailed in the annex to this recommendation, be adopted;

REQUESTS the Working Group on Marine Meteorological Services to review periodically specific requirements for the international coordination of meteorological broadcasts through NAVTEX and to assist in such coordination as appropriate;

REQUESTS the Secretary-General:

(1) To provide appropriate technical advisory assistance to Members concerned, as required, in the coordination of NAVTEX broadcasts;

(2) To bring this recommendation to the attention of IMO, IHO, ICS and Inmarsat, and other organizations and bodies directly concerned.

ANNEX TO RECOMMENDATION 3 (CMM-XII)

AMENDMENTS TO THE *MANUAL ON MARINE METEOROLOGICAL SERVICES*

MANUAL ON MARINE METEOROLOGICAL SERVICES

PART II

4. SERVICES FOR COASTAL AREAS USING THE INTERNATIONAL NAVTEX SERVICE

4.1 General

(*a*) NAVTEX is an international automated direct-printing service for the promulgation of navigational and meteorological warnings, meteorological forecasts and other urgent information to ships. The international NAVTEX service forms part of the Global Maritime Distress and Safety System (GMDSS) developed by the International Maritime Organization (IMO) and, since 1 August 1993, a NAVTEX receiving capability has become part of the mandatory equipment which is required to be carried in certain vessels under the provisions of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended in 1988;

(*b*) The International NAVTEX Service is the coordinated broadcast and automatic reception on the frequency 518 kHz of maritime safety information by means of narrow band direct printing telegraphy using the English language;

(*c*) Responsibility for coordinating the establishment of the global NAVTEX service has been vested by IMO in its Coordinating Panel on NAVTEX (See note);

(*d*) The operational and technical characteristics of the NAVTEX system are contained in Recommendation ITU-R M.540-2 and in the *NAVTEX Manual* published by the International Maritime Organization (IMO Publication Sales Number IMO-951E).

4.2 Procedures

4.2.1 The time-shared nature of NAVTEX imposes the need for strict discipline in controlling the information flow of the broadcast.

4.2.1.1 Gale warnings are placed at the NAVTEX transmitters by national Meteorological Services. The warnings are broadcast on receipt and at the next routine scheduled transmission only.

4.2.1.2 Forecasts should normally be broadcast twice each day. This service should be carefully coordinated where transmitters are geographically close together. It is important that such forecasts are dedicated to the specific area covered by the NAVTEX transmitter.

4.3 General principles for coordination

Where there is a requirement for coordination of meteorological information via NAVTEX, the following principles should be adopted:

(*a*) It is assumed that there is an existing exchange using the GTS of weather warnings and some weather forecasts (once or twice daily) for mariners between all national Meteorological Services working in the area;

(*b*) There should be one national Meteorological Service working as meteorological coordination centre responsible for the provision of weather bulletins for mariners via the NAVTEX system in the area concerned. The selection of the NMS as meteorological coordination centre may be governed by its proximity to the majority of forecasting areas in the region and existing involvement in the provision of NAVTEX services;

(*c*) The meteorological coordination centre should submit its forecasts and warnings to the NAVTEX station operators for dissemination on a daily operational basis. If necessary, the provision of weather bulletins from other countries could be included for waters not already covered by the coordination centre;

(*d*) Every national Meteorological Service serving the area concerned should have access to the meteorological coordination centre to deliver by GTS its warnings and forecasts for the areas for which it intends to have responsibility;

(*e*) The meteorological coordination centre should decide which warning is sent to the NAVTEX operator for dissemination by the system. The criteria for such decisions are based on warnings with the highest wind speed. In cases of significant difference and serious doubts in warnings the centre should ask the service which prepared the message in question for additional confirmation (via the GTS link);

(*f*) The meteorological bulletins and additional warnings which have been sent to the NAVTEX station operators for dissemination should be copied, by the meteorological coordination centre via the GTS, to all national Meteorological Services serving the area.

4.4 Coordination arrangements

Specific international coordination arrangements for NAVTEX broadcasts of meteorological information, whenever established, are detailed in the relevant section of Volume II of the *Manual*.

NOTE: The NAVTEX Coordinating Panel can be contacted at the following address:
The Chairman
Coordinating Panel on NAVTEX
International Maritime Organization
4 Albert Embankment
LONDON SE1 7SR

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 5 (CMM-XII)

THE WMO WAVE PROGRAMME FOR 1997–2001

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 4 (CMM-XI) — WMO wave programme 1993–1997,

(2) Resolution 3 (CMM-XI) — Working Group on Marine Meteorological Services,

(3) The report to CMM-XII of the chairman of the Subgroup on Wave Modelling and Forecasting,

NOTING further:

(1) The WMO *Guide to Wave Analysis and Forecasting* (WMO-No. 702),

(2) The Marine Meteorology and Related Oceanographic Activities Report No. 12 — *WMO Wave Programme: National Reports for 1984 on Wave Measuring Techniques, Numerical Wave Models and Intercomparisons* (WMO/TD-No. 35), and its supplements 1 to 4,

CONSIDERING:

(1) That almost all maritime Members of WMO provide wave-related services to many users, and that these Members, and CMM itself, will benefit directly from the implementation of the WMO wave programme,

(2) That the services module of the Global Ocean Observing System programme also envisages developments which directly include basic elements and activities of the WMO wave programme or are closely related to them,

RECOMMENDS:

(1) That the WMO wave programme during the period 1997–2001 should comprise the elements and activities detailed in the annex to this recommendation;

(2) That the scope of, and activities under, the programme should be further reviewed at the next session of the Commission;

(3) That Members be urged to participate to the extent possible in the use, implementation, and development of the programme;

REQUESTS the Secretary-General, in consultation with the president of the Commission and in cooperation with Members and relevant users groups where appropriate, to assist in the implementation of the programme within available budgetary resources;

INVITES the IOC to participate actively in the implementation of the programme.

ANNEX TO RECOMMENDATION 5 (CMM-XII)

WAVE PROGRAMME ELEMENTS AND ACTIVITIES FOR 1997–2001

A. DATA

Real time exchange and reporting of wind wave and related data

1. Measurement and modelling of waves provide data which are of great interest to a large community of marine forecasters, climatologists, offshore and coastal operators, etc. Large and increasing volumes of data from satellite sensors and wave models (especially directional wave spectra) make it necessary to provide efficient and effective means of communicating and storing this information. This is also true for other marine meteorological variables that are derived from atmospheric boundary layer wind data or are produced by satellite sensors (e.g. sea level). Important issues in this respect are coding and relevant standards.

Recommended actions:

(*a*) Consider the development of standards for presentation of the WMO wave programme-related variables on the Internet;

(*b*) Promote the practices set out in the *Users' Guide for the Exchange of Measured Wave Data* (IOC);

(*c*) Investigate the applicability of new codes concepts (such as CREX) to non-wave elements.

Rescue of wave data and promoting access to it

2. Further development of wind wave modelling, ocean–atmosphere interaction and climate studies as well as some other applications require access to historic wave data. Not all sources of such data are yet known and not always is the data storage reliable enough to guarantee that the data may be accessed by a user in future. Therefore, WMO should continue its attempts to identify existing public and private sources of wave and surface wind measurement data with the objective to ensure safe data storage and, if possible, open access to the data and its incorporation into the international data exchange system. Furthermore, WMO should assist Members in making the best use of such data.

Recommended actions:

(*a*) To identify wave and marine surface wind datasets existing on the Internet (both real-time and historic);

(*b*) Promote the cataloguing of all known sources of data through the Responsible National Oceanographic Data Centre for Waves (RNODC-Waves) of IOC;

(*c*) Ensure that Members receive summaries of catalogued data as a stimulus for their participation;

(*d*) Ensure that the practice of open access to all data catalogued by RNODC-Waves for all data contributors is known by potential contributors.

Visual wave observations

3. Much of the wave information used in climatological studies and in operational forecasting is acquired as visual observations from shipping (especially from vessels in the VOS system). The use of such data requires caution as they exhibit considerable variability in quality. These data can be enhanced by seeking more uniform observing practices through training and providing guidance material. Guidance material is reviewed in the *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8) and the *Guide to Wave Analysis and Forecasting* (WMO-No. 702).

Recommended actions

Include material on wave observation practices in relevant WMO training seminars.

B. BASIC WAVE SERVICES

Real-time wave analysis and forecasting

4. Access to appropriate surface wind fields still remains one of the most limiting factors to wave nowcasting and forecasting. It is important to assess specific requirements for boundary-layer fields to be used in various types of wave models and in wave nowcasting and forecasting. This is particularly pertinent as surface winds derived from satellite data become incorporated into wind and wave estimation.

Recommended action:

Publish a review on boundary layer wind fields to be used in wave modelling.

Use of observations in wave forecasting

5. Very often wave observations are not used in wave analysis and forecasting. Waves are diagnosed from wind information. The application of observed data (both wave and wind) in operational forecasting has to be promoted and existing techniques for observation assimilation in predictive models have to be reviewed. Of particular importance at present is the progress in assimilation of remotely-sensed wave and marine surface wind data. This item should be pursued in conjunction with the Rapporteur on Ocean Satellites.

Recommended action:

Prepare a review on techniques and benefits of the use of satellite-derived data in wave and marine surface wind models and on assimilation of observations (especially remotely-sensed waves and near surface wind) in wave forecasting.

Wave hindcast/forecast verification

6. The lack of sufficient volume of high quality continuing observations for a long time was a limiting factor in the verification of operational wave hindcasts and forecasts. In its turn, it slowed down considerably the development of wave modelling and forecasting. Recognizing this fact a group of wave modellers initiated a project on real-time verification of large-scale wave models and operational exchange of skill scores. This activity can help in the evaluation of operational wave analysis and forecast skill of many national centres and therefore facilitate further development of wave prediction techniques through elimination of persistent biases and identification of areas of potential improvement. In addition, estimates of characteristic wave analysis and forecast errors may be used in some applications and in the development of data assimilation techniques.

Recommended actions:

(*a*) Promote the verification of operational wind/wave analyses and forecasts, establishing a standard set of scores and encouraging the exchange of verification scores between all operational centres;

(*b*) Elicit within national reviews all reports on known work regarding experiments on instrumental and model intercomparisons and verifications, including relevant bibliographies.

C. SPECIAL WAVE-RELATED SERVICES

Application of wave and surface wind data to interdisciplinary problems

7. The application of wave information to interdisciplinary problems is an important motivation for its acquisition and processing. Wave and surface wind data are components in integrated environmental modelling efforts, which are providing a holistic approach to a range of problems involving biophysical, land-sea and air-sea actions.

8. The wave programme should ensure that the requirements of wave information and its applications in areas of national and international concern (such as marine pollution, coastal erosion, etc.) and other special services (ship routeing, fisheries, aquaculture, etc.) are understood and facilitated. Special attention is to be paid to wave information requirements of various modules of GOOS.

Recommended action:

Establish requirements for wave and wind information, its application, and its relationship to other elements in a range of environmental problems, especially those connected to various modules of GOOS.

Hindcast studies

9. With the increasing use of numerical wave models to generate wave climatologies by hindcasting, a wealth of synthetic wave data is accumulating. These data extend knowledge of the wave conditions from areas in the vicinity of wave measuring devices to regions where no such instruments have ever been deployed. An inventory of known hindcast and measured climatologies is given in the revised *Guide to Wave Analysis and Forecasting*.

Recommended action:

Monitor studies on surface wind and wave climatologies and continually update the inventory of hindcast climatologies, in particular through the Subgroup on Marine Climatology.

Extreme wave events

10. Wave nowcasting and forecasting concentrates on routine parameters and extrapolation from those parameters (for example to expected maximum height). Many users are only perturbed by unlikely or rogue waves in the present storm event. An effort is needed to establish techniques to assess the risk of extreme waves occurring.

Recommended action:

Review the subject and prepare a technical note on the occurrence and forecasting of extreme waves.

Storm surges

11. Storm surges are an important factor in marine and coastal forecasting for many regions. They are often associated with severe weather events. Coasts of the northern part of the Indian Ocean are especially prone to storm surges. Basic technical guidance for forecasting surge events, both in tropical and mid-latitudes, should be provided. Furthermore, publication on what services are presently available and what models are employed by organizations actively providing storm surge forecasts should be initiated.

Recommended actions:

(*a*) Survey present surge forecasting services and disseminate information to Members;

(*b*) Support further development of the storm surge forecasting project in the Bay of Bengal and in the northern part of the Indian Ocean.

D. GUIDANCE MATERIAL AND ASSISTANCE

Guide to Wave Analysis and Forecasting

12. The *Guide to Wave Analysis and Forecasting* (WMO-No. 702) was recently revised. Its updating should be an ongoing effort. Translation of the revised *Guide* from English into other WMO languages is required.

Recommended action:

Develop a methodology for ongoing review and updating of the *Guide*.

Catalogue of wave programme-related activities

13. The cataloguing of operational and experimental wave models has become an established activity and regular updates are a useful means of disseminating to Members the nature and status of models currently in use. Furthermore, the standardization of presentation formats for chart and grid-point data from wave models would be promoted by the exposure of acceptable and technically-correct formats.

Recommended action:

Prepare regular updates (two-yearly) of the catalogue of operational and experimental wave models along with their products and disseminate these alongside other wave programme information in WMO publications.

Training and other types of assistance

14. Establishment and improvement of the provision of services can only be achieved by adequately training staff. Every opportunity should be taken to incorporate wave analysis and forecasting material in training workshops and seminars on marine meteorology, and Member States, which run professional meteorology courses, should be encouraged to include specific course material on wave analysis and forecasting.

15. Furthermore, WMO should provide assistance in the creation of new national and international wave programmes providing guidance and assistance to Members in establishing wave-related services and in implementing wave models.

Recommended actions:

(*a*) Encourage Members to include specific material on wave analysis and forecasting in training courses;

(*b*) Organize training courses and workshops to include wave analysis and forecasting and promote the inclusion of such material in an advanced physical oceanography and marine meteorology course in RMTC Nairobi;

(*c*) Provide assistance, as required, to Members or groups of Members on the establishment and development of wave-related services including, in particular, technology transfer relating to forecast model software for PCs and workstations.

E. DEVELOPMENT

Wave modelling

16. The rapid development in wave modelling in recent years has made it necessary to monitor the state-of-the-art and make such information available to Members. Much of the effort is now focusing on specialized and local applications. Apart from the increased resolution often required in such applications there are a number of factors needing more detailed attention, such as effects of complicated topography, shallow water, strong tides and currents, wind modification near land-sea interface, etc. Numerical implementation of spectral wave models deserves a special attention. Through the wave programme, expert advice on such specialized requirements can be provided. The collation of such technical information, and continuing reviews of practices adopted by various wave modellers is desirable.

Recommended actions:

(*a*) Monitor the state-of-the-art in wave modelling and wave model numerical implementation;

(*b*) Prepare information on the application of wave models in areas affected by strong local influences, such as complicated topography, currents, shallow water, tides, etc.;

(*c*) Establish and maintain contacts with other research communities developing wind wave models and extend international cooperation in the scientific and technical aspects of wave modelling and related areas.

Combined ocean-atmosphere-sea ice modelling

17. Waves are only one manifestation of the atmosphere-ocean interaction. The role of waves in

the exchange of momentum, heat and gases in the system "ocean-atmosphere-sea ice" is an important research problem. The dependence of the sea roughness and other related variables on sea state (wave age) has to be taken into account in the coupled models of ocean and atmosphere. The requirements for wind and wave data in such research problems need to be addressed.

Recommended action:

Review requirements for use of a fully interactive wind wave model in a number of research areas where joint models of ocean and atmosphere have to be employed (such as climate simulation and long-range weather prediction).

New types of data, techniques and experiments for the measurement of waves and surface wind

18. Preparing Members for introduction of new kinds of data is part of a continuing campaign to share the benefits of new technology. Members should be made aware of the expected impact of new data streams and how to use such data.

19. By making information available to Members, they are in a better position to take opportunities for exploiting new technology and for participating in national and international initiatives. National reports of known work are elicited through the national focal points in conjunction with the survey of wave models. These keep Members informed on progress in developing techniques.

20. Cooperation with international and national research projects depends on local involvement of personnel who are associated with national Meteorological Services. Such involvement is to be encouraged through national focal points. Publicity should be given to future plans and to network experiments to facilitate cooperation of parties with a potential interest. This includes large-scale international efforts which have some element of interest to the WMO wave programme.

Recommended actions:

(*a*) Consider procedures and techniques for the operational application of new types of satellite-derived data by national Meteorological Services;

(*b*) Continue to update and publish information on new techniques for the measurement of waves and surface wind;

(*c*) Collate and publish material on major wave/marine wind experimental campaigns.

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 7 (CMM-XII)

REVISED MINIMUM QUALITY CONTROL STANDARDS

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) The *Manual on Marine Meteorological Services* (WMO-No. 558), paragraph 5.6.3.1 and Appendix I.15 — Minimum quality control standards,

(2) The final report of the seventh session of the CMM Subgroup on Marine Climatology (Geneva, April 1996), paragraphs 4.1.1 and 4.1.2 and Annex VIII,

RECOGNIZING that the experience gained by the Global Collecting Centres in the operation of the Marine Climatological Summaries Scheme had enabled them to evaluate and clarify the application of the existing minimum quality control standards,

CONSIDERING that the correct and uniform application by contributing Members of agreed minimum quality control standards is essential to ensuring that high quality marine climatological data are available under the MCSS to support the whole range of applications,

RECOMMENDS:

(1) That the revised minimum quality control standards given in the annex to this recommendation should be adopted to replace those presently given in Appendix I.15 of the *Manual on Marine Meteorological Services* (WMO-No. 558);

(2) That these minimum quality control standards should be strictly and universally applied by all Members contributing data under the MCSS.

ANNEX TO RECOMMENDATION 7 (CMM-XII)

MINIMUM QUALITY CONTROL STANDARDS

NOTE: See specification for quality control indicators Q_1 to Q_{20} at the end of this annex. Δ = space (ASCII 32)

Element	*Error*	*Action*
1	$i_T \neq$ 0-5	Correct manually
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	G ≠ 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 $Q_{20} = 4$
	$L_aL_aL_a$ = ΔΔΔ	$Q_{20} = 2$
8	$L_oL_oL_oL_o \neq$ 0000-1800	Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$
	$L_oL_oL_oL_o$ = ΔΔΔΔ	$Q_{20} = 2$
But	$L_aL_aL_a = L_oL_oL_oL_o$ = ΔΔΔ(Δ)	Correct manually otherwise reject

Element	*Error*	*Action*
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 $Q_1 = 4$
	h = Δ	$Q_1 = 9$
11	VV ≠ 90-99, ΔΔ	Correct manually and $Q_2 = 5$, otherwise $Q_2 = 4$
	VV = ΔΔ	$Q_2 = 9$
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, ΔΔ	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 ≠ 0, 1, 3, 4	Correct manually, otherwise $Q_5 = 4$
15	ff > 80 knots	Correct manually and $Q_5 = 5$, otherwise $Q_5 = 3$
	ff = ΔΔ, //	$Q_5 = 9$
16	S_n ≠ 0, 1	Correct manually, otherwise $Q_6 = 4$
17	TTT = ΔΔΔ, ///	$Q_6 = 9$
	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_n ≠ 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 = ΔΔΔ	$Q_7 = 9$
20	930 > PPPP > 1 050 hPa	Correct manually and $Q_8 = 1$, 3 and, if corrected, $Q_8 = 5$
	870 > PPPP > 1 070 hPa	Correct manually and $Q_8 = 5$, otherwise $Q_8 = 4$
	PPPP = ΔΔΔΔ	$Q_8 = 9$
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 $Q_9 = 4$
22, 23	$W_1 = W_2 = 7$ and latitude <20°	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
	$W_1 < W_2$	Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$
	$W_1 = W_2 = Δ$, /	$Q_9 = 9$
24-27	N = 0, Δ, 9 and $N_h C_L C_M C_H$ ≠ Δ	Correct manually and $Q_3 = 5$, otherwise $Q_3 = 4$

Element	*Error*	*Action*
28	$s_n \neq 0, 1$	Correct manually otherwise $Q_{10} = 4$
29	$T_wT_wT_w = \Delta\Delta\Delta$, ///	$Q_{10} = 9$
	if -2.0 > $T_wT_wT_w$ > 37.0 then	
	when latitude < 45.0	
	$T_wT_wT_w$ < -2.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$
	$T_wT_wT_w$ > 37.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$
	when latitude >= 45.0	
	$T_wT_wT_w$ < -2.0	Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$
	$T_wT_wT_w$ > 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_wP_w < 30	$Q_{11} = 3$
	P_wP_w > 30 and ≠ 99	$Q_{11} = 4$
	$P_wP_w = \Delta\Delta$, //	$Q_{11} = 9$
33	35< H_wH_w < 50	$Q_{12} = 3$
	H_wH_w > = 50	$Q_{12} = 4$
	$H_wH_w = \Delta\Delta$, //	$Q_{12} = 9$
34	d_{w1} d_{w1} ≠ 00-36, 99, ΔΔ	Correct manually and $Q_{13} = 5$, otherwise $Q_{13} = 4$
	$swell_1 = swell_2 = \Delta$	$Q_{13} = 9$
35	25 < $P_{w1}P_{w1}$ < 30	$Q_{13} = 3$
	$P_{w1}P_{w1}$ > 30 and ≠ 99	$Q_{13} = 4$
36	35 < $H_{w1}H_{w1}$ < 50	$Q_{13} = 3$
	$H_{w1}H_{w1}$->= 50	$Q_{13} = 4$
37	$I_s \neq 1$-5, Δ	Correct manually, otherwise Δ
38	$E_sE_s \neq 00$-99, ΔΔ	Correct manually, otherwise ΔΔ
39	$R_s \neq 0$-4, Δ	Correct manually, otherwise Δ
40	Source ≠ 0-6	Correct manually
41	Platform ≠ 0-9	Correct manually
42	No call sign	Insert manually
43	No country code	Insert manually
44		No quality control
45	Q ≠ 0-6, 9	Correct manually
46	$i_x \neq 1$-7	Correct manually
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 $Q_{14} = 2$
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	$s_n \neq 0, 1, 2, 5, 6, 7, 9$	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 $Q_{15} = 5$, otherwise $Q_{15} = Q_{16} = 2$
	a = Δ	$Q_{15} = 9$
53	ppp > 150	Correct manually and $Q_{16} = 1, 3$ and if corrected $Q_{16} = 5$
	ppp > 250	Correct manually and $Q_{16} = 5$ otherwise $Q_{16} = 4$
	ppp = ΔΔΔ	$Q_{16} = 9$
54	$D_s \neq 0$-9, Δ	Correct manually and $Q_{17} = 5$, otherwise $Q_{17} = 4$
	$D_s = \Delta$, /	$Q_{17} = 9$
55	$V_s \neq 0$-9, Δ	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	$Q_{13} = 3$
	$P_{w2}P_{w2}$ > 30 and ≠ 99	$Q_{13} = 4$
58	35 < $H_{w2}H_{w2}$ < 50	$Q_{13} = 3$
	$H_{w2}H_{w2}$ >= 50	$Q_{13} = 4$

Element	*Error*	*Action*
59	$c_i \neq$ 0-9, Δ	Correct manually, otherwise Δ
60	$s_i \neq$ 0-9, Δ	Correct manually, otherwise Δ
61	$b_i \neq$ 0-9, Δ	Correct manually, otherwise Δ
62	$D_i \neq$ 0-9, Δ	Correct manually, otherwise Δ
63	$z_i \neq$ 0-9, Δ	Correct manually, otherwise Δ

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
6-8	Reserve
9	The value of the element is missing

RECOMMENDATION 8 (CMM-XII)

HARMONIZED COUNTRY CODES IN THE IMMT FORMAT AND THE *INTERNATIONAL LIST OF SELECTED, SUPPLEMENTARY AND AUXILIARY SHIPS* (WMO-NO. 47)

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 16 (CMM-XI) — Modifications to the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47),

(2) The final report of the seventh session of the CMM Subgroup on Marine Climatology (Geneva, April 1996), paragraphs 7.1 and 7.2 and Annex XI,

NOTING with appreciation that:

(1) WMO-No. 47 had been revised in accordance with the recommendation of CMM-XI and was now available to users in electronic form, including through the WMO homepage on the Internet,

(2) The ISO Alpha-2 country or area codes had already been adopted for use in the *International List of Selected, Supplementary and Auxiliary Ships*,

CONSIDERING:

(1) The importance to users of marine climatological data of having the same country code system used uniformly in the *International List of Selected, Supplementary and Auxiliary Ships*, in data exchange in the IMMT format, and in the MCSS data archives,

(2) That the MCSS archives could adapt to the use of the ISO Alpha-2 code,

BEING INFORMED that the ISO codes were likely to remain stable, with former country codes continuing to be available,

RECOMMENDS:

(1) That the ISO Alpha-2 country or area codes given in the annex to this recommendation be used as the country codes in the IMMT format for MCSS data exchange and in the MCSS data archives, with effect for data exchange from 1 January 1998;

(2) That these codes be included in the *Guide to Marine Meteorological Services* (WMO-No. 471), to replace the existing IMMT country codes, with effect from the same date.

ANNEX TO RECOMMENDATION 8 (CMM-XII)

STANDARD COUNTRY OR AREA CODES FOR STATISTICAL USE

Interim list, November 1995

NOTE

This interim list contains the latest available information on numerical codes and 12-character abbreviations of the English language names of countries or areas, assigned for statistical use by the United Nations Statistics Division (UNSD). It also includes corresponding two- and three-character alphabetical codes

assigned by the International Organization for Standardization (ISO).

The names of countries or areas shown in this interim list are the English language names in the form generally used in publications of UNSD. These are not the full names usually used in formal documents such as treaties; rather these are the names used for general purposes at the United Nations. For information about official country names of the United Nations Member States see Terminology Bulletin No. 347, *Country Names*, and its corrigenda.

The ISO alphabetical codes are printed with the permission of:

International Organization for Standardization
3166 Maintenance Agency
DIN. Burgrafenstrasse 6
D-10787 Berlin
GERMANY

Questions about alphabetical codes should be addressed to ISO directly. Any other questions should be addressed to:

The Director
United Nations Statistics Division, United Nations
New York, N.Y. 10017
USA

This interim list will be subject to final adjustments when formally incorporated into the next version of the United Nations publication *Standard Country or Area Codes for Statistical Use*, series M. No. 49. For further information, see *Standard Country or Area Codes for Statistical Use*, series M. No. 49, Rev. 2.

PART I — Current Country or Area Codes

[Country or area codes assigned since 4 June 1990 are identified by an asterisks (*). See Part II for information about related country or area codes for former listings.]

Code	*Country or area*	*Standard abbreviation*	*ISO-Code* *Alpha-2*	*Alpha-3*
004	Afghanistan	AFGHANISTAN	AF	AFG
008	Albania	ALBANIA	AL	ALB
012	Algeria	ALGERIA	DZ	DZA
016	American Samoa	AMER SAMOA	AS	ASM
020	Andorra	ANDORRA	AD	AND
024	Angola	ANGOLA	AO	AGO
660	Anguilla	ANGUILLA	AI	AIA
028	Antigua and Barbuda	ANTIGUA,BARB	AG	ATG
032	Argentina	ARGENTINA	AR	ARG
051*	Armenia	ARMENIA	AM	ARM
533	Aruba	ARUBA	AW	ABW
036	Australia	AUSTRALIA	AU	AUS
040	Austria	AUSTRIA	AT	AUT
031*	Azerbaijan	AZERBAIJAN	AZ	AZE
044	Bahamas	BAHAMAS	BS	BHS
048	Bahrain	BAHRAIN	BH	BHR
050	Bangladesh	BANGLADESH	BD	BGD
052	Barbados	BARBADOS	BB	BRB
112	Belarus	BELARUS	BY	BLR
056	Belgium	BELGIUM	BE	BEL
084	Belize	BELIZE	BZ	BLZ
204	Benin	BENIN	BJ	BEN
060	Bermuda	BERUMDA	BM	BMU
064	Bhutan	BHUTAN	BT	BTN
068	Bolivia	BOLIVA	BO	BOL
070*	Bosnia and Herzegovina	BOSNIA HERZG	BA	BIH
072	Botswana	BOTSWANA	BW	BWA
076	Brazil	BRAZIL	BR	BRA
086	British Indian Ocean Territory	BR.UBD.IC.TR	IO	IOT
092	British Vergin Islands	BR.VIRGIN IS	VG	VGB
096	Brunei Darussalam	BRUNEI DARSM	BN	BRN
100	Bulgaria	BULGARIA	BG	BGR
854	Burkina Faso	BURKINA FASO	BF	BFA

Code	Country or area	Standard abbreviation	ISO-Code Alpha-2	ISO-Code Alpha-3
108	Burundi	BURUNDI	BI	BDI
116	Cambodia	CAMBODIA	KH	KHM
120	Cameroon	CAMEROON	CM	CMR
124	Canada	CANADA	CA	CAN
132	Cape Verde	CAPE VERDE	CV	CPV
136	Cayman Islands	CAYMAN IS	KY	CYM
140	Central African Republic	CENT.AFR.REP	CF	CAF
148	Chad	CHAD	TD	TCD
830	Channel Islands	CHANNEL IS		
152	Chile	CHILE	CL	CHL
156	China	CHINA	CN	CHN
162	Christmas Island [Australia]	CHRISTMAS IS	CX	CXR
166	Cocos (Keeling) Islands	COCOS IS	CC	CCK
170	Colombia	COLOMBIA	CO	COL
174	Comoros	COMOROS	KM	COM
178	Congo	CONGO	CG	COG
184	Cook Islands	COOK IS	CK	COK
188	Costa Rica	COSTA RICA	CR	CRI
384	Côte d'Ivoire	COTE DIVOIRE	CI	CIV
191*	Croatia	CROATIA	HR	HRV
192	Cuba	CUBA	CU	CUB
196	Cyprus	CYPRUS	CY	CYP
203*	Czech Republic	CZECH REP	CZ	CZE
208	Denmark	DENMARK	DK	DNK
262	Djibouti	DJIBOUTI	DJ	DJI
212	Dominica	DOMINICA	DM	DMA
214	Dominican Republic	DOMINICAN RP	DO	DOM
626	East Timor	EAST TIMOR	TP	TMP
218	Ecuador	ECUADOR	EC	ECU
818	Egypt	EGYPT	EG	EGY
222	El Salvador	EL SALVADOR	SV	SLV
226	Euatorial Guinea	EQ.GUINEA	GQ	GNQ
232*	Eritrea	ERITREA	ER	ERI
233*	Estonia	ESTONIA	EE	EST
231*	Ethiopia	ETHIOPIA	ET	ETH
234	Faeroe Islands	FAEROE IS	FO	FRO
238	Falkland Islands (Malvinas)	FALKLAND IS	FK	FLK
242	Fiji	FIJI	FJ	FJI
246	Finland	FINLAND	FI	FIN
250	France	FRANCE	FR	FRA
254	French Guiana	FR.GUIANA	GF	GUF
258	French Polynesia	FR.POLYNESIA	PF	FYF
266	Gabon	GABON	GA	GAB
270	Gambia	GAMBIA	GM	GMB
268*	Georgia	GEORGIA	GE	GEO
276*	Germany	GERMANY	DE	DEU
288	Ghana	GHANA	GH	GHA
292	Gibraltar	GIBRALTAR	GI	GIB
300	Greece	GREECE	GR	GRC
304	Greenland	GREENLAND	GL	GRL
308	Grenada	GRENADA	GD	GRD
312	Guadeloupe	GUADELOUPE	GP	GLP
316	Guam	GUAM	GU	GUM
320	Guatemala	GUATEMALA	GT	GTM
324	Guinea	GUINEA	GN	GIN
624	Guinea-Bissau	GUINEABISSAU	GW	GNB

Code	Country or area	Standard abbreviation	ISO-Code Alpha-2	ISO-Code Alpha-3
328	Guyana	GUYANA	GY	GUY
332	Haiti	HAITI	HT	HTI
336	Holy See	HOLY SEE	VA	VAT
340	Honduras	HONDURAS	HN	HND
344	Hong Kong	HONG KONG	HK	HKG
348	Hungary	HUNGARY	HU	HUN
352	Iceland	ICELAND	IS	ISL
356	India	INDIA	IN	IND
360	Indonesia	INDONESIA	ID	IDN
364	Iran, Islamic Republic of	IRAN	IR	IRN
368	Iraq	IRAQ	IQ	IRQ
372	Ireland	IRELAND	IE	IRL
833	Isle of Man	ISLE OF MAN	IM	IMY
376	Israel	ISRAEL	IL	ISR
380	Italy	ITALY	IT	ITA
388	Jamaica	JAMAICA	JM	JAM
392	Japan	JAPAN	JP	JPN
396	Johnston Island	JOHNSTON IS	JT	JTN
400	Jordan	JORDAN	JO	JOR
398*	Kazakstan	KAZAKSTAN	KZ	KAZ
404	Kenya	KENYA	KE	KEN
296	Kiribati	KIRIBATI	KI	KIR
408	Korea, Democratic People's Republic of	KOREA D P RP	KP	PRK
410	Korea, Republic of	KOREA REP.	KR	KOR
414	Kuwait	KUWAIT	KW	KWT
417*	Kyrgyzstan	KYRGYZSTAN	KG	KGZ
418	Lao People's Democratic Republic	LAO P.DEM.R.	LA	LAO
428*	Latvia	LATVIA	LV	LVA
422	Lebanon	LEBANON	LB	LBN
426	Lesotho	LESOTHO	LS	LSO
430	Liberia	LIBERIA	LR	LBR
434	Libyan Arab Jamahiriya	LIBYA	LY	LBY
438	Liechtenstein	LIECHTENSTEN	LI	LIE
440*	Lithuania	LITHUANIA	LT	LTU
442	Luxembourg	LUXEMBOURG	LU	LUX
446	Macau	MACAU	MO	MAC
450	Madagascar	MADAGASCAR	MG	MDG
454	Malawi	MALAWI	MW	MWI
458	Malaysia	MALAYSIA	MY	MYS
462	Maldives	MALDIVES	MV	MDV
466	Mali	MALI	ML	MLI
470	Malta	MALTA	MT	MLT
584*	Marshall Islands	MARSHALL IS	MH	MHL
474	Martinique	MARTINIQUE	MQ	MTQ
478	Mauritania	MAURITANIA	MR	MRT
480	Mauritius	MAURITIUS	MU	MUS
484	Mexico	MEXICO	MX	MEX
583*	Micronesia, Federation States of	MICRONESIA	FM	FSM
488	Midway Islands	MIDWAY IS	MI	MID
492	Monaco	MONACO	MC	MCO
496	Mongolia	MONGOLIA	MN	MNG
500	Montserrat	MONTSERRAT	MS	MSR
504	Morocco	MOROCCO	MA	MAR
508	Mozambique	MOZAMBIQUE	MZ	MOZ
104	Myanmar	MYANMAR	MM	MMR
516	Namibia	NAMIBIA	NA	NAM

Code	Country or area	Standard abbreviation	ISO-Code Alpha-2	ISO-Code Alpha-3
520	Nauru	NAURU	NR	NRU
524	Nepal	NEPAL	NP	NPL
528	Netherlands	NETHERLANDS	NL	NLD
530	Netherlands Antilles	NETHANTILLES	AN	ANT
540	New Caledonia	NEW CALEDONIA	NC	NCL
554	New Zealand	NEW ZEALAND	NZ	NZL
558	Nicaragua	NICARAGUA	NI	NIC
562	Niger	NIGER	NE	NER
566	Nigeria	NIGERIA	NG	NGA
570	Niue	NIUE	NU	NIU
574	Norfolk Island	NORFOLK IS	NF	NFK
580*	Northern Mariana Islands	N.MARIANA IS	MP	MNP
578	Norway	NORWAY	NO	NOR
512	Oman	OMAN	OM	OMN
586	Pakistan	PAKISTAN	PK	PAK
585*	Palau	PALAU	PW	PLW
275*	Palestine	PALESTINE		
591	Panama	PANAMA	PA	PAN
598	Papua New Guinea	PAPUA N.GUIN	PG	PNG
600	Paraguay	PARAGUAY	PY	PRY
604	Peru	PERU	PE	PER
608	Philippines	PHILIPPINES	PH	PHL
612	Pitcairn	PITCAIRN	PN	PCN
616	Poland	POLAND	PL	POL
620	Portugal	PORTUGAL	PT	PRT
630	Puerto Rico	PUERTO RICO	PR	PRI
634	Qatar	QATAR	QA	QAT
498*	Republic of Moldova	REP MOLDOVA	MD	MDA
638	Reunion	REUNION	RE	REU
642	Romania	ROMANIA	RO	ROM
643*	Russian Federation	RUSSIAN FED	RU	RUS
646	Rwanda	RWANDA	RW	RWA
654	Saint Helena	ST.HELENA	SH	SHN
659	Saint Kitts and Nevis	ST.KITTS-NEV	KN	KNA
662	Saint Lucia	ST.LUCIA	LC	LCA
666	Saint Pierre and Miquelon	ST.PIERRE.MQ	PM	SPM
670	Saint Vincent and the Grenadines	ST.VINCENT.G	VC	VCT
882	Samoa	SAMOA	WS	WSM
674	San Marino	SAN MARINO	SM	SMR
678	Sao Tome and Principe	SAO TOME PRN	ST	STP
682	Saudi Arabia	SAUDI ARABIA	SA	SAU
686	Senegal	SENEGAL	SN	SEN
690	Seychelles	SEYCHELLES	SC	SYC
694	Sierra Leone	SIERRA LEONE	SL	SLE
702	Singapore	SINGAPORE	SG	SGP
703*	Slovakia	SLOVAKIA	SK	SVK
705*	Slovenia	SLOVENIA	SI	SVN
090	Solomon Islands	SOLOMON IS	SB	SLB
706	Somalia	SOMALIA	SO	SOM
710	South Africa	SOUTH AFRICA	ZA	ZAF
724	Spain	SPAIN	ES	ESP
144	Sri Lanka	SRI LANKA	LK	LKA
736	Sudan	SUDAN	SD	SDN
740	Suriname	SURINAME	SR	SUR
744	Svalbard and Jan Mayen Islands	SVALBARD IS	SJ	SJM
748	Swaziland	SWAZILAND	SZ	SWZ

Code	Country or area	Standard abbreviation	ISO-Code Alpha-2	ISO-Code Alpha-3
752	Sweden	SWEDEN	SE	SWE
756	Switzerland	SWITZERLAND	CH	CHE
760	Syrian Arab Republic	SYRIA	SY	SYR
762*	Tajikistan	TAJIKISTAN	TJ	TJK
764	Thailand	THAILAND	TH	THA
807*	The former Yugoslav Republic of Macedonia	TFYR MACEDNA	MK	MKD
768	Togo	TOGO	TG	TGO
772	Tokelau	TOKELAU	TK	TKL
776	Tonga	TONGA	TO	TON
780	Trinidad and Tobago	TRINIDAD TBG	TT	TTO
788	Tunisia	TUNISIA	TN	TUN
792	Turkey	TURKEY	TR	TUR
795*	Turkmenistan	TURKMENISTAN	TM	TKM
796	Turks and Caicos Islands	TURKS.CAICOS	TC	TCA
798	Tuvalu	TUVALU	TV	TUV
800	Uganda	UGANDA	UG	UGA
804	Ukraine	UKRAINE	UA	UKR
784	United Arab Emirates	UNTD ARAB EM	AE	ARE
826	United Kingdom	UK	GB	GBR
834	United Republic of Tanzania	TANZANIA	TZ	TZA
840	United States	USA	US	USA
850	United States Virgin Islands	US.VIRGIN IS	VI	VIR
858	Uruguay	URUGUAY	UY	URY
860*	Uzbekistan	UZBEKISTAN	UZ	UZB
548	Vanuatu	VANUATU	VU	VUT
862	Venezuela	VENEZUELA	VE	VEN
704	Viet Nam	VIET NAM	VN	VNM
872	Wake Island	WAKE IS	WK	WAK
876	Wallis and Futuna Islands	WALIS FUT.I	WF	WLF
732	Western Sahara	WESTN.SAHARA	EH	ESH
887*	Yemen	YEMEN	ZR	ZAR
891*	Yugoslavia	YUGOSLAVIA	YU	YUG
180	Zaire	ZAIRE	ZR	ZAR
894	Zambia	ZAMBIA	ZM	ZMB
716	Zimbabwe	ZIMBABWE	ZW	ZWE

P A R T 1: TRANSITIONAL RESERVATIONS

Former codes used in ISO 3166:1988

Former codes should not be used during a period of at least five years after a change (Clause 6.4.1 of ISO 3166:1993)

The dates of reservation are indicated in brackets.

LIST OF RESERVED ALPHA-2 CODES

BU	Burma	(1989–12)
CS	Czechoslovakia	(1993–06)
NT	Neutral Zone	(1993–07)
SF	Finland	(1995–09)
SU	USSR	(1992–09)

LIST OF RESERVED ALPHA-3 CODES

BUR	Burma	(1989–12)
BYS	Byelorussian SSR	(1992–06)

CSK	Czechoslovakia	(1993–06)
NTZ	Neutral Zone	(1993–07)
SUN	USSR	(1992–09)

P A R T 2: EXCEPTIONAL AND INDETERMINATE RESERVATIONS

Exceptional Reservations

Codes may be reserved exceptionally for entities for which the Maintenance Agency has not found reasons for inclusion in the entity list, but for which an exchange requirement exists. Before such codes are reserved approval of the relevant entity authority must be obtained (Clause 6.4.3 of ISO 3166:1993). Exceptional reservations were made on behalf of:

CCC = Code reserved on special request of Customs Cooperation Council
FR = Code reserved on special request of France
GB = Code reserved on special request of the United Kingdom
ITU = Code reserved on special request of the International Telecommunication Union
UPU = Code used by the Universal Postal Union

Indeterminate Reservations

Certain code designations existing in other coding systems at the time of publication of ISO 3166 but differing from those established in this Standard should not be used for designating different entities in ISO 3166[1)]. Code designations of coding systems other than ISO 3166 may be reserved for an indeterminate period.

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1) The Maintenance Agency has noted that the World Intellectual Property Organization (WIPO) uses the following nine code elements:

AP	=	African Regional Industrial Property Organization
BX	=	Benelux Office for Industrial Property
EF	=	Union of Countries under the European Community Patent Convention
EM	=	European Trademark Office
EP	=	European Patent Organization
EV	=	Eurasian Patent Organization
IB	=	International Bureau of WIPO
OA	=	African Intellectual Property Organization
WO	=	World Intellectual Property Organization

Additionally, the Maintenance Agency has noted that the following code elements are used in ISO/IEC 7501-1 (1993) *Idenfication Cards — Machine Readable Travel Documents.* Part 1: Machine readable passport:

GBD	=	Identifies a British Passport holder who is a "dependent territories citizen"
GBN	=	Identifies a British Passport holder who is a "Overseas National"
GBO	=	Identifies a British Passport holder who is a "Overseas Citizen"
GBP	=	Identifies a British Passport holder who is a "Protected Person"
GBS	=	Identifies a British Passport holder who is a "Subject"
UNO	=	Used to designate the United Nations Organization as the issuer and used as a substitute for nationality where the holder is an official of the United Nations Organization
UNA	=	Used a substitute for nationality where the holder is an Official of a Specialized Agency of the United Nations Organization

The ISO 3166/MA will not use these alpha-2 and alpha-3 code elements at the present stage.
This applies to country designations notified under the 1949 and 1968 United Nations Conventions on Road Traffic:

R 49	=	1949 United Nations Convention on Road Traffic
R 68	=	1968 United Nations Convention on Road Traffic
R	=	List of car vehicle distinguishing signs notified to the Secretary-General of the United Nations on 1994-01-01 under the 1949/68 Conventions on Road Traffic
R *)	=	1949 United Nations Conventions on Road Traffic (Signs in use, but not notified to the Secretary-General of the United Nations)

LIST OF RESERVED ALPHA-2 CODES

AC	Ascension Island	UPU
DG	Diego Garcia	ITU
DY	Benin	R

EA	Ceuta, Melilla	CCC
EW	Estonia	R
FL	Liechtenstein	R *)
FX	France, Metropolitan	FR
GG	Guernsey	UPU
IC	Canary Islands	CCC
IM	Isle of Man	UPU
JA	Jamaica	R 49
JE	Jersey	UPU
LF	Libya Fezzan	R *)
LT	Libya Tripoli	R *)
ME	Western Sahara	R *)
PI	Philippines	R 49
RA	Argentina	R 49
RB	Bolivia	R *)
		identical code element
RB	Botswana	R 49
RC	China	R 49
RH	Haiti	R
RI	Indonesia	R 49
RL	Lebanon	R 49
RM	Madagascar	R 49
RN	Niger	R 68
RP	Philippines	R 68
RU	Burundi	R *)
TA	Tristan de Cunha	UPU
UK	United Kingdom	GB
WG	Grenada	R
WL	Saint Lucia	R
WV	Saint Vincent	R
YV	Venezuela	R

LIST OF RESERVED ALPHA-3 CODES

ADN	Aden		R
ASC	Ascension Island	ITU use	UPU
BDS	Barbados		R
BRU	Brunei		R
CDN	Canada		R
DGA	Diego Garcia		ITU
EAK	Kenya		R
EAT	Tanganyika (Part of Tanzania, United Republic of)		R
EAU	Uganda		R
EAZ	Zanzibar (Part of Tanzania, United Republic of)		R
FXX	France, Metropolitan		FR
GBA	Alderney		R
GBG	Guernsey		R
GBJ	Jersey		R
GBM	Isle of Man		R
GBZ	Gibraltar		R
GCA	Guatemala		R
GGY	Guernsey		UPU
HKJ	Jordan		R
IMN	Isle of Man		UPU
JEY	Jersey		UPU
MAL	Malaysia		R
RCA	Central African Republic		R
RCB	Congo, People's Republic of		R

RCH	Chile	R
RMM	Mali	R
RNR	Zambia	R
ROK	Korea, Republic of	R
ROU	Uruguay	R
RSR	Southern Rhodesia (now ZW Zimbabwe)	R
RSM	San Marino	R
SLO	Slovenia	R
SME	Surinam	R
TAA	Tristan da Cunha	UPU
TMN	Turkmensitan	R
WAG	Gambia	R
WAL	Sierra Leone	R
WAN	Nigeria	R
ZRE	Zaire, People's Republic of	R

RECOMMENDATION 9 (CMM-XII)

MODIFICATIONS TO THE *INTERNATIONAL LIST OF SELECTED, SUPPLEMENTARY AND AUXILIARY SHIPS* (WMO-NO. 47)

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) Recommendation 16 (CMM-XI) — Modifications to the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No. 47),

(2) The final report of the seventh session of the CMM Subgroup on Marine Climatology (Geneva, May 1996),

CONSIDERING:

(1) That the WMO *International List of Selected, Supplementary and Auxiliary Ships* is a valuable tool in monitoring the quality of surface marine observations, as well as in processing these observations for climate study purposes,

(2) That additional information on the location, type, exposure, etc. of meteorological instrumentation onboard ships of the VOS is essential for an accurate interpretation of the observations from these ships, for both operational and research purposes,

RECOGNIZING with appreciation that the modifications proposed to the *International List of Selected, Supplementary and Auxiliary Ships* at CMM-XI had been implemented,

RECOMMENDS:

(1) That the format and content of the *International List of Selected, Supplementary and Auxiliary Ships* should be modified as indicated in the annex to this recommendation;

(2) That the vessel digital image (profile) data planned for column 6 should be developed in due course as a project of the Subgroup on Marine Climatology, with the assistance of the Secretariat and as resources permit, and in close consultation with PMOs;

(3) That the database of the *International List of Selected, Supplementary and Auxiliary Ships* should be continuously updated and made available for consultation and downloading by Members, as part of the future WMO policy of electronic publishing, through the WMO homepage on the World Wide Web;

REQUESTS the Subgroup on Marine Climatology and the Secretariat to develop detailed specifications of the database fields, for distribution to Members, as quickly as possible.

ANNEX TO RECOMMENDATION 9 (CMM-XII)

INTERNATIONAL LIST OF SELECTED, SUPPLEMENTARY AND AUXILIARY SHIPS
(WMO-NO. 47) — TABLE 1 — CONTENTS

Column No.	*Column/field code name*	*Description of field*
1	name	Ship's name
2	call	Ship's call sign
3	IMOn	IMO number*
4	rcnty	Recruiting country
5	vssl	Vessel type
6	vsslP	Vessel digital image (profile)*
7	vsslD	Vessel dimensions (in metres) — length, breadth, freeboard, **draft, cargo height**
8	brdg	Position of bridge — distance from the bow*
9	vsslM	Type of meteorological reporting ship
10	Atm	Automation*
11	blc	Baseline check*
12	rte	Route(s)
13	barm	Type of barometer
14	bMS	Model (brand) of barometer (manufacturer/series no.)*
15	brmH	Height of barometer (**tenths** of metres)
16	brmL	Barometer location*
17	brmU	Pressure units *
18	brmC	Barometer calibration date*
19	thrm	Type of thermometer — dry bulb
20	thMS	Model (brand) of thermometer (manufacturer/series no.)*
21	thmE	Conditions of exposure of thermometer
22	thmL	Location of instruments used to measure dry bulb/hygrometer*
23	thmH	Height of thermometers*
24	tscale	Temperature scale; original units*
25	hygr	Type of hygrometer
26	hgrE	Conditions of exposure of hygrometer
27	sstM	Method of obtaining sea surface temperature
28	sstD	Depth of sea temperature measurement (**tenths** of metres)
29	barg	Type of barograph
30	anHL	Height of anemometer (above the maximum load line) (**tenths** of metres)
31	anHD	Height of anemometer (above the deck)*
32	anmL	Anemometer location*
33	anDB	Anemometer distance (from the bow)*
34	anDC	Anemometer distance (from the center)*
35	anmI	Anemometer instrument type (manufacturer/series no.)*
36	anmU	General anemometer usage*
37	anmC	Anemometer calibration date*
38	wwH	Visual wind/wave observational height*
39	othI	Other meteorological instruments
40	phGr	Telephoney and telegraphy
41	prSt	Teleprinter and satellite
42	chgd	Change date*

* New data requirements.
Bold denotes modification of specifications.

RECOMMENDATION 10 (CMM-XII)

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

THE COMMISSION FOR MARINE METEOROLOGY,

NOTING:

(1) The *Guide to Marine Meteorological Services* (WMO-No. 471),

(2) Resolution 3 (CMM-XI) — Working Group on Marine Meteorological Services, which appointed, *inter alia*, a rapporteur on the revision to the *Guide to Marine Meteorological Services*,

(3) The report of the rapporteur to CMM-XII,

CONSIDERING:

(1) The many new developments which have occurred in the field of marine meteorological services since the second edition of the *Guide* was published in 1982, including in particular the GMDSS, MPERSS and the revised MCSS,

(2) The substantial revisions to the *Manual on Marine Meteorological Services* (WMO-No. 558) which have been implemented in the past five years,

RECOGNIZING that the draft new edition of the *Guide* has been extensively reviewed within CMM and further revised on the basis of these reviews,

EXPRESSES its sincere appreciation to the rapporteur, Mr D. Linforth (Australia) for his substantial and excellent work;

RECOMMENDS that the complete revised edition of the *Guide to Marine Meteorological Services*, adopted at the session, should be published in all working languages of WMO, to replace the existing guide.

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 12 (CMM-XII)

REVISION OF THE RESOLUTIONS OF THE EXECUTIVE COUNCIL BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR MARINE METEOROLOGY

THE COMMISSION FOR MARINE METEOROLOGY,
NOTING with satisfaction the action taken by the Executive Council on the previous recommendations of the Commission for Marine Meteorology and on other matters related to the work of the Commission,
CONSIDERING that many of these recommendations have become redundant in the meantime,

RECOMMENDS:

(1) That Resolutions 8 (EC-XLIV) and 10 (EC-XLV) no longer be considered necessary;

(2) That Resolutions 15 (EC-XXI), 12 (EC-XXV), 9 (EC-XLV), 2 and 3 (EC-XLVIII) be kept in force.

ANNEX

Annex to paragraph 3.7 of the general summary

WORK PROGRAMME OF THE COMMISSION FOR MARINE METEOROLOGY FOR THE PERIOD 1997–2001

Major project		*Task*	*Execution*	*Target date*
Project 44.1 Marine meteorological and oceanographic services	(*a*)	Implement and maintain a systematic long-term global marine meteorological services monitoring programme with clear feedback and results distribution mechanisms;	WG on MMS and Secretariat	Continuous
	(*b*)	Promote continuing improvement in basic and specialized MMS, monitor marine user requirements and make recommendations for relevant MMS including updating of the *Guide to*, and *Manual on, MMS*;	WG on MMS and Secretariat	Continuous
	(*c*)	Coordinate with CBS, IGOSS and WCP, and service organizations such as IMO, IHO, IOC and with user organizations (E&P Forum, ICS, FAO, etc.) the user requirements for MMS;	WG on MMS and Secretariat	Continuous
	(*d*)	Keep under review, in coordination with IMO, IHO and Inmarsat, the implementation of the GMDSS;	WG on MMS and Secretariat	Continuous
	(*e*)	Provisionally implement and continue developing in conjunction with IMO, IOC and UNEP, the MPERSS for meteorological support for marine pollution emergency operation for presentation to CMM-XIII;	WG on MMS, rapporteur and Secretariat	Continuous
	(*f*)	Propose procedures for the development of specifications for potential future RSMCs for MPERSS;	AWG	When required
	(g)	Prepare and keep under review guidance material on the application of remote-sensing techniques to the provision of MMS, including the preparation of appropriate amendments to the *Manual on*, and *Guide to, MMS*;	WG on MMS, WG on MOS	
	(*h*)	To keep under review specific requirements for the international coordination of meteorological broadcasts through NAVTEX;	WG on MMS, rapporteur and Secretariat	Continuous
	(*i*)	Promote and continue the implementation of the WMO wave programme;	WG on MMS and Secretariat	CMM-XIII
	(*j*)	Promote improvements in the provision of specialized MMS, including the preparation of guidance material on: (i) Services for ports, harbours and confined waterways; (ii) Technical guidance on meteorological services for fisheries;	WG on MMS, WG on ETIS, rapporteurs and Secretariat	2000

Major project	*Task*	*Execution*	*Target date*
	(iii) Weather routing of ships; (iv) Coastal marine services (including forecasting techniques and automatic observing instrumentation); (v) Services for offshore industry;		
	(*k*) Continue developing a wind-wave forecast model verification scheme;	WG on MMS and Members	CMM-XIII
	(*l*) Develop requirements and specification of services to be provided by potential RSMCs for ocean-wave modelling and prediction;	WG on MMS	CMM-XIII
	(*m*) Develop further the project on storm surge forecasts;	WG on MMS	Continuous
	(*n*) Develop new methods beyond HF radiofax for distributing graphic presentations to ships, including transmission through Inmarsat-C.	WG on MMS and Inmarsat through rapporteur	2001
Project 44.2 Marine climatological and related oceano-graphic database	(*a*) Coordination of marine climatological requirements (including for sea-ice data) with WCP and provision of technical advice on exchange and archival of such data;	WG on MMS	Continuous
	(*b*) Continued review and revisions, as appropriate, of the MCSS;	WG on MMS	Continuous
	(*c*) Evaluation and development of marine climatological data exchange;	WG on MMS	Continuous
	(*d*) Review and revision of relevant sections of the *Guide to*, and *Manual on, MMS*;	WG on MMS, WG on MOS and Secretariat	Continuous
	(*e*) Publication of the *Guide to the Applications of Marine Climatology* (WMO-No. 781) in languages other than English, and maintain and update the *Guide*;	WG on MMS with Secretariat	2001
	(*f*) Contribute to the preparation of a workshop to provide input to the dynamic part of the *Guide to the Applications of Marine Climatology* (WMO-No. 781);	President of CMM, WG on MMS and Secretariat	1988
	(*g*) Continuing review of quality control procedures for marine climatological data, including implementation of the best set of minimum quality control standards and harmonizing standards worldwide;	WG on MMS	Continuous
	(*h*) Promote cooperation in improving the methodology for the acquisition, exchange, processing, quality control, storage and dissemination of sea-ice data (including remotely-sensed data);	WG on MMS	Continuous
	(*i*) Interact with CCl in the implementation of the following and related activities: (i) Preparation of a public information initiative; (ii) Establishment of a GCOS Surface Network (GSN); (iii) Evolution of WMO climate database management system for Members needing more advanced systems than CLICOM; (iv) Prepare the publication *Guidance on the Presentation and Management of Meteorological Data for Use on Climate Analysis, Studies and Services*;	WG on MMS	Continuous
	(*j*) Develop contacts with the Global Runoff Data Centre (GRDC) through WMO's HWR programme;	WG on MMS	Continuous

Major project	*Task*	*Execution*	*Target date*
	(*k*) Prepare consolidated report on an assessment of the impacts of WMO policy and practice on data and product exchange;	Vice-president, AWG and Secretariat	End 1998
	(*l*) Review the formats nomenclature and data quality procedures for digital sea-ice data;	WG on MMS	2001
	(*m*) Continuing review of the information available in the *International List of Selected, Supplementary and Auxiliary Ships* (WMO-No.47);	WG on MMS/MOS	Continuous
	(*n*) Prepare information document on national web sites providing metadata on marine climatological data availability, access and costs.	WG on MMS	1999
Project 44.3 Systems for marine and ocean observation and data collection	(*a*) Monitor user requirements for meteorological and oceanographic data for marine services and other programmes and activities such as GCOS, GOOS, WCRP, CLICOM, etc.;	WG on MOS, WG on MOS and AWG	Continuous
	(*b*) Develop action plan to enhance marine observing systems to fulfil requirements of GOOS and GCOS;	WG on MOS with IGOSS; DBCP and Secretariat	End 1998
	(*c*) Take the necessary actions to respond to GOOS/GCOS requirements for VOS observations;	WG on MOS	Continuous
	(*d*) Keep close coordination with relevant GOOS/GCOS bodies concerning requirements for remotely-sensed data;	WG on MOS, Rapporteur OS, Secretariat	Continuous
	(*e*) Continue monitoring and promoting the improvement of the VOS scheme, specifically to: (i) Improve data quality; (ii) Coordinate and distribute software for the automation of observations; (iii) Prepare guidance for developing countries; (iv) Automate observations, taking care to preserve climatological continuity; (v) Increase recruitment in data-sparse areas;	WG on MOS and Members with Secretariat	Continuous
	(*f*) Keep under review requirements for satellite-derived marine data;	WG on MOS, Rapporteur on OS and Secretariat	Continuous
	(*g*) Follow closely the work of the OOPC responding, as appropriate, to relevant elements of specific requirements to support global climate studies;	WG on MOS, SG on VOS and Rapporteur on OS	Continuous
	(*h*) Draft coordinated action plan for the implementation of relevant components of GOOS/GCOS based on already existing scientific designs;	President of CMM, chairmen of WGs on MMS and on MOS, Secretariat through consultations with IOC, chairman of IGOSS, DBCP, OOPC, etc.	End 1997
	(*i*) Improvement of real-time data collection procedures through:	WG on MOS with Secretariat	Continuous

Major project	*Task*	*Execution*	*Target date*
	(i) Enhanced use of Inmarsat, in particular Inmarsat-C, and report transmission in binary format; (ii) Increased use of other satellite-based systems such as Argos and the geostationary satellites; (iii) Close liaison for monitoring the requirements of COSNA for VOS data;		
	(*j*) Develop proposals to improve the availability of data collected by satellites (VOS and drifting buoys) for countries near their origin;	WG on MOS	1997
	(*k*) Preparation for the collection, processing and application of satellite ocean data (including priorities and procedures);	WG on MOS	Continuous
	(*l*) Improvement of the PMO network through the provision of guidance on the organization, training and operation of PMOs;	SG on MC and WG on ETIS	Continuous
	(*m*) Review and propose amendments, as necessary, to marine reporting codes;	WG on MOS with IGOSS	Continuous
	(*n*) Develop with the IGOSS SOO Implementation Panel a plan for collaboration on VOS and SOO activities, including the use of PMOs;	WG on MOS	CMM-XIII
	(*o*) Standardize procedures for the exchange of sea-ice data through the Internet;	WG on MOS	2001
	(*p*) Prepare guidance on techniques for determining precipitation at sea.	WG on MOS	2000
Project 44.4 Information exchange on marine technology and services	(*a*) Preparation and publication of technical guidance material on: (i) Application of marine model output to marine services; (ii) The work of CMM in relation to global issues (IYO contribution); (iii) Beaufort equivalent scales; (iv) Analysis and forecasting of sea ice;	WG on MMS, WG on MOS	Continuous
	(*b*) Review and updating, as appropriate, of: (i) *Guide to Marine Meteorological Services* (WMO-No. 471); (ii) Relevant chapters of the CIMO *Guide to Meteorological Instruments and Methods of Observation* (WMO-No. 8); (iii) *Guide to Wave Analysis and Forecasting* (WMO-No. 702); (iv) *Sea-ice Information Services in the World* (WMO-No. 574); (v) Sea-ice nomenclature and SIGRID data format;	WG on MOS, WG on MMS	1997
	(*c*) Complete the catalogue on storm surge data holdings;	WG on MMS	Continuous
	(*d*) Review and update, as appropriate, the *Manual on MMS* and other WMO regulatory and guidance material, including the *Technical Regulations* (WMO-No. 49);	All WGs with Secretariat	Continuous
	(*e*) Continue the preparation and publication of relevant material in the Marine Meteorology and Related Oceanographic Activities Report series, including the scientific lectures on marine pollution (CMM-XII);	All WGs with Secretariat	Continuous
	(*f*) Prepare a feasibility study on and eventually implement a comprehensive metadata base for ODAS.	WG on MMS, DBCP, IOC, Members and Secretariat	CMM-XIII

Major project		*Task*	*Execution*	*Target date*
Project 44.5 Marine science and techniques development	(*a*)	Keep under review development in the automation of shipboard observations, including hardware and software;	WG on MOS, CIMO	Continuous
	(*b*)	Advise and assist in the implementation of new wave forecast models, particularly those that can be run on PCs;	WG on MMS	Continuous
Project 44.6 Capacity building in marine observations and services	(*a*)	Develop a structured approach to the management of CMM projects;	AWG, WG on ETIS	CMM-XIII
	(*b*)	Monitor specific national and regional requirements for the coordination and implementation of MMS and MOS in particular through the regional rapporteurs on MMS;	WG on ETIS, Secretariat and RAs	Continuous
	(*c*)	Continue studying mechanisms for closer cooperation between CMM and IOC;	AWG	Cg-XIII
	(*d*)	Monitoring of follow-up action on Agenda 21 by Members of WMO;	Rapporteur, AWG with Secretariat	Continuous
	(*e*)	Application of new information technology techniques to marine programmes;	AWG, WG on ETIS	Continuous
	(*f*)	Develop regional implementation enhancement projects (SEACAMP, East Africa, etc.);	Secretariat, WG on ETIS	Continuous
	(*g*)	Provide an input to the work of the IPCC in areas of competence of CMM;	President of CMM, all WGs and Secretariat	Continuous
	(*h*)	Participate and contribute to the preparation and publication of the United Nations *Atlas of the Oceans*.	President of CMM, AWG and Secretariat	1998
Project 44.7 Specialized staff development	(*a*)	Review the curriculum for specialized long-term training courses at RMTCs and advise on the establishment of additional courses;	WG on ETIS	Continuous
	(*b*)	Provision of specialized input and identification of expert lecturers for training seminars;	All WGs	Continuous
	(*c*)	Identification and preparation of appropriate specialized training material for use by Members and RMTCs;	WG on ETIS with Secretariat	Continuous
	(*d*)	Provide guidance material for education;	All WGs with WG on ETIS	1997
	(*e*)	Support education and training and technical cooperation activities for implementation of GOOS;	AWG, WG on ETIS with I-GOOS	Continuous
	(*f*)	Update the *Compendium of Meteorology for Use by Class I and II Meteorological Personnel* (WMO-No. 364), Volume II — Part 3, Marine meteorology;	WG on ETIS with Secretariat	1997
	(*g*)	Develop clear priorities and themes for the general area of training and implementation support.	WG on ETIS	CMM-XIII

APPENDIX A

LIST OF PERSONS ATTENDING THE SESSION

A. Representatives of WMO Members

Member	*Name*	*Capacity*
Algeria	M. Drici Office national de la météorologie B.P. 153, Dar-el-Beida Alger Tel: (213-2) 50.67.91 Fax: (213-2) 50.88.49	Principal delegate
	A. Guersi Office national de la météorologie B.P. 153, Dar-el-Beida Alger Tel: (213-2) 50.67.91 Fax: (213-2) 50.88.49	Delegate
	M. A. Tlili Office national de la météorologie B.P. 153, Dar-el-Beida Alger Tel: (213-2) 50.67.91 Fax: (213-2) 50.88.49	Delegate
Australia	P. R. Parker Bureau of Meteorology G.P.O. Box 1289 K Melbourne, Vic. 3001 Tel: (61-3) 96.69.45.10 Fax: (61-3) 96.69.46.95 E-mail: P.Parker@bom.gov.au	Principal delegate
Belgium	E. De Dycker Institut Royal Météorologique de Bélgique 3, Avenue Circulaire B-1180 Bruxelles Tel: (32-2) 373.06.36 Fax: (32-2) 375.50.62 E-mail: dde@oma.be	Principal delegate
Benin	M. A. Dehoue Direction Marine Marchande B.P. 1234 Cotonou Tel: (229) 31.46.69	Principal delegate
Canada	B. Appleby Environment Canada 1496 Bedford Hwy Bedford, Nova Scotia Canada B4A 1E5 Tel: (1-902) 426 9120 Fax: (1-902) 426 9158 E-mail: bill.appleby@ec.gc.ca	Principal delegate
	G. Wells Environment Canada 200-1200 West 73rd Ave. Vancouver, B.C. Canada V3S 8S3 Tel: (1-604) 664 9090 Fax: (1-604) 664 9004 E-mail: gary.wells@ec.gc.ca	Alternate
	S. Lapczak Environment Canada 373 Sussex Drive Ottawa, Ontario Canada K1A 0H3 Tel: (1-613) 996 5088 Fax: (1-613) 996 4218 E-mail: steve.lapczak@ec.gc.ca	Delegate
China	Li Huang China Meteorological Administration Baishiqiaolu No. 46 Western Suburb Beijng 100081 Tel: (86-10) 62 17 29 57 Fax: (86-10) 62 17 47 97 E-mail: HL@Rays.cma.go.cn	Principal delegate
	Tian Cuiying (Ms) China Meteorological Administration Baishiqiaolu No. 46 Western Suburb Beijng 100081 Tel: (86-10) 62 17 22 77 Fax: (86-10) 62 17 47 97	Delegate
	Qiu Zhigao State Oceanic Administration 1, Fuxingmenwai Ave. Beijng Tel: (86-10) 68 53 22 11 Fax: (86-10) 68 53 35 15	Delegate
Costa Rica	H. Hidalgo, Ramírez Instituto Meteorológico Nacional Apartado Postal 7-3350 1000 San José Tel: (506) 222.5616 Fax: (506) 223.1837 E-mail: hidalgo@meteoro.imm.ac.cr	Principal delegate
Croatia	M. Hodžić State Meteorological and Hydrological Service Croatian Marine Meteorological Service Glagoljaša 11 HR-21000 Split Tel: (385-21) 58 93 78/59 14 66 Fax: (385-21) 59 10 33/58 93 78 E-mail: hodzic@cirus.dhz.hr	Principal delegate
Cuba	T. L. Gutiérrez Perez Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 61.75.00 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Principal delegate
	M. Carnesoltas Calvo Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Alternate
	L. A. Barreras Carizo Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate

Member	*Name*	*Capacity*
Cuba (*Contd.*)	A. Calnick Gamboa (Ms) Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	A. del Sol Hernandez (Ms) Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	J. Duarte Martinez Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	N. Hernández Orozco Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	Y. Juantorena Alèn (Ms) Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	I. Mitrani Arenal (Ms) Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	A. Muñoz Méndez Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
	P. J. Pérez Osorio Instituto de Meteorología Apartado 17032 C.P. 11700, La Habana 17 Tel: (53-7) 62.66.46 Fax: (53-7) 33.80.10 E-mail: meteoro@ceniai.cu	Delegate
Denmark	S. E. Olufsen Danish Meteorological Institute Lyngbyvej 100 2100 Copenhagen Tel: (45) 39.15.75.00 Fax: (45) 39.27.06.84	Principal delegate
Dominican Republic	F. A. Abreu Hernandez Oficina Nacional de Meteorología Apartado de Correos No. 1053 Santo Domingo, D.N. Tel: (1-809) 593.12.05 Fax: (1-809) 594.88.44	Principal delegate
Egypt	M. S. El-Shinety Official Alexandria Airport Egyptian Meteorological Authority P.O. Box 11784 Cairo Tel: (20-2) 83.01.05 Fax: (20-2) 284.98.57 E-mail: ma@idsc.gov.eg	Principal delegate
Finland	M.-L. Komulainen (Ms) Finnish Meteorological Institute P.O. Box 503 (Vuorikatu 24) 00101 Helsinki Tel: (358-9) 1929.33.20 Fax: (358-9) 1929.33.03 E-mail: marja-leena.komulainen@fmi.fi	Principal delegate
	H. Grönvall Finnish Institute of Marine Research P.O. Box 33 00931 Helsinki Tel: (358-9) 61.39.44.22 Fax: (358-9) 61.39.44.94 E-mail: hannu@fimr.fi	Delegate
France	J. Poitevin Météo-France SCEM/PREVI/MAR 42, Avenue G.-Coriolis 31057 Toulouse Tel: (33-5) 61.07.82.90 Fax: (33-5) 61.07.85.38 E-mail: joel.poitevin@meteo.fr	Principal delegate
	P. Daniel Météo-France SCEM/PREVI/MAR 42, Avenue G.-Coriolis 31057 Toulouse Tel: (33-5) 61.07.82.92 Fax: (33-5) 61.07.82.32 E-mail: pierre.daniel@meteo.fr	Delegate
	M. Hontarrede Météo-France S3C/COM/PUB 1, quai Branly 75340 Paris Tel: (33-1) 45.56.74.60 Fax: (33-1) 45.56.74.59 E-mail: michel.hontarrede@meteo.fr	Delegate
Germany	A. Kresling Deutscher Wetterdienst Bernhard-Nocht-Str. 76 20359 Hamburg Tel: (49-40) 31.90.88.05 Fax: (49-40) 31.90.88.03 E-mail: akresling@dwd.d400.de	Principal delegate
	L. Kaufeld Deutscher Wetterdienst Bernhard-Nocht-Str. 76 20359 Hamburg Tel: (49-40) 31.90.88.23 Fax: (49-40) 31.90.88.03 E-mail: lkaufeld@dwd.d400.de	Delegate
Ghana	K. Wurodu Ghana Meteorological Department P.O. Box 9471 Airport-Accra Tel: (233-21) 77.64.64/77.11.72 Fax: (233-21) 77.75.72	Principal delegate

Member	*Name*	*Capacity*
Greece	G. Kassimidis Hellenic National Meteorological Service Hellenikon 167 77 Athens Tel: (30-1) 962.11.16 Fax: (30-1) 962.89.52	Principal delegate
Hong Kong	W. L. Chang Royal Observatory 134A Nathan Road Kowloon Tel: (852) 29.26.31.11 Fax: (852) 23.75.75.55	Principal delegate
Iceland	T. E. Jakobsson Icelandic Meteorological Office Bústadavegur 9 IS-150 Reykjavík Tel: (354) 560 0600 Fax: (354) 552 8121 E-mail: thor@vedur.is	Principal delegate
Iran, Islamic Republic of	H. Khaleghizavareh The Islamic Republic of Iran Meteorological Organization (IRIMO) P.O. Box 13185-461 Tehran Tel: (98-21) 646.90.47 Fax: (98-21) 646.90.44	Principal delegate
	H. Fakhari The Islamic Republic of Iran Meteorological Organization (IRIMO) P.O. Box 13185-461 Tehran Tel: (98-21) 646.90.47 Fax: (98-21) 646.90.44	Alternate
	H. Shahriari Gholam The Islamic Republic of Iran Meteorological Organization (IRIMO) P.O. Box 13185-461 Tehran Tel: (98-21) 646.90.47 Fax: (98-21) 646.90.44	Delegate
Japan	K. Nagasaka Japan Meteorological Agency 1-3-4 Otemachi Chiyoda-ku Tokyo, 100 Tel: (81-3) 3211-4966 Fax: (81-3) 3211-2032 E-mail: inad-jma@hg.kishou.go.jp	Principal delegate
	K. Sasaki Japan Meteorological Agency 1-3-4 Otemachi Chiyoda-ku Tokyo, 100 Tel: (81-3) 3211-4966 Fax: (81-3) 3211-2032 E-mail: inad-jma@hg.kishou.go.jp	Delegate
Libyan Arab Jamahiriya	Ali M. Fares Meteorological Department P.O. Box 5069 Tripoli Tel: (218-21) 360.55.54 Fax: (218-21) 360.55.33	Principal delegate
Malaysia	Lim Joo Tick Malaysian Meteorological Service Jalan Sultan 46667 Petaling Jaya Selangor Darul Ehsan Tel: (60-3) 756.94.22 Fax: (60-3) 755.09.64 E-mail: jtlim@kjc.gov.my	Principal delegate
Mauritius	S. Ragoonaden Meteorological Services St. Paul Road Vacoas Tel: (230) 686.10.31 Fax: (230) 686.10.33 E-mail: meteo@intnet.mu	Principal delegate
Morocco	H. Bouksim Direction de la météorologie nationale B.P. 8106 Casa Oasis 20103 Casablanca Tel: (212) 291.33.29/78/85	Principal delegate
Netherlands	P. T. Gelton Royal Netherlands Meteorological Institute Maritime Services Wilhelminalaan 10 P.O. Box 201 3730 AE De Bilt Tel: (31) 17.43.89.113 Fax: (31) 17.43.83.963 E-mail: gelton@knmi.nl	Principal delegate
Nigeria	L. E. Edafienene Marine Unit Department of Meteorological Services Private Mail Bag 12542 Lagos Tel: (234-1) 263.33.71 Fax: (234-1) 263.60.97	Principal delegate
Norway	J. Guddal Norwegian Meteorological Institute Region West Allegt. 70 5007 Bergen Tel: (47) 55.23.66.31 Fax: (47) 55.23.67.03 E-mail: j.guddal@dnmi.no	Principal delegate
Poland	M. Ziemianski Institute of Meteorology and Water Management Waszyngtona 42 81-342 Gdynia Tel: (48-58) 20.34.22 E-mail: ziemians@stratus.imgw.gdynia.pl	Principal delegate
Portugal	F. Carvalho Instituto de Meteorologia Rue C - Aeroporto de Lisboa 1700 Lisboa Tel: (351-1) 848.39.61 Fax: (351-1) 840.23.70	Principal delegate
Republic of Korea	Y. Hong Korea Meteorological Administration 1, Songwol-dong Chongno-gu Seoul, 110-101 Tel: (82-2) 733.06.55 Fax: (82-2) 739.59.69 E-mail: fcstlong@nwpsvr.kma.go.kr	Principal delegate

Member	*Name*	*Capacity*
Russian Federation	S. S. Khodkin Federal Service for Hydrometeorology and Environmental Monitoring 12 Novovagankovsky Street 123242 Moscow Tel: (7-095) 252.03.13 Fax: (7-095) 255.22.69	Principal delegate
	Y. Izrael Institute of Global Climate and Ecology Glebovskaya Street 20 B Moscow Tel: (7-095) 169.24.30 Fax: (7-095) 160.08.31	Alternate
	V. A. Martychtchenko Federal Service for Hydrometeorology and Environmental Monitoring 12 Novovagankovsky Street 123242 Moscow Tel: (7-095) 282.45.11 Fax: (7-095) 255.20.90	Delegate
South Africa	I. T. Hunter South African Weather Bureau Department of Environmental Affairs and Tourism Private Bag X097 Pretoria 0001 Tel: (27-12) 309.31.04 Fax: (27-12) 309.39.90 E-mail: ian@cirrus.sawb.gov.za	Principal delegate
Spain	F. Vicente Cerrajeria Instituto Nacional de Meteorología Apartado de Correos 285 28071 Madrid Tel: (34-1) 581.96.42 Fax: (34-1) 581.97.67 E-mail: vcerraj@inm.es	Principal delegate
Sweden	S. Andersson Swedish Meteorological and Hydrological Institute (SMHI) Folkborgsvägen 1 601 76 Norrköping Tel: (46-11) 15.80.00 Fax: (46-11) 17.41.03 E-mail: svante.andersson@smhi.se	Principal delegate
United Arab Emirates	H. M. Alakbari Meteorology and A.T.C. Administration P.O. Box 906 Abu Dhabi Tel: (971-2) 515.11.71 Fax: (971-2) 515.16.88	Principal delegate
	N. A. Albaloushi Meteorology and A.T.C. Administration P.O. Box 3880C-5 Abu Dhabi Tel: (971-2) 515.11.11 Fax: (971-2) 515.13.33	Delegate
United Kingdom of Great Britain and Northern Ireland	R. J. Shearman UK Meteorological Office Beaufort Park Easthampstead Wokingham Berkshire RG40 3DN Tel: (44-1344) 85.56.00 Fax: (44-1344) 85.58.97 E-mail: rjshearman@meto.govt.uk	Principal delegate
United Kingdom of Great Britain and Northern Ireland (*Contd.*)	Capt. S. M. Norwell UK Meteorological Office OI (OM) London Road, Bracknell Berkshire RG12 2SZ Tel: (44-1344) 85.56.54 Fax: (44-1344) 85.59.21 E-mail: smnorwell@meto.gov.uk	Delegate
	Capt. S. J. Auty Room 3113 Main Building Ministry of Defence Whitehall, London SW1 Tel: (44-171) 807 0167 Fax: (44-171) 807 0170	Delegate
United States of America	T. Pierce (Ms) W/OM12 National Weather Service/NOAA 1325 East-West Highway, SSMC2 Silver Spring, MD 20910 Tel: (301) 713 1677, ext. 125 Fax: (301) 713 1598 E-mail: therese.pierce@noaa.gov	Principal delegate
	D. Feit National Weather Service/NOAA Marine Prediction Center W/NP41 Washington, D.C. 20233 Tel: (301) 763 8294, ext. 7401 Fax (301) 763 8085 E-mail: david.feit@noaa.gov	Alternate
	J. Elms E/CC 22 National Climatic Data Center/NOAA 151 Patton Ave. Ashville, NC 28801-5001 Tel: (704) 271.4344 Fax: (704) 271 4328 E-mail: jelms@ncdc.noaa.gov	Delegate
Viet Nam, Socialist Republic of	Tran Duc Hai Service hydrométéorologique 4, rue Dang Thai Than Hanoi Tel: (84-4) 825.33.43 Fax: (84-4) 826.07.79	Principal delegate
	Nguyen The Tuong Service hydrométéorologique 4, rue Dang Thai Than Hanoi Tel: (84-4) 834.37.94 Fax: (84-4) 835.06.06	Delegate

B. Scientific lecturers

P. Daniel
Météo-France
SCEM/PREVI/MAR
42, Avenue G.-Coriolis
31057 Toulouse
France
Tel: (33-5) 61.07.82.92
Fax: (33-5) 61.07.82.32
E-mail: pierre.daniel@meteo.fr

R. A. Duce
College of Geosciences
Texas A and M University
College Station
Texas, 77843, USA
Tel: (409) 845-3651
Fax: (409) 845-0056
E-mail: rduce@ocean.tamu.edu

D. L. Elder
Marchissy 1261
Switzerland
Tel: (41-22) 368 21 03
Fax: (41-22) 369 21 04

J. S. Gray
Department of Marine Biology
University of Oslo
P.B. 1064
Blindern
0316 Oslo
Norway
Tel: (47) 22.85l.45.10
Fax: (47) 22.85.44.38
E-mail: j.s.gray@bio.uio.no

P. R. Parker
Bureau of Meteorology
G.P.O. Box 1289 K
Melbourne
Vic. 3001
Tel: (61-3) 96.69.45.10
Fax: (61-3) 96.69.40.95
E-mail: P.Parker@bom.gov.au

S. Ragoonaden
Meteorological Services
St. Paul Road
Vacoas
Tel: (230) 686.10.31
Fax: (230) 686.10.33
E-mail: meteo@intnet.mu

J. W. Readman
Plymouth Marine Laboratory
Prospect Place
West Hoe
Plymouth PL1 3DH
United Kingdom
Tel: (44-1752) 63.34.60
Fax: (44-1752) 63.31.01
E-mail: j.readman@pml.ac.uk

C. Representatives of international organizations

Organization	*Name*
Argos Collecte Localisation Satellites (CLS/Service Argos)	P. Roche 1801 McCormick Avenue Suite 10, Largo MD 26785, USA Tel: (1-301) 925 4411 Fax: (1-301) 925 8995 E-mail: philippe@argosinc.com
Intergovernmental Oceanographic Commission (IOC)	G. Garcia Montero Unesco 1, rue Miollis 75732 Paris Cédex 15 France Tel: (33-1) 45.68.39.76 Fax: (33-1) 45.60.10.00
International Hydrographic Organization (IHO)	J. Martín Ruiz J. Alvarez Rodríguez Dirección de Hidrografía y Geodesia Ave. del Puerto Nº 102 Esquina Obrapía La Habana, Cuba Tel: (53-7) 60.29.77, 62.71.94 Fax: (53-7) 33.28.69
International Maritime Organization (IMO)	G. S. Singhota Maritime Safety Division 4, Albert Embankment London SE1 7SR Tel: (44-171) 735 7611 Fax: (44-171) 587 3210
International Mobile Satellite Organization (INMARSAT)	A. C. Fuller 99 City Road London EC1A 1AX United Kingdom Tel:(44-171) 728 1465 Fax: (44-171) 728 1752 E-mail:andy fuller@inmarsat.org

APPENDIX B
AGENDA

	Agenda item	*Documents*	*Resolutions and recommendations adopted*
1.	**OPENING OF THE SESSION**	PINK 1	
2.	**ORGANIZATION OF THE SESSION**	PINK 1	
2.1	Consideration of the report on credentials		
2.2	Adoption of the agenda	1; 2	
2.3	Establishment of committees		
2.4	Other organizational matters		
3.	**REPORT BY THE PRESIDENT OF THE COMMISSION**	13; 32; PINK 11; PINK 14	Rec. 1
4.	**REPORTS BY THE CHAIRMEN OF WORKING GROUPS AND BY RAPPORTEURS**	14; 14, ADD. 1; 21; 22; PINK 1	
5.	**MARINE METEOROLOGICAL SERVICES**		
5.1	Basic and specialized marine meteorological services	19; 27; PINK 2	
5.2	Marine pollution emergency response support system (MPERSS)	28; PINK 2	
5.3	Marine telecommunication arrangements for product dissemination	17; 17, ADD. 1; 17, ADD. 2; PINK 2	Rec. 2; 3
5.4	WMO wave programme	18; PINK 16	Rec. 4; 5
6.	**SYSTEMS AND TECHNIQUES FOR MARINE OBSERVATION AND DATA COLLECTION**		
6.1	Observational data requirements	6; PINK 3	
6.2	Voluntary observing ships (VOS) and ship-of-opportunity (SOO)	16; PINK 18	
6.3	Drifting and moored data buoys	9; PINK 18	Rec. 6
6.4	Oceanographic satellites and other remote sensing	12; 12, ADD. 1; PINK 18	
6.5	Automated shipboard aerological programme (ASAP)	7	
6.6	Marine telecommunication arrangements for data collection and transmission	15; PINK 5; PINK 19	
6.7	Requirements for reporting codes	3; PINK 5	
7.	**MARINE CLIMATOLOGY**	11, 11, ADD. 1; 11, ADD. 2; PINK 17	
7.1	Contribution of the Commission to the World Climate Programme (WCP)		
7.2	Marine climatological summaries scheme (MCSS)		Rec. 7; 8; 9
7.3	Other matters related to marine climatology	33	
8.	**SEA ICE**	24; 24, ADD. 1; PINK 4	
9.	**REVIEW OF TECHNICAL REGULATIONS OF INTEREST TO THE COMMISSION**	PINK 9	
10.	***GUIDES* AND OTHER TECHNICAL PUBLICATIONS**	10; 29; PINK 6	Rec. 10

	Agenda item	*Documents*	*Resolutions and recommendations adopted*
11.	**EDUCATION AND TRAINING, TECHNOLOGY TRANSFER AND IMPLEMENTATION SUPPORT ACTIVITIES IN THE FILED OF THE COMMISSION**	14; 14, ADD. 1; PINK 8	
11.1	Specialized education and training activities		
11.2	Technology transfer and implementation support activities		
11.3	Regional developments of interest to the Commission	30	
12.	**RELATIONSHIP WITH OTHER WMO PROGRAMMES AND THOSE OF OTHER ORGANIZATIONS AND BODIES**		
12.1	Other WMO Programmes	20; PINK 9	
12.2	Integrated global ocean services system (IGOSS)	5; PINK 9	
12.3	Global ocean observing system (GOOS) and global climate observing system (GCOS)	26; 26, ADD. 1; PINK 15	
12.4	Intersecretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) and other organizations and bodies	8; PINK 9	
12.5	Follow-up to the United Nations Conference on Environment and Development (UNCED)	31; PINK 9	Rec. 11
13.	**WMO LONG-TERM PLAN**	23; PINK 6	
14.	**SCIENTIFIC LECTURES**	34; PINK 12	
15.	**ESTABLISHMENT OF WORKING GROUPS AND NOMINATION OF RAPPORTEURS**	25; PINK 10	Res. 1–4
16.	**REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT RESOLUTIONS OF THE EXECUTIVE COUNCIL**	4; PINK 13	Res. 5 Rec. 12
17.	**ELECTION OF OFFICERS**	PINK 7; PINK 20	
18.	**DATE AND PLACE OF THE THIRTEENTH SESSION**	PINK 20	
19.	**CLOSURE OF THE SESSION**	PINK 20	

APPENDIX C

LIST OF DOCUMENTS

Doc. No.	*Title*	*Agenda item*	*Submitted by*
	I. "DOC" series		
1	Provisional agenda	2.2	
2	Explanatory memorandum relating to the provisional agenda	2.2	
3	Requirements for reporting codes	6.7	Secretary-General
4	Review of previous resolutions and recommendations of the Commission and of relevant resolutions of the Executive Council	16	Secretary-General
5	Integrated global ocean services system (IGOSS)	12.2	Secretary-General
6	Observational data requirements	6.1	Secretary-General
7	Automated shipboard aerological programme (ASAP)	6.5	Secretary-General
8	Intersecretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) and other organizations and bodies	12.4	Secretary-General
9	Drifting and moored data buoys	6.3	Secretary-General
10	*Guides* and other technical publications	10	Rapporteur
	Revision of the *Guide to Marine Meteorological Services*		
11	Marine climatology	7	Secretary-General
	ADD. 1		
	ADD. 2		
12	Oceanographic satellites and other remote sensing	6.4	Chairman, Subgroup
	Report of the chairman of the CMM/IGOSS/IODE Subgroup on Ocean Satellites and Remote Sensing		
	ADD. 1		
13	Report by the president of the Commission	3	President of the Commission
14	Reports by the chairmen of working groups and by rapporteurs	4, 11	Chairman, Working Group
	Report by the chairman of the Working Group on Education, Training and Implementation Support		
	ADD. 1		
15	Marine telecommunication arrangements for data collection and transmission	6.6	Secretary-General

Doc. No.	*Title*	*Agenda item*	*Submitted by*
16	Voluntary observing ships (VOS) and ship-of-opportunity (SOO)	6.2	Secretary-General
17	Marine telecommunication arrangements for product dissemination	5.3	Secretary-General
	The WMO global maritime distress and safety system (GMDSS) marine broadcast system		
	ADD. 1		
	ADD. 2		
18	WMO wave programme	5.4	Chairman, Subgroup
	Report by the chairman of the Subgroup on Wave Modelling and Forecasting		
19	Basic and specialized marine meteorological services	5.1	Chairman, RA III Working Group on Marine Meteorological Services
20	Other WMO Programmes	12.1	Secretary-General
21	Reports by the chairmen of the working groups and by rapporteurs	4	Chairman, Working Group
	Report by the chairman of the Working Group on Marine Observing Systems		
22	Reports by the chairmen of the working groups and by rapporteurs	4	Chairman, Working Group
	Report by the chairman of the Working Group on Marine Meteorological Services		
23	WMO Long-term Plan	13	Secretary-General
24	Sea ice	8	Chairman, Subgroup
	ADD. 1		
25	Establishment of working groups and nomination of rapporteurs	15	Secretary-General
26	Global ocean observing system (GOOS) and global climate observing system (GCOS)	12.3	Secretary-General
	ADD. 1		
27	Basic and specialized marine meteorological services	5.1	Secretary-General
	Monitoring of marine meteorological services		
28	Marine pollution emergency response support system (MPERSS)	5.2	Secretary-General
29	*Guides* and other technical publications	10	Secretary-General
30	Regional developments of interest to the Commission	11.3	Secretary-General

Doc. No.	*Title*	*Agenda item*	*Submitted by*
31	Follow-up to the United Nations Conference on Environment and Development (UNCED)	12.5	Secretary-General
32	Report by the president of the Commission	3	President of the Commission
	Closer cooperation between WMO and the Intergovernmental Oceanographic Commission (IOC)		
33	Other matters related to marine climatology	7.3	United States
	Ocean data acquisition systems (ODAS) metadata		
34	Scientific lectures	14	Secretary-General
	II. "PINK" series		
1	Opening of the session; organization of the session; reports by the chairmen of working groups and by rapporteurs	1, 2, 4	President of the Commission
2	Basic and specialized marine meteorological services; marine pollution emergency response support system (MPERSS); marine telecommunication arrangements for product dissemination	5.1, 5.2 5.3	Co-chairmen, Committee A
3	Observational data requirements	6.1	Co-chairmen, Committee B
4	Sea ice	8	Co-chairmen, Committee A
5	Automated shipboard aerological programme (ASAP); requirements for reporting codes	6.5, 6.7	Co-chairmen, Committee B
6	*Guides* and other technical publications; WMO Long-term Plan	10, 13	Co-chairmen, Committee B
7	Election of officers	17	Chairman, Nomination Committee
	Report of the Nomination Committee		
8	Education and training, technology transfer and implementation support activities in the field of the Commission	11	President of the Commission
9	Review of technical regulations of interest to the Commission; other WMO Programmes; integrated global ocean services system (IGOSS); Intersecretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) and other organizations and bodies; follow-up to the United Nations Conference on Environment and Development (UNCED)	9, 12.1, 12.2, 12.4 12.5	Vice-president of the Commission
10	Establishment of working groups and nomination of rapporteurs	15	President of the Commission
11	Report by the president of the Commission	3	President of the Commission
12	Scientific lectures	14	President of the Commission

Doc. No.	*Title*	*Agenda item*	*Submitted by*
13	Review of previous resolutions and recommendations of the Commission and of relevant resolutions of the Executive Council	16	President of the Commission
14	Report by the president of the Commission	3	President of the Commission
15	Global ocean observing system (GOOS) and global climate observing system (GCOS)	12.3	Vice-president of the Commission
16	WMO wave programme	5.4	Co-chairmen, Committee A
17	Marine climatology	7	Co-chairmen, Committee A
18	Voluntary observing ships (VOS) and ship-of-opportunity (SOO); drifting and moored data buoys; oceanographic satellites and other remote sensing	6.2, 6.3 6.4	Co-chairmen, Committee B
19	Marine telecommunication arrangements for data collection and transmission	6.6	Co-chairmen, Committee B
20	Election of officers; date and place of the thirteenth session; closure of the session	17, 18 19	President of the Commission