

# Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology

Fourth session

Yeosu, Republic of Korea

28–31 May 2012

Executive summary of the abridged final report with  
resolutions and recommendations



**World  
Meteorological  
Organization**

Weather · Climate · Water

WMO-IOC/JCOMM-4/3  
WMO-No. 1093



United Nations  
Educational, Scientific and  
Cultural Organization



Intergovernmental  
Oceanography  
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## GENERAL SUMMARY OF THE WORK OF THE SESSION

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

**1.01** The fourth session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was formally opened by Dr Peter Dexter, co-president of the Commission, at 9.00 a.m. on Monday, 28 May 2012, in the Conference Hall, International Pavilion, Expo 2012, in Yeosu, Republic of Korea. Prior to the Scientific and Technical Workshop which took place on 24 and 25 May 2012, Dr Dexter presided over an opening ceremony on Monday, 23 May 2012.

**1.02** On behalf of the Government of the Republic of Korea, Mr Seok-Joon Cho, Administrator of the Korean Meteorological Administration (KMA), welcomed the delegates to Yeosu, Republic of Korea. He noted that JCOMM successfully brought together the marine meteorological and oceanographic communities to find the most effective ways of using and sharing collective resources, through enhanced partnerships among Members/Member States for a common purpose.

**1.03** Mr Cho recognized that JCOMM is playing an important role on proactive measures against ocean-related disasters coupled with climate change and variability by providing relevant data, information and products to decision-makers and the general public. He reiterated the willingness of the Republic of Korea to continuously contribute to JCOMM projects and activities by sharing expertise and experience of marine meteorological services of the KMA and organizing capacity building projects, including a Coastal Inundation Forecasting Demonstration Project (CIFDP) for the Southeast Pacific region. In closing, Mr Cho expressed the pleasure of the Republic of Korea in hosting this session and associated Scientific and Technical Workshop.

**1.04** On behalf of the local hosts, Dr Joon-Yung Park, Governor of JeollaNamdo Province, Mr Keun-Soo Kim, Secretary-General of the Expo 2012 Yeosu Korea Organizing Committee, and Mr Chung-Seog Kim, Mayor of Yeosu, also welcomed the delegates to Yeosu and to Expo 2012, which has as its theme "The Living Ocean and Coast" relevant to the work of the Commission. They wished participants a productive meeting and an enjoyable stay in Yeosu and in JeollaNamdo Province.

**1.05** On behalf of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the Assistant Director-General of UNESCO and Executive Secretary IOC, Dr Wendy Watson-Wright, welcomed the assembled dignitaries, delegates and guests. She recalled that the Commission was a unique body in the UN system, serving two organizations and two communities in oceanography and meteorology. She noted that it was an excellent model of the UN system working as one to meet the objectives of Members and Member States, and had encouraged and facilitated enhanced collaboration, to the benefit of both meteorological and oceanographic communities. JCOMM contributed to the IOC objectives in preventing and reducing the impacts of natural hazards, and mitigating the impacts of and adapting to climate change and variability. She encouraged the Commission to improve its oceanographic representation, for balanced decision-making.

**1.06** The Executive Secretary recalled the timetable of revisions to the IOC Strategy and funding challenges for the Secretariat (see item 4), and expressed confidence that the new JCOMM Management Committee would be able to respond to these challenges. She gave her strong thanks to the Korean organizations that had funded and provided hospitality for the session: the Korea Meteorological Administration, the Expo 2012 Yeosu Korea Organizing Committee, JeollaNamdo Province, and the City of Yeosu. She expressed her gratitude for the engagement of the Members and Member States in the work of the Commission and wished the participants a successful session and workshop.

**1.07** On behalf of the World Meteorological Organization (WMO), Mr Michel Jarraud, Secretary-General, welcomed the delegates and expressed his appreciation to the Government of the Republic of Korea and in particular to the Korea Meteorological Administration for hosting this session in the beautiful coastal city of Yeosu. He expressed his appreciation to the JCOMM co-president, Dr Peter Dexter and former co-president, Dr Alexander Frolov, for their leadership of the Commission during the intersessional period, as well as to all JCOMM Groups, Teams, Panels and Focal Points, for their outstanding work since the third session, held in Marrakech (Morocco) in November 2009.

**1.08** Mr Jarraud mentioned that the Fourth Assessment Report of the Intergovernmental Panel on Climate change (IPCC) had shown that weather extremes are likely to become more frequent and/or more intense because of climate variability and change, while also bringing into focus the potential impacts of sea-level rise on coastal regions and lowlands, and the increasingly visible consequences of warming on sea ice cover and future navigation and trade in the polar regions. He noted that JCOMM had been very quick in responding to the challenge with partners, by implementing five new METAREAs for maritime safety services in the Arctic Ocean.

**1.09** The Secretary-General of WMO expressed his pleasure with the recent JCOMM efforts to enlarge its inter-programme collaboration with other WMO Technical Commissions, as well as its contribution to the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS), as well as to the objectives of the IOC.

**1.10** Mr Jarraud concluded by emphasizing that a key challenge for WMO and IOC would be to contribute, through JCOMM, to the objectives and development plans of their respective Members as well as those of the major international strategies, while at the same time striving for sustainable development and promoting scientific advances in marine meteorology and oceanography. He noted that for this to be possible there was a need for greater involvement in JCOMM of developing countries, in particular Least-developed Countries (LDCs).

**1.11** The IOC Chair, Dr Sang-Kyung Byun of the Korea Ocean Research and Development Institute (KORDI), welcomed the participants in the session on behalf of all of the IOC Member States and wished them a successful meeting.

**1.12** Following the long tradition within WMO Technical Commissions to formally recognize selected individuals who had undertaken outstanding work over many years, certificates for outstanding service to WMO and IOC, through JCOMM, were awarded by the Secretary-General of WMO and the Executive Secretary of IOC to:

- (i) Dr Vasily Smolyanitsky of the Russian Federation, in recognition of his dedication and outstanding contributions over two decades to the development, implementation and enhancements to all aspects of the collection, exchange and management of sea ice and related data, to the development and delivery of sea ice services, and to the increased use of modern technology for enhanced availability and quality of sea ice information for mariners at sea;
- (ii) Mr David Meldrum of the United Kingdom, in recognition of his outstanding contributions, over 25 years, to all aspects of the work of the Commission, and in particular to facilitating spectacular enhancements in the use of autonomous ocean platforms and devices to collect ocean data, to relay these data in real time through satellite and other communication channels, and to their quality control and delivery to users;
- (iii) Mr Henri Savina of France, in recognition of his dedication and outstanding contributions over more than 15 years to improving and enhancing marine meteorological services in support of the safety of life and property at sea, in particular through strengthening, refining and extending the WMO marine broadcast system for the Global Maritime Distress and Safety System.



**1.13** Additional certificates were awarded at the session to the two new WMO-IOC Regional Marine Instrumentation Centres (RMICs). The concept of RMICs grew out of a Pilot Project for the integration of marine meteorological and other appropriate oceanographic observations into the WMO Integrated Global Observing System (WIGOS). Statements of compliance had been submitted by China and the USA for hosting RMICs. Following the agreed-upon evaluation process, the RMICs in Tianjin and Mississippi offered by the National Centre of Ocean Standards and Metrology (NCOSM) of the State Oceanic Administration (SOA), and the National Data Buoy Centre (NDBC) of the National Oceanic and Atmospheric Administration (NOAA), were established by the WMO Sixteenth Congress and IOC Twenty-sixth Assembly in 2011.

**1.14** Mr Richard Crout, Chief Data Officer, National Data Buoy Center, NOAA, Stennis Space Center, and Dr Hong Wang, head of the Chinese delegation, Deputy Administrator of the State Oceanic Administration, received the certificates on behalf of the Centres.

**1.15** There were 191 participants in the session. These included representatives of 47 Members of WMO and/or Member States of IOC, six international organizations and a number of invited experts. A complete list of participants is given in [Appendix I](#) to this report.

## **2. ORGANIZATION OF THE SESSION** (*agenda item 2*)

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

**2.1.1** The representative of the Secretary-General of WMO presented a brief report on delegations whose credentials had been found valid. In accordance with WMO General Regulations 20 to 23, the Commission approved this report and decided not to set up a Credentials Committee (see item 2.3).

### **2.2 ADOPTION OF THE AGENDA** (*agenda item 2.2*)

**2.2.1** The Commission adopted the agenda for this session as contained in [Appendix II](#) to this report, on the understanding that additions or alterations could be made at any time during the session.

### **2.3 ESTABLISHMENT OF COMMITTEES** (*agenda item 2.3*)

**2.3.1** The Commission agreed that the plenary session would carry out the work on all agenda items. The sessions would be chaired by the co-president of the Commission, in general, and delegated to (a) Mr Johan Stander (South Africa) the chairmanship for the discussion under agenda items 5, 6, and 9; (b) Mr Greg Reed (Australia) the chairmanship for the discussion under agenda item 7; and, (c) Dr Nadia Pinardi (Italy) for the discussion under agenda item 8.

**2.3.2** In accordance with WMO General Regulations 22 to 31, the Commission decided to establish three Committees as following:

- **Coordination Committee:** In accordance with Regulation 28 of the WMO General Regulations, a Coordination Committee was established consisting of the co-president of the Commission, the representatives of the Secretary-General of WMO and Executive Secretary of IOC, and a representative of the host country.
- **Nomination Committee:** To facilitate the election of the officers, the Commission established a Nomination Committee consisting of Dr Georgi Korchev (chair, Bulgaria) and principal delegates from the following members of the Commission: Chile, Malaysia, Mauritius, Republic of Korea and United States of America.
- **Selection Committee:** The Commission decided to establish a Selection Committee for selecting members of the Commission's groups and teams, by reviewing nominating individual experts to undertake specific tasks. This Committee

chaired by Dr Trevor Guymer (United Kingdom of Great Britain and Northern Ireland). The Commission decided that the Selection Committee would have an open membership.

**2.3.3** The Commission recalled the normal practice of designating a rapporteur to review on behalf of the Commission the draft resolutions and recommendations under agenda item 12.3 regarding the actions to be taken by the Commission on past resolutions and recommendations of JCOMM, as well as the resolutions adopted by the governing bodies of WMO and the IOC of relevance to JCOMM. The Commission appointed Mr Val Swail (Canada) as the rapporteur on item 12.3.

## **2.4 OTHER ORGANIZATIONAL MATTERS** (*agenda item 2.4*)

**2.4.1** The Commission decided on its working hours for the duration of the session.

**2.4.2** Taking into account the limited time allowed for the sessional discussion, it was decided that the interventions during the sessions (with full interpretation) would focus on the Commission's decisions and workplans presented in the documents. With regard to Regulation 112 of the WMO General Regulations, it was agreed that no minutes of the session would be prepared but that statements by delegations might be reproduced and distributed as and when requested. With regard to Regulation 110 of the WMO, it was agreed that this would be suspended for the session, and that all documents would be available in all WMO languages in time for review by Members/Member States before consideration in plenary.

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

**3.01** The Commission noted with appreciation the report of the co-president for Meteorology, which provided an overview of the highlights of the past 2.5 years since JCOMM-III (4–11 November 2009, Marrakech, Morocco), as well as the major challenges and issues that the Commission had faced during this period, and would continue to face in the years to come. The key elements of this report are summarised below, with more details given under specific agenda items.

**3.02** The Commission noted with regret that the co-president for Oceanography, Dr Alexander Frolov, in line with WMO Regulations, had to resign from his JCOMM position in June 2011, following his elevation to the position of Permanent Representative of the Russian Federation with WMO, and subsequent election as acting member of the WMO Executive Council. The Commission warmly congratulated Dr Frolov on his election and new roles, offered its sincere appreciation to him for all his work for JCOMM during his time as co-president, and expressed the hope that he would continue to support JCOMM and its work in the future. The Commission noted that, due to the timing of JCOMM-4, it had not been possible to fill this vacant Co-president position during the intersessional period by correspondence.

**3.03** The Commission recognized with appreciation that, despite the intersessional period being shortened from the normal four years to two and a half years, nevertheless a number of substantial achievements against the agreed workplan had been realised. In addition, all Programme Areas (PAs) had developed realistic forward programmes for the next intersessional period, which was likely to be longer than usual. The Commission noted and supported some key points and/or actions from the PAs and cross cutting activities, as outlined in the following paragraphs. More details of these and other activities were considered under the relevant agenda items.

**3.04** The Commission expressed its concern that the ocean observing system being coordinated through the Observations Programme Area had plateaued at just over 60% of the requirements specified in the Global Climate Observing System Implementation Plan (GCOS-138, revised in 2010). It congratulated the Observations Coordination Group (OCG) for its efforts to

address this issue, which was largely related to the Members/Member States resources being made available for ocean observations. The Commission further congratulated the OCG on its efforts to advance the feedback loop on cost and feasibility of new, incremental requirements, in particular in engaging with promising new pilot projects being developed within the emerging Global Ocean Observing System Framework for Ocean Observations, one of the major outcomes of OceanObs'09 (21–25 September 2009, Venice, Italy), and in promoting dialogue to respond to all observing requirements. The Commission expressed its appreciation for the excellent work being accomplished by JCOMMOPS in support of JCOMM and the ocean observing system, including the provision of an expanding range of operational system performance metrics, and the innovative ship chartering activities to support platform deployments, which were bringing new resources to JCOMMOPS, including a possible new “ship logistics coordinator”.

**3.05** The commission noted with satisfaction that the final report and recommendations from the JCOMM Pilot Project for WIGOS had been warmly welcomed by the Sixteenth World Meteorological Congress, and that the JCOMM Data Management Programme Area, working closely with the IOC International Oceanographic Data and Information Exchange (IODE), had embarked on the implementation of many of the legacy recommendations from the project, including two Regional Marine Instrument Centres, which had already been implemented (in China and USA), and a third proposed in Morocco. Further successful work in support of WIS/WIGOS included the implementation of new ocean data standards; the consolidation and expansion of the IOC/IODE Ocean Data Portal; updating existing oceanographic manuals; updating and expanding BUFR tables for oceanographic data; enhancing metadata availability; maintenance and expansion of the Catalogue of Standards and Best Practices, as part of the JCOMM Data Management Plan; and work towards an integrated ocean in situ /satellite data management system. The Commission noted with appreciation that the modernization effort of the Marine Climatological Summaries Scheme (MCSS) had led to developing a vision and draft strategy for a new Marine Climate Data System. A key component of this system would be a proposed network of WMO-IOC Centres for Marine Meteorological and Oceanographic Climate (CMOCs) data (agenda item 7.2).

**3.06** The Commission recalled the major thrust areas for the Services and Forecast Systems Programme Area (SFSPA) during the past intersessional period:

- Ensure maritime weather and sea ice safety including the operational implementation of five (5) new Arctic Ocean METAREAs by July 2011;
- Implement operational ocean forecasting capability by initially developing a Guide to Operational Ocean Forecasting;
- Reduce risks of marine hazards on coastal communities in response to expected consequences of global climate change by implementing the recommendations of the first JCOMM storm surge symposium.

The Commission was pleased to note the advances made in these areas, despite the short intersessional period. In particular, the five new Arctic METAREAs became operational on 1 June 2011, with a new Global Maritime Distress and Safety System (GMDSS) web server for operational exchange of products across the Arctic Preparation Services. Extended suites of sea ice, high-resolution satellite and Metocean products were now being broadcast to the new METAREAs. In conjunction with this work, the Services and Forecasting Systems Programme Area (SFSPA) had enabled the placement of sea ice objects on Electronic Nautical Charts (ENC), with shipboard display, with future capability to include other Metocean information. The Commission recognized that operational ocean forecast capability had now been implemented at a number of National Meteorological (and Hydrological) Services (NMHS), and expressed its appreciation to SFSPA for coordinating and assisting in this implementation in a number of ways, including routine performance monitoring of the forecasting systems among the operational centres. In addition, further advances had been made in preparing the planned Guide to Operational Ocean Forecasting, and this was now scheduled for completion early in the coming intersessional period. The Commission noted with satisfaction that the Guide to Storm Surge Forecasting had now been published (WMO-No.1076), and that the SFSPA was making major contributions to implementing

the recommendations of the first JCOMM storm surge symposium (2–6 October 2007, Seoul, Republic of Korea). This included, in particular, the joint JCOMM/CHy Coastal Inundation Forecast Demonstration Project (CIFDP). As this project represented JCOMM's potential contribution to multi-hazard forecasting and warning, discussion had begun with related WMO and IOC programmes including the IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation System (IOC/TOWS-WG), for cooperation in dealing with multi-hazard forecast and warning issues, as a coordinated input to the disaster risk reduction priority area of both WMO and IOC. The Commission commended the efforts to keep the JCOMM Statement of Guidance up to date, within the context of the WMO Rolling Requirements Review.

**3.07** Capacity development under JCOMM had been undertaken largely within the three Programme Areas, with guidance and coordination provided by the Management Committee, and in accordance with a set of JCOMM Capacity Development Principles. Noting that some pilot projects under the Programme Areas make significant direct contributions to capacity development, the Commission also expressed appreciation for the major events in the past intersessional period, which included three training workshops on wave and surge forecasting; courses and workshops on ocean data buoys (and the applications of buoy data) and tide gauges; a maritime safety services enhancement workshop; an ice analysts workshop; two training courses to enhance marine forecasting; and workshops on ocean data management, in conjunction with IODE. The Commission stressed the importance of considering the UNESCO/IOC priorities Africa and gender equality, and decided to address these in the JCOMM Strategy.

**3.08** The Commission noted with appreciation that the Task Team on Satellite Data Requirements, which was formally established by the Management Committee in 2010, had developed a set of recommendations for improving the integration and comparison of satellite and in situ data, to improve data products in response to specified end-user requirements. The Commission supported the recommendation of the Management Committee, for the task team to focus on documenting JCOMM non-climate requirements for ocean satellite data, as the latter were already well covered in the GCOS Implementation Plan. In this context, the Commission requested the Task Team and Management Committee to plan for the establishment of a project similar to the successful Global High Resolution Sea Surface Temperature Project, for integrated satellite and in situ surface vector winds. Further details are provided under agenda item 6.

**3.09** The Commission recalled that JCOMM was directly involved in all the major WMO cross-cutting activities, including Disaster Risk Reduction (DRR), WIGOS, WIS and the Quality Management Framework (QMF). It had continued to provide strong support for the follow-up to the IPY, and would be heavily involved in the implementation of the GFCS, through all programme areas and the Management Committee. It had also developed strong links, and joint projects, with other WMO Technical Commissions and major IOC subsidiary bodies. In this regard, the cooperation between JCOMM and IODE was now almost seamless. In addition to the joint JCOMM/CHy CIFDP now underway, another significant new joint activity recently initiated joined the expertise of CAgM and JCOMM in a project to develop, as a contribution to the GFCS, data sets and tools to enable NMHS and other agencies, in particular in SIDS, to assess and respond appropriately to the impacts of climate variability and change on oceanic fisheries.

**3.10** The Commission recalled that both the Sixteenth WMO Congress and the Twenty-sixth IOC Assembly had identified DRR and the prevention and reduction of the impacts of marine hazards as major priority areas for the coming intersessional period. It noted with satisfaction that JCOMM was already making a significant contribution in this area, through the SFSPA and all its component expert teams, especially in coastal hazard risk reduction and maritime safety, including sea ice, as well as through the CIFDP Project. The Commission agreed that for the coming intersessional period, the Expert Team on Waves and Coastal Hazards should take the lead (with the chair of ETWCH as the focal point) for JCOMM in coordinating with the DRR/Marine Hazards programmes of WMO and IOC.

**3.11** The Commission recognized that, while past interactions between JCOMM and the WMO Regional Associations had not been strong, it was important that this be further developed in the future, from the perspective both of the importance of regional and local marine observations to the overall ocean observing system, as well as for enhancing regional and local forecast capabilities for extreme events affecting coastal areas. Likewise, the interactions between JCOMM and the IOC Sub-Commissions and GOOS Regional Alliances should be further developed, to nurture and emphasize JCOMM outcomes that appeal to the broad set of IOC Member States concerns.

**3.12** The Commission recalled that JCOMM continued to have widespread recognition as the primary implementation coordination body for the Global Ocean Observing System, while the requirements specified in the GCOS Implementation Plan (GCOS-138) formed the backbone of the ocean observing system being implemented by the Commission. The Ocean Observation Panel for Climate (of GOOS, GCOS and the WCRP) was a primary science advisory body for JCOMM. JCOMM was looking to partner with the tsunami programme of IOC, through the Management Committee and the IOC/TOWS Working Group, in particular in addressing multi-hazard warning systems for coastal inundation. The Commission had strong links with the International Maritime Organization (IMO) and the International Hydrographic Organization (IHO) in maritime safety-related issues; it was involved in the implementation of a number of tasks in the Group on Earth Observations (GEO) workplan; and it also had strong links with key peak bodies in the private sector, including the International Chamber of Shipping, the offshore Oil and Gas Producers forum, and marine classification societies.

**3.13** The Commission recognized that the adoption, in both WMO and IOC, of strategic plans based around a set of strategic objectives and expected results, accompanied by a results based management (RBM) system focused on these expected results, had posed a major challenge. JCOMM, as with the other WMO Technical Commissions and major subsidiary bodies of IOC, had responded successfully to this new approach, with all its major programme activities mapped onto the combined set of expected results.

**3.14** At the same time, the Commission agreed that JCOMM should maintain a programmatic approach to its work, as it was much easier for all those involved in JCOMM work to associate with and work towards an identifiable JCOMM programme. To this end, the Commission had revised and updated the JCOMM Strategic Plan, the new version of which was to be considered during the session. This new plan aligned with the strategic objectives and expected results of both parent Organizations, but at the same time addressed these within the existing programme structure. In line with this, all programme areas had developed operating plans, combined into a single JCOMM operating plan, again aligned with the expected results and Secretariat operating plans. The Commission agreed that the Management Committee should keep the implementation and revision of the strategic and operating plans under constant review, in response to developments both internal and external to WMO and IOC.

**3.15** The Commission noted that, despite a strong desire expressed at JCOMM-III, the proposed external review of the Commission had not taken place, through lack of the required extra-budgetary funds. The Commission recommended that, while organizing a review using traditional methods would be difficult in the current financial climate, other methods such as a questionnaire should be used to identify future priorities and to increase awareness of JCOMM in Members/Member States.

**3.16** The Commission agreed that the JCOMM website ([www.jcomm.info](http://www.jcomm.info)), with linked components maintained by both WMO and IOC, was a major resource and outreach tool to facilitate communications and information sharing, both internally and externally. Likewise, a regular electronic JCOMM newsletter had proven popular as an information sharing tool for both JCOMM members and the external marine community. It recognized that JCOMM had maintained an extensive technical publication programme: a new Guide to Storm Surge Forecasting had been published, and major revisions completed for the Manual and Guide on Marine Meteorological Services; and various sea ice related publications had been extensively reviewed and updated.

**3.17** The Commission agreed with the co-presidents that highlights of the past 2.5 years had been the ongoing efforts by JCOMM to support the operational implementation of ocean forecast systems; the implementation of new Arctic METAREAs; the development of CIFDP; and initial implementation of legacy recommendations from the JCOMM pilot project for WIGOS. These would remain a challenge and focus in the coming intersessional period. Other future priority challenges, in response to the agreed priorities of WMO and IOC, included:

- Long-term maintenance of the in situ observing system, encouraging the diversification of Members/Member States contributions to observing networks and to JCOMMOPS;
- Negotiating responses to the combined observing requirements in promoting further implementation of the in situ observing system;
- Input to GFCS implementation;
- The implementation of quality management systems in national services, within an overall Quality Management Framework;
- Disaster risk reduction;
- Ongoing overall WIGOS implementation; and
- Capacity development and resource mobilization in marine meteorology and oceanography.

#### **4. REVIEW OF DECISIONS OF THE GOVERNING BODIES OF WMO AND IOC RELATED TO THE COMMISSION** (*agenda item 4*)

**4.01** The Commission noted that the forty-third session of the IOC Executive Council (June 2010) and the twenty-sixth session of the IOC Assembly (June 2011) had acknowledged progress made under JCOMM.

**4.02** The Commission further noted that the General Conference of UNESCO at its thirty-sixth session (Paris, 25 October–15 November 2011) approved a zero nominal growth budget for UNESCO, with a budgetary allocation to the IOC of \$10,405,400, and planned activity support to JCOMM from IOC of \$170,000. However, following the General Conference vote admitting Palestine as a Member State of UNESCO, the United States of America and Israel have withheld their assessed contributions (22.38% of UNESCO totals), leading to a budget deficit for 2011 and a projected budget shortfall for 2012–2013. To restore cash-flow stability and to eliminate the deficits for both 2011 and the next two years, UNESCO effected a budget reduction of 29% of the approved budget. For the IOC, even with utilizing what little flexibility there is in staff allocation, the reduction translates into a 77% cut to resources for activities. For IOC Secretariat support to JCOMM, the allocation for 2012–2013 was provisionally set at \$34,000 or 20% of planned. The Commission expressed concerns on the current financial situation of the IOC (see also paragraph [12.2.4](#)).

**4.03** Under the circumstances, the Commission appreciated in particular the Republic of Korea's contribution to maintaining the IOC's responsibility to host this fourth session of JCOMM (JCOMM-4, 28–31 May 2012) and Scientific and Technical Workshop. Voluntary contributions came from the Korea Meteorological Administration, Yeosu City, Jellonamdo Province, and the Expo 2012, Yeosu, Korea Organizing Committee. The Commission noted the total cost to the IOC and WMO Secretariats and host country of the JCOMM-4 session (for staff travel, in-session interpretation and translation, pre-session translation, and report preparation —not including in-kind salary and hospitality costs) was estimated at \$400,000, and requested the Management Committee and the Secretariats to explore ways of working that would improve the ratio of funding between governance and activities in the future. In this context, the Commission noted with interest the work being carried out by the WMO through its Task Group on “Continuous Improvement to



Practices and Processes” which aims to identify better and more efficient ways for WMO to operate, thereby increasing the amount of funding that can be allocated to programme activities.

**4.04** The Commission noted with appreciation that the United States of America would maintain its membership in and commitment to UNESCO and the IOC, serving as a leading member of the IOC, participating on the Executive Council, and as active members of IOC programmes, providing scientific leadership and contributing its national capabilities to achieve agreed goals, for example, through JCOMM, IODE, GOOS, and the tsunami programme.

**4.05** The Commission expressed concerns on the current financial situation of the IOC, and requested the Management Committee, once re-established by the current session, to establish an ad hoc group to consult Members/Member States on improved in-kind and financial support for JCOMM activities (see also paragraph 12.2.4). The Commission also requested the Management Committee to review the JCOMM priorities for intersessional period to ensure effective use of the available resources. The Commission also requested the WMO and IOC Secretariats to take all necessary measures to facilitate in-kind and financial supports by Members/Member States for the Commission’s work during the coming intersessional period.

**4.06** The Commission was pleased to note that the sixteenth World Meteorological Congress had reaffirmed the success of a jointly sponsored technical commission in bringing together the marine meteorological and oceanographic communities, and integrating operational marine activities. The Commission noted that Congress approved regular budget funding for activities falling within the WMO’s Marine Meteorology and Oceanography programme at a similar level as in the previous four-year financial period (2008–2011); however, Congress also highlighted new directions and priorities for the Organization that would affect how these regular budget funds could best be utilized. The Commission took note of the requests by Congress on intersessional activities, and made decisions accordingly under agenda items 5 to 12.

**4.07** The Commission noted with satisfaction the reaffirmed support of WMO Congress for JCOMM’s project-oriented approach to address specific, defined, and time-bound activities. The Commission requested the Management Committee and the Secretariats to revise the JCOMM Operating Plan for the intersessional period to reflect this approach.

**4.08** The Commission noted priorities of WMO which would impact the intersessional work of JCOMM, such as a full integration of the Quality Management Framework (QMF)/Quality Management System (QMS) into the wider WMO Strategic Planning, as well as support for Global Framework for Climate Services (GFCS). The Commission agreed that focused efforts should be made to ensure concrete results in these areas, while recognizing the need for additional resources in order for JCOMM to carry out its ongoing work as well as emerging priority requirements. In light of the limited resources, particularly at the IOC, the Commission urged Members/Member States to contribute extrabudgetary funding for JCOMM, and in-kind contributions, including secondments, to enable the IOC and WMO Secretariats to implement the programme for JCOMM, foreseen for the coming intersessional period.

## **5. SCIENTIFIC AND OPERATIONAL REQUIREMENTS**

### **5.1 OBSERVING REQUIREMENTS FOR CLIMATE (GCOS AND GOOS) (agenda item 5.1)**

**5.1.1** The Commission recalled that observing system requirements for global climate research, monitoring, forecasts and projections for the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the World Climate Research Programme (WCRP) were written into the Implementation Plan for the Global Observing System for Climate in support of the UNFCCC (*GCOS Implementation Plan*, 2004, GCOS-92). The Commission also recognized that the updates of the GCOS Implementation Plans in 2010 (GCOS-138, GOOS-184, WMO-TD/No. 1523) as well as its satellite supplement, which was updated in 2011 (GCOS-154), took into account the latest status of observing systems, recent progress in science and technology, the

increased focus on adaptation, enhanced efforts to optimize mitigation measures, and the need for improved predictions of climate change. The Commission expressed its satisfaction, in particular, that the plans also formed the basis for an ocean observing system for global operational ocean forecasting. The Commission recalled that the ocean and marine meteorological portion of these plans were written by the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), which is the scientific partner of JCOMM in the development of an ocean observing system for climate. The Commission appreciated the ongoing work of the OOPC in defining requirements for deep ocean observations, and asked the OOPC to begin work on revisiting the requirements for upper ocean thermal observations, emphasizing the importance of including relevant JCOMM bodies and experts from the Observations Coordination Group in the review. The Commission recognized the importance of implementing these plans to address the requirements of climate science, support the Global Framework for Climate Services (GFCS), and to support informed decisions on climate change mitigation and adaptation.

**5.1.2** The Commission noted that it is recognized in these plans as the Agent of Implementation for 23 actions in coordination of observing networks, data management systems, and development of products and standards, and agreed to this responsibility.

**5.1.3** The Commission recognized the efforts of Members/Member States that had contributed to sustaining a number of components of the initial ocean observing network for climate that have reached their design goals (Argo, VOSCLIM, and the DBCP surface drifter networks). It agreed that these should be sustained as a priority and that a number of others required increased contributions in order to reach their design goals. The Commission therefore urged Members/Member States to implement the actions, coordinated through JCOMM, called for in the GCOS Implementation Plan and satellite supplement updates. It asked the Management Committee and the Programme Area Coordinators to address the 23 actions for JCOMM in the GCOS Implementation Plan (2010 update) in reviewing and assessing progress, in developing their workplans, and in setting priorities.

## **5.2 OBSERVATIONAL REQUIREMENTS FOR FORECASTS AND SERVICES (*agenda item 5.2*)**

**5.2.1** The Commission recalled that operational observations requirements for marine services and forecasting systems, as well as ocean observations requirements for other applications areas (e.g. Numerical Weather Prediction —NWP), have been routinely managed through the WMO Rolling Review of Requirements.

**5.2.2** Considering that the requirements for climate monitoring (GCOS, see item 5.1) were already well taken into account as part of the JCOMM Observations Programme Area Implementation Goals (OPA-IG), the Commission requested the OPA to make sure that the ocean observational requirements for the following applications areas are also included in the OPA-IG:

- Ocean Applications, including Met-Ocean Forecasts and Services, including marine services, marine hazards warnings, ocean mesoscale forecasting, sea ice and iceberg warnings and forecasts, global and regional wave modelling, serving the needs of maritime transportation (e.g. safety, routing), fishing, and coastal and offshore areas activities;
- Global Numerical Weather Prediction;
- High Resolution Numerical Weather Prediction;
- Synoptic Meteorology;
- Seasonal to Inter-annual Forecasts;
- Climate applications and services.



**5.2.3** In doing so, and taking into account the Statements of Guidance (<http://www.wmo.int/pages/prog/www/OSY/GOS-RRR.html#SOG>) for the above application areas, and identified key gaps, the Commission recommended the following JCOMM response:

- (i) OPA is requested to continue to evaluate the quality of wave observations, and the development of cost-effective wave observations from drifters through the DBCP-ETWS Pilot Project on Wave Measurement Evaluation and Test from Moored Buoys (PP-WET) and the DBCP Pilot Project on Wave Measurement from Drifters (PP-WMD) respectively;
- (ii) Commission members are invited to make precipitation measurements from moored buoys, including coastal moorings, tropical moorings, and OceanSITES;
- (iii) Commission members are urged to install barometers on all newly deployed drifters; and are encouraged to deploy more autonomous AWS on ships;
- (iv) The RAMA array of tropical moored buoys in the Indian Ocean should be completed;
- (v) More cooperation is encouraged between OPA and SFSPA Expert Teams in charge of marine services activities (e.g. ETSI, ETWS, ETOOFS).

**5.2.4** The Commission emphasized the importance of an integrated approach between in situ and remotely sensed (space-based and surface-based) observations when considering requirements. Noting with appreciation that the WMO-CEOS database now contained a new subset relevant to marine meteorology and operational oceanography, allowing an accurate assessment of how the existing in situ ocean observing system was addressing JCOMM's own service requirements for such data, the Commission requested the Services and Forecasting Systems Programme Area (SFSPA) to ensure that the set of observational data requirements to support met-ocean applications continues to be reviewed and updated. Further noting that the SFSPA had participated in the WMO Commission for Basic Systems (CBS) Rolling Review of Requirements (RRR) process and that an updated Statement of Guidance (SoG) for Ocean Applications had been produced (JCOMM-4/BM.5.4), the Commission requested that the existing SoG should continuously be kept updated (see also item 8.1).

**5.2.5** The Commission recalled that the Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP), managed through WMO/CBS, was currently being drafted. This would be an important reference document in providing Members with clear and focused guidelines and recommended actions in order to stimulate cost-effective evolution of the observing systems. The Commission noted that good progress has been made in developing the new version of the EGOS-IP in response to the Vision of the GOS in 2025, WIGOS needs, GFCS requirements, and Ocean Application requirements. The Commission also noted that, through a Congress-XVI decision, a draft WIGOS Implementation Plan had been developed by the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) for submission to Executive Council (EC-64) for approval. Execution of this plan would establish the WMO framework for managing observing component contributions of its Members in an integrated fashion and in collaboration with partner organizations. The Commission particularly thanked Dr Ali Mafimbo (Kenya) and the SFSPA for their substantial efforts in both regards. The Commission urged Members/Member States to make sure that all ocean observations related actions which are part of the EGOS-IP should be properly addressed once the new EGOS-IP is approved by the WMO Executive Council (in principle EC-65 in 2013). The Commission emphasized the importance of working on a strategy for properly engaging JCOMM in various implementation plans, such as EGOS-IP, WIGOS-IP, GFCS, to avoid duplication of effort.

### **5.3 REQUIREMENTS FOR INTEGRATED DATA PRODUCTS** (*agenda item 5.3*)

**5.3.1** The Commission noted that a cross-cutting Task Team on Satellite Data Requirements (TT-SAT) was established during the past intersessional period to improve the integration of satellite data with other remotely-sensed and in situ data including real-time systems. The Commission also noted that non-satellite remotely-sensed data from land, ship and airborne platforms such as RADAR winds and ocean current measurements was increasingly becoming

available. The Commission agreed that the TT-SAT should replace the Activity Leaders on Satellite Data Requirements in each Programme Area, with the chair to be a member of the Management Committee. The Commission agreed that the TT-SAT should lead the intersessional activities to document JCOMM non-climate requirements, taking into account an integrated use of available products derived from in situ and remotely sensed data.

**5.3.2** The Commission, noting that in situ and remotely-sensed (space-based and surface-based) observations are complementary for most areas of met-ocean applications, agreed that further consistent quality control between in situ and remotely-sensed data must be promoted as a matter of priority, together with appropriate feedback mechanisms. The Commission requested that the TT-SAT coordinate with appropriate programmes of WMO and IOC to develop and document best practices and standards for data and product integration.

**5.3.3** The Commission, while recognizing that the core mission of JCOMM remains the sustained provision of basic observational data, agreed that efforts should be made to improve integrated products, through gap analysis if necessary, to meet end user requirements. In this context, the Commission endorsed the Management Committee's initial proposal for TT-SAT to coordinate the development of integrated Surface Vector Wind (SVW) products, in close collaboration with the interested satellite and surface-based observation communities. This would substantially improve operational applications (including those of maritime safety, sea state forecasting and warnings, and coastal applications) that provide societal benefit. The Commission requested the Management Committee to ensure, in designating task team membership, that appropriate areas of expertise would be represented in TT-SAT to efficiently carry out this task. The Commission recognized that integrated data products extended beyond SVW, and asked that during the intersessional period the Task Team should develop a plan to address those additional requirements. The Commission also requested TT-SAT to appropriately document the outcome of its work, and to update the User Requirements documented in the WMO Rolling Review of Requirements (RRR) database and the Statement of Guidance (SoG) for Ocean Applications as needed.

**5.3.4** The Commission agreed that JCOMM should maximize interactions with and utilization of the existing mechanisms for dealing with satellites and satellite products (e.g. CBS ET-SAT & ET-SUP, CEOS, CGMS), in order to streamline the Commission's activities in this area and to efficiently deliver the requirements identified for ocean data acquisition and improved applications for service delivery. In particular, the Commission agreed that better linkage was required between JCOMM and the various Committee on Earth Observation Satellites (CEOS) virtual constellation groups (e.g. tide gauge expert participation in the surface topography constellation). The Commission requested the Management Committee to enhance the partnership and develop joint activities with these groups.

## **5.4 CLIMATE SERVICES (agenda item 5.4)**

**5.4.1** The Commission noted that the Observations and Monitoring component of the Global Framework for Climate Services (GFCS) was an area in which JCOMM could make important contributions, through the completion and enhancement of the ocean observing systems for climate in both the open-ocean and coastal domains. The requirements for this were described in the *Implementation Plan for the Global Observing System for Climate in support of the UNFCCC* ("GCOS Implementation Plan", 2010 update, GCOS-138). The Commission agreed that the intersessional workplan should continue to give priority to this area (see items 5.1 and 6), and requested the groups/teams of all Programme Areas (PAs) enhance activities to support related research and development for climate services.

**5.4.2** The Commission agreed that the Expert Teams of the Services and Forecast Systems Programme Area (SFSPA) have a number of core mandates of JCOMM that directly support the GFCS. It also noted that JCOMM, as a Technical Commission of WMO and IOC working, inter alia, in the area of the applications of marine meteorology and oceanography, has a role to facilitate

engagement of, and interaction with, the users and the entities to JCOMM that have a requirement for climate services.

#### Polar Met-Ocean and sea ice information services

**5.4.3** The Commission noted that, as activities in oil and gas exploration, tourism, and eventually marine transportation grow in the Arctic, sub-Arctic and Antarctic, adequate marine weather safety and sea ice services would need to overcome major challenges in observation, short- and long-term forecasting and dissemination to meet the service demand. In this context, the Commission agreed that the SFSPA, through the Expert Team on Maritime Safety Services (ETMSS) and Expert Team on Sea Ice (ETSI), would lead JCOMM efforts in developing meteorological and oceanographic information for safety and efficiency of ice navigation and for response to marine environmental accidents in the Arctic Ocean, Southern Ocean and other areas with seasonal ice cover. Further, the Commission endorsed the ETSI work on ice charting archival and climatology within the WMO “Global Digital Sea Ice Data Bank” and asked the ETSI to continue this activity in close cooperation with International Ice Charting Working Group and JCOMM Expert Team on Marine Climatology. Potential SFSPA projects and recommendations for the next intersessional period were discussed under agenda item 8. The Commission further noted that JCOMM’s data management activities would contribute to furthering our understanding of the rapidity of change in the Polar Regions and that those data collected under the auspices of ETSI including polar GMDSS would be beneficial to the Global Integrated Polar Prediction System through improved ocean-atmosphere-ice coupled models and predictions on seasonal timescales.

#### Reducing coastal natural hazard risks through demonstration and capacity building in storm surge and coastal inundation forecasting

**5.4.4** The Commission recognized that the Expert Team on Wind waves and Storm surges (ETWS) has long been taking a leading role in providing scientific and technical support for forecasting systems/capability for storm surge prediction and risk reduction. Taking into account increasing risks of coastal communities to natural hazards associated with global sea level rise and coastal storms, the Commission re-emphasized that the improvement of NMHSs’ capability for storm surge and coastal inundation prediction should be the Commission’s priority during the intersessional period. The Commission agreed that the ETWS (to be renamed Expert Team on Waves and Coastal Hazard Forecast Systems, ETWCH; see items 8.2.8 and 12.4) would lead JCOMM efforts in developing a GFCS component for coastal inundation forecasting and warning. This component would place particular emphasis on interaction with end users through demonstration projects such as the JCOMM-CHy Coastal Inundation Forecasting Demonstration Project (CIFDP) as well as through continuous work to establish a storm surge climatology by coordinating relevant activities of Members/Member States, especially in the developing countries. Associated plans and recommendations for the intersessional period were discussed under agenda item 8.2.

**5.4.5** The Commission agreed that the joint JCOMM-WCRP project Coordinated Ocean Wave Climate Projections (COWCLIP) would directly contribute to GFCS through the results of coordinated intercomparison on global wave projections between international research groups, and through better understanding uncertainty within the community ensemble of wave climate projections. In this context, the Commission requested the ETWCH to take a lead in coordinating this activity, with a view to including wave information in greater detail in the IPCC Fifth Assessment Report (AR5).

#### Ocean observation and modelling in supporting coupled seasonal climate forecasting systems

**5.4.6** The Commission recalled that a unique characteristic of JCOMM among WMO Technical Commissions was the ocean aspects in the Commission’s core competency. These “ocean aspects” are reflected not only in the Commission’s ocean observation mandate for broad time scales spanning from weather and seasonal to inter-annual climate variability to long term climate

change, but also in the Commission's mandate in coordinating operational ocean modelling/forecasting systems. Noting that these two core competency areas and mandates of the JCOMM were also critical elements for operational seasonal climate forecasting, the Commission requested that the Services and Forecasting Systems Programme Area (SFSPA) (through ETOOFS) and Data Management Programme Area (DMPA) work with other relevant international groups (e.g. GODAE Ocean View Science Team (GOVST), JSC/CAS Working Group on Numerical Experimentation (WGNE), Commission for Basic Systems Expert Team for Extended Long-Range Forecasting (ET-ELRF), WMO/UNESCO/ICSU World Climate Research Programme (WCRP) Working Group on Seasonal-to-Interannual Prediction (WGSIP)) and the seasonal forecasting community to develop a coordination framework for operational coupled seasonal climate forecast systems. The focus of the JCOMM contribution should be on the ocean component of the system, applications of ocean observations and standardization of ocean data for use in ocean analyses and seasonal forecast systems. Some relevant workplans and recommendations for the intersessional period were discussed under agenda item 8.1.

### Developing Climate Services for Fisheries Community

**5.4.7** The Commission noted with interest the recent development of a joint activity by JCOMM and the WMO Commission for Agricultural Meteorology (CAgM), to address the required climate information and services for fisheries, in view of supporting decision-making process and the development of impact and adaptation strategies. It further noted a proposal at the Fifteenth Session of the CAgM (Brazil, July 2010) to establish a joint CAgM/JCOMM Expert Team on Weather, Climate and Fisheries. The Commission recognized potential advantages in such activities, as presented during the International Workshop on Climate and Oceanic Fisheries (October 2011, Rarotonga, Cook Islands), to provide a mechanism to address marine service requirements of fisheries as well as to become an important source of Metocean data and the data/service requirements, and particularly to explore the user interface dimensions of the GFCS regarding food security. The Commission agreed that, while seeking to establish contact with other competent bodies already active in this area (e.g. PICES, FAO), JCOMM should continue this crosscutting activity during the intersessional period within JCOMM's areas of expertise including Metocean climate data management and data analysis, as the direct contribution to GFCS. The Commission endorsed the proposed Terms of Reference (see [Annex II](#)). The Commission requested the Management Committee to work with the CAgM Management Group to identify the members of the new joint Team (proposed as a Task Team) and to support the intersessional activities, that would address the issues of Metocean climate analysis and data management. The Commission recognized that there would be resource implications associated with this new activity, and requested the Management Committee to identify appropriate resources in consultation with the CAgM and GFCS office so as to properly support the activity of the new Expert Task Team.

## **6. IN SITU AND SATELLITE OBSERVING SYSTEMS (agenda item 6)**

### Introduction

**6.01** The Commission noted that the Observations Programme Area (OPA) continued to be guided by the "GCOS Implementation Plan" (GCOS-138) in developing and supporting a climate-quality composite ocean observing system (see item 5.1). As such, the OPA acted as an umbrella for a diverse range of observing programmes, some supported by national met-ocean services, some supported largely by research funding with sustained intent but uncertain continuity. The OPA was also mindful of the emerging requirements for new technologies and observations, especially of biogeochemical variables, that had been outlined during the OceanObs'09 conference (Venice, Italy, September 2009). Coordination of this would be developed through the GOOS Framework for Ocean Observations (see item 11). The OPA also regularly reviewed non-climate observing requirements expressed through the WMO Rolling Review of Requirements process. The Commission asked the OPA to continue with its efforts in developing the composite observing system to address those challenging requirements.

**6.02** The Commission recalled that the WMO Integrated Global Observing System (WIGOS) has entered in its Implementation Phase per Resolution 50 (Cg-XVI), and agreed that JCOMM should be fully involved in this activity. Particularly, considering the successful outcome of the JCOMM Pilot Project for WIGOS, the Commission requested the OPA and DMPA to address the legacy recommendations of the Pilot Project during the next intersessional period (JCOMM/TR-No. 48) as JCOMM's contribution to WIGOS implementation. See also item 6.2 for further details.

**6.03** The Commission considered the recent WMO initiative to establish a Global Framework for Climate Services (GFCS, see item 5.3) and asked the OPA to engage fully with this process and to establish a dialogue regarding any additional observing requirements that the GFCS might in due course identify.

**6.04** The Commission noted with concern that the status of the observing system, expressed as a percentage of the in situ implementation goals, had not significantly increased since JCOMM-III in 2009, and that some networks have decreased compared to these goals. The Commission urged Members/Member States to commit towards achieving and sustaining the initial implementation goals.

**6.05** The Commission noted with appreciation the activities of the Observations Programme Area during the intersessional period since JCOMM-III, and stressed the need for continuous action towards the goals identified by the OPA. The Commission encouraged further action in improving observations in high latitudes and in marginal seas and the coastal ocean, while recognizing that barriers related to procedures for access to territorial waters and Exclusive Economic Zones would have to be recognized and overcome. The Commission expressed concern about the sustainability of the research funding sources that are supporting much of the observations coordinated in the OPA, and encouraged the Commission to further engage with operational agencies that may be better able to sustain ocean observations.

**6.06** The Commission recalled that all observations coordinated by the OPA flowed from in situ observing programmes, and that productive collaborative links with remote sensing programmes had been slow to establish (but see paragraph 6.09 below). The Commission urged the OPA to be as proactive as possible in forging links with the remote sensing community for the overall benefit of ocean observation.

**6.07** The Commission noted with appreciation the establishment of Regional Marine Instrument Centres (RMICs) in WMO Regional Association (RA) IV (N. America, Central America and the Caribbean) and RA II (Asia), addressing observing instrument best practices and standards (see item 6.2), and decided to pursue these initiatives. In so doing, the Commission urged Members/Member States to consider offering new RMIC facilities in other regions.

**6.08** The Commission was pleased to note that most OPA programmes had benefited from the dedicated technical support of the Technical Coordinators based at the JCOMM in situ Observations Programme Support Centre (JCOMMOPS) in Toulouse, France. Nonetheless, financial support for JCOMMOPS remained fragile and fragmentary, and the Commission urged all Members/Member States to do their utmost to contribute to or enhance their existing level of support to JCOMMOPS (see item 6.3).

### **Issues by observing system**

#### **Data Buoy Cooperation Panel (DBCP)**

**6.09** The Commission noted with approval that, since JCOMM-III, major activities by the DBCP had included (i) capacity development, (ii) the continued extension of buoy coverage and sea level pressure observations to data-sparse regions, and (iii) outreach to other observing systems and platforms (e.g. OceanSITES). In this latter context, the Panel, as was its custom at these junctures,

had proposed changes to its Terms of Reference at its previous session (Geneva, September 2011) to reflect this new activity (see also item 12.4).

**6.10** The Commission noted with concern that the number of operating drifters had fallen to around 75% of the 1,250 target due to technical problems, and that DBCP was actively engaged with the drifter manufacturers on this issue. The Panel had also continued with the initiation of a number of pilot projects to evaluate new communications technologies and sensors with a view to their eventual transition to routine operational use. The Commission was pleased to record that the pilot project approach had proved particularly successful, making full use of the Panel's expertise and wide-ranging connections within the research, manufacturing and operational sectors, and urged Members/Member States to support the DBCP in these activities, which did much to ensure a consensus-based approach to the development of the global buoy network. The Commission encouraged the DBCP to continue with its efforts to extend buoy coverage and sea level pressure observations to data-sparse areas and in particular the South West Indian Ocean.

**6.11** The Commission expressed its appreciation of the DBCP for the Report on Ocean Data Buoy Vandalism — Incidence, Impact and Responses, that was received and endorsed by the IOC Assembly, WMO Congress, and the United Nations General Assembly, with a view to promoting an integrated UN approach to address this critical issue. The Commission acknowledged guidance from WMO and IOC governing bodies regarding the issue of vandalism on data buoys through WMO Resolution 25 (Cg-XVI) and IOC Assembly Resolution XXVI-6, and requested that the Management Committee respond to these resolutions to continue monitoring and documenting ocean observing systems vandalism events (see recommended format for reporting events on the web<sup>1</sup>) and develop an implementation strategy across the Programme Areas to increase awareness of the essential nature of these ocean observing systems to protect life and property and enhance our understanding of climate and oceans.

**6.12** The Commission was pleased to hear that the most recent project, a joint venture between the DBCP and the Group for High Resolution SST (GHRSSST), was serving as a model of how to engage the remote sensing sector in developing new standards and practices for better in situ validations and ultimately better satellite products. It encouraged the DBCP to continue with its proactive engagement with the global satellite community.

**6.13** Noting that the DBCP had recently assumed responsibility for the coordination of data collection and dissemination from rigs and platforms operated by the offshore industry, the Commission urged the Panel and the OPA in general to continue to investigate all possible means to recruit to additional ocean observing platforms.

**6.14** The Commission further noted with appreciation that substantial efforts had been made by the DBCP to realize the Partnership for New Global Earth Observation System of Systems (GEOSS) Applications concept (PANGEA) starting through a series of workshops in the Western Indian Ocean region, and now expanding to other regions. The Commission requested the OPA to continue these capacity development efforts, and urged Members/Member States to contribute to these activities.

**6.15** In considering the need to extend JCOMM's activities in ocean wind and wave observation, the Commission decided to work through the DBCP and ETWCH to continue efforts to enhance in situ global wave observing capability, in support of satellite product and ocean model validation, through the evaluation of in situ wave measurements and the development of cost-effective buoy technology.

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<sup>1</sup> <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/dbcp/templates/Format-DBCP-Buoy-Vandalism-Reports.doc>

### Ship Observations Team (SOT)

**6.16** The Commission recalled that the SOT coordinated the activities of the Voluntary Observing Ship (VOS) programme and Ship Of Opportunity Programme (SOOP). Within the VOS component, moves had been agreed to promote the migration of observing ships to the climate-quality (VOSclim) standard, with ideally 25% of the VOS fleet achieving that status within the next two years. In a similar vein, the goal of creating a leaner but more efficient VOS fleet had led to the requirement that all VOS should aim to report at least 20 times per month. In part, the motivation for these changes had to come from the ship operators, and the SOT had extended its dialogue in this regard to include the World Ocean Council (WOC), which had established itself as a forum for the promotion of environmental issues amongst all sectors of marine industry. The Commission urged the SOT to continue with its efforts in this regard and asked Members/Member States to encourage their shipping companies to implement the VOSclim standard as widely as possible amongst their VOS fleets. The Commission recognized the trend over recent years of an increase in the number of reports from ship-based automatic weather stations and the likely continued reduction in the manual observations from the VOS fleet.

**6.17** The Commission agreed that motivation had also to be promoted amongst ships' officers, and that action had been taken to reinvigorate the Port Meteorological Officer (PMO) network, especially in developing countries, as a key component in enlisting an enthusiastic body of marine observers. In this regard, the Commission urged its Members/Member States, especially from developing regions, to work with the SOT to develop and strengthen their PMO services.

**6.18** With regard to the SOOP, the Commission noted that this Panel implemented routine oceanographic observations, mostly from selected cargo ships, and mainly in the form of expendable Bathy-Thermographs (XBTs). The Commission urged Members/Member States to continue their support for this activity, which complemented the observations being obtained from the Argo programme. In particular, it encouraged a more extensive implementation of other *en route* oceanographic measurement systems, such as Ferry Boxes, expendable Conductivity Temperature Depth probes (XCTDs), Acoustic Doppler Current Profilers (ADCPs), ThermoSalinoGraphs (TSGs) and Continuous Plankton Recorders (CPRs).

**6.19** The Commission recalled that ship call-sign masking had risen markedly in importance as a means to prevent ship positions being readily identified by third parties, especially via websites that published data circulating on the Global Telecommunication System (GTS). Free access to such data had raised serious security concerns amongst commercial ship operators on whose goodwill the VOS network depended. At its Sixth Session (Hobart, Australia, April 2011), the SOT had agreed to promote the development of a ship call-sign encryption scheme that would mask ship's identities from the general public, but yet allow data quality monitoring centres to subsequently link observations to particular ships. The Commission, in noting the importance of this initiative in retaining the participation of the VOS and in permitting thorough quality analysis and feedback to participating ships, urged the SOT to work closely with expert bodies such as the WMO CBS in developing a common and robust standard for call-sign masking.

### Global Sea Level Observing System (GLOSS)

**6.20** The Commission recognized the role of GLOSS in promoting and maintaining a multi-purpose network of tide level gauges that supported a broad research and operational user base, and expressed appreciation for the GLOSS contribution to the climate, coastal and operational service modules of GOOS through the sea level measurement network and data exchange arrangements. The Commission welcomed the increased operational contribution GLOSS had made in the development of tsunami warning systems, although it also noted significant gaps in the network, particularly in Africa, the Arctic, the western Pacific and Indian Ocean. It strongly urged Members/Member States to contribute to the GLOSS Core Network (GCN) as outlined in *The GLOSS Implementation Plan 2012* (IOC Technical Series, 100), especially to meet the requirement

for all GCN stations to report data in near-real time and to continuously measure geodetic changes using the Global Navigation Satellite System.

### OceanSITES

**6.21** Noting with appreciation the excellent collaboration that had been established between OceanSITES and the DBCP, and the provision through JCOMMOPS of a part time Project Office function, the Commission requested Members/Member States to contribute to or enhance their existing level of support to JCOMMOPS (see item 6.3).

**6.22** The Commission invited OceanSITES to continue to work with its Principal Investigators on a number of issues, namely (i) the definition of a minimal set of interdisciplinary variables, (ii) the development of clear data management policies and systems, (iii) the identification of additional resources for project support through JCOMMOPS, and (iv) the creative use of matching funds to encourage deep ocean observations. In thanking OceanSITES for its collaboration with the OPA, the Commission urged it to continue its efforts to increase the number of reference stations making geophysical variables available in real-time to the international community on a free and unrestricted basis.

### Argo

**6.23** The Commission noted with appreciation the efforts of the Argo Steering Team and the support of Members/Member States in the continued maintenance of the global array of now 3,500 Argo profiling floats operating in the deep ocean, marginal seas and high latitudes. The Commission recognized that the target of 3,000 floats refers to the original (core) mission of Argo to deliver 3 degree coverage in the ice-free regions (nominally between 60°N and 60°S) of the open ocean regions of greater than 2,000 m depth. The Argo Steering Team has recommended to define the global Argo mission to now include all areas in the ocean where depths are more than 2,000 m, including marginal seas and high latitudes, which will imply a need for more than 3,000 floats and a new target will be defined for this.

**6.24** The Commission also applauded the successful implementation of a completely open data policy (coupled to strong data management and quality control procedures), the extension of the array to serve additional missions on top of its core climate objectives, and the efforts of Argo in the Scientific Educational Resources and Experience Associated with the Deployment of Argo (SEREAD) project for climate education in the South Pacific. However, it recognized that major efforts were necessary to ensure adequate geographical coverage and to ensure sustainability of the array, and urged Members/Member States to contribute to float deployments and to the JCOMMOPS Argo Information Centre in order to maintain and strengthen this capability.

**6.25** The Commission requested the OCG work with all OPA networks and the proposed JCOMMOPS Ship Coordinator (see item 6.3) to achieve synergies in the use of common deployment opportunities. This would permit the deployment of more floats in furtherance of the array's design goals, especially in the southern hemisphere, as well as other platforms.

### International Ocean Carbon Coordination Project (IOCCP)

**6.26** The Commission noted that the IOCCP had continued to work proactively in developing both a consensus for best practices and an effective network for global surface ocean carbon observations. In this context, the IOCCP had been instrumental in compiling the *GO-SHIP Repeat Hydrography Manual* and the *Guide to Best Practices for Ocean CO<sub>2</sub> Measurements*, and had facilitated data collection, management and data synthesis activities, including the Surface Ocean CO<sub>2</sub> Atlas. In reviewing these activities, the Commission recalled the importance of ocean carbon measurements in elucidating the issues surrounding climate change and ocean acidification, and urged Members/Member States to contribute actively to the work of the IOCCP, including to the project office which had recently left the IOC secretariat (see item 4).



**6.27** In this context, the Commission also noted the emergence of the Global Ocean Ship-based Hydrographic Investigations Program (GO-SHIP) that was working alongside IOCCP and the SOT to coordinate research-ship-based hydrographic observations of the properties of the water column. As for IOCCP, there was a clear need for adequate technical coordination to ensure that the aims of the programme were met and sustained, and the Commission encouraged the IOCCP, the SOT and Members/Member States to support this research activity and to explore possible synergies with other ship-based activities.

*Issues faced by the Observations Programme Area (OPA)*

**6.28** The Commission was well aware that the fragmented funding of OPA activities not only affected the maintenance of JCOMMOPS and its technical coordinators (see item 6.3), but also impacted the ability of individual observing teams and panels to capitalize on their central coordination role in initiating pilot projects for the impartial evaluation of new technologies, in creating task teams to tackle important issues, and in extending outreach to other observing groups and developing country regions through Capacity Development workshops and other activities. Given that these practical activities were central to establishing the value of JCOMM in delivering its central purpose of better observing the oceans in a sustainable way, the Commission urged all Members/Member States to prioritise contributions towards these practical actions, and to seek guidance as necessary from the OPA chair as to how best to target their effort in support of the global endeavour in better observing the oceans.

**6.29** The Commission noted the WMO Congress decision to establish an International Forum of Users of Satellite Data Telecommunication Systems, covering a wide user basis. The Forum would address remote data communication requirements, including tariff negotiations as needed, for automatic environment observing systems coordinated through WMO and partner organizations such as the IOC and FAO. The Commission requested the OPA and DMPA to take an active role in the forum with the objective of realizing more cost-effective and efficient satellite data collection from autonomous ocean observing platforms.

**6.30** With the goal of facilitating operator insertion of data into real-time data streams, the Commission noted that the JCOMM Cookbook for the submission of ocean data in real time and delayed mode was nearly complete, and requested the OPA in collaboration with the DMPA to finalize the cookbook and publish it as a JCOMM Technical Report as soon as possible.

**6.31** In this context, the Commission requested that the OPA, together with the DMPA, promote the establishment and publication of access routes to the authoritative data sets for the observing system elements under its coordination.

*Outreach – new collaborations and contributions*

**6.32** The Commission recognized that new ocean observing technologies had a strong potential to contribute to the evolution of the observing system. The Commission requested the OPA to engage with these new ocean observing communities, especially those using porpoising sub-surface gliders and surface wave gliders, to ensure that the benefits of working with JCOMM were well appreciated.

**6.33** The Commission noted with appreciation the OPA involvement in the World Ocean Council "Smart Ocean/Smart Industries" workshop (12–13 December 2011, IOC, Paris, France) and requested the OPA to engage proactively with this group in order to expand the role and scale of ocean industry participation in all aspects of oceanographic and marine meteorological observation and services.

**6.34** The Commission encouraged the OPA to continue its efforts, already under way with GHRSSST, to develop a dialogue with the satellite communities in order to better understand their

needs, to define a realistic set of in situ requirements, and to initiate joint pilot projects to demonstrate the value of new synergies.

## **6.1 JCOMM OPA IMPLEMENTATION GOALS** (*agenda item 6.1*)

**6.1.1** The Commission recalled that the implementation goals of the OPA were defined by the GCOS Implementation Plan (GCOS-138), and requested the OCG to continue proactively engaging with the WMO Rolling Review of Requirements process in setting its goals and metrics for implementation (see JCOMM-4/BM 6). The Commission regarded the issue of metrics to be of central importance in identifying shortcomings in the observing system and in demonstrating progress and value in JCOMM's activities and the contributions of Members/Member States thereto. In commending the efforts that had been made in maintaining these metrics, it urged the OPA, through JCOMMOPS and the NOAA Observing System Monitoring Center (OSMC), to further develop its capability in this regard and to draw up metrics by Essential Ocean Variable (EOV, see item 11) and by individual Member/Member State, as well as by platform type, as had been the practice so far.

## **6.2 INSTRUMENTS AND METHODS OF OBSERVATION** (*agenda item 6.2*)

**6.2.1** The Commission recalled that the now completed Pilot Project for the Integration of Marine Meteorological and other appropriate oceanographic Observations into the WMO Integrated Global Observing System (WIGOS) —also referred to as the “JCOMM Pilot Project for WIGOS”— had called for a better integration of ocean instrument practices in order to harmonize instrument standards across ocean observing system components and achieve traceability of the observations to international standards. The Commission concurred with the legacy recommendations of the Pilot Project, and particularly those related to instrument practices. In particular, the Commission:

- (i) Urged the Secretariats to promote resource mobilization to achieve a regular review of the WMO and IOC Publications dealing with instrument standards and practices;
- (ii) Urged Members/Member States to proactively facilitate the collection, sharing, distribution (including in real-time and through appropriate archives), and discovery of instrument/platform metadata. In particular, the depth of the SST (Sea Surface Temperature) and SSS (Sea Surface Salinity) measurements should be reported as accurately as possible to assist in the generation of satellite products;
- (iii) Requested the Observations Programme Area (OPA) to develop guidelines for marine instrument intercomparison, publish them as a JCOMM Technical Report, and provide input to the Commission for Instruments and Methods of Observation (CIMO) Guide accordingly;
- (iv) Invited the IOC to establish a Memorandum of Understanding with the Association for Hydro-Meteorological Equipment Industry (HMEI) in order to strengthen metadata with manufacturers and also invited the HMEI to review its Terms of Reference in order to fully incorporate ocean instrumentation in its mandate;
- (v) Requested Members/Member States to promote the International Oceanographic Data and Information Exchange (IODE)/JCOMM Standards process, seek harmonization of standards between WMO and the IOC, and ensure that such processes are fully documented.

**6.2.2** The Commission was pleased to note the progress, through joint efforts of DBCP and ETWCH (formally ETWS) on the evaluation of wave measurement systems, in support of a wide range of applications, including the monitoring of extreme wave events for disaster risk reduction, wave modelling, and the calibration and validation of satellite wave measurements (see <http://www.jcomm.info/wet>). The Commission noted that there were presently eight participants in the Pilot Project, and invited additional Members/Member States to assist in the development of technology through deployment, testing of prototypes, and evaluation of wave measuring

instruments. The Commission also invited National Meteorological and Hydrological Services (NMHSs) to facilitate and enhance the provision of wave data through the Global Telecommunication System (GTS) as well as File Transfer Protocol (FTP).

**6.2.3** The Commission, recalling with appreciation that two Regional Marine Instrumentation Centres (RMICs) have already been established in the USA (for Regional Association IV) and in China (for the Asia Pacific region), noted an offer made by Morocco during JCOMM-III to host a RMIC for WMO Regional Association I at the National Meteorological Service in Casablanca. The Commission noted that good progress was being made according to the formal procedure for formal adoption of the RMICs as per WMO Resolution 9 (Cg-XVI) and IOC Resolution XXVI-9, including a workshop on marine instrumentation to be held in Casablanca in late 2012. Noting that Morocco was now almost ready for submitting its statement of compliance for the RMIC to be hosted in Casablanca, the Commission asked the Secretariat to initiate a consultation amongst JCOMM members by correspondence during the next intersessional period in order to have the RMIC established by the WMO and IOC Executive Bodies as early as possible. The Commission noted with appreciation that the USA National Oceanographic and Atmospheric Administration (NOAA) and China State Oceanic Administration (SOA) have hosted two JCOMM Marine Instrumentation workshops at the RMIC for RA-IV in Mississippi (USA) and the RMIC for the Asia-Pacific region in Tianjin (China) in 2010 and 2011 respectively. The Commission recommended that coordination mechanisms should be established in each region which benefit from RMIC facilities, for example by seeking the nomination of JCOMM focal points on marine instrumentation in each country.

**6.2.4** The Commission thanked Morocco for its commitments to the RMIC, and urged Members/Member States to offer RMIC facilities in other regions, especially within Regional Association III (South America), Regional Association V (Southwest Pacific), and Regional Association VI (Europe), and to collaborate with the existing RMICs.

### **6.3 COORDINATED TECHNICAL SUPPORT FOR OBSERVING PROGRAMMES (JCOMMOPS)** (agenda item 6.3)

**6.3.1** The Commission noted with appreciation the activities of the JCOMM in situ Observations Programme Support Centre (JCOMMOPS) during the intersessional period, and the progress that the Technical Coordinators and JCOMMOPS have made towards integrating technical coordination of the observing networks to meet the needs of the Commission. It commended the efficiencies made possible by co-locating and harmonizing technical functions in support of multiple observing networks. The Commission commended the efforts of the Observations Coordination Group (OCG), the IOC and WMO secretariats, the host country and institution and the JCOMMOPS technical coordinators in developing a strategy for JCOMMOPS. The Commission asked the OCG to work in concert with the individual panels, and to provide overall guidance of the JCOMMOPS workplan and budget.

**6.3.2** The Commission acknowledged that the SOT had received very limited technical coordination support from JCOMMOPS since 2010. The Commission applauded a pilot project that would combine the Technical Coordinator function with activities dedicated to securing and coordinating vessels for deployment of multi-platform observing system activities. It noted that this "Ship Logistics Coordinator" would be an international focal point for ship logistics for the implementation of global observing networks, and would focus on:

- deployment opportunities,
- technical support and expertise on platforms, technology, and deployment methods,
- collection of metadata and information on ship based observation, including cruise plans,
- coordination for the SOT, and
- development of international cooperative arrangements.

The Commission noted that this would proceed as a pilot experiment in 2012 and 2013 based on existing funds, and should integrate with other similar national and regional efforts. The Commission urged Members/Member States to additionally support this effort and ensure its sustainability if successful.

**6.3.3** The Commission noted the potential usefulness of JCOMMOPS to extend technical coordination support to other observing systems that are capable of providing financial resources, with likely candidates being the emerging glider community, polar observations and the IOCCP. Working more closely with the satellite community was also being envisaged. The Commission fully realized that these developments, and indeed the continued support to the existing observing programmes, could only be achieved through enhanced and broadened support to JCOMMOPS, and it asked the OCG to initiate contact with these communities.

**6.3.4** The Commission agreed on the need to increase and diversify Members/Member States contributions to the technical coordination to operators provided at JCOMMOPS, and urged its Members/Member States to examine whether contributions might be initiated or increased.

#### **6.4 FUTURE PRIORITY FOR THE OBSERVATION PROGRAMME AREA** (*agenda item 6.4*)

**6.4.1** The Commission noted its potential role in the emergence of Africa in the domains of oceanography and marine meteorology, through the development of synoptic observations. It recognized that Africa was ready to face a number of challenges to human security through marine scientific research, and recognized the ambition of young African researchers wishing to work in oceanography and marine meteorology. Africa was ready to contribute through the involvement of the navies and other national agencies of Members/Member States which could support climate research and operational oceanography by the installation of real-time observing networks in coastal and the high seas, assuring their security and maintenance. The Commission recognized that it could provide a way to attract more coastal African States to its programmes and activities, and urged developed Members/Member States to cooperate with African Members/Member States in the framework of equitably shared operational programmes.

**6.4.2** The Commission endorsed the future priority activities for the next intersessional period for the Observations Programme Area (OPA), as proposed by the Observations Coordination Group (OCG). These are described below, in no particular order:

- Contribute to WIGOS Implementation;
- proactively engage and establish dialogue with requirements setters and writers of implementation plans (such as OOPC, the WMO RRR, and the GFCS) to set realistic priorities for the future composite ocean observing system, establish practical ways of moving forward, and together seek routes for funding;
- recruit additional Members/Member States, institutions and agencies, in a way that allows their activities to progress on their own priorities and to contribute to the global observing effort;
- identify other ocean observing communities (e.g. ocean glider operators) and marine industry fora (e.g. the World Ocean Council) that might be recruited to extend the scope and capability of ocean observation;
- develop synergies between observing systems to exploit the potential of joint deployment opportunities, and to foster a common approach to sensor development and best practices;
- develop pilot projects as a means towards the rolling out of the new platforms, sensors and technologies that will in due course become routine components of the observing network;

- continue capacity development activities, including training workshops, that will assist developing countries to better use ocean products and to participate more fully in the global observing effort;
- encourage identification and implementation of observing standards and best practices, with particular focus on developing countries, including through encouraging JCOMM members to offer new Regional Marine Instrumentation Centre (RMIC) facilities; and
- continue to document institutional data and metadata management practices for each component of the observing system to advance consistent, climate-quality, seamless data delivery both in near real time and delayed mode.

## **7. JCOMM DATA MANAGEMENT PROGRAMME AREA: ACHIEVEMENTS AND FUTURE PRIORITIES** (*agenda item 7*)

**7.01** The Commission recalled the priority activities for the Data Management Programme Area during the last intersessional period as decided by JCOMM-III (priority (i) to (ix) of paragraph 7.4, WMO-No. 1049), and noted with appreciation the following achievements.

**7.02** Regarding JCOMM-III priority (i), the DMPA contributed to the improvement of standardization for ocean data management. In particular, two standards have been published through the JCOMM/IODE<sup>2</sup> Ocean Data Standards (ODS<sup>3</sup>) process, additional standards are currently under review, and additional standards have been identified for submission through the process. (See item 7.1 for details.)

**7.03** Regarding JCOMM-III priority (ii), the DMPA supported the WMO Integrated Global Observing System (WIGOS) through collaboration in the JCOMM Pilot Project for WIGOS, focusing on interoperability between the IOC/IODE Ocean Data Portal (ODP) (now progressing to version 2) and the WMO Information System (WIS), contributing to making the IODE ODP and the WIS interoperable as well as other ocean data systems interoperable with ODP and/or WIS (see item 7.3). The JCOMM Pilot Project for WIGOS has been completed in late 2010, and 13 key ocean data-sets made interoperable with the ODP or the WIS (see item 7.4, and JCOMM/TR-No. 48 for details), while the ODP is developed in such a way as to become interoperable with the WIS. Noting that the ODP provides a simple and cost-effective solution for developing countries to make their ocean data sets visible and accessible to the international community, the Commission requested the DMPA to continue to collaborate in the development of the IODE ODP. The DMPA contributed to the development of a global integrated observing system by making steps towards an integrated in situ/satellite data management system. The Commission requested the DMPA to continue efforts in this regard, and improve the integration and comparison of satellite and in situ data, e.g. address the climatic and non-climatic requirements for in situ and satellite data, and consider data homogenization and interoperability issues.

**7.04** Regarding JCOMM-III priority (iii), the DMPA supported the WIS implementation by assisting with the updating of manuals (e.g. Global Temperature Profile Programme —GTSP— Real-Time Quality Control Manual, Revised Edition, 2010), updating the data management plan, and finalizing the Oceanographer's Cookbook for Submitting Ocean Data in Real Time and Delayed Mode. Changes have also been proposed to the BUFR<sup>4</sup> templates for ocean data (ship-based observations, data buoys) in order to include in the GTS real-time data flow the instrument/platform metadata that are required in real-time by end-user applications. Plans are underway for sharing tools for encoding/decoding software within the oceanographic community, and example of BUFR reports have been produced for training purposes. The Commission requested the DMPA to keep the "Cookbook" under review, and continue to maintain the BUFR

2: IOC International Oceanographic Data and Information Exchange (IODE)

3 : <http://www.oceandatastandards.org/>

4: FM-94 BUFR: Binary Universal Form for the Representation of Meteorological Data (used for distribution of time critical data onto the Global Telecommunication System – GTS).

templates for ocean data under review so that they continue to take end-user requirements into account. Highlighting the importance of BUFR, the Commission further requested the DMPA to finalize the BUFR Master Table 10 (Oceanographic Data) (see also item 7.4 for more discussion on WIS). It was noted that the “Cookbook” has now been documented within the IODE OceanTeacher (<http://www.oceanteacher.org>).

**7.05** Regarding JCOMM-III priority (iv), the Water Temperature Instrument/Platform Metadata (META-T) Pilot Project has been completed, and some key recommendations made in particular regarding the need to collect and distribute the metadata together with the data. Some recommendations have then been made in this regard by the Expert Team on Marine Climatology (ETMC) for the evolution of the Ocean Data Acquisition System (ODAS) Metadata Service (ODASMS) (see item 7.2). The META-T also facilitated improvement of the instrument metadata management by updating the Table Driven Codes. The Commission urged Members/Member States to collect, distribute and record instrument/platform metadata together with the ocean observational data, and adopted [Recommendation 1 \(JCOMM-4\) – Provision of Ocean/Instrument Metadata](#) (see also item 7.2 for some additional information on metadata).

**7.06** Regarding JCOMM-III priority (v), the modernization effort of the Marine Climatological Summaries Scheme (MCSS) led to proposing a vision and draft strategy for a new Marine Climate Data System (MCDS, see item 7.2) to better address in particular the requirements for climate services. The Commission requested the DMPA to lead the development of the MCDS in close cooperation with the IODE. (See item 7.2 for details.)

**7.07** Regarding JCOMM-III priority (vi), the Data Management Coordination Group (DMCG) reviewed progress on the implementation details<sup>5</sup> of the Data Management Plan (JCOMM/TR No. 40, Rev. 1), as well as the future actions for the realization of the plan. Tasks and future actions for the realization of its objectives were also discussed, and a new version of the Plan and its implementation details were proposed accordingly. The Commission requested the DMPA to keep the Data Management Plan and its implementation details under review, and to update them as needed.

**7.08** Regarding JCOMM-III priority (vii), the DMPA has updated the Catalogue of Standards and Best Practices, and as part of the JCOMM Data Management Plan recommended implementation of Quality Management Systems (QMSs) by Members/Member States in compliance with the WMO Quality Management Framework (QMF). The Commission invited Members/Member States to consider implementing QMSs for their ocean data centres and data management systems if that was not already the case, noting also that the lack of sharable Quality Control tools applicable in different environments will be a barrier for many Members/Member States, especially in these times of financial constraints.

**7.09** Regarding JCOMM-III priority (viii), the DMPA webpages on the JCOMM website have been substantially reviewed and updated to provide useful information to the targeted audience. The Commission requested the DMPA to keep the webpages under review and to update them as needed.

**7.10** Regarding JCOMM-III priority (ix), the third International Workshop on Advances in the Use of Historical Marine Climate Data (MARCDAT-III) was organized in Frascati, Italy from 6 to 8 May 2011, and the workshop’s proceedings with recommendations published. The Commission requested the DMPA to proceed with organizing a fourth JCOMM Workshop on Advances in Marine Climatology (CLIMAR-IV) around 2014, and a fourth MARCDAT in 2015.

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<sup>5</sup> : <http://www.jcomm.info/dmp-id>

## **7.1 STANDARD SETTING AND DOCUMENTATION (agenda item 7.1)**

**7.1.1** The Commission recalled the priority activities for the JCOMM/IODE Ocean Data Standards (ODS) Pilot project during the last intersessional period as decided by JCOMM-III, and noted with appreciation the following achievements.

**7.1.2** Regarding JCOMM-III priority (i), Development of Data Management Standards, which recommends Members/Member States submit their proposals to the JCOMM/IODE Ocean Data Standards Pilot Project for wide community adoption: the ODS Task Team received standards submissions on country codes from National Oceanographic Data Center, NOAA, USA and World Data Center for Oceanography, USA. The Commission noted that the date and time proposal was submitted by the IODE Committee Co-chair (Greg Reed, Australia); the Common Data Index (CDI) metadata profile was submitted by the SeaDataNet Technical Task Team, while the quality flag scheme was submitted by the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH). In particular, two standards have been published through the JCOMM/IODE Ocean Data Standards (ODS<sup>6</sup>) process (date/time, and country codes), CDI metadata profile was returned to the authors for revision while QC flags scheme is in the community review process under further revision.

**7.1.3** The Commission noted with concern that the process of receiving recommended standards from Member States has been very slow. The Commission stressed the importance of standards for all aspects of JCOMM's work and in particular to ensure interoperability arrangements between data systems such as the Ocean Data Portal (ODP) and the WMO Information System (WIS), and emphasized that the success of this process is highly dependent on active participation of all WMO/IOC Members/Member States, programmes and related organizations through submitting suitable standards for consideration. The Commission therefore requested Members/Member States to participate actively in submitting standard proposals through the ODS process.

**7.1.4** Noting that additional standards have been identified for submission (i.e. Latitude, Longitude and Altitude (based on ISO 6709), Units (based on the International System, SI), Platform Types, Geo area (International Hydrographic Bureau, IHB), Instrument Types, Parameters, Institutions, and Cyclic Redundant checks (CRC)), the Commission requested Members/Member States to participate in identifying standard proposals for submission through the ODS process for wide community adoption. The Commission also encouraged Members/Member States to participate actively in reviewing the candidate standards. The Commission noted with appreciation that the "Standards Process" is being revised so as to be published during the second semester of 2012, and that priorities for future candidate standards had been identified during the ad hoc Joint JCOMM-IODE Steering Group for the Ocean Data Standards Pilot Project (SG-ODSPP), Ostend, Belgium, 23–25 April 2012 (report available from the JCOMM web site).

**7.1.5** Regarding JCOMM-III priority (ii), Development of Data Management Standards, which recommends Members/Member States implement the recommended standards in agencies in their own countries at the earliest possible date, the Commission requested the DMPA to follow-up on the implementation of the recommended standards by Members/Member States.

## **7.2 MARINE CLIMATOLOGY (agenda item 7.2)**

**7.2.1** The Commission was pleased to note that the Expert Team on Marine Climatology (ETMC) continued to progress during the intersessional period on a wide range of topics, focused around marine climatological data management and services. Modifications to the International Maritime Meteorological Tape (IMMT) format and Minimum Quality Control Standard (MQCS) are addressed under agenda item 10.

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<sup>6</sup> : <http://www.oceandatastandards.org/>

**7.2.2** The Commission noted that the JCOMM Workshops on Advances in Marine Climatology (CLIMAR) and MARCDAT series provide a valuable ongoing contribution to the development of the activities assigned to the Expert Team on Marine Climatology (ETMC), and recommended that similar workshops continue to be held in the future.

**7.2.3** The Commission noted with appreciation continuing progress on modernization of the Marine Climatological Summaries Scheme (MCSS; originally established in 1963), and endorsed the proposed intersessional workplan. Generally, the vision for a proposed new JCOMM Marine Climate Data System (MCDS) is to fully replace the MCSS, formalize and coordinate the activities of existing data management systems within JCOMM, and address gaps to produce a dedicated WMO-IOC data system operational by 2020.

**7.2.4** The Commission noted in this regard a set of recommendations and draft strategy prepared at the Workshop for a New MCDS (MCDS1; 28 November–2 December 2011, Hamburg, Germany), aiming to set the plan for the MCDS to provide high quality marine meteorological and/or oceanographic climate data. The Commission agreed that a limited number (less than ten) of WMO-IOC Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs) covering specific JCOMM data domains, will form a key component of the MCDS, and will further facilitate interoperability with, and seek to internationally formalize the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) and eventual similar existing domain-specific international archives, within the remit of JCOMM. In order to implement this plan, the Commission concurred with the establishment of a new crosscutting Task Team on MCDS under the ETMC with the Terms of Reference as detailed in the workshop's report), to pursue this objective. The Commission requested ETMC in close cooperation with IODE and the ODP Task Team of the IODE/JCOMM ETDMP, and other appropriate partners such as the ICSU World Data System to review and update the MCDS strategy and to develop an implementation plan (including performance indicators for participating centres) for achieving the Vision for a new MCDS. The role of ODP in the MCDS should also be clarified by DMPA. The Commission adopted [Recommendation 2 \(JCOMM-4\) – Marine Climate Data System](#).

**7.2.5** The Commission strongly supported the MCDS development, viewing it as an opportunity to better integrate existing WMO and IOC data infrastructures serving the requirements for climate applications, including climate services. The Commission noted that the National Marine Data and Information Service (NMDIS) of the China State Oceanic Administration (SOA) and the Deutscher Wetterdienst (DWD) have already submitted statements of capability and commitment to host CMOCs in Tianjin and Hamburg respectively. The Commission also noted their commitment to undertake this work at the earliest opportunity and to commence the necessary development immediately.

**7.2.6** The Commission decided that China and Germany could begin filling the role of CMOCs on a trial basis immediately. The Commission noted that the CMOC evaluation criteria will have to be adopted by the IODE Twenty-Second Session (March 2013), and documentation further finalized. In the event of subsequent successful evaluation of the CMOC proposals from China and Germany with respect to the approved criteria, the Commission requested the Management Committee to work by correspondence with Members/Member States through a fast-track procedure to seek approval of these two proposals within six months after the IODE Session. Formal approval could then be given by the IOC Executive Council in 2014.

**7.2.7** The Commission invited France and Canada, and other parties currently performing the functions of DACs and/or GDACs or similar (e.g. GCCs, Argo, OceanSITES, GTSP, GDP DAC) to participate in the discussions regarding the development of the MCDS strategy and implementation plan with a view to offering MCDS DAC or GDAC functions as appropriate. Meanwhile, the Commission approved the designation of the relevant French and Canadian centres as provisional GDAC for Drifting Buoys under JCOMM and IODE (GDAC-DB) to continue in their present roles until the role of the MCDS GDACs is further clarified as a part of the MCDS strategy.



**7.2.8** The Commission welcomed the initial work funded by the U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Observation and Monitoring Program, to develop a value-added version of ICOADS that capitalizes on the marine climate community's decades of work on bias adjustments, data quality control, and metadata enhancements. It noted that the International Maritime Meteorological Archive (IMMA) format used for ICOADS would serve as the underpinning for this ICOADS Value-Added Database (IVAD; <http://icoads.noaa.gov/ivad/>). IVAD will provide a mechanism to link community-developed adjustments back to the individual marine reports in ICOADS. The Commission requested ETMC to establish a broader JCOMM Pilot Project on IVAD to extend the scope of these efforts with wider participation.

**7.2.9** The Commission noted the essential importance of the ICOADS reference dataset to many experts and users for applications and analysis amongst Members/Member States, and heard concerns that its future might be uncertain. ICOADS observations (currently dating from 1662 to the present), together with their associated metadata and basic gridded products, were critical for many areas of research. These included, inter alia, serving as the data underpinning national and international (IPCC) scientific assessments of climate, global analyses of temperature, and atmospheric reanalysis.

**7.2.10** In this context, it greatly welcomed a statement by the U.S. that it remained committed to the continued vitality of ICOADS through the U.S. National Center for Atmospheric Research (NCAR) and the NOAA National Climatic Data Center (NCDC), and that near-real-time updates to ICOADS would continue without disruption. Longer-term plans and resourcing for ICOADS delayed-mode processing were still under development in conjunction with potential new national/international partnership arrangements, and it was envisioned by the USA that ICOADS would eventually be formalized as a CMOC under the MCDS.

**7.2.11** The Commission reiterated its appreciation to the NOAA National Oceanographic Data Centre (NODC) for agreeing to host the Extreme Waves Dataset. The Commission requested the ETMC and the Expert Team on Waves and Coastal Hazards Forecasting Systems (ETWCH) to revisit and possibly restructure the project, with a simpler (less costly to implement) initial design and product. The Commission endorsed the tentative suggestion from ETMC and ETWCH (formerly ETWS) for the USA and Canada to engage in a pilot version of the project, to develop the necessary technological framework and thus encourage and facilitate contributions from other countries. (See also item 8.2.)

**7.2.12** The Commission noted with interest that the Shipboard Automated Meteorological and Oceanographic System (SAMOS) data centre at the Florida State University (USA), in support of ETMC, has developed a partial catalogue of digital observations made by research vessels (R/Vs) that may not be readily available in delayed-mode climate archives, and encouraged the ETMC to work with SAMOS in the view to further develop this catalogue.

**7.2.13** In the context of the assembly of marine data and metadata for delayed mode quality control, the Commission noted with concern that the ship call-sign masking scheme was hampering the efforts of the archive centres and some sectors of the satellite community to match observations to particular ships. This in turn has negative impacts on the ability of Members/Member States to quality control historical data. The masking scheme had been introduced in response to security concerns voiced by the shipping industry to hide the identity of ships reporting observations on the GTS, but it had never been intended to adversely affect the work of the archive and satellite validation communities. The Commission therefore asked the OPA and DMPA to give urgent consideration to this issue, and to accelerate the development of encryption or similar schemes, that could replace the current masking scheme and overcome the difficulties in quality controlling ship data in climate databases while also addressing the ship operators' security concerns

**7.2.14** The Commission strongly encouraged Members/Member States to continue their support for data rescue —through the development of more robust institutional arrangements, possibly

linked with the Global Framework for Climate Services (GFCS), and through inter-Commission collaboration with the WMO Commission for Climatology (CCI)— to provide ongoing resources to recover, image, digitize, and preserve historical marine and oceanographic climate data. The Commission requested the ETMC to develop a strategy for the further encouragement and coordination of these efforts by Members/Member States.

**7.2.15** The Commission also noted that the European Environment Agency (EEA) was developing its role as the coordinator of the Global Monitoring for the Environment and Security (GMES) in situ component and has identified and prioritised the in situ marine data requirements in metadata with the GMES Marine Service (MyOcean) and relevant stakeholders. It had also proposed solutions aimed at ensuring sustainable access to marine in situ data in Europe. The Commission requested the Programme Areas to investigate and promote the possible cooperation between EEA and JCOMM and its relevant groups and expert teams in this regard (see item 11).

### **7.3 JCOMM DATA MANAGEMENT PRACTICES: ACHIEVEMENTS AND FUTURE PRIORITIES** (agenda item 7.3)

**7.3.1** The Commission was pleased to note the progress of the JCOMM/IODE Expert Team on Data Management Practices (ETDMP) during the intersessional period which had focused on the implementation of the IODE/JCOMM Ocean Data Standards process, the improvement of metadata management, and the development of the IODE Ocean Data Portal (ODP) including participation in the JCOMM Pilot Project for the WMO Integrated Global Observing system (WIGOS).

**7.3.2** The Commission noted with appreciation the progress made by the Task Team on Metadata and requested the relevant ETDMP task team to continue the work on comparison of semantic metadata profiles (Marine Community Profile —MCP—, SeaDataNet<sup>7</sup> Common Data Index —CDI—, and the WMO Core Profile) and make recommendations for better interoperability between ODP and WIS.

**7.3.3** The Commission welcomed the close and productive cooperation between the IOC/IODE and WMO through the JCOMM Pilot Project for WIGOS, and congratulated the participating experts with the achieved results that will contribute to effective interoperability between WMO and the IOC data systems. The Commission recommended to continue work on the interoperability of WIS/WIGOS and IODE ODP as these systems further develop and evolve. The Commission congratulated the Russian National Oceanographic Data Centre (NODC) for their considerable contribution towards the development of the IODE ODP as well as the JCOMM Pilot Project for WIGOS during the intersessional period. The Commission recommended that the work of WIGOS be as an interface of cooperation between the WMO WIS and the IODE ODP.

**7.3.4** The Commission noted with appreciation the ongoing development, by IODE, of a revised version of the IOC Strategic Plan for Oceanographic Data and Information Exchange (2013–2016) as well as a quality management framework for IODE National Oceanographic Data Centres (NODCs) which will be complementary to the WMO Quality Management Framework (QMF). Meanwhile, the Commission noted with concern the low number of data centres providing data through ODP and urged Members/Member State to actively participate in ODP. The Commission also called on other national, regional or international distributed ocean data systems to actively pursue interoperability with the ODP.

**7.3.5** The Commission welcomed the offer by the Russian Federation for establishment of a Partnership Centre for IOC/IODE supporting IODE ODP in Obninsk as an “in-kind” contribution of the Russian Federation into the activities of the IOC and JCOMM. The Commission requested the IOC Secretariat to work with the Russian Federation to prepare agreements for the establishment of such a centre.

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<sup>7</sup> Pan-European Infrastructure for Ocean & Marine Data Management

**7.3.6** The Commission adopted [Recommendation 3 \(JCOMM-4\) – The IODE Ocean DataPortal \(IODE ODP\)](#).

#### **7.4 WMO INFORMATION SYSTEM (WIS) AND DESIGNATION OF DATA COLLECTION AND PRODUCTION CENTRES (DCPCS) (agenda item 7.4)**

**7.4.1** The Commission recalled that as part of the activities of the JCOMM Pilot Project for WIGOS, a number of datasets have been made discoverable and accessible via the Ocean Data Portal (ODP) and the WMO Information System (WIS) (see list in JCOMM/TR-No. 48). It noted with satisfaction that full interoperability has been built between the ODP and WIS, where the ODP would meet the functional requirements of a WIS Data Collection and Production Centre (DCPC), and thereby contribute ocean datasets from the IODE National Oceanographic Data Centre (NODC) network to the WIS. The Commission urged Members/Member States, through relevant programmes of WMO and the IOC, to support and actively participate in this process (see items 7.1 and 7.3). The Commission also agreed to further develop synergies between ODP and WIS, especially in terms of (i) WMO and IOC data policies, and (ii) implementation of ODP and the implementation of and/or WIS nodes so as to avoid duplication.

**7.4.2** The Commission noted the *Manual on the WMO Information System* (WMO No. 1060) approved by Cg-XVI is now available online in all WMO languages and that Appendix B.2 of the Manual contains the list of designated DCPCs. The Commission noted WMO Resolution 51 (Cg-XVI) and that those centres marked with an asterisk in the Manual were conditionally designated as DCPCs subject to their having demonstrated the pre-operational compliance requirements of CBS before EC-64. It encouraged those centres that had not yet done so, to arrange demonstrating their compliance with CBS through the secretariat as soon as possible. The list of JCOMM candidate DCPCs is provided in [Annex III](#).

**7.4.3** The Commission encouraged Members/Member States to take maximum benefit from the network of data centres under development for the collection and dissemination of marine data and products. Noting that WIS is open to designation of national centres (Appendix B.3 of the Manual), it invited Members/Member States to consider registering relevant national data or centres and services as NCs and advising the Secretariat accordingly through correspondence from the Permanent Representative. The Commission encouraged Members/Member States to establish regional and sub-regional mechanisms for the exchange of marine related data, and products through DCPCs for specific ocean areas and seas. In this regard, the Commission noted with appreciation the successful initiative by Croatia towards that goal for the Adriatic Sea, as highlighted by the outcome of the WMO Workshop on Establishing WIS-DCPC/WIGOS Marine Meteorological Centre as a RA VI Sub-regional Facility for Adriatic Sea Area (Zagreb, Croatia, 17–18 May 2012).

#### **7.5 DMPA PRIORITIES FOR THE NEXT INTERSESSIONAL PERIOD (2012-2017) (agenda item 7.5)**

**7.5.1** The Commission endorsed the future priority activities for the next intersessional period for the Data Management Programme Area (DMPA) as described below, with no particular order:

- (i) Continue to adopt standards/best practices for use by the marine meteorological and oceanographic community through the IODE-JCOMM Ocean Data Standards Process in support of the Global Framework for Climate Services (GFCS), the IOC-WMO-UNEP-ICSU Global Ocean Observing System (GOOS), IODE, and the WMO Integrated Global Observing System (WIGOS) implementation;
- (ii) Assist in the further development of the IODE Ocean Data Portal, its linkages with other ocean data systems (e.g. SeaDataNet, IMOS<sup>8</sup>, OBIS<sup>9</sup>, GEOSS<sup>10</sup>), its interoperability with

<sup>8</sup>: Australian Integrated Marine Observing System

<sup>9</sup>: Ocean Biogeographic Information System

<sup>10</sup>: Global Earth Observing System of Systems

the WMO Information System (WIS), and its capacity development activities to ensure full participation of Members/Member States;

- (iii) Develop a strategy and implementation plan in the next two years for achieving a vision for a new MCDS and start implementation preparation of the new JCOMM Marine Climate Data System (MCDS);
- (iv) Improve the management of instrument/platform metadata;
- (v) Organize the fourth JCOMM Workshop on Advances in Marine Climatology (CLIMAR-IV), possibly in 2014, and the fourth International workshop on Advances in the Use of Historical Marine Climate Data (MARCDAT-IV), possibly in 2015.

## **8. MARINE METEOROLOGICAL AND OCEANOGRAPHIC SERVICES AND FORECASTING SYSTEMS**

### **8.1 FORECASTING SYSTEMS AND SERVICES** (*agenda item 8.1*)

**8.1.1** The Commission recalled Recommendation 5 (JCOMM-III) to develop a Guide to Operational Ocean Forecasting Systems, with the objective of documenting the current practices for ocean forecasting, in order to: (a) provide existing centres with alternative approaches to promote discussion on the best practice; and (b) serve as an aid for developing centres. The Commission reaffirmed that operational ocean forecasting would remain the priority of JCOMM for the intersessional period, and noted with appreciation the ongoing effort by the Expert Team on Operation Ocean Forecast Systems (ETOOFS) in developing the Guide. The Commission requested ETOOFS to complete the first Guide during the intersessional period and encouraged Members/Member States to contribute content writers and reviewers for the Guide during the intersessional period.

**8.1.2** The Commission recognized the value of the *Guide to Wave Analysis and Forecasting* (WMO-No. 702), the *JCOMM Guide to Storm Surge Forecasting* (WMO-No. 1076) and other relevant technical guidance publications in ensuring the provision of high quality, accurate, consistent, and timely operational forecast products. Recognizing the developments and advances relating to wave and storm surge forecasting, the Commission agreed on the usefulness of dynamic parts of both the wave and storm surge guides to keep abreast of the latest development. The Commission noted that the publications, including their web-based dynamic parts, should be maintained as up-to-date as possible and therefore requested the Expert Team on Waves and Coastal Hazards Forecast Systems (ETWCH, re-named from the Expert Team on Wind Waves and Storm Surge, ETWS. See items 8.2.8 and 12.4.) to keep the contents of these publications under review as well as cross-referenced with other Manuals and Guides, such as the Manual of Quality Control Procedures for Validation of Oceanographic Data (UNESCO/IOC M&G No. 26), and to advise on the need for future updating as appropriate. In this context, the Commission requested ETWS to revise the *Guide to Wave Analysis and Forecasting* during the intersessional period, following the format of the present version.

**8.1.3** The Commission reaffirmed the importance of the wave forecast verification scheme, which was initiated in 1997. It was pleased to note the successful collaboration with the European Space Agency (ESA) GlobWave project in implementing components of the wave forecast verification scheme specifically to expand the verification scheme to include additional remotely sensed data, and spatial intercomparison. The Commission requested ETWCH to continue this collaboration and to continue with the development of spectral validation of wave model outputs. In this context, the Commission expressed its appreciation to the current seventeen —up from twelve— contributing centres and encouraged Members/Member States to participate in the wave forecast verification scheme and to disseminate their wave data in order to further develop the scheme. It urged Members/Member States to make maximum use of the scheme applications for marine forecasting purposes.

**8.1.4** The Commission noted the establishment of the routine monitoring of operational quality control systems for operational ocean forecasting systems, and expressed its appreciation to participating centres including the Australian Bureau of Meteorology, Environment Canada, NAVOCEANO, and UK Met Office. The Commission endorsed the ETOOFS workplan to consolidate the monitoring of the quality control systems with extended participation of forecasting centres, as well as to establish a set of initial performance metrics for Operation Ocean Forecast Systems (OOFs). The Commission encouraged ETOOFS and the Global Ocean Data Assimilation Experiment (GODAE) OceanView to continue their collaboration to develop the next generation of metrics.

**8.1.5** The Commission noted the ETOOFS workplan to develop an Ocean Extremes Monitoring System that would establish a suite of ocean variables and indices together with their reference variability/probability density. The Commission encouraged its Members/Member States to contribute to this activity, in both ocean observations and modelling. The Commission agreed that this system would help to raise awareness of the frequency and distribution of extremes in the ocean and provide a context to regional impacts and represent a JCOMM contribution to the Global Framework for Climate Services (GFCS).

**8.1.6** Noting that the quality of ocean forecasting depends on a range of sustained remote sensing and in situ observations, the Commission agreed on the importance of updating and communicating requirements for key variables for ocean forecasting systems. The Commission noted with satisfaction the effort by ETOOFS and other Teams of the Services and Forecasting Systems Programme Area (SFSPA) to extend the scope of requirements in WMO Rolling Review of Requirements (RRR) and in the Statement of Guidance (SoG) to include essential variables for ocean forecasting. The Commission noted the extension of ocean observing requirements to include coastal ocean forecasting and coupled climate forecasting systems that would serve as a JCOMM contribution to GFCS, and requested the ETOOFS to continue working with other Teams and the JCOMM Point of Contact for the CBS/RRR on Ocean Applications (Ali Mafimbo) to review and update the requirements.

**8.1.7** The Commission recalled the many published studies demonstrating the importance of remotely sensed altimeter observations to the nowcasting and forecasting of the ocean state and circulation with a minimum of two low latency missions (e.g., Jason-type, ERS-type) required to sustain a basic level of performance and four missions providing near optimal performance. The Commission noted the recent decline in performance of all ocean forecasting systems resulting from the decline in coverage of altimetry observations with the current status including one Jason-type satellite (Jason-2) supplemented with two long repeat orbit satellites Cryosat-2 and a re-tasked Jason-1.

**8.1.8** The Commission acknowledged and encouraged the ongoing efforts of space agencies and science teams to extend the life of all altimeter missions, to provide high quality, low latency data products for ocean forecasting. At the same time, the Commission encouraged all international space agencies to place the highest priority on missions (e.g. HY-2A, SARAL/AltiKa, Sentinel-3, Jason-3, GFO3) that will contribute altimetry observations suitable for ocean forecasting systems (i.e., high quality, low latency, open data sharing policies) and that all reasonable steps be taken to minimise delays for launch and to empower the science teams to complete the necessary Cal/Val to facilitate data product delivery in the shortest period possible.

**8.1.9** Following the discussion under agenda item 5.4 on JCOMM contribution to GFCS through operational seasonal climate forecasting, the Commission requested the Services and Forecasting Systems Programme Area (SFSPA) (through ETOOFS) and other relevant international groups (e.g., the Working Group on Numerical Experimentation, WGNE; GODAE OceanView Science Team, GOVST; Working Group on Seasonal to Interannual Prediction, WGSIP) to develop a coordination framework to support ocean and marine observing, modelling and service requirements for operational coupled seasonal climate forecast systems. The Commission requested ETOOFS to liaise with partners to identify the best approach for the coordination for

relevant aspects of seasonal climate forecasting and in particular prepare a recommendation specifying the role required from JCOMM and to facilitate the implementation of the approved recommendation.

**8.1.10** The Commission agreed on the role of ETOOFS in the coordination of the strategy for the Marine Pollution Emergency Response Support System (MPERSS) outlined in the [Recommendation 4 \(JCOMM-4\)](#), and requested ETOOFS to lead the coordination of an extension of capability to fill the gap identified following the recent Fukushima nuclear accident in cooperation with the International Atomic Energy Agency (IAEA) and partner groups. In doing so, the Commission requested ETOOFS to identify a responsible member within the Team for this task as activity leader on marine environmental emergencies. The Commission also requested the ETOOFS to work with the Expert Team on Maritime Safety Services (ETMSS), who should take the lead on the international coordination for meeting the service requirements (see item 8.3).

**8.1.11** The Commission highlighted the importance of capacity building for the development of operational ocean forecast systems as well as the interpretation and application of ocean forecast products. The Commission noted that ETOOFS would provide a supporting role to planned capacity building workshops: the GODAE summer school, the IOC Perth-Office demonstration project for operational ocean forecasting in the Indian Ocean, and DBCP capacity building. The Commission requested that ETOOFS continue to assist where possible other initiatives during the intersessional period. The Commission also requested the ETWCH to continue working with the WMO Tropical Cyclone Programme (TCP) to assist Members/Member States to operationalize the wave and storm surge modelling and forecasting, through the joint JCOMM/TCP training workshop series.

## **8.2 SUPPORTS FOR DISASTER RISK REDUCTION, PARTICULARLY IN COASTAL ZONES** *(agenda item 8.2)*

**8.2.1** The Commission recalled that both WMO and IOC recognized the increasing requirements placed on it in coordination and support for developing and improving forecasting capabilities and service delivery in coastal risk reduction. Also considering the emerging importance of coastal zones in delivering climate services in the Global Framework for Climate Services (GFCS), as well as the potential role of JCOMM in this area, the Commission agreed to identify activities related to marine and coastal hazards as a priority during the intersessional period.

**8.2.2** Recalling the relevant decision at its third session (Morocco, 2009), the Commission requested the ETMSS and the ETWCH to continue developing proposals to include information on complex sea states as well as associated terminology in weather and sea bulletins to be disseminated through SafetyNET and NAVTEX. The Commission requested ETMSS and ETWCH to ensure broad participation in or input to this effort from interested Members/Member States. The Commission also requested the Teams to submit amendment of the respective part of the WMO *Manual on Marine Meteorological Services* (WMO-No. 558) as well as the Catalogue on MetOcean Object Classes and Attributes.

**8.2.3** The Commission decided to continue its joint effort with the WMO Tropical Cyclone Programme (TCP) to support the Storm Surge Watch Scheme (SSWS), including the series of JCOMM-TCP training workshop on storm surge and wave forecasting, noting the importance of the SSWS as a regional framework for technical advisories of coordinated operational services for storm surge forecasting and warning that are the core elements of the JCOMM contribution to coastal hazard management.

**8.2.4** The South and East African coasts suffer in particular from recurrent coastal inundation by storm surges. Taking into account the ongoing requests from the region for technical support and training, as well as the recent dialogue at the Climate Change workshop and the effects on African Coastal communities (August 2011, South Africa), the Commission agreed to make further efforts



to provide training opportunities in the region of concern by holding the Eighth JCOMM-TCP training workshop on storm surge and wave forecasting for the South/East African and West Indian Ocean countries.

**8.2.5** The Commission emphasized the importance of capacity development in pursuing this line of work, as well as addressing the regional aspects. In this context, the Commission agreed that it should continue preparing and updating technical guidance material such as the *Guide to Storm Surge Forecasting* (WMO-No. 1076, and its dynamic part: <http://www.jcomm.info/SSguide>). It also agreed to provide enhanced support for the time-bound demonstration projects addressing regional issues of concern, upon strong participation of the Members/Member States and in close coordination with relevant programmes.

**8.2.6** The Commission recognized the leading role of the ETWCH in scientific and technical support for monitoring and predictions relevant for coastal hazard forecasting and warning services, and requested the Team to extend its activities during the next interessional period. Considering the recent interaction between the ETWCH and the multi-hazard Task Team of the North-East Atlantic and Mediterranean Tsunami Warning System (NEAMTWS), the Commission also decided to extend an invitation to the working groups and/or task teams of the Intergovernmental Coordination Groups of the Tsunami Early Warning and Mitigation System, who concentrate on preparedness, response and planning. The IOC Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG) and the International Tsunami Partnership (ITP) of DBCP and the Indian Ocean Tsunami Warning System (IOTWS) may be an appropriate group to partner with JCOMM in dealing with the full spectrum of multi-hazard monitoring, warning and preparedness issues.

**8.2.7** The Commission noted with appreciation the ETWCH initiative in collaboration with the ETMC to develop and maintain an Extreme Wave Dataset, and requested that the Teams continue their effort during the interessional period. Following the recommendation from the First JCOMM Scientific and Technical Symposium on Storm Surges (2007, Republic of Korea), the Commission also requested ETWCH in collaboration with ETMC and the Global Sea Level Observing System (GLOSS) in coordinating the development of storm surge climatologies as a measure of risk assessment for marine hazards and to assist Members/Member States in developing their own databases and hazard analysis, in view of its important potential contribution to the GFCS.

**8.2.8** Taking into account the increasing requirement to address coastal hazard forecasting issues, primarily associated with storm surges, the Commission re-named the ETWS the Expert Team on Waves and Coastal Hazards Forecast Systems (ETWCH) (see item 12.4). The Commission emphasized the importance of aligning new activities with existing ones to ensure effectiveness, and requested the new ETWCH to closely collaborate with other teams and relevant external organizations/programmes in identifying positive synergies.

#### JCOMM/CHy Coastal Inundation Forecasting Demonstration Project (CIFDP)

**8.2.9** The Commission noted that, pursuant to Recommendation 6 (JCOMM-III), the Coastal Inundation Forecasting Demonstration Project (CIFDP, <http://www.jcomm.info/CIFDP>) was developed jointly by JCOMM and the WMO Commission for Hydrology (CHy) aiming to implement a comprehensive and integrated approach for marine multi-hazard forecasting and warning systems and coastal risk management. The Commission noted and endorsed a strategy for CIFDP, as follows:

- The Project would be implemented under each regional/national sub-project, launched for a country that meets the essential requirement for initiating a national agreement between national institutions with relevant responsibilities, and the provisional establishment of a National Coordination Team (NCT) that includes operator(s) of the NMHS;

- The Project would be designed based on users' perspectives and requirements, considering only existing and available open source techniques. Final products of the Demonstration Project should be operated and maintained by a national operational agency which has the responsibility/authority for storm surge warning and flood warning;
- The developed procedure/best practice through a sub-project should be applicable to other (neighbouring) countries with common issues and interests, and should be closely linked to and cooperating with related projects and activities, such as the regional Severe Weather Forecasting Demonstration Project (SWFDP) in building a "cascading forecasting process" to produce services for coastal zones.

**8.2.10** The Commission also considered that there were potential positive synergies between CIFDP and some of the work of GODAE OceanView Science Team, and requested the Secretariat and the Services Programme Area Coordination Group to investigate how these could be realised to mutual benefit.

**8.2.11** Noting the successful launch of the first sub-project in Bangladesh (Bay of Bengal), followed by the progress in Dominican Republic (Caribbean), the Commission emphasized the necessity of strong national participation as well as of extrabudgetary contributions for the successful implementation of the sub-projects. The Commission therefore strongly encouraged the NCTs to work closely with the Project Steering Group (PSG) to implement CIFDP in respective country/region. The Commission also requested the NCTs and PSG, once the project was successfully implemented in the first sub-projects, to document the established procedure and best practices in order to guide other interested Members/Member States.

**8.2.12** The Commission also encouraged developing country Members/Member States with concerns of coastal inundation, such as those in Africa, Indonesia and elsewhere, to consider participating in the CIFDP. In this context, the Commission noted that the CIFDP could benefit from partnership with organizations focused on coastal zone management, possibly for the development of a joint pilot project and/or for transfer of knowledge relating to best management.

**8.2.13** The Commission recognized potential challenges of data availability (e.g. tide gauge measurements, bathymetry data) in the implementation of the Project and application of the results in the region, and therefore encouraged the Members/Member States implementing the CIFDP to ensure that data was available between involved national institutions for coastal inundation forecasting and warning.

**8.2.14** The Commission noted the key role of the Services and Forecasting Systems Programme Area (SFSPA), particularly its ETWCH, in the CIFDP design and implementation phases, and endorsed the Team's intersessional workplan focusing on the related activities.

#### *Coordination with WMO Disaster Risk Reduction Programme*

**8.2.15** The Commission, recalling that both the sixteenth World Meteorological Congress (2011) and the twenty-sixth IOC Assembly (2011) identified the Disaster Risk Reduction (DRR) as a major priority area for the intersessional period, agreed that the Commission's activities regarding coastal hazard mitigation should be closely coordinated with related programmes of WMO and the IOC. The Commission noted that tropical cyclones, storm surges and related coastal flooding as well as other marine and coastal hazards, were among the top hydrometeorological hazards of concern to Members/Member States and therefore agreed that JCOMM should continue to leverage the activities to support the workplan of the WMO DRR Programme during the intersessional period 2012–2015.

**8.2.16** The Commission recognised that a number of the DRR activities are closely linked to the work of JCOMM, particularly through its Expert Team on Wind, Waves and Storm Surges (ETWS, to be the Expert Team on Waves and Coastal Hazards (ETWCH) upon the decision at JCOMM-4).



It therefore requested the chairperson of ETWCH to act as the JCOMM focal point for WMO DRR, and work with the ETWCH members to:

- Engage in the workplan of DRR on hazard/risk analysis for storm surges and other coastal and ocean related hazards, through participation in the DRR Expert Advisory Group on Hazard/Risk Analysis and linking to the workplan of ETWS;
- Contribute to the new operational guidelines for Multi-Hazard Early Warning Systems (MHEWS), based on the *Guide to Storm Surge Forecasting* (WMO-No 1076);
- Link ETWCH activities to the comprehensive and coordinated DRR national/regional projects in the Caribbean and Southeast Asia, where appropriate, and;
- Identify and engage other relevant activities of JCOMM to the DRR Programme Workplan implementation.

### **8.3 SAFETY-RELATED MARINE METEOROLOGICAL SERVICES** (*agenda item 8.3*)

**8.3.1** The Commission adopted the specifications for ice information in SafetyNET bulletins prepared by ETSI, including the definition of ice-edge and the common set of Sub-Areas agreed by Preparation Services. It requested that the Secretariat update the *Manual on Marine Meteorological Services* (WMO-No. 558) accordingly. The Commission requested Members/Member States providing MSI in the other METAREAs concerned, especially those covering the Southern Ocean, to follow the agreement of METAREAs XVII-XXI on the exchange and preparation of GMDSS sea ice information. The Commission adopted the list of abbreviations for ice information to be used in NAVTEX bulletins and requested the Secretariat to include it in the list of abbreviations in the *Guide on Marine Meteorological Services* (WMO-No. 471).

**8.3.2** The Commission requested that the Secretariat keep the appropriate references to the WWMIWS and to the METAREA Co-ordinators including all the publications on the JCOMM website (<http://www.jcomm.info/GMDSS>). It requested the Expert Team on Maritime Safety Services (ETMSS) to continue working with IHO and IMO to update the joint Manual on MSI and IMO Resolution A.705(17). To facilitate the work of the METAREA Co-ordinators, the Commission urged Members/Member States to disseminate all MSI prepared for GMDSS (i.e. to be broadcast on SafetyNET or International NAVTEX) on the Global Telecommunication System (GTS), and adopted the appropriate amendment to be included in the *Manual on Marine Meteorological Services* (WMO-No. 558). The Commission requested that JCOMM Management Committee work with IMO and relevant national authorities to encourage greater responsiveness to marine meteorological warnings.

**8.3.3** The Commission noted that updated versions of both the *Manual on Marine Meteorological Services* (WMO-No. 558) and the *Guide on Marine Meteorological Services* (WMO-No. 471) have been prepared to be available online. The Commission adopted several additional changes for the Manual, including the provision of sea ice information, the availability of MSI prepared for the GMDSS on the GTS, and references to the WWMIWS and METAREA Coordinators and the volume II (Regional Aspects). It adopted a change for the Guide in order to include the NAVTEX Ice abbreviations (see item 10).

**8.3.4** The Commission anticipated new demands for sea ice standards from the end-users, in connection with the potential International Polar Initiative (IPI) and in the framework of the Global Cryosphere Watch (GCW). It therefore requested ETSI, in cooperation with the International Ice Charting Working Group as a technical forum of ice services, to continue to maintain and extend as appropriate WMO sea ice technical documentation. In particular, this should include "Sea Ice Nomenclature" as the main WMO sea-ice standard, "Sea-Ice Information Services in the World" as extension for Polar Regions of WMO-No. 9, Volume D, "Ice Objects Catalogue" as a joint WMO-IHO standard for ice in the Electronic Chart Display Information System (ECDIS), and new

publications such as “Format for Sea Ice Data Assimilation”, “Understanding and Identifying Old Ice in Summer” and “Manual for Ice Experts – Ice Observers”.

**8.3.5** The Commission also noted with appreciation the development of the online version of the questionnaire (<http://www.jcomm.info/MMMS>) by the Secretariat, which should enable the dissemination of surveys more frequently to assess the level of satisfaction of end-users. It therefore requested the ETMSS and the Secretariat to conduct surveys more often (2 years) with the support of the Issuing Services, and to use these surveys to gather additional user requirements.

**8.3.6** The Commission noted the enrichment of the GMDSS-Weather website (<http://weather.gmdss.org>) including operational and archival SafetyNET ice bulletins in textual and binary (WMO SIGRID-3 format) (<http://gmdss.aari.ru/bull>), the Ice Logistic Portal (<http://www.bsis-ice.de/IcePortal/index.html>), and some of the products prepared for the dissemination by the International NAVTEX service. The Commission noted the challenge for Météo-France to get the appropriate information from Members/Member States required to manage the system. It therefore urged Members/Member States who had not already done so to disseminate all MSI prepared for the GMDSS on the GTS and to provide Météo-France ([henri.savina@meteo.fr](mailto:henri.savina@meteo.fr)) with the appropriate metadata.

**8.3.7** The Commission re-emphasized the usefulness of graphical products for mariners, and noted that the ETSI have been developing the Ice Objects Catalogue and is engaged in developing the S-1xx version (latest IHO standards) of this catalogue, which includes descriptions of extended set classes, attributes and presentation libraries. The Commission also noted that the ETMSS has initiated the development of a catalogue of Met-Ocean Object Classes and Attributes. The Commission requested that these Teams continue working on the definition of Object Catalogues for the provision of numerical information for mariners, as a set of IHO S-1xx formats. As not all the SOLAS vessels are equipped with ENC's, the Commission requested the continuing broadcast of MSI in text format. The Commission recognized concerns of the Issuing Services on the high telecommunication cost of providing both text and graphical products. Therefore, it encouraged ETMSS to explore issuing MSI in text format that can be displayed on ENC systems.

**8.3.8** The Commission emphasized the importance for all NMHSs to implement a Quality Management Framework (QMF) in order to ensure the use of best practices and the improvement of value for mariners. The Commission noted with appreciation the QM training, focused on Internal Audit procedures, provided to Issuing Services by a QM specialist supporting the Australian Bureau of Meteorology during the Maritime Safety Services Enhancement Workshop in May 2010. It further noted with appreciation the “Marine Weather, Tsunami Warning and Ocean Services Quality Manual” as a key document of the QMS that would help to define the roles and responsibilities of the marine meteorological and ocean services (see item 8.4). Recalling that ISO practices or certificates, although not mandatory at this stage but which may be required in the future by bodies in charge of the coordination of international systems, the Commission encouraged the Members/Member States concerned to implement a Quality Management System (QMS) that includes the provision of Maritime Safety Services.

**8.3.9** The Commission also noted the first version of the template for self-assessment reports by Issuing Services or METAREA Co-ordinators prepared by the ETMSS. In order to monitor the WMO contribution to the GMDSS, the Commission therefore requested all Issuing Services/METAREA Co-ordinators to report annually using this template.

**8.3.10** Taking into account the work of IMO in developing the concept of e-Navigation, the international code of safety for ships operating in polar waters (Polar Code) and the ongoing review of the GMDSS, the Commission requested the ETMSS and ETSI to continue to contribute to these processes and to provide input on weather and ice safety related to Polar Code development to IMO.

**8.3.11** Noting that volcanic ash floating on the sea surface has the potential to disable a ship's engine through its water intake, the Commission encouraged the ETMSS to develop guidelines for advisories for such events.

**8.3.12** The Commission noted that severe solar magnetic storms can disrupt positioning systems, satellite communications and HF radio communications, and therefore might cause severe disturbance in receiving navigation and marine weather information. The Commission noted with concern that the next peak solar activity period (2012–2013) is approaching, and requested ETMSS to interact with IHO to identify possible measures to provide appropriate navigational warnings for mariners.

#### JCOMM's role in Marine Environmental Accident Responses

**8.3.13** The Commission recalled that one of its essential tasks is coordinating the Marine Pollution Emergency Response Support System (MPERSS) as well as maritime search and rescue (SAR) operations, supported by the ETMSS and the ETOOFS. It also recalled that the current MPERSS capability and framework of the Area Meteorological and Oceanographic Coordinators (AMOCs) focuses on providing tracking for objects adrift (e.g. containers, ships, persons at sea) and forecasts for dispersion of hazardous material spills.

**8.3.14** The Commission noted that MPERSS has been extended to the Arctic Ocean with minimum capabilities achieved. It therefore requested ETMSS, ETSI and Arctic METAREA Coordinators to continue to develop the system beyond the minimum requirements during the next intersessional period, taking into account national and international initiatives and projects for the monitoring and forecasting of oil spills.

**8.3.15** Considering recent events of marine environmental incidents such as the radioactive material leak at Fukushima, the Commission noted a capability and service gap in MPERSS. The Commission therefore agreed that it should take a proactive role in supporting Members/Member States to respond to marine environmental emergencies. This should include supporting responsible centres to extend their technical capabilities, exchange diagnostic and forecast data, as well as provide enhanced coordination for services and information provision in a way that meets requirements as defined by the IAEA and IMO. The Commission noted the potential advantage of having oceanic dispersion modelling activities for radioactive hazards in operational NWP centres, operated in conjunction with atmospheric dispersion modelling infrastructures and expertise so as to leverage the existing capabilities.

**8.3.16** The Commission endorsed the outline for the JCOMM strategy on developing its work related to a wider range of marine pollution emergencies. It adopted [Recommendation 4 \(JCOMM-4\) – Enhancement of Capability for Marine Environmental Emergencies](#). The Commission requested ETMSS, ETOOFS and the Secretariat to develop a full strategy for JCOMM activities in cooperation with IMO, IAEA and other relevant bodies, and to identify and implement actions as appropriate.

#### **8.4 QUALITY MANAGEMENT** (*agenda item 8.4*)

**8.4.1** The Commission recognized that quality management issues related to instruments, observations and data management were discussed at the session under the relevant agenda items. It agreed that the JCOMM should continue to encourage a quality management approach to the delivery of met-ocean data, products and services, and requested the Management Committee to coordinate the related intersessional activities. To continue to deal effectively with quality management, the Commission decided to maintain one of its Management Committee members as activity leader for the issue. Action in this regard is taken under item 12.4.

**8.4.2** The Commission considered that the adoption of a quality management approach would: assist the efficient and effective management and operation of a service; assist Members/Member

States in adopting good management practices; and, enhance user confidence in the quality of data, products and services backed by a quality management framework.

**8.4.3** The Commission noted that Members/Member States had to comply with national and regional policies, and that the implementation of a QMS was both customer-driven and country-specific. The Commission further noted that a number of Members/Member States have undergone ISO-9001 certification processes, and that the WMO Resolution 26 (Cg-XVI) invited Members with a well-developed QMS in place to share experiences, expertise and documentation with other Members currently developing or planning such systems. In this context, the Commission urged Members/Member States to actively share experiences for the establishment of best practices for enhancing the development and implementation of a QMS. The Commission further noted that ISO/IEC-17025 is a standard specially made for marine laboratories that covers all the requirements of ISO-9001, and therefore saw advantages in Member/Member States in adhering to ISO/IEC-17025.

**8.4.4** The Commission noted that the working arrangements between WMO and the International Civil Aviation Organization (ICAO) had been a driver for the coordination of the implementation of the QMS for aeronautical meteorology by the Commission for Aeronautical Meteorology. It considered that the International Maritime Organization (IMO) would have an interest in the development of the QMS requirements for marine meteorological and oceanographic services, and therefore suggested that JCOMM, on behalf of WMO, discuss with IMO future directions and strategy related to this matter. It further suggested that, in relation to this process it would consult with the WMO Commission for Aeronautical Meteorology (CAeM) as necessary.

**8.4.5** The Commission noted with interest the work of a WMO Task Team on Quality Management Systems Implementation to promote, oversee and guide the further implementation of the Quality Management Framework. The Commission recognized that this Task Team could provide valuable support to JCOMM in implementing its own work in QMS, and requested the Management Committee, through the activity leader on QMS, to maintain close liaison with the Task Team (which is chaired by the activity leader).

**8.4.6** The Commission noted with appreciation that the Australian Bureau of Meteorology was continuing to implement a QMS pilot project on behalf of JCOMM to achieve certification of compliance with the AS/NZS ISO-9001:2008 Quality Management Standard for the delivery of marine weather, tsunami warning and ocean services. The Commission agreed that this continued to be an important project and requested that the Management Committee and the Services and Forecasting Systems Coordination Group (SCG) continue to be kept informed on progress, with a view to using the results as a pilot, to assist other countries to implement their own QMSs for met-ocean services. The Commission recommended that demonstration projects leading to the implementation of QMSs for marine meteorological and oceanographic services be carried out, particularly in developing countries, and encouraged interested Members/Member States to undertake such projects in coordination with the activity leader on QMS and SCG.

**8.4.7** The Commission noted with satisfaction that a new WMO Quality Management web site hosted by the Australian Bureau of Meteorology had been launched at [http://www.bom.gov.au/wmo/quality\\_management/index.shtml](http://www.bom.gov.au/wmo/quality_management/index.shtml). The web site also provided access to the WMO QM Forum where issues of best practice and benchmarking could be shared amongst Members. The Commission noted with satisfaction that *A Practical Guide for the Implementation of Quality Management System for National Meteorological and Hydrological Services* (also available on the above-mentioned website and to be translated in six official languages), a result of the QMS pilot project on behalf of JCOMM, was a valuable resource for the adoption of a quality management approach to the delivery of met-ocean data, services and products. It therefore encouraged Members/Member States to apply the developed framework of practice described in the new *QM Guide* for the development and implementation of the QMS.

**8.4.8** Whilst it encouraged Members/Member States to implement, where possible, a QMS following as far as possible the ISO-9000 quality management standards, the Commission recognized that the key element in implementation of the QMS for marine meteorological and oceanographic service was the capacity development and associated training. The Commission noted the decision by the WMO Congress at its sixteenth session (2011) that all Technical Commissions make this a high priority activity and follow the model developed by the WMO Commission for Aeronautical Meteorology (CAeM). A key part of the implementation of this model in the marine sector will be the development of competency requirements for personnel in marine meteorological and oceanographic agencies. To pursue this work during the intersessional period, the Commission decided to establish a small ad hoc task team chaired by the activity leader on QMS. The Commission requested this team to prepare and submit to the Management Committee a draft of an internationally acceptable competency framework focusing on the competency requirements for marine meteorological and oceanographic services. The competency framework should be consistent with the Commission's Quality Management Framework (QMF) and be based on the model used in CAeM and other related Frameworks such as "Knowledge and Skill Guidelines for Marine Science and Technology" developed by U.S. Marine Advanced Technology Education. Trials of the draft competency framework should be carried out in conjunction with one of the QMS pilot projects. The Commission further noted that the developed standards and related material should be used to update the part IV of the WMO-No. 558 (*Training in the Field of Marine Meteorology*), and to develop education and training programmes to meet competency based requirements for marine meteorology and oceanography (see also item 9).

**8.4.9** The Commission adopted [Recommendation 5 \(JCOMM-4\) – Quality Management Implementation for JCOMM](#).

**8.4.10** The Commission noted with pleasure that the IODE programme has been developing a Quality Management Framework to ensure the National Oceanographic Data Centres (NODCs) are established and operate according to defined principles, including adherence to agreed standards and best practices and the requirements of the IOC Oceanographic Data Exchange Policy. The IODE-QMF describes the formal process for accreditation of data centres to ensure NODCs are able to provide quality data to meet the requirements of a broad community of users. IODE has been accepted as a network member of the ICSU World Data System which requires NODCs demonstrate their capability to meet ICSU certification requirements. The IODE-QMF provides guidance for NODCs to design and implement quality management systems for the successful delivery of oceanographic and related data, products and services. The IODE would work closely with JCOMM to promote quality management and standards in compliance with the WMO Quality Management Framework. The IODE-QMF would be adopted at the Twenty-second Session of the IODE Committee in March 2013.

## **8.5 FUTURE PRIORITY FOR THE SERVICES AND FORECASTING SYSTEMS PROGRAMME** (agenda item 8.5)

**8.5.1** Responding to the decisions and requests of the governing bodies, the Commission recognized that contribution contributing to GFCS implementation for marine and coastal communities should be a high priority for the intersessional period, along with fulfilling the Commission's core service mandates in providing maritime safety services as well as supporting marine and coastal emergency responses and risk reduction.

**8.5.2** Noting the discussions and decisions made at the session, the Commission endorsed the priority activities for the intersessional period for each key area of the Services and Forecasting Systems Programme Area (SFSPA) as described below, with no particular order. The Commission requested the Expert Teams and the WMO-IOC Secretariats to update and document their workplans (<http://www.jcomm.info/SPAWP>), and implement them in a seamless manner:

### Operational Ocean Forecasting Systems and Services

- Develop technical documentation, particularly the new *Guide to Operational Ocean Forecasting Systems*, and provide relevant contributions to the *Manual on the Global Data-Processing and Forecasting System* (GDPFS, WMO-No. 485);
- Continue implementing operational ocean forecasting services for daily to seasonal time scales, including developing performance metrics and coordinating data management and dissemination standards through close collaboration with DMPA and CBS;
- Coordination of ocean metrics for monitoring ocean extremes in close collaboration with OOPC;
- Develop a JCOMM coordination framework to support ocean and marine requirements for operational coupled seasonal climate forecasting systems, in support of the GFCS;
- Coordinate the development of oceanic dispersion modelling, prediction and impact assessment capabilities through partnerships with GODAE Ocean View Science Team, IAEA, and IMO/IHO to address the marine emergency response needs for oceanic discharge of radioactive hazards;
- Maintain and update requirements documents for ocean applications, including RRR and SoG;
- Continue leading the wave forecast verification scheme (<http://www.jcomm.info/wave>), and support verification/evaluation activities through the Pilot Project on Wave Evaluation and Test (PP-WET, <http://www.jcomm.info/wet>).

### Support Disaster Risk Reduction in Coastal Zones

- Maintain and update technical documentation (and their dynamic parts), including the *Guide to Storm Surge Forecasting* (WMO-No. 1076), *Guide to Wave Analysis and Forecasting* (WMO-No. 702), and relevant parts of the *Manual on the Global Data-Processing and Forecasting System* (GDPFS, WMO-No. 485);
- Continue supporting Members/Member States to develop and implement the regional sub-projects of the Coastal Inundation Forecasting Demonstration Project (CIFDP). This work further aims to provide advice for regional and national forecast/warning systems for coastal meteorological/oceanographic hazards;
- Support Members/Member States in establishing Extreme Wave datasets and storm surge climatologies;
- Extend cooperative activities with IOC Working Group on Tsunamis and Other Hazards related to Sea Level Warning and Mitigation Systems (TOWS-WG) for multi-hazard approach;
- Lead research efforts for coordinated wave climate projection (COWCLIP).

### Safety-related Marine Meteorological Services

- Continue supporting Maritime Safety Information Services (with IMO and IHO) including ice navigation services and information on complex sea states, and enhance ENC/Electronic Chart Display Information System (ECDIS) or other display capabilities for met-ocean safety information, under the agreed scheme for IMO e-Navigation;
- Maintain and update technical documentation, including the *Manual on Marine Meteorological Services* (WMO-No. 558), *Guide to Marine Meteorological Services* (WMO-No. 471), relevant parts of the *Manual on the Global Data-Processing and*

*Forecasting System* (GDPFS, WMO-No. 485), and sea-ice standards and reference material;

- Assess services requirements for marine pollution emergency response, through enhanced partnerships with IAEA, IMO, IHO and other partners. This work will be conducted in parallel with the development and implementation of a JCOMM Strategy for enhanced marine pollution emergency response, with a focus on radioactive material discharge;
- Enhance interaction with marine users to keep abreast of user requirements for improvement of services, and improve service/information interface;
- Address emerging requirements for extended maritime safety information, including marine volcanic ash fall hazard advisories and developing warnings for high impact space weather events.

#### Quality Management and Capacity Building

- Leverage on the successful implementation of a Quality Management System (QMS) at several advanced Services to expand the QMF/QMS approach in NMHSs in developing Members/Member States through training and pilot demonstrations;
- Support training for operational ocean forecasting;
- Continue supporting the Storm Surge Watch Scheme (SSWS), including training workshops on storm surge and wave forecasting (JCOMM/TCP training workshop series);
- Continue supporting and harmonizing sea-ice related training (e.g. IAW, COMET, manual for ice experts —ice observers).

### **9. CAPACITY DEVELOPMENT AND TECHNOLOGY TRANSFER** (*agenda item 9*)

**9.01** The Commission noted that capacity development is a high priority for both WMO and IOC, and JCOMM activities related to specialized education and training in marine meteorology, physical oceanography and data management have been focusing on programme support and implementation/delivery through the Programme Areas (PAs). The Commission agreed that this general direction and principles should be kept for the next intersessional period, and requested its Management Committee to assign one member to oversee the overall activities in this area.

**9.02** The Commission noted that workshops and training undertaken under all PAs during the past intersessional period have been very successful, which should assist developing countries — particularly Least Developed Countries (LDCs) and Small Island Developing States (SIDS)— to enhance capabilities for marine meteorological and oceanographic services and delivery. In order to maximize the effect of such activities, the Commission agreed that further efforts should be made through the following type of activities:

- Preparation and management of technical guidance material, in conjunction with the regular review and update of the Guides and Manuals;
- Strengthened liaison and contacts with wider WMO-IOC capacity development programmes, particularly for the application of developed marine meteorological and oceanographic training material and for the development of training programmes;
- Development of a web-based tool to document/consolidate/visualize overall Capacity Development activities of the Commission, particularly those initiated and directly supported by the Members/Member States;
- Enhanced support for time-bound projects with clear objectives and plans for delivery, which serve for Members'/Member States' capacity development and

technology transfer needs, with a view to leveraging other potential funding sources and responding to expressed priorities of Members/Member States;

- Enhanced collaboration through the Partnership for New GEOSS Applications (PANGEA), a concept developed by JCOMM with the goal to develop resource sharing partnerships to realize the socio-economic benefits of ocean observing systems at global and regional scales.

**9.03** The Commission noted with appreciation that both UNESCO/IOC and WMO had made continued efforts to facilitate access to a wide range of training materials through OceanTeacher (<http://www.oceanteacher.org>) developed by the IODE of UNESCO/IOC, and Met e-learning (<http://www.met-elearning.org>) managed by the WMO Education and Training Programme (ETRP). It strongly recommended that these efforts should be closely coordinated, and that the developed material should be used to the maximum extent possible to enhance the efficiency of the various hands-on trainings and workshops as common/standard curricula and preparatory material. The Commission also encouraged its Members/Member States to actively coordinate with WMO and UNESCO/IOC to develop partnerships among distance learning programmes, such as USA's Cooperative Programme for Operational Meteorology, Education and Training (COMET, <http://www.met.ed.ucar.edu/>).

**9.04** The Commission particularly welcomed the OceanTeacher Global Classroom initiative, being developed by IODE, which allows training courses to take place simultaneously in multiple locations through the use of video conferencing technology. It recalled that a similar type of virtual training was conducted also at the WMO High Profile Training Event (HPTE) in 2006, and noted that such an initiative would increase the number of students per course while reducing travel cost. The Commission requested the Secretariats and Programme Area Coordinators to use the OceanTeacher Global Classroom as much as possible for JCOMM training courses.

**9.05** The Commission considered that the series of international and regional seminars and workshops had very well achieved its purpose, and corresponded well with national and regional requirements. The Commission, in particular, acknowledged that cooperation with the International Oceanographic Data and Information Exchange (IODE) and its Project Office in Ostend, Belgium, had been particularly beneficial in stimulating capacity development activities, and agreed that such collaboration should continue and be strengthened. The Commission agreed that the following series of training workshops, and new initiatives as deemed appropriate to address the need of Members/Member States, should be continued during the intersessional period in parallel with an effort to streamline their programmes and curricula:

- Training courses on the Ocean Data Portal (ODP)
- Training courses on ocean and marine meteorology data management, including cross-discipline introductory courses
- Workshops for Port Meteorological Officers (PMOs)
- Workshops on marine instrumentation and deployment through RMICs
- Training workshops on ocean observations and modelling
- JCOMM-TCP Training workshops on storm surge and wave forecasting
- Training workshops on application of satellite products to marine forecasting
- Training workshops on sea ice analysis
- Workshops on maritime safety services and marine service quality management

**9.06** The Commission also noted the expressed need for formal education and training, notably graduate, Masters' and Ph.D. research programmes on marine meteorology and oceanography by several Members/Member States from developing countries in the African Region. It therefore requested the Management Committee to work with interested Members/Member States to



encourage development of such programmes in all regions, as this would ensure effectiveness and sustainability of the JCOMM series of related short training and workshops.

**9.07** The Commission requested the Management Committee to carry out an assessment of the effectiveness of training courses, workshops and capacity building efforts undertaken by the Commission and its associated bodies in order to better understand the success of these initiatives, impact, gaps, evaluate the sustainability of the learning, and make proposals for future work.

**9.08** The Commission reviewed the JCOMM Capacity Development Principles (<http://www.jcomm.info/CBprinciples>) and adopted this document with revision, taking into account the WMO and IOC capacity development strategies as well as the emerging focus of the activities as described in paragraph 9.02.

#### Competencies for marine meteorological and oceanographic services

**9.09** The Commission noted discussions and decisions made at the sixteenth World Meteorological Congress (Cg-XVI, 2011) on personnel competencies of the core job-tasks in meteorological and hydrological services, which are closely linked to the issue of Quality Management as well as training/education. The Commission agreed that intersessional activities for training should be streamlined along with this initiative, and requested the responsible member of the Management Committee to work with the PA Coordinators to ensure that all training activities would be incorporated with a framework to enhance competencies of national meteorological and oceanographic institutions.

**9.10** Noting that each WMO Member has to make its own decision on the formal education and standards, provided that it could meet minimum qualification and competency (knowledge, skills and behaviour) requirements in respective fields, the Commission agreed that general requirements for qualification and competency should be firstly defined for marine meteorology and oceanography (see item 8.4 for related decisions). The Commission requested the Management Committee to organize a survey for national forecasters and related operators during the intersessional period, in order to help identifying such requirements and associated training needs.

### **10. REVIEW OF TECHNICAL REGULATIONS OF INTEREST TO THE COMMISSION, INCLUDING GUIDES AND OTHER TECHNICAL PUBLICATIONS** (*agenda item 10*)

#### WMO Technical Regulations

**10.01** The Commission noted with satisfaction that the new edition of the *Manual on Marine Meteorological Services* (WMO-No. 558) was published in 2012 and made available on the WMO and JCOMM websites (<http://www.jcomm.info/558>), and the *Guide to Marine Meteorological Services* (WMO-No. 471) was in the publishing process, taking into account all the revisions made at previous JCOMM Sessions. It recognized the value of these publications in ensuring the provision of high quality and timely services to marine users, as well as in assisting and guiding National Meteorological Services, and recommended that these two publications should be maintained as up-to-date as possible. The Commission therefore agreed to keep in force the fast-track procedure adopted at JCOMM-III through Recommendation 11 (JCOMM-III) for the approval of amendments to these two publications.

**10.02** The Commission recalled that, under item 7.2, it had agreed to amend the Manual on, and the Guide to Marine Meteorological Services (WMO-No. 558, and WMO-No. 471 respectively) as first step of the Marine Climatological Summaries Scheme (MCSS) modernization effort, and the initial development of the Marine Climate Data System (MCDS) that would replace the MCSS upon the Commission's respective decisions. In particular, the Commission agreed that while the form of the tabular/graphic Marine Climatological Summaries (MCS) products would continue to be standardized as documented in the Manual and Guide, their production by the Responsible

Members could now become optional under the MCSS. The Commission also agreed on changes to the International Maritime Meteorological Tape (IMMT) format, and the Minimum Quality Control Standard (MQCS).

**10.03** The Commission further agreed to the proposal by the Ship Observations Team (SOT) to update, *Weather Reporting* (WMO-No. 9), Volume D, Information for Shipping, to replace the list of Inmarsat C Land Earth Stations accepting code 41 messages (in Chapter 2) with a link to the WMO webpage where the list is being maintained by the SOT.

**10.04** The Commission, following the discussion under item 8.3, agreed to adopt a number of amendments to the Volume I of the WMO-No. 558 in order to keep the Manual updated with the recent development in the provision of Maritime Safety Information (MSI), including the NAVTEX Ice abbreviations.

**10.05** The Commission adopted [Recommendation 6 \(JCOMM-4\) – Modifications to the Manual on Marine Meteorological Services – WMO No. 558, the Guide to Marine Meteorological Services – WMO No. 471, and WMO No. 9, Volume D, Information for Shipping.](#)

**10.06** The Commission also requested the Expert Teams and the Secretariat to prepare proposals for further amendments of these Technical Regulations in parallel with the implementation of intersessional workplan, particularly for the relevant parts on the training in the field of marine meteorology (WMO-No. 558, Volume I, Part IV; along with the progress in the work of quality management approach and competency requirements), and regional aspects of the marine meteorological services (WMO-No. 558, Volume II; to be consistent with the Implementation Plan of the WMO Regional Associations).

#### WMO and UNESCO/IOC guides and other technical publications

**10.07** Recalling the legacy recommendations from the WIGOS Pilot Project for JCOMM to undertake a review of WMO and UNESCO/IOC Technical Publications in terms of best practices for instruments and methods of observation, and as documented in JCOMM/TR-No. 48, the Commission requested the Observations Coordination Group (OCG) and the related Groups and Panels to continue such efforts and make proposals to update the relevant chapters of relevant WMO and IOC Publications for consideration by JCOMM-5.

**10.08** The Commission endorsed the proposals from the Ship Observations Team (SOT) relating to modifications to the WMO-No. 47 (*International List of Selected, Supplementary and Auxiliary Ships*), including metadata requirements, as documented in the final report of SOT-VI (available from the web<sup>11</sup>), and urged that these be considered by the WMO Executive Council, at its sixty-fourth session (Geneva, June 2012) for promulgation as a new version (version 4.0) of Pub. 47, with an implementation date of 1 January 2013. The Commission, also noted with appreciation that E-SURFMAR is maintaining a parallel version<sup>12</sup> of the Pub. 47, which is kept up to date on a more timely basis than the WMO website version<sup>13</sup>.

**10.09** The Commission requested the relevant JCOMM Groups and Expert Teams to keep the contents of all WMO and UNESCO/IOC marine-related publications under review, and advise on the need for future updating as necessary.

## **11. RELATIONSHIP WITH OTHER PROGRAMMES AND BODIES** (*agenda item 11*)

**11.01** The Commission recognized that to accomplish its objectives and those of WMO and the IOC, it needed to cooperate with a number of programmes and bodies of the WMO and the IOC,

<sup>11</sup> <http://www.jcomm.info/sot6>

<sup>12</sup> <http://esurfmar.meteo.fr/doc/vosmetadata/index.php>

<sup>13</sup> <http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm>

as well as external organizations. The Commission recalled that it maintained working relationships with the following WMO and IOC programmes and bodies:

- the IOC-WMO-UNEP-ICSU **Global Ocean Observing System (GOOS)**, where the Commission is an implementation coordination mechanism for a number of aspects of GOOS. The GOOS governing structures were reformed by the twenty-sixth session of the IOC Assembly. The IOC-WMO-UNEP Intergovernmental Committee for GOOS (I-GOOS), the GOOS Scientific Steering Committee (GSSC) and its subsidiary panels were dissolved, and replaced with an interim GOOS Steering Committee (GSC). IOC recommitted to GOOS that is a holistic system of global, regional and coastal observations and products, aligned with a Framework for Ocean Observing and oriented to an essential ocean variable approach, promoting GOOS role in informing key societal issues as expressed in UN conventions, and reinforcing global participation through capacity development. The Commission has an ex officio seat on the GSC.
- the IOC **International Ocean Data and Information Exchange (IODE)**, where cooperation between the Commission's Data Management Programme Area and IODE is very strong to support the objectives of both bodies. This cooperation is covered under item 7.
- the **WMO Space Programme (SAT)**, so that the needs and requirements of the JCOMM community are represented at a high level in the satellite community.
- The **WMO Disaster Risk Reduction (DRR) Programme and WMO/CBS Severe Weather Forecasting Demonstration Project (SWFDP)**, (see also item 8.2).
- other **WMO Programmes and Technical Commissions** related to coastal hazards, Quality Management Systems, and in the context of the emerging Global Framework for Climate Services (GFCS).
- **IOC Tsunami warning and coastal management programmes**, for their complementary focus on preparedness, response, and planning in the domain of coastal hazards (see also item 8.2).
- the WMO-IOC-UNEP-ICSU **Global Climate Observing System (GCOS)** and the WMO-IOC-UNEP **World Climate Research Programme (WCRP)**, as JCOMM coordinates the implementation of key ocean and marine meteorological observing and data management systems (see also item 5.1).
- the **WMO Regional Associations RAs** which complement the role of JCOMM in fulfilment of national user needs and requirements for production of marine and oceanographic information, data and products, particularly related to the WIS and DRR, GFCS, and capacity development, and the **IOC Regional Subsidiary Bodies**, which complement the role of JCOMM in regional implementation of IOC objectives through Member States.

**11.02** Regarding GOOS, the Commission looked forward to the new GSC, and acknowledged the value-added contribution that the Observations Coordination Group could offer in providing a negotiating space on how to meet requirements for a broader suite of coastal, biological and biogeochemical observations in developing the ocean observing system. The Commission recognized that this was an important dimension to the work of the GOOS as it more fully embraces coastal requirements for services as well as the broader suite of non-climate requirements. The Commission recognized that it should continue to be a full partner in this discussion.

**11.03** The Commission recalled the valuable input it was able to provide to the successful accomplishment of the goals of the WMO-ICSU International Polar Year 2007–2008. It welcomed the outcomes of the IPY2012 Conference "From Knowledge to Action" (22–27 April 2012, Montréal, Canada) and expressed its readiness to contribute to the implementation of an emerging

International Polar Initiative that WMO, IOC, and other organizations were developing to launch within a few years.

**11.04** The Commission further recalled that it maintained working relationships with the following external organizations:

- the International Maritime Organization (IMO), the International Hydrographic Organization (IHO), the International Mobile Satellite Organization (IMSO) and Inmarsat on safety-related marine meteorological services, as detailed in JCOMM-4/Doc. 8.3.
- the Group on Earth Observations (GEO) and its Global Earth Observing System of Systems (GEOSS), where the Commission in its role as coordinating implementation of ocean and marine meteorological observations, data management, and services, provides an important contribution to the Societal Benefit Areas of the Global Earth Observing System of Systems. It is represented in GEO through the participation of WMO, IOC, and GOOS.
- the World Ocean Council (WOC), which brings together a wide range of ocean industries in an international coalition to coordinate industry support for ocean science and other environmental action. Cooperation with the Commission is expected to improve opportunities for collaboration in ocean and marine meteorological observations.
- The **International Ice Charting Working Group (IICWG)**, which brings the national ice services together with their partners and clients to address issues of common concern. Since 1999, the IICWG has served as an active advisory body to the JCOMM Expert Team on Sea Ice.
- the **International Telecommunication Union (ITU)**, which together with WMO and IOC, is exploring the use of undersea cables for ocean observations supporting tsunami and climate monitoring.
- the emerging **Satellite Telecommunications Forum**, which is similar to the current Argos Joint Tariff Agreement, aims to engage other satellite service providers in a synergistic way on issues related to data transmission from autonomous in situ observing platforms.

**11.05** The Commission requested the Management Committee and the Secretariats of WMO and IOC to explore further collaboration, including the possibility of establishing formal relations, with the following external organizations,:

- the **International Union of Geodesy and Geophysics (IUGG)**, which with its constituent Associations, Commissions, and services is dedicated to advance, promote, and communicate knowledge of the Earth system, its space environment, and the dynamical processes causing change.
- The **European Environment Agency (EEA)**, developing its role as the coordinator of the Global Monitoring for Environment and Security (GMES) in situ component, has identified and prioritised the in situ marine data requirements in metadata with the GMES Marine Service (MyOcean) and relevant stakeholders, proposing solutions aimed at ensuring sustainable access to marine in situ data in Europe.
- the **Large Marine Ecosystem (LME)** projects, and particularly those involving Africa and adjacent islands: the Canary Current LME (CCLME), the Guinea Current LME (GCLME), the Benguela Current LME (BCLME), and the Agulhas and Somali Current LME (ASCLME, which already cooperates with the DBCP and other observing networks TIP), that collectively work on ecosystem approaches to sustaining regional ocean goods and services.

**11.06** The Commission noted that it maintains relationships with a number of other programmes and organizations, and requested the Management Committee to keep these under regular review, particularly for those identified joint activities.

## **12. JCOMM PROGRAMME AND PLANNING**

### **12.1 WMO AND IOC STRATEGIC PLANNING AND THE JCOMM STRATEGY** (*agenda item 12.1*)

**12.1.1** The Commission recalled that the current Terms of Reference (ToRs) for the Commission were approved, in conjunction with the establishment of JCOMM in 1999 by the thirteenth WMO Congress and the twentieth session of the IOC Assembly, and revised at JCOMM-III (2009) through its Recommendation 14 (JCOMM-III) – Terms of reference for the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology, to align the Commission's programme and deliverables to the implementation of the WMO Strategic Plan and IOC Medium-term Strategy. The revised ToRs were submitted to the sixty-second session of the WMO Executive Council and the forty-third session of the IOC Executive Council in 2010. The Commission reviewed the current ToRs and agreed to continue with the scope and responsibilities described at present.

**12.1.2** The Commission recalled that, at its third session (JCOMM-III, Marrakesh, Morocco, November 2009), it reviewed and adopted the Executive Summary for the JCOMM Strategy for 2010–2013 and requested the co-presidents and the Management Committee to finalize the Strategy. The Commission noted with satisfaction that a Strategy for JCOMM 2010–2013 had been compiled in conformity with the overall objectives, strategies and expected results of WMO and IOC, and published at <http://www.jcomm.info/Strategy>. A further revision to the strategy had subsequently been undertaken by the co-president and Management Committee. The Commission reviewed, revised and adopted the Executive Summary for this revised JCOMM Strategy for 2013–2016 as given in the [Annex IV](#) to this report.

**12.1.3** The Commission requested the co-presidents and Management Committee to finalize the Strategy document based on decisions taken during the session and to keep it under review and revise it as necessary during the intersessional period, and requested the Secretariats to publish the revised JCOMM Strategy Document in electronic form on the JCOMM Website.

### **12.2 FUTURE WORK PROGRAMME AND OPERATING PLAN** (*agenda item 12.2*)

**12.2.1** The Commission recognized that it had considered all elements of its work programme for the period 2013–2016, based on priorities identified by the WMO sixteenth Congress and twenty-sixth session of the IOC Assembly in 2011 (see item 4), when discussing the various agenda items above. It requested the Secretariats to compile the work programme in an appropriately structured form after the Session and to include it as an [Annex I](#) to this report.

**12.2.2** The Commission noted that the Management Committee prepared a JCOMM Operating Plan 2010–2013 (<http://www.jcomm.info/JCOMM-OP>), taking into account the WMO and IOC strategic planning processes and their respective Expected Results and Actions. The Commission requested the Management Committee and the Secretariats to establish a JCOMM Operating Plan 2013–2016, aligned with the adopted JCOMM work programme and the Operating Plans of WMO and IOC.

**12.2.3** The Commission recognized the need to communicate with Members/Member States, on a regular basis, on the status of the JCOMM workplan implementation particularly in view of the current financial situation. These reports would include activities that are being implemented, those that require additional extrabudgetary resources for effective implementation and the plans for addressing them. Such reports would help JCOMM to seek and receive guidance from the Members/Member States, and also to inform the Members/Member States of its achievements.

**12.2.4** The Commission expressed concerns on the current financial situation of IOC, and requested the Management Committee, once re-established by the current session, to establish an ad hoc group to consult Members/Member States on improved in-kind and financial support for JCOMM activities. The Commission also requested the WMO and IOC Secretariats to take all necessary measures to facilitate in-kind and financial support by Members/Member States for the Commission's work during the coming intersessional period.

**12.2.5** The Commission, noting that a full external review of JCOMM had not been undertaken within the previous intersessional period, nevertheless saw value in providing the opportunity for Member States to provide feedback on the past performance and its future. The Commission noted that analysis of information from its past performance would assist in the preparation for meetings of JCOMM's governing bodies. The Commission requested the Management Committee and the Secretariats to establish a mechanism for undertaking this task. In doing so, the Commission also requested the Management Committee to review the JCOMM priorities for intersessional period to ensure effective use of the available resources.

**12.2.6** The Commission, noting the ongoing development such as the "Oceans Compact" developed for 10-yearly UN Conference on Sustainable Development in the framework of Rio+20, requested the Management Committee to plan and continuously review the Commission's workplan to maintain and strengthen the JCOMM collaboration with governments, academic and non-government organizations/programmes (see also item 11). The Commission also requested the Management Committee to keep abreast of the latest GEO activities, and seek ways to strengthen the Commission's interaction with GEO during the intersessional period.

### **12.3 REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION AND OF RELEVANT RESOLUTIONS OF THE GOVERNING BODIES OF WMO AND IOC** (agenda item 12.3)

**12.3.1** In accordance with WMO General Regulation 190, the Commission examined those resolutions and recommendations adopted by JCOMM at its previous sessions, which were still in force. It noted that actions identified through previous recommendations had mostly taken place and completed, or became ongoing activities of the teams and groups of the Commission. The Commission therefore adopted [Resolution 1 \(JCOMM-4\) – Review of previous resolutions and recommendations of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology](#).

**12.3.2** The Commission then examined resolutions of the governing bodies of WMO and IOC within the field of the activities of JCOMM, and adopted [Recommendation 7 \(JCOMM-4\) – Review of relevant resolutions and recommendations of the governing bodies of WMO and IOC](#).

### **12.4 ESTABLISHMENT OF GROUPS AND EXPERT TEAMS** (agenda item 12.4)

**12.4.1** The Commission discussed the most efficient way to organize its working structure, without increasing the cost, in view of: (i) the priorities and requirements set by the governing bodies of WMO and IOC; (ii) the need for enhanced coordination between its Programme Areas (PAs); (iii) the need to fulfil the Commission's growing responsibilities and to respond to emerging tasks; (iv) the need for resources in terms of number of experts engaged in the work of the Commission; and (v) budget allocated within the WMO and the IOC to support the work of the Commission. The Commission decided to continue with the three Programme Areas: Observations, Data Management, and Services and Forecasting Systems. It agreed that a project-oriented approach should be adopted wherever possible to address specific, defined, time limited activities. The Commission entrusted the Management Committee with keeping the JCOMM structure under permanent review and adapting it when necessary.

**12.4.2** The Commission stressed that the success of the structure would depend on the role of the Management Committee in assessing, guiding and coordinating the work of the PAs, in making



necessary adjustments in the intersessional period and in advising the co-presidents. The Commission therefore decided to re-establish the Management Committee by adopting [Resolution 2 \(JCOMM-4\)](#). It also requested the Management Committee, amongst its other duties, to oversee specific activities and projects that would be implemented through time-bound task teams.

**12.4.3** The Commission considered that the current structure and composition of the teams have been generally appropriate to make progress in the implementation of the Commission's intersessional workplan, and therefore agreed that the current structure should carry forward during the intersessional period. The Commission re-established the three Programme Areas and their appropriate component groups and expert teams by adopting [Resolutions 3 to 5 \(JCOMM-4\)](#).

**12.4.4** Taking into account the increasing requirements for the Expert Team on Waves and Storm Surges (ETWS) regarding its work on coastal hazards issues primarily associated with storm surges, the Commission decided to rename this team the Expert Team on Waves and Coastal Hazards Forecasting Systems (ETWCH) in order to more accurately represent its interests, skills and deliverables while continuing to carry out its current work in global coordination for waves and storm surges (see also item 8.2).

**12.4.5** Noting the emerging requirements for the climate data, information and services along with the development of the Global Framework for Climate Services (GFCS), the Commission felt that it would be timely to plan a future development for a fully joint venture of JCOMM and IODE based on achievements and past experience. In this context, the Commission requested the new Data Management Coordination Group (DMCG), in consultation with the Management Committee and IODE Committee, to develop an overall long-term strategy as well as propose a new structure for the Data Management Programme Area (DMPA), focusing on the following main issues:

- Marine climate data management to support GFCS;
- Near-real time ocean data management supporting ocean services, Disaster Risk Reduction and GFCS, with particular attention to providing a link from JCOMM OPA networks;
- Related matters of standards, formats, data discovery and access.

The Commission requested the Management Committee and the IODE Co-Chairs to provide guidance in the process, and if required, make decisions on the necessary revision of the DMPA workplan during the intersessional period.

**12.4.6** The Commission recognized the fundamental importance of the accomplishment of the JCOMM work programme and the actions of the individual experts within the proposed structure. It therefore requested Members/Member States to ensure that their appointed experts were allowed sufficient time and resources within their national work programme to complete allocated tasks in support of the Commission.

**12.4.7** In view of the potentially long intersessional period, the Commission asked the Programme Areas to ensure succession plans for key posts.

## **12.5 DATE AND PLACE OF THE FIFTH SESSION** (*agenda item 12.5*)

**12.5.1** The Commission noted with appreciation the proposal of Indonesia to investigate the possibility of hosting the the fifth session of JCOMM. It requested Indonesia to liaise with the co-presidents and the Secretariat in this regard. In any case, it was recalled that, in accordance with Regulation 188 of the WMO General Regulations, the date and place of that session shall be determined by the co-presidents of the Commission after consultation with the Secretary-General of WMO and the Executive Secretary of IOC.

### **13. THE SCIENCE AND TECHNOLOGY WORKSHOP** (*agenda item 13*)

**13.01** The Commission noted that the call for presentations to the Workshop "Improving Marine and Ocean Data and Products for Science and Society: the role of JCOMM" had elicited 61 high quality submissions covering a wide spectrum of JCOMM's interests, and from a wide geographical representation. This had posed a difficult challenge for the Selection Committee, comprised of the incumbent JCOMM co-president, senior representatives from the IOC and WMO, and the Workshop co-organizers, who were charged with drawing up an oral programme comprised of a maximum of two keynote addresses and 24 science/technology presentations. Unsuccessful oral presenters had been offered the possibility to exhibit posters, and a total of 26 were displayed. The Workshop drew 150 participants, who engaged fully with the presenters in lively debate and the creation of new partnerships.

**13.02** All areas of JCOMM's activities were covered within the overall theme of future improvements to JCOMM's deliverables. Particular focus was directed towards new synergies between observing systems (both in situ and satellite), the development of enhanced modelling capabilities coupled to extended observational networks, and the increasing availability of better tools for climate forecasting and disaster management. Nonetheless, the Workshop took heed of the dangers of over-dependence on sophisticated but unverified models, and the need to continue to devote considerable effort to the understanding of the underlying physics. Similarly, care needed to be taken to ensure the independent validation of model outputs, particularly during extreme episodes, whose accurate forecasting was crucial. In both of these areas, the need for in situ observations remained paramount, and JCOMM was uniquely placed to facilitate the sustained provision of such datasets if adequately resourced. The Commission was unanimous in agreeing that the Workshop had achieved its aims in both reviewing the status quo of JCOMM's science and technology, and in pointing the way ahead, and recommended that such a Workshop should continue to be a feature of future Commission sessions.

**13.03** A key outcome of the Workshop had been to identify the challenges that lay ahead for the implementation of JCOMM's objectives, and, as had been the case in the past, the need for collaboration, partnerships, resourcefulness, pragmatism and goodwill in addressing these challenges. The Commission asked the Programme Area chairs and Expert Teams to take careful note of this guidance in shaping their objectives and work programmes in an achievable way during the intersessional period. The Commission asked the Secretariat to ensure that the presentations were assembled into a JCOMM Technical Report for eventual publication via the web.

**13.04** Finally, the Commission thanked all participants, presenters and the organizers for working together in delivering an excellent Workshop, and the local hosts for providing such excellent facilities and financial support.

**13.05** The Commission also thanked Neville Smith (Australia) for delivering the George Needler Memorial Lecture. George Needler had played an important role in the design of the ocean observing system. The lecture followed the journey of oceanography, with particular focus on the evolution of the ocean observing system. The journey included examples of great innovation and leadership; of responses to major events; of dedication and cooperation spreading over decades; of good fortune and opportunity; and of the role of the intergovernmental process. The lecture addressed secrets behind sustainability and resilience as well as some thoughts on what the future might hold.

### **14. ELECTION OF OFFICERS** (*agenda item 14*)

**14.01** The Commission elected Mr Johan Stander (South Africa) as its co-president for meteorology and Ms Nadia Pinardi (Italy) as its co-president for oceanography.



**15. CLOSURE OF THE SESSION** (*agenda item 15*)

**15.01** The Commission praised and thanked the outgoing Co-President, Dr Peter Dexter, for his tremendous contribution and dedicated service for JCOMM over many years. The Commission wished his continuous involvement in the Commission's activities for coming years.

**15.02** The fourth session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology closed at 1.03 p.m. on Thursday, 31 May 2012.

## RESOLUTIONS ADOPTED BY THE SESSION

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### Resolution 1 (JCOMM-4)

#### **REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE JOINT WMO- IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)**

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

**Noting:**

- (1) The actions taken on the resolutions and recommendations adopted by the Commission prior to its fourth session,

**Decides:**

- (1) To keep in force the following Recommendations:
- |               |                      |
|---------------|----------------------|
| (a) CMM-XI    | 1 and 12             |
| (b) CMM-XII   | 4 and 6              |
| (c) JCOMM-I   | 2, 5 and 12          |
| (d) JCOMM-II  | 3, 5, 12 and 13      |
| (e) JCOMM-III | 1, 2, 4, 5, 6 and 15 |
- (2) Not to keep in force other resolutions and Recommendations adopted before its fourth session (2012).
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### Resolution 2 (JCOMM-4)

#### **MANAGEMENT COMMITTEE OF THE JOINT WMO-IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY**

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

**Noting:**

- (1) Resolution 1 (JCOMM-III) - Management Committee of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology,
- (2) WMO Resolution 4 (EC-LXII) - Report of the third session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology,
- (3) IOC Resolution EC-XLIII.5 - Third session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology,

- (4) Resolution 24 (Cg-XVI) - Marine Meteorology and Oceanography Programme,
- (5) The report of the co-president of the Commission at its fourth session,

**Decides:**

- (1) To re-establish a Management Committee with the following terms of reference:
  - (a) Review and prioritize the short- and long-term planning of the work programme of JCOMM and advise on its implementation;
  - (b) Take all necessary actions to ensure that the JCOMM strategy, work programme and operating plan are aligned with and contribute directly to the WMO Strategic Plan and the UNESCO/IOC Medium-Term Strategy and their Expected Results, as well as with the respective Operating Plans;
  - (c) Assess the resources required for the implementation of the work programme, as well as approaches to identifying and mobilizing these resources;
  - (d) Coordinate and integrate the work of JCOMM, as implemented through the various subsidiary groups and expert teams;
  - (e) Coordinate and provide oversight for the capacity development and quality management activities undertaken within the three programme areas, as appropriate;
  - (f) Ensure that the JCOMM requirements for satellite and other remotely sensed ocean data are properly documented and communicated to the appropriate mechanisms of WMO and IOC, and to the satellite system operators, as required;
  - (g) Coordinate and integrate the work of JCOMM, as appropriate, with that of the other WMO technical commissions, IOC major subsidiary bodies and other programmes of WMO and IOC, and in particular initiate, coordinate and provide oversight for joint projects and activities with these bodies and programmes;
  - (h) Review the internal structure and working methods of the Commission, including its relationship to other bodies, both internal and external to WMO and IOC, develop proposals for modifications, and approve such modifications on an interim basis as required;
  - (i) Bring priority issues before the governing bodies of the WMO and IOC during the intersessional period as required;
  - (j) Assess the implementation of activities and projects referred to JCOMM for action by WWW, WCP, GOOS, GCOS, IODE, DRR, GFCS and other programmes;
- (2) That the co-presidents shall have the responsibility to jointly undertake the duties required of presidents of technical commissions of WMO and technical committees of IOC as defined in their respective regulations. These would include or be extended to include the following:
  - (a) In joint consultation, to guide and coordinate the activities of the Commission and its groups intersessionally;
  - (b) In joint consultation, and with the assistance of the Secretariats, to direct and approve intersessional actions including the creation and dissolution of expert groups and task teams, pending approval by the Commission in session;

- (c) To carry out specific duties as prescribed by decisions of the governing bodies of WMO and IOC, as well as by the Regulations of each organization;
  - (d) To report to the governing bodies of WMO and IOC at their regular sessions on the activities of the Commission, as required;
  - (e) To ensure that the activities, recommendations and resolutions of the Commission are consistent with the provisions of the WMO Convention, the IOC Statutes, the decisions of WMO and IOC governing bodies, and the regulations of both organizations;
  - (f) To liaise with presidents of regional associations and chairs of GOOS Regional Alliances to ensure that regional requirements are taken into consideration when developing the work programme for JCOMM;
- (3) That the Management Committee will be composed of:
- (a) The two co-presidents of the Commission;
  - (b) The Programme Area coordinators;
  - (c) Bryan BOASE (Australia) as the leader on Quality Management;
  - (d) Ali MAFIMBO (Kenya) as the leader on Capacity Development and on Requirements;
  - (e) Peter DEXTER (Australia) as the immediate past co-president of JCOMM, as well as the leader on contribution to GFCS;
  - (f) Nikolai MIKHAYLOV (Russian Federation) as a member;
- (4) That additional experts may be invited by the co-presidents in consultation with the Secretary General of WMO and Executive Secretary of IOC, in the identified priority areas within the intersessional workplan of the Commission on a self-funded basis, and in general with no resource implications to JCOMM;
- (5) That senior representatives of GOOS, GCOS, IODE, and the IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) will also be invited to participate in Management Committee sessions, to ensure full coordination of programmes and activities;
- (6) That representatives of WMO technical commissions such as the Commission for Basic Systems, WMO regional associations, GOOS regional alliances and other bodies may be invited, as appropriate;
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Resolution 3 (JCOMM-4)

**OBSERVATION PROGRAMME AREA**

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

**Noting:**

- (1) Resolution 2 (JCOMM-III) - Observations Programme Area,
- (2) WMO Resolution 4 (EC-II) and IOC Resolution EC-XXXIII.8 - Data Buoy Cooperation Panel,
- (3) IOC Resolution EC-XXXIII.9 - Global Sea Level Observing System,
- (4) The Abridged Final Report with Resolutions of the Fourteenth World Meteorological Congress (WMO-No. 960), paragraph 3.4.4.13 (Argo),
- (5) IOC Resolution XX-6 - The Argo Project,
- (6) IOC Resolution XXVI-8 - Strengthening and Streamlining the Global Ocean Observing System,
- (7) The report of the chairperson of the Observations Coordination Group to the Commission at its fourth session,

**Considering:**

- (1) The need to maintain, improve, coordinate and integrate a comprehensive, in situ, ocean observing system, in response to stated requirements for marine data to support the World Weather Watch, World Climate Programme, World Climate Research Programme, Global Ocean Observing System, Global Climate Observing System and marine services,
- (2) The need to monitor new developments in marine observing technology and advise on their incorporation into operational observing networks, as appropriate,
- (3) The need to coordinate the development and implementation of standardized, high quality marine observing practices and instrumentation,
- (4) The need to review continuously and provide advice on new marine telecommunications systems and procedures,
- (5) The need to provide guidance to Members/Member States on technical aspects of marine observing systems,
- (6) The need to identify and coordinate the provision of resources and logistic facilities for the deployment and servicing of marine observing platforms and instrumentation,
- (7) The need to continuously monitor the performance and quality of marine observing systems and to assist in the implementation of remedial actions as necessary,
- (8) The need to coordinate with appropriate bodies of Commission for Basic Systems, Commission for Instruments and Methods of Observation, Global Ocean Observing System and Global Climate Observing System on marine instrumentation, observations networks and requirements for marine data,

**Decides:**

- (1) To re-establish a JCOMM Observations Programme Area, with the following components:
  - (a) An Observations Coordination Group;
  - (b) A Data Buoy Observations Team, known as the Data Buoy Cooperation Panel;
  - (c) A Sea Level Observations Team, known as the GLOSS Group of Experts;

- (d) A Ship Observations Team, aimed at continuing to develop coordination and synergies among the existing ship-based panels, that is, the Ship-of-Opportunity Programme Implementation Panel and the Voluntary Observing Ship Panel;
- (2) To maintain a close liaison and coordination with the Argo Steering Team, the OceanSITES project, the International Ocean Carbon Coordination Project, and the Global Ocean Ship-based Hydrographic Investigations Program;
- (3) That the terms of reference for the Observations Coordination Group and the Ship, Data Buoy and Sea Level Observations Teams shall be as given in the annex to this resolution;
- (4) That the general membership of the Observations Coordination Group and Ship, Data Buoy and Sea Level Observations Teams shall also be as given in the annex to this resolution;
- (5) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure:
  - (a) Candyce CLARK (United States of America) as chairperson of the Observations Coordination Group and Observations Programme Area Coordinator;
  - (b) Graeme BALL (Australia) as chairperson of the Ship Observations Team;
  - (c) Gustavo GONI (United States of America) as chairperson of the Ship-of-Opportunity Programme Implementation Panel of the Ship Observations Team;
  - (d) Julie FLETCHER (New Zealand) as chairperson of the as chairperson of the Voluntary Observing Ship Panel of the Ship Observations Team;
  - (e) David MELDRUM (United Kingdom of Great Britain and Northern Ireland) as vice-chair of the Observations Coordination Group;
  - (f) Jingli SUN (China), leading intercomparison activities;

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

#### **Annex to Resolution 3 (JCOMM-4)**

### **TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE COORDINATION GROUP AND TEAMS OF THE OBSERVATION PROGRAMME AREA**

#### **1. Observations Coordination Group**

##### **Terms of reference**

The Observation Coordination Group shall:

- (a) Keep under review and advise on the effectiveness, coordination and operation of the Observations work programme, including performance measured against scientific requirements, delivery of raw data, marine telecommunications, measurement standards, logistics and resources;
- (b) Provide advice to JCOMM and to Observations Teams on possible solutions for newly-identified requirements, consulting, as appropriate, with relevant scientific groups, the

Commission for Basic Systems and the Commission for Instruments and Methods of Observation;

- (c) Coordinate with appropriate bodies to ensure the JCOMM contribution towards the development of the WMO Integrated Global Observing System;
- (d) Review in situ data requirements and recommend changes, as appropriate, taking into account the continuing development of satellite observations and their capabilities;
- (e) Coordinate the development of standardized, high quality observing practices and instrumentation and prepare recommendations for JCOMM;
- (f) With concurrence of the co-presidents of JCOMM, establish and create expert teams, task teams, and pilot projects, as appropriate, to undertake the work of the Observations Programme Area;
- (g) Examine trade-offs and use of new and improved observation techniques/developments against: (i) relevant requirements for variables within Global Climate Observing System, Global Ocean Observing System, the WMO Commission for Basic Systems rolling review of requirements and the Global Observing System; and (ii) available resources;
- (h) Liaise with, and input to, Commission for Basic Systems activities regarding the consolidated requirements database and operational satellites;
- (i) Liaise with, and input to, Commission for Instruments and Methods of Observation activities regarding instruments and methods of observation;
- (j) Identify capacity development requirements related to the programme area;
- (k) Identify requirements on satellite data and information in the meteorological and ocean domains related to the Programme Area.

### **General membership**

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

- (a) Programme Area/Observations coordinator (Observations Coordination Group chairperson)
- (b) Observations Coordination Group vice-chairperson
- (c) Chairperson Ship Observations Team
- (d) Chairperson Data Buoy Cooperation Panel
- (e) Chairperson Global Sea Level Observing System (GLOSS) Group of Experts
- (f) Representative of Argo Steering Team
- (g) Representative of International Ocean Carbon Coordination Project
- (h) Representative of OceanSITES
- (i) Representative of the Global Ocean Ship-based Hydrographic Investigations Program

Additional experts may be invited as appropriate to lead the range of Observations Programme Area activities, on a self-funded basis, and in general with no resource implications to JCOMM;

The Data Management Programme Area Coordinator as well as the Services and Forecasting Systems Programme Area Coordinator will be invited to participate in Observations Coordination Group sessions, to ensure full coordination of cross-PA programmes and activities;

The JCOMM In Situ Observing Platform Support Centre (JCOMMOPS) will participate in the work and the meetings of the Coordination Group.

## **(2) Ship Observations Team**

### **Terms of Reference**

The Ship Observations Team shall:

- (a) Respond to requirements for ship-based observational data expressed by relevant existing international programmes and/or systems in support of marine services, and coordinate actions to implement and maintain the networks to satisfy these requirements;
- (b) Provide continuing assessment of the extent to which those requirements are being met;
- (c) Develop methodology for constantly controlling and improving the quality of data;
- (d) Review marine telecommunication facilities and procedures for observational data collection, as well as technology and techniques for data processing and transmission, and propose actions as necessary for improvements and enhanced application;
- (e) Coordinate Port Meteorological Officer (PMO)/ship greeting operations globally, propose actions to enhance PMO standards and operations, and contribute as required to PMO and observers training;
- (f) Review, maintain and update as necessary technical guidance material relating to ship observations and Port Meteorological Officers;
- (g) Liaise and coordinate as necessary with other JCOMM programme areas and expert teams, as well as with other interested parties;
- (h) Participate in the planning activities of the appropriate observing system experiments and major international research programmes as the specialist group on observations based onboard ships, including Voluntary Observing Ships, Ships-Of-Opportunity and research ships;
- (i) Seek new opportunities for deploying various kinds of measuring devices as recommended by the relevant panels and widely publicise those opportunities;
- (j) Develop as necessary new pilot projects and/or operational activities and establish new specialized panels as required;
- (k) Carry out other activities as agreed by participating Members/Member States to implement and operate the SOT programme and to promote and expand it internationally.

### **Terms of Reference of Component Panels**

#### **Ship-of-Opportunity Implementation Panel (SOOPIP)**

The Ship-of-Opportunity Implementation Panel (SOOPIP) coordinates the installation and deployment of instrumentation from Ships of Opportunity that travel in fixed transects, and in particular coordinates the implementation of regional and basin-wide instrumentation that measure



physical, chemical and biological parameters, such as XBTs, TSGs, and CPR. Its terms of reference are to:

- (a) Review, recommend on and, as necessary, coordinate the implementation of specialized shipboard instrumentation and observing practices dedicated, but not limited, to temperature and salinity measurements;
- (b) Coordinate the exchange of technical information on relevant oceanographic equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices;
- (c) Ensure the distribution of available programme resources to ships to meet the recommended sampling network in the most efficient way;
- (d) Ensure the transmission of data in real time from participating ships; ensure that delayed mode data are distributed in a timely manner (within 24 hours of the observations) to data processing centres;
- (e) Maintain, through the SOT chairperson, appropriate inventories, monitoring reports and analyses, performance indicators and information exchange facilities;
- (f) Provide guidance to the coordinator in supporting the Ship-of-Opportunity Programme (SOOP);
- (g) Prepare annually a report on the status of SOOP operations, data availability and data quality;
- (h) Where relevant, serve as a platform for other observational programmes;
- (i) Maintain close communications with the scientific community;
- (j) Support the formation of an XBT Science Team dedicated to meet and discuss on a periodic basis results and ongoing research performed with XBT observations.

### **Voluntary Observing Ship Panel**

The Voluntary Observing Ship (VOS) Panel shall:

- (a) Review, recommend and coordinate the implementation of new and improved specialized shipboard meteorological instrumentation, siting and observing practices, as well as of associated software;
- (b) Support the development and maintenance of new pilot projects;
- (c) Oversee the upgrade of ships to VOSclim standard, and encourage other new ships to be recruited to the VOSclim class;
- (d) Develop and implement activities to enhance ship recruitment, including promotional brochures and training videos;
- (e) Prepare annually a report on the status of VOS operations, data availability and data quality.

### **General Membership**

- Chairperson of the Ship Observations Team, selected by the Commission

- Chairpersons of the SOOPIP and Voluntary Observing Ship Panel, selected by the Commission
- Open membership, comprising operators of VOS and SOOP, representatives of monitoring centres, data management centres and bodies, representatives of the International Mobile Satellite Organization and other communications satellite systems, representatives of manufacturers, representatives of science advisory bodies and users as appropriate.

The JCOMM In Situ Observing Platform Support Centre will participate in the work and the meetings of the Ship Observations Team.

### (3) Data Buoy Observations Team

#### Data Buoy Cooperation Panel

##### Terms of Reference

Existing Terms of Reference for the Data Buoy Cooperation Panel (DBCP), the Tropical Moored Buoy Implementation Panel (TIP) and action groups. The DBCP terms of reference will be kept under review by the panel, with any changes proposed to be considered by the Management Committee, with a view to their approval by the co-presidents on behalf of the Commission.

##### General Membership

- Open membership, comprising existing DBCP members, action groups, TIP.
- JCOMMOPS will participate in the work and the meetings of the Team.

### (4) Sea Level Observations Team

#### GLOSS Group of Experts

##### Terms of Reference

Existing terms of reference as determined by the IOC Executive Council.

##### General Membership

- Existing GLOSS Group of Experts and GLOSS Scientific Sub-group.

#### Resolution 4 (JCOMM-4)

### **DATA MANAGEMENT PROGRAMME AREA**

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

##### **Noting:**

- (1) Resolution 3 (JCOMM-III) - Data Management Programme Area,

- (2) The report of the chairperson of the Data Management Programme Area to the Commission at its fourth session,
- (3) The report of the twenty-first session of the IOC Committee on the International Oceanographic Data and Information Exchange (IODE),

**Considering:**

- (1) The need to implement, maintain and make available to users a fully integrated ocean/atmosphere data system,
- (2) The requirement for the timely delivery of integrated data and associated metadata,
- (3) The need to develop and maintain monitoring, evaluation and follow-up procedures,
- (4) The need for common practices including quality control, metadata, analysis, data flow and data exchange standards, formats and procedures,
- (5) The need to identify and as appropriate, rescue, digitize and archive historical data,
- (6) The need to collaborate and coordinate closely with other programmes and bodies, both within and outside WMO and IOC, namely the Commission for Basic Systems, Commission for Climatology and IODE of IOC,
- (7) The capabilities and experience of existing data management centres, systems and programmes, both within and outside WMO and IOC,
- (8) The need to develop and/or strengthen national data management capacity, especially in developing countries,
- (9) The successful ongoing collaboration between JCOMM and IODE of IOC,

**Agrees** that, to the extent possible, the work of the Data Management Programme Area should be implemented through specific, clearly defined, time-limited projects,

**Decides:**

- (1) To re-establish a JCOMM Data Management Programme Area with the following components:
  - (a) A Data Management Coordination Group;
  - (b) An Expert Team on Data Management Practices, co-sponsored by the IOC Committee on IODE;
  - (c) An Expert Team on Marine Climatology;
- (2) That the terms of reference of the Data Management Coordination Group and the expert teams shall be as given in the annex to this resolution;
- (3) That the general membership of the Data Management Coordination Group and the expert teams shall also be as given in the annex to this resolution;
- (4) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure, the following experts to serve as members of the Data Management Coordination Group:

- (a) Sissy IONA (Greece) as chairperson of the Data Management Coordination Group and Data Management Programme Area Coordinator;
  - (b) After consultation with the Co-Chairs of the IOC Committee on IODE, Sergey BELOV (Russian Federation) as chairperson of the Expert Team on Data Management Practices;
  - (c) Nicola SCOTT (United Kingdom of Great Britain and Northern Ireland) as chairperson of the Expert Team on Marine Climatology;
- (5) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure, the following experts to serve as members of the Expert Team on Marine Climatology:
- Shaohua LIN (China): core member
  - Gudrun ROSENHAGEN (Germany): core member and vice-chair
  - Svetlana SOMOVA (Russian Federation): core member
  - David BERRY (United Kingdom of Great Britain and Northern Ireland): core member
  - Eric FREEMAN (United States of America): core member
  - Scott WOODRUFF (United States of America): core member
  - Olga SATO (Brazil): self-funded member
  - Hing Yim MOK (Hong Kong, China): self-funded member
  - Mizuho HOSHIMOTO (Japan): self-funded member
- (6) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure and in consultation with the IOC Committee on IODE, the following experts to serve as members of the Expert Team on Data Management Practices:
- IOC-IODE selections (Valid until new members designated by IOC):
    - Sergey BELOV (Russian Federation): core member
    - Donald COLLINS (USA): core member
    - Yutaka MICHIDA (Japan): core member
    - Mathieu OUELLET (Canada): core member
  - JCOMM selections:
    - Paulo S. POLITO (Brazil): core member
    - Jixiang CHEN (China): core member
    - Paul OLOO (Kenya): core member
    - Richard CROUT (United States of America): core member
    - Anyuan XIONG (China): self-funded member

**Requests** the Secretary-General of WMO and the Executive Secretary IOC to invite the Commission for Basic Systems, Commission for Climatology, IODE of IOC, directors of relevant centres of the World Data System and other relevant organizations and bodies to participate in the work of this programme area as appropriate.

**Annex to Resolution 4 (JCOMM-4)****TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE COORDINATION GROUP AND TEAMS OF THE DATA MANAGEMENT PROGRAMME AREA****Data Management Coordination Group****Terms of Reference**

The Data Management Coordination Group, in close collaboration with the International Oceanographic Data and Information Exchange (IODE) and Commission for Basic Systems subsidiary bodies and related experts, shall:

- (a) Maintain a data management plan for JCOMM that identifies, assesses and specifies priorities and actions for the Data Management Programme Area;
- (b) In concurrence with the co-presidents of JCOMM and the co-chairs of IODE, establish and create expert teams, task teams, and pilot projects, as appropriate, to undertake the work of the Data Management Programme Area;
- (c) Ensure collaboration, appropriate coordination and liaison with IODE as well as with the Commission for Basic Systems and other relevant bodies and activities external to WMO and IOC;
- (d) Keep under review, assess and coordinate the adoption of appropriate new information technology;
- (e) Establish and maintain cooperation with science programmes and assist with their data management activities, as appropriate;
- (f) Provide advice and feedback to users of the Data Management Programme Area functions, through the appropriate JCOMM Programme Area, through IODE directly;
- (g) Identify capacity development requirements related to the programme area and, as appropriate, coordinate activities to address these requirements;
- (h) Identify requirements for satellite data and information related to the programme area.

**General Membership**

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

- (a) Data Management Programme Area coordinator (Chairperson of the Data Management Coordination Group);
- (b) Chairperson of the Expert Team on Data Management Practices;
- (c) Chairperson of the Expert Team on Marine Climatology;
- (d) IODE co-chairpersons;
- (e) Up to four additional experts with experience in the priority areas of oceanography and marine meteorology data management in the DMCG workplan;

Additional experts may be invited as appropriate, with the concurrence of the co-presidents of the Commission, on a self-funded basis, and in general with no resource implications to JCOMM.

### **Expert Team on Data Management Practices**

The JCOMM/IODE Expert Team on Data Management Practices, in close collaboration with JCOMM Programme Areas, Commission for Basic Systems subsidiary bodies, IODE officers and related experts, shall:

- (a) Manage the process of adopting and documenting standards and best practices to be used in IODE-JCOMM data management through the Ocean Data Standards Process;
- (b) Assist in the further development of the IODE Ocean Data Portal, its linkages with other ocean data systems (e.g. SeaDataNet, IMOS, OBIS, GEOSS), its interoperability with the WMO Information System (WIS), and its capacity development activities to ensure full participation of Members/Member States;
- (c) Assist with the development, review and update the MCDS strategy, implementation plan and performance indicators in the next two years for achieving the Vision for a new MCDS
- (d) In concurrence with the co-presidents of JCOMM, the chairperson of the JCOMM Data Management Coordination Group and IOC-IODE officers, establish task teams and pilot projects, as necessary, to undertake the work of the Expert Team on Data Management Practices;
- (e) Direct and coordinate the activities of the task teams and pilot projects referred to under (d);
- (f) Provide advice to the IODE and the Data Management Coordination Group and other groups of JCOMM, as required;
- (g) Liaise and collaborate with other groups as needed, to ensure access to required expertise, appropriate coordination and to avoid duplication.

### **Membership**

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

- (a) Up to five experts are selected by JCOMM, including the chairperson, selected from Members/Member States with an appropriate geographical representation;
- (b) Up to four experts with relevant expertise based on the current workplans of the Task Teams and Projects established by the Expert Team on Data Management Practices, selected by IODE of IOC;
- (c) One co-chairperson of the IOC Committee on IODE.

Additional experts may be invited as appropriate, with the concurrence of the co-presidents of the Commission, on a self-funded basis, and in general with no resource implications to JCOMM.

Representatives of JCOMM Programme Areas, the IODE Committee, and other expert bodies may be invited as appropriate with the concurrence of the Co-Presidents of JCOMM and with no resource implications to the Commission.

(A) Representative(s) of the Expert Team on Marine Climatology (ETMC) should be invited, in order to ensure close collaboration and cooperation across the DMPA.

### **Expert Team on Marine Climatology**

The Expert Team on Marine Climatology, in close collaboration with IOC-IODE, the Global Ocean Observing System, Global Climate Observing system, Commission for Climatology and Commission for Basic Systems subsidiary bodies and related experts, shall:

- (a) Determine procedures and principles for the development and management of global and regional oceanographic and marine meteorological climatological datasets;
- (b) Review and assess the climatological elements of the Commission, including the operation of the Marine Climatological Summaries Scheme and the Global Collecting Centres, and the development of required oceanographic and marine meteorological products;
- (c) Review the Global Ocean Observing System and Global Climate Observing System requirements for climatological datasets, taking account of the need for quality and integration;
- (d) In close cooperation with IODE and other appropriate partners such as the ICSU World Data System, to develop, review and update the MCDS strategy, implementation plan and performance indicators in the next two years for achieving the Vision for a new MCDS, based upon the results of the Workshop for a new Marine Climate Data System (MCDS1, 28 Nov.-2 Dec. 2011, Hamburg, Germany);
- (e) Develop procedures and standards for data assembly and the creation of climatological datasets, including the establishment of dedicated facilities and centres;
- (f) Collaborate and liaise with other groups as needed to ensure access to expertise and ensure appropriate coordination;
- (g) Keep under review and update, as necessary, relevant technical publications in the area of oceanographic and marine meteorological climatologies.

### **Membership**

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

- (a) Up to eight experts, including the chairperson, selected from Members/Member States, representative of the range of responsibilities of the Expert Team. It is expected that, in general, the Expert Team on Marine Climatology will be self-funding;
- (b) Additional representatives from the responsible members for the Marine Climatological Summaries Scheme and the Global Collecting Centres, from the Services and Forecasting Systems Programme Area's Expert Teams on Waves and Coastal Hazards Forecasting Systems and on Sea Ice, and from relevant projects and subsidiary bodies of IODE of IOC, as required, in consultation with the co-presidents of JCOMM;

Additional experts may be invited as appropriate, with the concurrence of the co-presidents of the Commission, on a self-funded basis, and in general with no resource implications to JCOMM.

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

(A) Representative(s) of the Expert Team on Data Management Practices (ETDMP) should be invited, in order to ensure close collaboration and cooperation across the DMPA.

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Resolution 5 (JCOMM-4)**SERVICES AND FORECASTING SYSTEMS PROGRAMME AREA**

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

**Noting**

- (1) Resolution 4 (JCOMM-III) – Services and Forecasting Systems Programme Area,
- (2) The report of the co-president of the Commission at its fourth session,
- (3) The report of the chairperson of the Services Programme Area the Commission at its fourth session,

**Considering:**

- (1) The continuing and expanding requirements of marine users for marine meteorological and oceanographic services and information,
- (2) The need to ensure that the services provided to users meet these requirements, including in terms of timeliness and quality,
- (3) The need to keep under review and to respond to the requirements of Members/Member States for guidance in the implementation of their duties and obligations with regard to marine services, in particular those specified in the *Manual on Marine Meteorological Services* (WMO-No. 558),
- (4) The need to monitor closely the operations of the WMO marine broadcast system for the Global Maritime Distress and Safety System, as well as the Marine Pollution Emergency Response Support System, to develop modifications to the systems as necessary and to assist Members/Member States as required,
- (5) The need to guide and coordinate developments in the preparation and dissemination of ocean products and services,
- (6) The need to coordinate closely with other programmes of WMO and IOC (World Weather Watch, World Climate Programme, Global Ocean Observing System, Global Climate Observing System, Disaster Risk Reduction, Global Framework for Climate Services, etc.), as well as with other organizations such as the International Maritime Organization, International Hydrographic Organization, International Mobile Satellite Organization and International Chamber of Shipping in the provision of marine services and information,

**Agrees that**, to the extent possible, the work of the Services and Forecasting Systems Programme Area should be implemented through specific, clearly defined, time-limited projects;

**Decides:**

- (1) To implement a JCOMM Services and Forecasting Systems Programme Area with the following components:
  - (a) A Services and Forecasting Systems Coordination Group;
  - (b) An Expert Team on Maritime Safety Services;
  - (c) An Expert Team on Waves and Coastal Hazards Forecasting Systems;



- (d) An Expert Team on Sea Ice;
  - (e) An Expert Team on Operational Ocean Forecasting Systems;
- (2) That the terms of reference of the Services and Forecasting Systems Coordination Group and the expert teams shall be as given in the annex to this resolution;
- (3) That the general membership of the Services and Forecasting Systems Coordination Group and the expert teams shall also be as given in the Annex to this resolution;
- (4) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure:
- (a) Ming JI (United States of America) as chairperson of the Services and Forecasting Systems Coordination Group, and Services and Forecasting Systems Programme Area Coordinator;
  - (b) Henri SAVINA (France) as chairperson of the Expert Team on Maritime Safety Services;
  - (c) Kevin HORSBURGH (United Kingdom of Great Britain and Northern Ireland) as chairperson of the Expert Team on Waves and Coastal Hazards Forecasting Systems;
  - (d) Vasily SMOLYANITSKY (Russian Federation) as chairperson of the Expert Team on Sea Ice;
  - (e) Gary BRASSINGTON (Australia) as chairperson of the Expert Team on Operational Ocean Forecasting Systems;
  - (f) Nicolas ASHTON (United Kingdom of Great Britain and Northern Ireland) as vice-chairperson of the Services and Forecasting Systems Coordination Group;
- (5) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure, the following experts to serve as core members of the Expert Team on Maritime Safety Services:
- Neal MOODIE (Australia): core member  
 John PARKER (Canada): core member  
 Jing XU (China): core member  
 Marja AARNIO-FRISK (Finland): core member  
 Satoshi SUGIMOTO (Japan): core member  
 Bruce HACKETT (Norway): core member  
 Timothy RULON (United States of America): core member  
 Alicia Guadalupe CEJAS (Argentina): self-funded member  
 Lin MU (China): self-funded member  
 Giovanni Coppini (Italy): self-funded member  
 Christian PAULMANN (Germany): self-funded member  
 Evgeny NESTEROV (Russian Federation): self-funded member
- (6) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure, the following experts to serve as core members of the Expert Team on Waves and Coastal Hazards Forecasting Systems:
- Maria Paula ETALA (Argentina): core member  
 Mikhail ENTEL (Australia): core member  
 Val SWAIL (Canada): core member and vice-chair

Thomas BRUNS (Germany): core member  
 Nadao KOHNO (Japan): core member  
 Sunghyup YOU (Republic of Korea): core member  
 Hendrik TOLMAN (United States of America): core member  
 Diana GREENSLADE (Australia): self-funded member  
 Fujiang YU (China): self-funded member  
 Jean-Michel LEFEVRE (France): self-funded member  
 Georg UMGIESSER (Italy): self-funded member  
 Hans DE VRIES (Netherlands): self-funded member  
 Andrew SAULTER (UK): self-funded member  
 Anna KORTCHEVA (Bulgaria): self-funded member

- (7) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure, the following experts to serve as core members of the Expert Team on Sea Ice:

Beatriz LORENZO (Argentina): core member  
 Darlene LANGLOIS (Canada): core member  
 Keld QVISTGAARD (Denmark): core member  
 Jurgen HOLFORT (Germany): core member and vice-chair  
 Keiji HAMADA (Japan): core member  
 Nicholas HUGHES (Norway): core member  
 Caryn PANOWICZ (United States of America): core member  
 Gonzalo CONCHA (Chile): member  
 Sihai LI (China): member  
 Antti KANGAS (Finland): member

- (8) To select, in accordance with WMO General Regulation 32 and Rule 25 of the IOC Rules of Procedure, the following experts to serve as core members of the Expert Team on Operational Ocean Forecasting Systems:

Guimei LIU (China): core-member  
 Eric DOMBROWSKY (France): core-member  
 Pierre DANIEL (France): core-member  
 Marina TONANI (Italy): core-member  
 Shiro ISHIZAKI (Japan): core-member  
 Alistair SELLAR (United Kingdom of Great Britain and Northern Ireland): core-member  
 Frank L. BUB (United States of America): core-member  
 Angella UNDURRAGA (Chile): self-funded member  
 Guijun HAN (China): self-funded member  
 Sudheer JOSEPH (India): self-funded member  
 Jang-Won SEO (Republic of Korea): self-funded member

**Requests** the Secretary-General of WMO and the Executive Secretary IOC to invite the International Maritime Organization, International Hydrographic Organization, International Chamber of Shipping, International Federation of Shipmasters' Associations, International Mobile Satellite Organization, Food and Agriculture Organization of the United Nations and other relevant organizations and bodies to participate in the work within this programme area as appropriate.

**Annex to Resolution 5 (JCOMM-4)****TERMS OF REFERENCE AND GENERAL MEMBERSHIP OF THE COORDINATION GROUP AND TEAMS OF THE SERVICES AND FORECASTING SYSTEMS PROGRAMME AREA****Services and Forecasting Systems Coordination Group****Terms of Reference**

The Services and Forecasting Systems Coordination Group, in close collaboration with Commission for Basic Systems, Global Ocean Observing System, Global Climate Observing System, Disaster Risk Reduction and other subsidiary bodies and related experts, shall:

- (a) Keep under review and ensure the effectiveness, coordination and operation of the Services work programme, including performance with respect to timeliness, standards, quality and relevance to established user requirements;
- (b) Through the assembly of requirements identified by specialist service groups, and other Programme Areas of JCOMM, provide advice on Services and Forecasting Systems Programme Area activities that need to be changed, implemented or discontinued;
- (c) Develop and enhance interfaces to representative user groups to monitor the strength and weaknesses of existing Services and Forecasting Systems Programme Area activities;
- (d) With the concurrence of the co-presidents of JCOMM, establish and create expert teams, task teams, and demonstration projects, as appropriate, to undertake the work of the Services and Forecasting Systems Programme Area;
- (e) Ensure effective coordination and cooperation with groups and bodies in the area of service provision, including other Programme Areas of the Commission;
- (f) Assess and recommend capacity development tools/systems in accordance with identified requirements;
- (g) Identify and maintain the requirements for in situ and satellite data and information for Metocean applications and services, and monitor its implementation.

**General Membership**

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

Programme Area/Services and Forecasting System Coordinator (chairperson)  
 Vice-chairperson of the Services and Forecasting Systems Coordination Group  
 Chairperson Expert Team on Maritime Safety Services  
 Chairperson Expert Team on Waves and Coastal Hazards Forecasting Systems  
 Chairperson Expert Team on Sea Ice  
 Chairperson Expert Team on Operational Ocean Forecasting Systems  
 Chairpersons of Task Teams upon the Teams' lifetime

Additional experts may be invited as appropriate, representative of the range of Services and Forecasting Systems Programme Area activities, on a self-funded basis, and in general with no resource implications to JCOMM.

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

### **Expert Team on Maritime Safety Services**

#### **Terms of Reference**

The Expert Team on Maritime Safety Services, in close collaboration with international organizations and other entities representing users' interests, such as the International Maritime Organization (IMO), International Hydrographic Organization (IHO), International Chamber of Shipping (ICS), International Mobile Satellite Organization (IMSO), and other concerned organizations and bodies on maritime safety, search and rescue and marine pollution issues, including the Global Maritime Distress and Safety System GMDSS, shall:

- (a) In support of the Maritime Safety, Efficiency, and Search and Rescue (SAR) operations:
  - (i) Monitor and review the operations of marine broadcast systems, including for the GMDSS and others for vessels not covered by the International Convention for the Safety of Life at Sea;
  - (ii) Monitor and review technical and service quality standards for meteorological and oceanographic maritime safety information, particularly for the GMDSS, and provide assistance and support to Members/Member States as required;
  - (iii) Propose actions as appropriate to meet requirements for international coordination of meteorological and related communication services;
  - (iv) Develop technical advice and guidance material on Marine Meteorological Services, including keep under review the *Manual on Marine Meteorological Services* (WMO-No. 558), the *Guide on Marine Meteorological Services* (WMO-No. 471) and *Weather Reporting* (WMO-No. 9, Volume D - *Information for Shipping*), and provide assistance and support to Members/Member States as required;
- (b) In support of the Marine Pollution Emergency Response Support System (MPERSS):
  - (i) Monitor implementation and operations of MPERSS; review and suggest, as necessary, improvements to the contents of the overall system plan; (in consistency with International Convention for the Prevention of Pollution from Ships, and other international conventions);
  - (ii) Facilitate coordination and cooperation amongst the Area Meteorological and Oceanographic Coordinators (AMOCs) of MPERSS, in particular, with a view to ensuring full and ongoing operations in all areas, as well as the exchange of relevant advice, information, data and products between AMOCs, as appropriate and required;
- (c) Monitor requirements by ensuring feedback from the user communities is obtained through appropriate and organized channels and applied to improve the relevance, effectiveness and quality of services;
- (d) Liaise with and gather input from Expert Team on Sea Ice, the Expert Team on Wind Waves and Storm Surges and the Expert Team on Operational Ocean Forecasting Systems on all aspects of sea ice, sea state, storm surge and ocean circulation relevant to the operation and improvement of maritime safety services and maritime accident emergency support;
- (e) Ensure effective coordination and cooperation with concerned organizations, bodies and Members/Member States on maritime safety issues and marine accident emergency support needs;

- (f) Assist Members/Member States in the implementation of services and in the development of standardized methods for the quality assurance related to the provision of Maritime Safety Information, especially for the GMDSS, through capacity development activities;
- (g) Develop, in accordance with existing standards (for example, from the International Hydrographic Organization), graphical/numerical product specification for marine parameters, foremost wind, sea state, currents and sea ice, in Electronic Navigation Chart Systems;
- (h) Provide advice to the Services and Forecasting Systems Coordination Group and other JCOMM groups, as required, on issues related to maritime safety services and marine accident emergency support;
- (i) Continue to liaise closely with relevant groups and teams of organizations, such as IMO, IHO, ICS, IMSO and the European Maritime Safety Agency, to coordinate and improve maritime safety services, SAR and marine accident emergency support.

As a general principle, these terms of reference will be implemented through specific, defined, time-limited projects.

### **General Membership**

The Membership will consist of a core membership of up to eight members, including the chairperson, selected to ensure an appropriate range of expertise in the provision of services for maritime safety and efficiency, SAR operations and marine pollution response.

Additional experts may be invited as appropriate, representative of a range of activities related to the implementation of services for maritime safety and efficiency, SAR operations and marine pollution response, as well as representatives of international organizations and other entities representing users' interests, such as the IMO, IHO, ICS, IMSO, and other user groups, on a self-funded basis, and in general with no resource implications to JCOMM.

### **Expert Team on Waves and Coastal Hazards Forecasting Systems**

#### **Terms of Reference**

The Expert Team on Waves and Coastal Hazards Forecasting Systems shall:

- (a) Provide advice to Members/Member States on the development of real time operational forecast capability for wind waves and, storm surge, as part of marine multi-hazard warning systems, to enhance their capacities to issue more accurate, consistent and timely operational forecast products;
- (b) Develop a component of the Global Framework for Climate Services for coastal inundation forecasting and warning, through relevant demonstration projects as well as through continuous work to establish a storm surge climatology by coordinating relevant activities of Members / Member States;
- (c) Develop technical advice and guidance material on wind wave and storm surge modelling, forecasting and service provision as part of marine multi-hazard warning systems, including coastal inundation modelling, forecasting and risk assessment, and provide assistance and support to Members/Member States as required;
- (c) Provide advice to Members / Member States on the development of capability to provide marine multi-hazard warning services, with special attention to Least Developed Countries and Small Islands Developing States, through capacity development activities;

- (d) Ensure effective coordination and cooperation with other WMO and appropriate Global Ocean Observing System bodies, particularly on requirements for, and implementation of, wind wave and storm surge data, products and services.

As a general principle, these terms of reference will be implemented through specific, defined, time-limited projects.

### **General Membership**

The Membership will consist of a core membership of up to eight members, four each representing the subject areas of waves, storm surges, and coastal hazards, including the chairperson, selected to ensure an appropriate range of expertise in both areas.

Additional experts may be invited as appropriate, representative of a range of activities related to wind waves, storm surges and coastal hazards, including coastal inundation, on a self-funded basis, and in general with no resource implications to JCOMM.

### **Expert Team on Sea Ice**

#### **Terms of Reference**

The Expert Team on Sea Ice shall:

- (a) Coordinate and advise Members/Member States on products and services required by user communities in sea ice areas, to support navigation, coastal and off-shore activities, monitoring of the sea ice cover;
- (b) Provide advice to ETMSS on all aspects of impacts of sea ice relevant to maritime safety, marine pollution response and search and rescue services;
- (c) Maintain linkages with Expert Team on Operational Ocean Forecasting Systems on the relevant sea ice modelling and forecasting techniques;
- (d) Maintain linkages with projects and programmes related to the role of sea ice in the global climate system, including through the World Climate Research Programme and the Global Cryosphere Watch;
- (e) Develop technical advice and guidance material, software exchange, specialized training and other appropriate capacity development activities with regard to sea ice observations, analysis and services, and provide assistance to Members/Member States as required;
- (f) Keep under review and provide guidance as appropriate on the operations of the Global Digital Sea Ice Data Bank, in collaboration with the Expert Team on Marine Climatology;
- (g) Maintain and develop formats, nomenclatures and procedures for sea ice data and information exchange as well as relevant terminology, coding and mapping standards;
- (h) Maintain linkages with relevant international organizations and programmes, in particular the Baltic Sea Ice Meeting, CLIC, European Ice Service, International Ice Charting Working Group, North American Ice Service, ASPeCt, Global Climate Observing System and the International Hydrographic Organization.

As a general principle, these terms of reference will be implemented through specific, defined, time-limited projects.

## **General Membership**

Up to eight Members, including the chairperson, representative of a range of activities related to sea ice and the ice-covered regions within JCOMM, and to maintain an appropriate geographical representation. It is expected that, in general, the ETSI will be self-funding. ETSI representatives will also act as full members of ETMSS and ETMC.

Representatives of regional and international sea ice bodies in particular the Baltic Sea Ice Meeting, European Ice Service, International Ice Charting Working Group and North American Ice Service will also be invited to participate at their own expense.

Additional experts may be invited as appropriate, representative of the range of activities related to sea ice, on a self-funded basis, and in general with no resource implications to JCOMM.

## **Expert Team on Operational Ocean Forecasting Systems**

### **Terms of Reference**

The Expert Team on Operational Ocean Forecasting Systems shall:

- (a) Manage and maintain the guide, scope and requirement documents, adhering to relevant Quality Management Systems, for Members/Member States providing ocean forecasting services;
- (b) Guide and initiate actions at an international level that will contribute to the improvement of operational ocean prediction system efficiency, fidelity and service quality;
- (c) Provide advice on operational ocean forecasting system related matters and prepare submissions on the requirements (for example, research, observational and data management) of operational ocean forecasting systems operated by Members / Member States to other international groups;
- (d) Manage and promote the adoption of an international standard to support interoperability and the common formatting of ocean forecast products and services;
- (e) Promote and facilitate the support for and development and adoption of member agency services to the wider community, particularly recognised special interest groups (for example, marine accident emergency support, maritime safety services, sea ice, and wind waves and storm surges).

As a general principle, these terms of reference will be implemented through specific, defined, time-limited projects.

### **General Membership**

Membership is selected to ensure an appropriate range of expertise and to maintain an appropriate geographical representation. Up to eight members, including the chairperson, representative of a range of activities related to ocean forecasting systems.

Additional experts may be invited as appropriate, representative of the range of activities related to ocean forecasting systems, on a self-funded basis, and in general with no resource implications to JCOMM.

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## RECOMMENDATIONS ADOPTED BY THE SESSION

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### Recommendation 1 (JCOMM-4)

#### PROVISION OF OCEAN INSTRUMENT/PLATFORM METADATA

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

#### **Noting:**

- (1) Recommendation 3 (JCOMM-III) – Provision of ocean data acquisition system and water temperature metadata
- (2) The Abridged Final Report with Resolutions and Recommendations of the Third Session of the Joint WMO/IOC Commission for Oceanography and Marine Meteorology (WMO-No. 1049), general summary, paragraphs 5.2.10, 6.1.5, 6.1.11.4, 6.2.5, 7.1.5, 7.2, 7.4, 10.1.7, 10.2.7
- (3) Resolution 24 (Cg-XVI) – Marine Meteorology and Oceanography Programme,
- (4) Resolution 50 (Cg-XVI) – Implementation of the WMO Integrated Global Observing System (WIGOS),
- (5) The final report of the third meeting of the JCOMM Expert Team on Marine Climatology (JCOMM/MR-No. 70),
- (6) The final report of the fourth session of the JCOMM Data Management Programme Area Coordination Group (JCOMM/MR-No. 71),
- (7) The final report of the Eighth Session of the JCOMM Management Committee (JCOMM/MR-No. 83),
- (8) The Final report of the workshop for a new Marine Climate Data System (MCDS) meeting, including the draft MCDS strategy in JCOMM MR-No. 90;
- (9) The summary report of the Twenty-First Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXI);
- (10) Recommendation 7.2/1 (JCOMM-IV) – Marine Climate Data System (MCDS)

#### **Considering:**

- (1) The importance of instrument and platform metadata in a number of domains including climate applications and research (for example, bias correction), and operational applications, permitting amongst other things to interpret the data correctly, ensure traceability to standards, enhance coherence of data records, and facilitate quality monitoring activities.
- (2) That China has fully developed an Ocean Data Acquisition System (ODAS) Metadata Service (ODASMS) for assembling, preserving and disseminating metadata on ODAS platforms.
- (3) That there is a number of systems in place that are collecting metadata from ocean observing platforms (e.g. WMO Publication No. 47, European Directory for Initial Ocean



and Observing Systems – EDIOS maintained by the SeaDataNet infrastructure) that can contribute metadata to the MCDS.

- (4) The Development of the JCOMM Marine Climate Data System (MCDS), including WMO-IOC Centres for Marine-meteorological and Oceanographic Climate Data (CMOCs), providing an integrated data-flow for the collection of marine-meteorological and oceanographic climate data, including metadata from in situ ocean observation platforms.
- (5) That metadata systems require the active involvement of all Members/Member States which operate such platforms and equipment to provide updated metadata in a routine fashion.

**Recommends:**

- (1) Members/Member States to record and provide through the appropriate mechanisms, including CMOCs – once established – on a routine basis required metadata about ocean instruments and observing platforms that they operate.
- (2) Members / Member States providing the functions of the ODASMS into their CMOC should they establish one.
- (3) The JCOMM in situ Observation Programme Support Centre (JCOMMOPS) to routinely contact platform operators so that the metadata are being submitted to the relevant CMOC(s), including for operational platforms and for historical ones.

**Requests** the Secretary-General of WMO and the Executive Secretary of UNESCO/IOC, to assist Members/Member States, as necessary, in the submission of metadata to the CMOCs.

This Recommendation replaces Recommendation 3 (JCOMM-III), which becomes obsolete.

Recommendation 2 (JCOMM-4)

**MARINE CLIMATE DATA SYSTEM (MCDS)**

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

**Noting:**

- (1) The JCOMM Terms of Reference, especially in relation to the development of standards and procedures regarding overall collection, management, exchanges and archival of high-quality marine-meteorological and oceanographic data, information and products, on which climate studies, predictions and services, as well as climate change impact and adaptation strategies, are based;
- (2) Resolution 4.4/1 (Cg-XVI) – Marine Meteorology and Oceanography Programme;
- (3) Resolution 11.3(1) (Cg-XVI) – Implementation of the WMO Integrated Global Observing System (WIGOS);
- (4) The Final report of the workshop for a new Marine Climate Data System (MCDS) meeting, including the draft MCDS strategy in JCOMM/MR-No: 90;

- (5) The summary report of the Twenty-First Session of the IOC Committee on International Oceanographic Data and Information Exchange (IODE-XXI);

**Noting further:**

- (1) Chapter 5, Marine Climatological Summaries Scheme, Part I, Services for the high seas, of the WMO-No. 558, *Manual to Marine-Meteorological Services*;
- (2) Chapter 3, Marine Climatology, of the WMO-No. 471, *Guide to Marine-Meteorological Services*;
- (3) The Project Report, and Legacy Recommendations of the Pilot Project for the Integration of Marine-Meteorological and other Appropriate Oceanographic Observations into the WMO Integrated Global Observing System (WIGOS) (JCOMM/TR-No. 48);
- (4) The proposal from China and Germany offering facilities for acting as WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOC), their statements of compliance and commitment, and readiness to operate as such as soon as possible;

**Having considered:**

- (1) the need of Members/Member States for high quality marine meteorological and oceanographic historical data/metadata from the world oceans, to address the requirements of WMO and UNESCO/IOC programmes and co-sponsored programmes including climate monitoring, and the Global Framework for Climate Services (GFCS);
- (2) The need to modernize the Marine Climatological Summaries Scheme (MCSS) to take into account the development of new observing systems and corresponding surface marine-meteorological data systems in recent years, new techniques for data management and quality control, and the current needs of end users for better statistical and graphical marine climatological products;
- (3) The need to standardize and perform collection, quality control, state of the art bias corrections, the recording of historical surface marine-meteorological data and metadata, and agree on data exchange formats and protocols, in order to achieve delivery and use of coherent data sets;
- (4) The similar need for the standardization of processing techniques including Quality Control, documentation, formats, exchange protocols in order to improve the use of subsurface ocean data in conjunction with marine-meteorological data;
- (5) The need for modernization of management of surface drifter data, to rationalize the roles and functioning of the former IODE Responsible National Oceanography Centre for Drifting Buoys (RNODC/DB), the JCOMM Specialized Oceanography Centre for Drifting Buoys (SOC/DB) the Global Drifter Programme (GDP) Data Assembly Centre (DAC), and the JCOMM Ocean Data Acquisition System (ODAS) Metadata Service (ODASMS) management of metadata for the surface drifters;
- (6) The need for Members/Member States to exchange and share such data and metadata;

**Recognizing:**

- (1) The cooperation that has been achieved between National Oceanographic Data Centres (NODCs) operating within IOC/IODE and data management activities of JCOMM;
- (2) That an integrated Marine Climate Data System (MCDS), including routine and standardized collection of appropriate delayed-mode and historical marine-meteorological

and oceanographic data and metadata, managed by a network of data centres facilitates fulfilling these requirements;

- (3) The effectiveness of the JCOMM Marine Climatological Summaries Scheme (MCSS) for the collection and quality control of delayed-mode Voluntary Observing Ship (VOS) data through a network of (i) Contributing Members, (ii) Responsible Members, and (iii) two Global Collecting Centres (GCCs) operated by the UK and Germany for the Marine Climate Summaries Scheme (MCSS);
- (4) The usefulness of the former IODE RNODC/DB operated by the Integrated Science Data Management (ISDM) of Canada, the GDP DAC operated by the Atlantic Oceanographic and Meteorological Laboratory (AOML) of the National Oceanic and Atmospheric Administration (NOAA) of USA, the ODASMS operated by the NMDIS of the SOA of China, and the JCOMM SOC/DB operated by Météo-France, to collect, manage and make available historical drifting buoy data and metadata to end users;
- (5) That the ISDM and the SOC/DB were requested by JCOMM-III to agree on complimentary functions to manage data from drifting buoys and that this activity should be done in cooperation with the GDP/DAC;
- (6) That IODE-XXI had requested the JCOMM ad hoc Task team on RNODCs and SOCs to draft a Recommendation for JCOMM-IV, including Terms of Reference of centres that integrate RNODCs and SOCs and contribute to the IODE Ocean Data Portal (ODP), as well as background information;
- (7) The existence of Data Acquisition/Assembly Centres (DACs) and Global Data Acquisition/Assembly Centres (GDACs) (which include some IODE NODCs operating in this context) specialized for specific ocean observing platform types;
- (8) That the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) operated by the U.S. NOAA and the U.S. National Center for Atmospheric Research (NCAR) is widely used and trusted in the marine climate community;
- (9) The expertise of Members/Member States with regard to marine meteorology and oceanography data management, as well as the dedicated facilities they operate;
- (10) That Members/Member States could provide specialized facilities with substantial benefits to end users when integrated into the MCDS;

#### **Recommends:**

- (1) Implementation of a modernized scheme for the management of surface marine climatological data in conjunction with ICOADS inside the MCDS;
- (2) Implementation of a modernized scheme for the management of surface drifter data within the MCDS, replacing the former RNODC/DB and the SOC/DB;
- (3) Establishment of a network of Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs) building on existing facilities as appropriate with the Terms of Reference in Annex 2, and adopt a mechanism for formal designation and withdrawal of CMOCs by WMO and IOC as detailed in Annex 3;
- (4) That the ODASMS, and the SOC/DB be declared obsolete;
- (5) That the National Marine Data and Information Service (NMDIS) of the China State Oceanic Administration (SOA) and the Deutscher Wetterdienst (DWD) undertake the

functions of an CMOC on a trial basis and report on the results to JCOMM through the Management Committee;

**Invites Members / Member States:**

- (1) To take advantage of the resources offered by the CMOCs once established;
- (2) To contribute national resources towards the activities identified in the recommendations;
- (3) To consider submitting applications for becoming a CMOC;

**Requests:**

- (1) the Expert Team on Marine Climatology (ETMC), in close cooperation with IODE and other appropriate partners such as the ICSU World Data System, to develop, review and update the MCDS strategy, implementation plan, designation criteria and performance indicators of CMOCs in the next two years for achieving the Vision for a new MCDS, based upon the results of the Workshop for a new Marine Climate Data System (MCDS1, 28 Nov.-2 Dec. 2011, Hamburg, Germany) and Ocean Data Portal technologies development;
- (2) the Secretary-General of WMO and the Executive Secretary of UNESCO/IOC to facilitate implementation of this recommendation and provide appropriate technical advisory assistance to Members/Member States concerned as required, in the operations of CMOC.

**Annex 1 to Recommendation 2 (JCOMM-4)**

**VISION FOR A MARINE CLIMATE DATA SYSTEM IN 2020**

JCOMM will strive to address the WMO and IOC applications requirements for appropriate marine-meteorological and oceanographic climatological data (met-ocean climate data), and particularly address those for long term climate monitoring (Global Climate Observing System – GCOS), seasonal to inter-annual climate forecasts, for the Global Framework for Climate Services (GFCS), and ocean climate requirements of the Global Ocean Observing System (GOOS).

To address those requirements, the Vision for a Marine Climate Data System (MCDS) is to formalize and coordinate the activities of existing systems, and address gaps to produce a dedicated WMO-IOC data system operational by 2020 in the view to have compiled coherent met-ocean climate datasets of known quality, extending beyond the GCOS Essential Climate Variables (ECVs). These will be of known quality collected from multiple sources to be served on a free and unrestricted basis to the end users through a global network of less than ten WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs) covering specific JCOMM data domains. Data, metadata and information will be fully interoperable with the WMO Information System (WIS) and the IOC/IODE Ocean Data Portal (ODP), will be compatible with, and contribute to the High Quality Global Data Management System for Climate (HQ-GDMSC) that is being developed by the WMO Commission for Climatology (CCI).

This system is expected to improve timescales for met-ocean climate data availability, facilitate the exchange of historical met-ocean climate data sets between countries, and thereby increase the amount of ocean observations eventually made available to the relevant end user applications. Furthermore, integrated data and metadata will be available containing comprehensive dataset information e.g. historic details on current and past data codes and formats.

The data management structure will be standardized, well defined and documented for existing and new data across JCOMM activities and state of the art marine climate and statistical products will be easily accessible.

The development of the MCDS requires using state of the art integrated and standardized international systems for the improved data and metadata-flow and management of a wide range of met-ocean climate data. This includes integrating collection, rescue, quality control, formatting, archiving, exchange, and access of in situ and satellite sources. This system will be based on improved quality management, documenting processes and procedures, using higher level quality control, added value data processing, including bias correction, and comparison of the observations with satellite and meteorological and oceanographic model gridded fields.

It is expected that the relevant data and associated metadata will be of known quality, and extend to products that satisfy the met-ocean climate data requirements for climate monitoring, forecasting, and services.

### **Annex 2 to Recommendation 2 (JCOMM-4)**

#### **TERMS OF REFERENCE FOR WMO-IOC CENTRES FOR MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATE DATA (CMOCs)**

The Vision for a Marine Climate Data System (MCDS) is to formalize and coordinate the activities of existing systems, and address gaps to produce a dedicated WMO-IOC data system operational by 2020 in the view to have compiled coherent met-ocean climate datasets of known quality, extending beyond the Global Climate Observing System (GCOS) Essential Climate Variables (ECVs). These will be of known quality collected from multiple sources to be served on a free and unrestricted basis to the end users through a global network of less than ten WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs). Data, metadata and information will be fully interoperable with the WMO Information System (WIS) and the IOC/IODE Ocean Data Portal (ODP), will be compatible with, and contribute to the High Quality Global Data Management System for Climate (HQ-GDMSC) that is being developed by the WMO Commission for Climatology (CCI).

It will cover different and specific JCOMM data domains (e.g. marine meteorology, physical oceanography, historical period(s), geographical coverage, specific procedures applied to the data) and enhance international partnerships within a new JCOMM framework, taking full benefit of the existing network of IODE NODCs, in the best manner of harmonizing with the work of IODE NODCs. The primary objectives are to improve availability, recovery and archival of contemporary and historical data, metadata and products and obtain standardized quality of a high level in a more timely manner. This will ensure the long-term stability of the data management system, permit the sharing of responsibility and expertise, optimize resources and help prevent loss from technological failures. Groups of CMOCs will operate within a given data domain (e. g. global, regional, atmospheric, surface and sub-surface oceanic) and provide complimentary functions. To achieve maximum continuity, reliability and completeness of data, metadata and products, specialized CMOCs will be established that mirror the processes, data and metadata across the CMOC domain.

Governance for defining the functions and adoption of CMOC is proposed by JCOMM and endorsed by the WMO Executive Council and UNESCO/IOC Executive Council or Assembly.

To meet these requirements CMOCs must have the following:

#### **Capabilities:**

- (a) Each Centre must have, or have access to, the necessary infrastructure, facilities, experience and staff required to fulfil the approved functions;
- (b) Each Centre must have, or have access to, interoperability with the WMO Information System (WIS) and/or IOC/IODE ODP;

- (c) Each Centre must be able to apply defined international standards applicable for Data and Quality Management;
- (d) Mirroring CMOCs must be able to actively and reliably “mirror” (i.e. maintain mutually consistent) data, metadata, and products, as agreed within the CMOC network;
- (e) A recognized authority (the JCOMM Data Management Coordination Group – DMCG) must assess each Centre, at least once every five years, to verify it meets the necessary capabilities and performance indicators as agreed by the Commission.

**Corresponding functions:**

- (a) Each Centre must contribute to WMO and IOC Applications for example by rescuing, collecting, processing, archiving, sharing, distributing and mirroring worldwide marine-meteorological and oceanographic data and metadata documented in appropriate WMO and IOC publications;
- (b) Each Centre must provide advice to Members/Member States internationally in response to enquiries regarding standards and best practices for example on data rescue, collection, processing, archival, and distribution of marine-meteorological and oceanographic data, metadata, and products;
- (c) Each Centre must make datasets, and corresponding metadata, maintained as part of its scope available, and discoverable through the WIS and/or IOC/IODE ODP;
- (d) All CMOC must communicate and liaise closely within the network; particularly on the development of quality processes and procedures, meeting on a regular basis;
- (e) Each Centre must operate appropriate data processing and quality control procedures, and generate the required products within its scope;
- (f) Following the procedures documented in appropriate WMO and IOC publications all Centres within the CMOC network must closely cooperate in the rescue, exchange, processing, and archival of marine-meteorological and oceanographic data, metadata, and products;
- (g) Each centre will undertake its core defined functions and replicate data from other centres appropriate to its domain such that the set of data and products offered from the CMOC network is mutually consistent when accessed from any individual centre;
- (h) Specialized CMOCs will mirror data, metadata, products and processes at defined time-scales; the method of mirroring will be agreed upon among mirroring centres;
- (i) All kinds of data, metadata and processes managed within a CMOC domain will be subject to a stringent version control (e.g. Digital Object Identifier – DOI);
- (j) Each Centre should report, on an annual basis, to the JCOMM Management Committee through the DMCG on the services offered to Members/Member States and the activities carried out. JCOMM in turn should keep the Executive Councils of the WMO and the UNESCO/IOC Assembly informed on the status and activities of the CMOC network as a whole, and propose changes, as required.

## Data and Software Policy Requirements

A CMOC must make all the data, metadata, and products falling within the scope of the CMOC network freely and openly available to the international research community in a way consistent with WMO Resolution 40 (Cg-XII) and IOC Resolution XXII-6. Where applicable software should also be made open and freely available.

### **Annex 3 to Recommendation 2 (JCOMM-4)**

#### **FORMAL DESIGNATION AND WITHDRAWAL OF WMO-IOC CENTRES FOR MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATE DATA (CMOCS)**

According to the Terms of Reference of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs) as detailed in Annex 2, the mechanism for formal WMO and UNESCO/IOC appointment of a CMOC implies the following:

- (a) Governance for defining the functions and adoption of each Centre is proposed by JCOMM and endorsed by the WMO Executive Council and UNESCO/IOC Assembly or Executive Council;
- (b) The host of a candidate CMOC is required to produce a statement of compliance with requirements and commitment, list and demonstrate capabilities of the proposed Centre, state the scope of the data and/or products managed by the centre, state the formal commitment to host the Centre.

The following approach is recommended by JCOMM:

1. The host of the candidate CMOC will describe the extent to which it will be addressing requirements of scope, capabilities, functions and data and software policy of the proposed CMOC.
2. Once the host of the candidate CMOC has established that it meets the requirements to a sufficient extent, the IOC Action Addressee of the Country, or the Permanent Representative of the Country with WMO, as appropriate, writes to the IOC Executive Secretary or the WMO Secretary General respectively, to formally state the offer to host and operate the CMOC on behalf of the WMO and IOC, and to request that the Centre be added to the list of CMOCs. In doing so, the host of the candidate CMOC also provides a statement of requirements of scope, capabilities, functions and data and software policy as described in the CMOC Terms of Reference detailed in Annex 2. The letter should be copied to the appropriate JCOMM Co-President, and also to the relevant President of the WMO Regional Association or Chair of the IOC Regional Subsidiary Body in the case where the CMOC is only providing data corresponding to a specific geographic region.
3. The IOC or WMO Secretariat will then request the appropriate JCOMM Co-President to take action, in particular to request the Data Management Coordination Group (DMCG) to evaluate and verify compliance with requirements of the proposed Centre.
4. The DMCG evaluates the request and advises in writing (see 5 and 6) whether the CMOC application should be endorsed. The DMCG may wish to delegate this work to individuals and/or groups acting on its behalf (e.g. one of the component teams, depending on the nature of the proposed Centre), but any advice and proposal to JCOMM should still be assessed by and come through the DMCG. DMCG will also conduct reviews of performance and capabilities at the required intervals.
5. If endorsed by the DMCG, and depending on timing, the DMCG makes a recommendation to the JCOMM Management Committee (MAN), and invites them to provide further advice to JCOMM.

6. If not endorsed by the DMCG or MAN, the JCOMM Co-President should advise the candidates about areas where the candidate Centre can be improved to meet requirements. Candidates can reapply at a later date once changes have been made to meet these criteria.
7. If endorsed by MAN, a recommendation is passed to the next JCOMM Session, or depending on timing, directly to the WMO Executive Council and IOC Executive Council or Assembly following JCOMM consultation in writing.
8. If recommended by JCOMM, a Resolution is proposed to the WMO Executive Council and IOC Executive Council or Assembly for including the candidate in the list of CMOCs.
9. If the recommendation is approved by both the WMO Executive Councils and IOC Executive Council or Assembly, the candidate CMOC is listed in the appropriate WMO and IOC Manuals and Guides;

It is expected that this process, from submission of the CMOC proposal to the JCOMM Co-President, to formal approval by both WMO/IOC Executive Councils, may take from 6 months to 2 years.

At times it may be necessary for a Centre to be withdrawn from the CMOC role. The approach proposed by JCOMM is the following:

- The DMCG are to review each Centre for necessary capabilities and performance once every five years. If the review is favourable then the CMOC can continue its role as before. If the review is not favourable then the DMCG must insist improvements to be made and reviewed within one year. If the second review is still not favourable then the CMOC role will be withdrawn from the Centre through a recommendation by JCOMM and subsequent decision by the WMO Executive Council and IOC Assembly.
- If a Centre no longer wishes to carry out the functions of a CMOC the Expert Team on Marine Climatology (ETMC) and DMCG should be advised immediately.

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### Recommendation 3 (JCOMM-4)

#### **THE IODE OCEAN DATA PORTAL (IODE ODP)**

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

**Noting** the IODE OceanDataPortal (ODP) is operational and provides a mechanism to integrate marine data from a number of distributed sources both in the network of IODE NODCs and from other systems including JCOMM data systems;

**Further noting** that the IODE ODP was developed in close collaboration with, and with the guidance of the JCOMM/IODE Expert Team on Data Management Practices (ETDMP) and that IODE ODP technology was used in the successful JCOMM Pilot Project for WIGOS;

**Considering** the importance of interoperability between the WMO Information System (WIS) and the IODE ODP,



**Recommends that:**

- (1) JCOMM projects and participating organizations (data centres) participate in the IODE ODP operation by providing access to their data resources;
- (2) the IODE ODP Project works closely with the WIS to implement a connection between IODE centres participating in IODE ODP and meteorological centres using WIS to ensure mutual access to data and information in their respective data systems;
- (3) DMPA and ETDMP further support and assist the IODE ODP operations and development including the technology infrastructure and training activities;
- (4) IODE and DMPA to further develop synergies between ODP and WIS, especially in terms of (i) WMO and IOC data policies, and (ii) implementation of ODP and the implementation of WIS nodes so as to avoid duplication.

Recommendation 4 (JCOMM-4)**ENHANCEMENT OF CAPABILITY FOR MARINE ENVIRONMENTAL EMERGENCIES**

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

**Noting:**

- (1) The Guide to Marine Meteorological Services (WMO-No. 471),
- (2) The Abridged Final Report with Resolutions and Recommendations of JCOMM-III (WMO-No. 1049), paragraphs 8.2.8 to 8.2.12 and Recommendation 13 (JCOMM-III) — Amendments to the Marine Accident Emergency,
- (3) The final report of the ninth session of the JCOMM Management Committee (JCOMM/MR-No. 88),
- (4) The final report of the sixth session of the JCOMM Services and Forecasting Systems Programme Area Coordination Group (JCOMM/MR-No. 89),

**Considering that:**

- (1) One of JCOMM's essential tasks is supporting the Marine Pollution Emergency Response Support System (MPERSS) as well as maritime search and rescue (SAR) operations,
- (2) Operations at sea in response to marine accident emergencies are fundamentally dependent on the support of meteorological and/or oceanographic data, information and services,
- (3) The Expert Team on Maritime Safety Services (ETMSS) and Expert Team on Operational Ocean Forecasting Systems (ETOOFS) have been in charge of supporting the MPERSS, in monitoring implementation and operations and in ocean forecasting systems in support of this application area, respectively,

**Further noting with concern** that the recent nuclear accident at Fukushima had indicated that the current coordination system for MPERSS suffered from a capability and service gap with regard to its ability to respond to marine environmental incidents such as radioactive material discharges,

**Recommends that:**

- (1) A Strategy for the JCOMM Activities on Marine Environmental Emergencies be developed in consultation with partners including IMO and IAEA, as well as Members / Member States,
- (2) This Strategy should be developed taking into account the outline described in the Annex to this recommendation,

**Requests** the ETMSS and ETOOFS in cooperation with IMO, IAEA and other relevant bodies, to identify and implement actions to implement the developed Strategy,

**Requests** Members / Member States to consider making commitment to the resources, directly and/or in-kind, required for planned activities,

**Requests** the Secretary-General of WMO and the Executive Secretary of UNESCO/IOC to arrange for the development and implementation of the Strategy, in consultation with the co-presidents of JCOMM, and other bodies and organizations as appropriate.

**Annex 1 to Recommendation 4 (JCOMM-4)**

**DRAFT OUTLINE FOR A STRATEGY FOR THE JCOMM ACTIVITIES  
ON MARINE ENVIRONMENTAL EMERGENCIES**

**1 Background**

1.1 Consideration on JCOMM's role within the global/international framework:

- International Convention for the Prevention of Pollution from Ships (MARPOL)
- Interaction/cooperation with the International Maritime Organization (IMO) Marine Environment Protection (MEPC) and Maritime Safety Committees (MSC)
- Interaction/cooperation with the International Atomic Energy Agency (IAEA), particularly with its Marine Environmental Studies Laboratory (MESL)
- European Maritime Safety Agency (EMSA)
- ...

1.2 JCOMM activities and roles within WMO-IOC framework

- WMO Emergency Response Activities (ERA) Programme / CBS Coordination Group on Nuclear Emergency Response Activities (coordination for emergency activities for oil spill and burning, radiological accident in marine and coastal zones, etc)
- MPERSS
- IOC's Harmful Algal Bloom (HAB) Programme

**2 Emerging issues of marine environmental emergencies**

- oil and other noxious substance spills
- accident related to objects (SAR)
- nuclear accidents in marine and coastal zones (after the Fukushima accident)
- other marine environmental hazards (e.g. harmful algal blooms)

### 3 Strategy for JCOMM on the Marine Environmental Emergency Response

#### 3.1 JCOMM Goals/objectives in this area:

To support NMHS in developing/enhancing capacity to provide a consistent level of met/ocean information and drift information in the event of a range of marine environmental incidents, including;

- spills of oil and other noxious substance
- accidents related to objects (SAR)
- Radioactive material discharges in marine and coastal zones
- other marine environmental hazards (e.g. harmful algal blooms)

To enhance the coordination for JCOMM's basic responsibility to support Marine Accident Emergency Support (MAES), through targeted activities during the intersessional period.

#### 3.2 Strategy

- 3.2.1. MAES should be set as priority for SFSPA and the Commission, in order to develop workplans as cross-PA and cross-programme activities.
- 3.2.2. Post-event analysis of the Fukushima accident identified a capability and service gap for the modelling of radioactive material discharge; in the light of this, there is an opportunity for JCOMM to focus, during the next intersessional period, on enhancing the technical capability for forecasting support in marine & coastal zones.
- 3.2.3. The International Atomic Energy Agency (IAEA), the world's centre of cooperation in the nuclear field under the United Nations framework, has initiated a Coordinated Research Project (CRP) for Benchmarking models for the Ocean Dispersion and Transfer of Radionuclides from the Tokyo Electric Power Company (TEPCO) Fukushima Nuclear Power Plant (NPP).
- 3.2.4. The CRP represents an opportunity for JCOMM to leverage existing expert teams and partner organisations to coordinate the development of this capability and the framework necessary to effectively deliver these services through the member states.
- 3.2.5. Undertaking this initiative as a focus for JCOMM-4 will deplete resources for other MAES applications already established within JCOMM. The strategy must include maintenance of established capability.
- 3.2.6. Taking into account related international initiatives to develop requirements for environmental monitoring (remote and in-situ), dispersion modelling and forecasting capability such as the planning activity for the IAEA's CRP by USA/NOAA, Japan/JAMSTEC, France, the Mediterranean Operational Oceanography Network and others;
- 3.2.7. Establishing this new capability will have benefits for other applications within MAES; however, during JCOMM-4 focus should remain on the application for radioactive material discharge. It is anticipated that the outcome and developed capabilities could be adapted to other MAES related applications.
- 3.2.8. The respective task/responsibility of each Team (mainly in SFSPA) is agreed as following:

## [Co-Presidents and MAN]

- General guidance and advice. Intersessional decisions can be made by a co-president in consultation with the designated experts.

## [ETMSS]

- continued coordination of the Marine Pollution Emergency Response Support System (MPERSS), including the update/streamlining of MAES-MPERSS Website (<http://www.maes-mperss.org>) with support by the Secretariat;
- review the role of the Area Meteorological and Oceanographic Coordinators (AMOCs) in support of marine pollution monitoring and response, marine SAR, and their applicability in the context of any response to radioactive material discharge;
- liaise with international organizations, in particular IAEA, on the requirements for the delivery of information in support of radioactive material discharge;
- to plan and support update of WMO-Nos. 471 and 558, and related training initiatives.

## [ETOOFS]

- Take responsibility for coordination of extension of capability to fill the identified gap, in cooperation with GOV, IAEA and other partners;
- Liaise with ETMSS on the international coordination for meeting the service requirements.

3.2.9. The implementation of this strategy will be in parallel to and in collaboration with national and international initiatives. A member of the SCG will lead a task team consist of MAES experts from the responsible Teams (ETMSS, ETOOFS and ETSI) and possibly additional invited experts, as needed. Their tasks will include coordinating and facilitating the identified initiatives of relevance, and set the Commission's workplan to support them. They will work directly with the Co-Presidents, SFSPA Coordinator and the Secretariat for the task.

## 3.3 Resource required:

- Contribution and support by Members / Member States through volunteering experts (to be members of relevant teams/groups)
  - Financial support for activities (mainly experts' participation in meetings). It will include ad hoc group meetings, in conjunction with the regular meetings of the relevant ETs / Groups (at least once during the next intersessional period, but not more than the number of relevant ET/Group meetings).
  - Secretariat time for coordination and support (particularly for regular surveys and reporting)
-

Recommendation 5 (JCOMM-4)**QUALITY MANAGEMENT IMPLEMENTATION FOR JCOMM**

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

**Noting:**

- (1) Abridged Final Report with Resolutions of the Sixteenth World Meteorological Congress (WMO-No. 1077), paragraphs 4.5.1 to 4.5.11 and 6.2.14 to 6.2.15, particularly Resolution 26 (Cg-XVI) – WMO Quality Management Framework,
- (2) The Abridged Final Report with Resolutions and Recommendations of JCOMM-III (WMO-No. 1049), paragraphs 11.0.1 to 11.2.2 and Recommendation 13 (JCOMM-III) — 8 (JCOMM-III) – Implementation of Quality Management Systems for Met-ocean Information and Warning Service,
- (3) The final report of the ninth session of the JCOMM Management Committee (JCOMM/MR-No. 88),
- (4) The outcomes of the second meeting of WMO Task Team on Quality Management Systems Implementation (29 February – 2 March 2012, Marrakesh, Morocco),

**Noting with appreciation** the ongoing implementation by the Australian Bureau of Meteorology of a QMS pilot project on behalf of JCOMM, to achieve certification of compliance with the AS/NZS ISO-9001:2008 Quality Management Standard for the delivery of marine weather, tsunami warning and ocean services, including the recent publication of A Practical Guide for the Implementation of Quality Management System for National Meteorological and Hydrological Services,

**Noting further:**

- (1) the working arrangements between the International Organization for Standardization (ISO) and WMO formally adopted on 16 September 2008,
- (2) the working arrangements between WMO and the International Civil Aviation Organization (ICAO), as an example, which recognize the ICAO as the decision-making body on the QMS requirement for meteorological services for aviation,

**Recognizing:**

- (1) the increasing requirements of a quality management approach for the efficient and effective management and operation of marine meteorological and oceanographic services,
- (2) the value of a Quality Management System (QMS) to assist Members / Member States enhance confidence in the quality of their data, products and services,
- (3) the implementation of a QMS should be user-driven and country-specific,

**Recommends:**

- (1) Members/Member States to apply the developed framework of practice described in the new Practical Guide for the Implementation of Quality Management System for National Meteorological and Hydrological Services, taking into account the relevant national/regional policies,

- (2) Members/Member States with a well-developed QMS in place to share experiences, expertise and documentation with other Members currently developing or planning such systems;

**Considering further** that the key element in implementation of the QMS is the capacity development, particularly through the development and implementation of competence standards for personnel,

**Agrees** that JCOMM should give high priority to the development of the competency requirements for inclusion in a Quality Management Framework (QMF) for marine meteorological and oceanographic services, and to supporting associated education and training activities by providing guidance and training material,

**Requests** the Management Committee to:

- (1) take leadership and add a member responsible for quality management, and arrange for the development and implementation of internationally acceptable competencies, in cooperation with WMO Task Team on Quality Management,
- (2) discuss with the International Maritime Organization (IMO) possible future working arrangements to develop QMS requirements for marine meteorological and oceanographic services, and to consult, as necessary with the WMO Commission for Aeronautical Meteorology (CAeM) on their experiences in developing such requirements,

**Recommends** Members / Member States to provide in kind and extra-budgetary resources to help achieve these goals,

**Requests** the Secretary-General of WMO and the Executive Secretary of IOC, in consultation with CAeM and the WMO Executive Council Panel of Experts on Education and Training, to support developing guidelines and training material for QMF/QMS for marine meteorological and oceanographic services, based on the developed competence standards.

#### Recommendation 6 (JCOMM-4)

### **AMENDMENT TO THE MANUAL ON MARINE METEOROLOGICAL SERVICES (WMO-NO. 558), THE GUIDE TO MARINE METEOROLOGICAL SERVICES (WMO-NO. 471) AND WMO NO. 9, VOLUME D, INFORMATION FOR SHIPPING**

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

**Noting:**

- (1) The International Convention for the Safety of Life at Sea (SOLAS), 1974, in particular Chapter V (Safety of navigation), Regulation 5 (Meteorological services and warnings) of the 2003 amendments, and the 1988 amendments to for the Global Maritime Distress and safety System (GMDSS);
- (2) Manual on Marine Meteorological Services, WMO-No. 558, Volume I, Part I and II and corresponding annexes;
- (3) Guide to Marine Meteorological Services, WMO-No. 471, Chapter 3, Marine Climatology;
- (4) Weather Reporting Publication, WMO-No. 9, Volume D, Information for Shipping;

- (5) The final report of the Third Session of the JCOMM Expert Team on Marine Climatology (JCOMM/MR-No. 70);
- (6) Final Report, Sixth Session of the JCOMM Ship Observations Team (JCOMM/MR-No. 84);
- (7) The final report of the Sixth Session of the Services and Forecasting Systems Coordination Group (JCOMM/MR-No. 89);

**Noting also** the IMO Resolution A.1051(27) – IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document;

**Recognizing:**

- (1) The obligation of countries that are signatories to SOLAS to provide meteorological warning and forecast services for shipping as specified in the Convention, for the safety of life and property at sea;
- (2) That the WMO GMDSS Marine Broadcast System needs to be constantly reviewed and updated to best meet the user requirements expressed by the International Maritime Organization, and in full harmony with navigational warning services for the GMDSS coordinated by the International Hydrographic Organization;
- (3) The recent development of the IMO/WMO Worldwide Met-ocean Information and Warning Service (WWMIWS), as well as the provision of sea ice information;
- (4) The effort to streamline and modernize the Marine Climatological Summaries Scheme (MCSS) through a new Marine Climate Data System (MCDS), as well as the revision in the Minimum Quality Control Standard (MQCS) and related practices;

**Recommends that:**

- (1) The amendments to the *Manual on Marine Meteorological Services* as detailed in the Annex 1 to this recommendation be approved and included in the appropriate parts in the *Manual*;
- (2) The amendments to the *Guide to Marine Meteorological Services* as detailed in the Annex 2 to this recommendation be approved and included in the appropriate parts in the *Guide*;
- (3) The amendments to the *Weather Reporting Publication*, WMO-No. 9, Volume D, Information for Shipping as detailed in the Annex 3 to this recommendation be approved and included in the appropriate parts in the *publication*;

**Requests** the Expert Teams of JCOMM to continue to review propose further amendments of these Technical Regulations, and to provide technical assistance to the Members/Member States concerned, as required;

**Requests** the Secretary-General of WMO to:

- (1) Provide technical advisory assistance to Members/Member States concerned, as required and within available resources, in the implementation of the revised regulations and standards;
- (2) Continue interaction with the International Maritime Organization, International Hydrographic Organization, International Chamber of Shipping, Inmarsat and other organizations and bodies concerns regarding the operation of the system.

**Annex 1 to Recommendation 6 (JCOMM-4)**

**Modifications to the Manual on Marine Meteorological Services – WMO No. 558**

**[ In Volume I, Part I, Section 2 ]**

To add at the end of the introductory paragraph, before 2.1 (Principles):

“To facilitate the work of the METAREA Co-ordinators (see § 2.2 of Part I) and allow the alimentation of the JCOMM GMDSS-Weather website (<http://weather.gmdss.org>), all MSI prepared for the GMDSS (i.e. to be broadcast on SafetyNET or International NAVTEX) should be disseminate on the GTS.

All internationally co-ordinated met-ocean MSI which does not apply to purely national services (including all MSI prepared for the GMDSS) are part of the World-Wide Met-Ocean Information and Warning Service (WWMIWS) The promulgation of those MSI is regulated by the IMO Resolution A1051.(27) on the IMO/WMO Worldwide Met-Ocean Information and Warning Service (WWMIWS) – Guidance Document.“

To add as a new paragraph 2.2.1.3

“*METAREA Co-ordinator* is the NMS charged with co-ordinating Marine Meteorological Information broadcasts by one or more National Meteorological Services acting as Preparation or Issuing Services within the METAREA.

The METAREA co-ordinator shall:

- act as the central point of contact on matters relating to meteorological information and warnings within the METAREA;
- promote and oversee the use of established international standards and practices in the promulgation of meteorological information and warnings throughout the METAREA;
- co-ordinate preliminary discussions between neighbouring Members, seeking to establish and operate NAVTEX services, prior to formal application;
- contribute to the development of international standards and practices through attendance and participation in the JCOMM Expert Team on Maritime Safety Services meetings, and also attend and participate in relevant IMO, IHO and WMO meetings as appropriate and required.

The METAREA co-ordinator shall also ensure that within its METAREA, National Meteorological Services which act as Issuing Services have the capability to:

- select meteorological information and warnings for broadcast in accordance with the guidance given in the Manual;
- monitor the SafetyNET transmission of their bulletins, broadcast by the Issuing Service.

The METAREA co-ordinator shall also ensure that within its METAREA, National Meteorological Services which act as Preparation Services have the capability to:

- endeavour to be informed of all meteorological events that could significantly affect the safety of navigation within their area of responsibility;



- assess all meteorological information immediately upon receipt in the light of expert knowledge for relevance to navigation within their area of responsibility;
- forward marine meteorological information that may require wider promulgation directly to adjacent METAREA co-ordinators and/or others as appropriate, using the quickest possible means;
- ensure that information concerning all meteorological warning subject areas that may not require a METAREA warning within their own area of responsibility is forwarded immediately to the appropriate National Meteorological Services and METAREA co-ordinators affected by the meteorological event;
- maintain records of source data relating to meteorological events.”

To be inserted as new paragraphs 2.2.11, 2.2.12 & 2.2.13 (Part I, Vol. I)

“Information on ice edge (where applicable) shall be provided in MSI prepared for the GMDSS.

Following practices should be used for the ice edge information prepared for SafetyNET bulletins:

- no more than 10 lat/long points for each Sub-Area;
- latitude 4 digits; longitude 5 digits (add preceding 0 if needed);
- N/W/E must be added for areas bordering the E/W divide;
- lat/long pairs separated by comma;
- period at the end of the lat/long string to define end of information;
- no local names used (exception – reference chart is to be prepared with acceptable well-known place names which are allowed in addition to Sub-Area names);
- location of sea ice relative to ice edge must be given before lat/long string;
- additional information on ice edge form state may be added – diffuse, compact, movement, growth;
- can cut across small islands as if they weren't there;
- for bulletins prepared for SafetyNET, extend into neighbouring METAREA by 150 nm (use issuing office ice boundaries as reference recognizing that, with different issue times, the boundaries may have moved);
- when describing neighbouring METAREA ice, use Sub-Area names from that METAREA;
- cannot create ice free “holes” in the ice pack unless they are significant as noted below; ice-free “inlets” in the ice pack will be ignored if the entrance is less than 30 nm wide:
  - o Significant open water within the main ice edge may be described with an ice edge if shipping is active within that area (significant means that an entire marine sub-area is open water);
- Include all sea ice within the ice edge – fast ice, strips and patches; ice edge is boundary between any sea ice and sea ice free (icebergs may be outside of the ice edge provided there is no sea ice);
- idea is to be conservative and not endanger shipping.

- in winter, when ice edge is outside of Sub-Area due to complete ice cover, bulletin to say “Ice covered”;
- in summer, when ice edge is outside of region due to lack of sea ice, bulletin to say “ice free” or “bergy water”.

Sharing and operational exchange of information on ice edge position is essential to ensure its contiguity across the METAREA boundaries.”

### **[ In Volume I, Part I, Section 5 ]**

In whole Section and its appendices, replace “responsible Members” by “Responsible Members”, “responsible Member” by “Responsible Member”, and “global collecting centres” by “Global Collecting Centres”, “global collecting centre” by “Global Collecting Centre”.

Add at the end of the note: “, Recommendation 8 (JCOMM-I), Recommendation 9 (JCOMM-II), Recommendation 9 (JCOMM-III), Recommendation 12 (JCOMM-III)”

In paragraph 5.1:

Principle 1, replace “the marine climatological” by “marine climatological”

Principle 2, replace “shall prepare” by “should optionally prepare”; add the word “historical” before “fixed ship stations”

Principle 3, replace “Members operating fixed ship stations” by “Members once operating (historical) fixed ship stations”

Principle 5, delete “on magnetic tape”

In paragraph 5.2: Replace “shall prepare” by “should optionally prepare”; add “(historical)” in front of the first occurrence of “fixed ship stations”, and add “once” after the second occurrence.

In paragraph 5.2.1.2: Replace “Commission for Marine Meteorology (CMM)” by “Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)”

In paragraph 5.2.3.2: Replace “President of CMM” by “Co-President of JCOMM”

In paragraph 5.2.3.5: Replace “shall” by “should”

In paragraph 5.3.3.2: Replace “shall” by “should optionally”, add “,1991-2000, 2011-2010” at the end of the sentence; and add new sentence : “The routine production of decadal summaries ceased in 2012. However, such summaries may continue to be published by Responsible Members on an optional basis.”

In paragraph 5.5.1: replace “Fixed ship stations” by “Fixed stations” in the title of the paragraph, and in the paragraph itself.

In paragraph 5.5.3: replace “shall” by “should”.

In paragraph 5.6.1.1: Add “(historical)” in front of “fixed ship stations”; add “(or other alternative modern media)” after “magnetic tape”.

In paragraph 5.6.1.3: Replace “tapes” by “data”; replace “Any alternative format” by “Use of this or any other alternative format”

In paragraph 5.6.1.4: Replace paragraph by “Members should ensure that magnetic tapes (or other modernized computer media) are readable at the global collecting centres.”

In paragraph 5.6.4.1: Replace “The Historical” by “While the Historical”; replace “project provide for” by “project provided in the past for”; add “this responsibility in the future will be transitioned to modernized international archives (CMOCs — ICOADS)” after “1960”. Add “past” in front of “participants”; replace “have agreed” by “agreed”.

In paragraph 5.6.4.2: add “previous” in from of “HSSTD”; add “(or modern day CMOC)”

### **[ In Volume I, Part I, Section 6 ]**

In paragraph 6.1, principle 2, replace “World Data Centres for Oceanography” by “WMO-IOC Centres for Marine-meteorological and Oceanographic Climate Data (CMOCs), and the ICSU World Data System”

### **[ In Appendix I.2 ]**

METAREA Co-ordinators to be inserted in the appropriate table

### **[ In Appendix I.8 ]**

Under the GCC United Kingdom, replace “Meteorological Office, S9” by “Met Office”; and replace website link by:

“Website: [http://www.metoffice.gov.uk/weather/marine/observations/gathering\\_data/gcc.html](http://www.metoffice.gov.uk/weather/marine/observations/gathering_data/gcc.html)”

### **[ In appendix I.11 ]**

Under note (2), replace definition of Steadiness by the following:

Steadiness = ratio of speed of the monthly mean vector wind to the speed of the monthly mean scalar wind.

Under note (3), replace the whole note by the following:

“(3) A resultant vector mean direction with each wind speed or wave height set equal to 1”

### **[ In Appendix I.12 ]**

In the title, add “(HISTORICAL)” in front of “FIXED SHIP STATIONS”.

### **[ In Appendix I.15 ]**

In the title, replace IMMT-IV by IMMT-5, and “(Version 4)” by “(Version 5)”

In note (b), replace IMMT-II by IMMT-2; replace “(FM 13-XIV)” by “(e.g. FM 13)”

In the table, in the last column “Coding Procedure”:

For element 15, replace “Tens and units of knots” by “Units of knots”.

For element No. 64, add the following code values at the end: “B- FM 13-XIII” and “C- FM 13-XIV Ext.”; delete (more version needed here)

For element No. 65, replace IMMT-I by IMMT-1, IMMT-II by IMMT-2, and IMMT-III by IMMT-3; replace “4 – IMMT-IV (this version)” by “IMMT-4 (in effect from Jan. 2011)”, and add the following code value at the end: “5 – IMMT-5 (in effect from June 2012)”.

For element 86, replace MQCS-I by MQCS-1, MQCS-II by MQCS-2, MQCS-III by MQCS-3, MQCS-IV by MQCS-4, and MQCS-V by MQCS-5; replace “6 = MQCS-VI (this version, to be agreed)” by “6 = MQCS-6 (Version 6, November 2009) JCOMM-III”, and add a new line: “7 = MQCS-7 (Version 7, in effect from June 2012)”

For element No. 87, replace “(000-360); e.g.” by “(001-360); e.g.”, and remove the line “000 – No Movement”

For element 104, add the following line at the beginning “0 – No Automated Weather Station (AWS)”

### **[ In Appendix I.17 ]**

In the title, replace "MQCS-VI (Version 6)" by "MQCS-7 (Version 7)"

In the table,

For element 64, column Error, replace “version ≠ 0-9, A, Δ” by “version ≠ 0-9, A-C, Δ”

For element 86, column Action, replace MQCS-I by MQCS-1, MQCS-II by MQCS-2, MQCS-III by MQCS-3, MQCS-IV by MQCS-4, and MQCS-V by MQCS-5; replace “6 = MQCS-VI (this version, to be agreed)” by “6 = MQCS-6 (Version 6, November 2009) JCOMM-III”, and add a new line: “7 = MQCS-7 (Version 7, in effect from June 2012) JCOMM-IV”

For element 87, column Error, replace "HDG ≠ 000-360" by "HDG ≠ 001-360"

### **[ As new Appendix I.20 ]**

To include NAVTEX Ice Abbreviations, as finalized in November 2011 by the Expert Team on Sea Ice (ETSI), as following:

## **NAVTEX ICE ABBREVIATIONS**

### *0. Background*

Ice (sea and lake ice) abbreviations for NAVTEX bulletin were developed in 2007-2011 by JCOMM Expert Team on Sea Ice (ETSI) in cooperation with the International Ice Charting Working Group (IICWG) and are based on a number national sea ice practices (in particular Canadian and German Ice Services). The rules were discussed and generally agreed by ETSI 4th session (March 2010, JCOMM Meeting Report No. 74), tested during the JCOMM 3rd Ice Analysts Workshop (June 2011, JCOMM Technical Report No. 56), discussed and agreed during the IICWG 12<sup>th</sup> Meeting (October 2011, <http://nsidc.org/noaa/iicwg/>).

According to JCOMM ETSI recommendation ice abbreviations in NAVTEX bulletins should be used by Preparation Services only in cases of reliable HF connections to vessels in particular area, otherwise plain text description of ice in NAVTEX bulletin should be used.

### *1. General rules*

Abbreviations concerning ice type always have two parts: the first part indicates the ice concentration, the second part the ice thickness or stage of development.

2. Concentration

The concentration abbreviations are given in tenths or in amount of ice. A 2-symbol abbreviation exists for all concentrations.

**Table 1 – Concentration**

Abbr.	Description	Abbr.	Description
1T	1 tenth	BW	bergy water
2T	2 tenths	OW	open water (less than 1/10)
3T	3 tenths	VO	very open ice
4T	4 tenths	OP	open ice
5T	5 tenths	CL	close ice
6T	6 tenths	VC	very close ice
7T	7 tenths	CO	compact or consolidated ice
8T	8 tenths	FI	fast ice
9T	9 tenths		
+T ; 9+	9+Tenths		
XT	10 Tenths (X is roman 10)		

3. Ice thickness and stages of ice development

The ice thickness can be given as a range in cm or as a stage of development. When given as a range, a single thickness should have at least 2 digits (e.g. 05-10 cm, 30-50 cm), It is also possible to use the abbreviation GT (greater than) and LT (less than) as in GT80 cm. All stages of sea ice development are characterized by a 2-symbol abbreviation, but for lake ice 3-symbol abbreviations are used.

If thickness is not known (or not applicable as in bergy water) it is recommended to use ???. Then the abbreviated sea ice type, using stages of development, always consists of 4 symbols. For example: 5TGR (5 tenths gray ice), +TNI (9+ Tenths new ice), FIGW (gray-white fast ice). This makes it clear, that with only 3 symbols there was a transmission problem. For lake ice most ice types would consist of 5 symbols. Clearly more symbols are needed if a thickness range is given (e.g. CL10-20 cm).

**Table 2 – Stages of ice development**

Abbr	Description	Abbr.	Description
.			
NI	New ice	FY	first year ice
NL	Nilas	F1; W1	thin first year stage 1 (Baltic white ice stage 1)
DN	dark Nilas	F2; W2	thin first year stage 2 (Baltic white ice stage 2)
LN	light Nilas	FM	medium first year
GR	gray ice	FT	Thick first year
GW	gray-white ice	OI	old ice
YG	young ice	MY	multi year ice
		THN	thin ice (main use for lake ice)
		MED	medium ice (main use for lake ice)
		THK	thick ice (main use for lake ice)
		VTK	very thick ice (main use for lake ice)
		??	undetermined

#### 4. Ice surface topography

The ice type abbreviation can be followed by an abbreviation giving the topography of the ice. The topography should be separated with ":". There can be none, one or several of these abbreviations. For example XTGW:HRDG:ROTN (10 tenths gray-white ice which is heavily ridged and rotten).

#### 5. Egg-code

There is also the possibility to use an Egg-code. In this case the ice definition start with the total concentration (in tenths, using just the first letter of the ice concentration abbreviations) followed by EGG. The partial ice type then follow separated with "-". For example: 9EGG-5TGW:RDG-4TNI (total concentration 9 tenths, with 5 tenths of ridged gray-white ice and 4 tenths new ice).

**Table 3 - Ice surface topography**

Abbr.	Description
LVL	level ice
RFT	rafted ice
HRFT	heavily rafted
RDG	ridged ice (hummocked)
HRDG	heavily ridged
ROTN	rotten ice

#### 6. Other abbreviations to be used in the text

**Table 4 – Miscellaneous abbreviations**

Abbr.	Description
PRESS	ice pressure
LGT	Light
MOD	Moderate
STRG	Strong
FI-LEAD	lead along the fast ice
CSTL-LEAD	coastal lead
GT	greater than
LT	less than

#### 7. Example coding

Made up example in the Baltic

##### **Abbreviated form:**

Bay of Bothnia N-part FI50-70cm; E-part FI30-50cm, 9EGG-6TW1:RFT:HRDG-3TLN MOD PRESS; W-part FI30-50cm, FI-lead, CLGW; S-part VCNI.  
Gulf of Finland E-part FI20-30cm, CL10-20cm; NE-part FI15-20cm:ROTN, OPRG:RFT:ROTN.

##### **Clear text:**

In the Bay of Bothnia there is 50-70 cm thick fast ice in the north. In the eastern part there is 30-50 cm thick fast ice, further out there is 9 tenths of ice, with 6 tenths of 30-50 cm thick ice which is rafted and heavily ridged and 3 tenths of light nilas. There is moderate pressure in the ice field. In the western part the fast ice is 30-50 cm thick, there is a lead along the fast ice, followed by close gray-white ice. In the

southern part there is very close new ice.  
 In the Gulf of Finland there is 20-30 cm thick fast ice in the east and farther out there is 10-20cm thick close ice. In the northeastern part there is 15-20 cm thick rotten fast ice and farther out rafted and rotten, open gray ice.

**[ In Volume I, Part II, Section 2 ]**

To replace the paragraph 2.2.3.2

“2.2.3.2 Warnings shall be given for:

- (a) Tropical cyclones and associated phenomena;
- (b) Gales and storms;
- (c) Ice accretion;

2.2.3.2.1 In addition, warnings should be given for the following phenomena, as necessary. Warnings for phenomena (e) and (f) may be the responsibility of more than one national agency or authority:

- (d) Restricted visibility (one nautical mile or less);
- (e) Unusual and hazardous sea-ice conditions;
- (f) Storm-induced water-level changes”

to be inserted as a new paragraph after 2.2.5.3

“Information on ice edge (where applicable) shall be provided in MSI prepared for the GMDSS.”

**Annex 2 to Recommendation 6 (JCOMM-4)**

**Modifications to the *Guide to Marine Meteorological Services* – WMO No. 471**

**[ In Section 3 – Marine Climatology ]**

In whole Section and its appendices, replace “responsible Members” by “Responsible Members”, “responsible Member” by “Responsible Member”, and “global collecting centres” by “Global Collecting Centres”, “global collecting centre” by “Global Collecting Centre”.

In Section 3.1

Third paragraph, replace “global data collecting centres” by “Global Collecting Centres”.

Fourth paragraphs, 2<sup>nd</sup> sentence, replace “The Interest in climate change and studies of air-sea...” by “Growing interest in studies of climate change and air-sea...”.

Fourth paragraph, first sentence, replace “to a few tens” by “to tens”. Add at the end: “, and in its Dynamic Part, *Advances in the Applications of Marine Climatology* (WMO/TD-No. 1081).”

Fifth paragraph, replace “High density” by “High-density”; remove “for use on large computers”; and replace “computer technology allows” by “computer technology allow”

Fifth paragraph, add “, e.g.” after “Data can be used in computer models to generate fields”

## In Section 3.2.1

First paragraph, replace entire paragraph by “The establishment of the international exchange and processing arrangements described above for the 'Marine Climatological Summaries Scheme', as it is called, required the cooperation of all maritime countries participating in the WMO Voluntary Observing Ships' Scheme, i.e. those which have recruited Selected, VOSclim, Supplementary or Auxiliary ships (see Chapter 6 of this *Guide*). More information about the Marine Climatological Summaries Scheme can be found on the GCC website ([http://www.metoffice.gov.uk/weather/marine/observations/gathering\\_data/gcc.html](http://www.metoffice.gov.uk/weather/marine/observations/gathering_data/gcc.html) or <http://www.dwd.de/gcc>), whilst more information about the VOS Scheme can be found on the VOS website (<http://www.bom.gov.au/jcomm/vos/>).”

Second paragraph, first sentence, delete “have” before “assumed responsibility”; 3<sup>rd</sup> sentence, replace “global collection centres” by “Global Collecting Centres”, and add “(historically)” before “fixed ship stations”.

Third paragraph, add “(WMO-No. 558),” before “Volume I, Part I, Section 5”.

## In Section 3.2.2

First paragraph, replace “responsible Members” by “Responsible Members”

Second paragraph, replace “summaries are prepared” by “summaries shall optionally be prepared”; add “(historically)” before “for fixed ship stations”.

Third paragraph, replace “Responsible Members are presented on the JCOMM’s...” by “Responsible Members are represented on the Expert Team on Marine Climatology, under

JCOMM’s...”

## In Section 3.2.3

First paragraph, first sentence, replace “responsible Members” by “Responsible Members”, and “from all members” by “from all Members with VOS fleet; delete second sentence “These centres ...”. 3<sup>rd</sup> sentence, replace “Two” by “These two”; and “maintained so that a data set” by “maintained in parallel so that the data set”

Delete Third paragraph

## In Section 3.2.4

In the title, delete “to Responsible Members”

First paragraph, replace “provided by NMSs” by “typically provided by National Meteorological and Hydrological Services (NMHSs)”; replace “Members” by “The Members”; replace “fixed ship stations” by “(historically) fixed ship stations, so-called Contributing Members, ”; replace “suitable form of meteorological logbook” by “suitable meteorological logbook, which can be in hard-copy or electronic format”; add “hard-copy” after “Details of the layout of the”

Second paragraph, add “hard-copy” before “logbooks”.

Add the following paragraph at the end of the section: “The data are then sent to both GCCs, i.e. two copies of each data set are required, one for each centre. The data should be dispatched at three-monthly intervals. The Member sending the data should notify the GCCs of the dispatch of the data and provide details of the order in which the data are sorted.”



In Section 3.2.5

Add "(WMO-No. 558)" before ", Volume I, Part I"; in second and fifth sentences, replace "summaries are prepared" by "summaries shall optionally be prepared"; add ",etc." at the end of the fifth sentence; delete the last sentence ("In view of ...").

In Section 3.2.6

Third paragraph, replace "Orders" by "Requests".

In Section 3.2.7

First paragraph, delete ", such as diskette"

In Section 3.2.8

Replace title of the paragraph to "Assembly and Exchange of Historical Marine Data"

First paragraph, add "(HSST)" after Sea Surface Temperature; replace "has compiled" by "compiled"; add ",1985" after "WMO/TD-No. 36".

Add the following paragraph after the first paragraph: "However in the decades since completion of the HSST Data Project, projects such as the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) have undertaken to build on that work, by assembling additional international historical ship (and other) records from a variety of sources, quality controlling the data, and making the observations and associated gridded products openly available to the international user community. This is now the responsibility of WMO-IOC Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs) to assemble historical marine and oceanographic climate data."

Third paragraph, replace "included in the Project" by "included in the original HSST Data Project or in ICOADS or CMOCs, "; after "IMMT format", add "- and the GCCs will ensure their provision to CMOCs (or ICOADS)".

In Section 3.2.9.2

First paragraph, replace "20 quality control flags" by "quality control flags".

Third paragraph, add new sentence at the end "Minimum quality control software is available from GCCs upon request or from the WMO ([http://www.wmo.int/pages/prog/amp/mmop/mqc\\_soft.html](http://www.wmo.int/pages/prog/amp/mmop/mqc_soft.html))."

In Section 3.3

Replace "which are used" by "which can be used"

In Section 3.4.2

Replace "NMSs" by "NMHSs"

**[ In Annex 3.A - Areas of responsibility and Responsible Members for climatological summaries ]**

In the footnote, add "shall optionally be responsible for" after "complete data set and"

**[ In Annex 3.C – Layout of the International Marine Meteorological Tape (IMMT) ]**

Apply the same changes as detailed in section 2 of Annex 1 of this Recommendation.

**Annex 3 to Recommendation 6 (JCOMM-4)****Modifications to the WMO No. 9 Publication, Weather Reporting,  
Volume D, Information for Shipping**

In Chapter 2, Satellite Inmarsat-C, replace the whole content of the chapter by the following:

The list of Inmarsat C Land Earth Stations (LES) accepting code 41 messages is maintained by the JCOMM Ship Observations Team (SOT) and provided on the WMO website at:

[http://www.wmo.int/inmarsat\\_les](http://www.wmo.int/inmarsat_les)

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**Recommendation 7 (JCOMM-4)****REVIEW OF RELEVANT RESOLUTIONS OF THE GOVERNING BODIES OF WMO AND IOC**

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

**Noting** with satisfaction the actions taken by the WMO and IOC governing bodies on the previous Recommendations of, or concerning, the Commission,

**Considering** that a number of previous Resolutions of the governing bodies of WMO and UNESCO/IOC are still valid,

**Recommends** that:

- (1) WMO Resolution 4 (EC-LXII) and IOC Resolution EC-XLIII.5 be no longer considered necessary;
  - (2) WMO Resolutions 8 (Cg-XVI), 24 (Cg-XVI), 25 (Cg-XVI) and 43 (Cg-XVI) be kept in force; and
  - (3) IOC Resolutions XX-12, XXVI-6, XXVI-7, and XXVI-8 be kept in force.
-

## ANNEX I

to paragraph [12.2.1](#) of the general summary

### WORKPLAN FOR THE JOINT WMO-IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY FOR THE PERIOD 2012–2017

<b>Management Committee and its ad hoc Task Teams / all Programme Areas</b>			
<b>Reference</b>	<b>Task</b>	<b>By whom</b>	<b>Target</b>
4.03	Improve the ratio of funding between governance and activities in the future	Management Committee and the Secretariats	Ongoing
4.06	Revise the JCOMM Operating Plan to reflect JCOMM's project-oriented approach to address specific, defined, and time-bound activities	Management Committee and the Secretariats	Interseasonal period
5.1.3	Address the 23 actions for JCOMM in the GCOS Implementation Plan (2010 update) in reviewing and assessing progress, in developing workplans, and in setting priorities.	Management Committee and the Programme Coordinators	Interseasonal period
5.3.2	Coordinate with appropriate programmes of WMO and IOC to develop and document best practices and standards for data and product integration	Management Committee and TT-SAT	Interseasonal period
5.3.3	Ensure appropriate areas of expertise in designation of task team membership would be represented in TT-SAT to efficiently coordinate the development of integrated Surface Vector Wind (SVW) products, in close collaboration with interested satellite and surface-based observation communities	Management Committee	Interseasonal period
5.3.3	Develop a plan to address integrated data products extended beyond SVW	TT-SAT	Interseasonal period
5.3.3	Document properly the outcome of TT-SAT work, and to update the User Requirements documented in the WMO Rolling Review of Requirement (RRR) database and the Statement of Guidance (SoG) for Ocean Applications as needed	TT-SAT	Interseasonal period
5.3.4	Enhance the partnership with the various CEOS virtual constellation groups, CBS, and CGMS and develop joint activities with various CEOS virtual constellation groups	Management Committee	Ongoing
5.4.1	Enhance activities to support research and development for climate services	All Programme Areas	Ongoing
5.4.7	Identify the members of the new joint Team (proposed as a TT) and support Metocean climate analysis and data management	Management Committee with CAgM Management Group	ASAP
6.11	Respond to WMO Resolution 25 (Cg-XVI) and IOC Resolution XXVI-6 to continue monitoring and documenting ocean observing systems vandalism events and develop an implementation strategy across the Programme Areas to increase awareness of the essential nature of observing systems	Management Committee	Ongoing

7.2.6	Work by correspondence with Members / Member States through a fast-track procedure to seek approval of CMOC proposals by China and Germany within six months after the IODE Session	Management Committee	ASAP
8.3.2	work with IMO and relevant national authorities to encourage greater responsiveness to marine meteorological warnings	Management Committee	Ongoing
8.4.1	1) Coordinate Quality Management activities; 2) maintain one of MAN members as activity leader for Quality Management	Management Committee	Intersessional period
8.4.4	Coordinate discussion with IMO, on behalf of WMO, on future directions and strategy related to developing the QMS requirements for marine meteorological and oceanographic services	Management Committee	ASAP and ongoing
8.4.5	Maintain close liaison with the Task Team on Quality Management Systems Implementation	Management Committee	Intersessional period
8.4.6	Continue keeping track of progress of QMS pilot project of Australia Bureau of Meteorology, and carry out demonstration projects	Management Committee and SCG	Intersessional period
8.4.8	Prepare a draft of an internationally acceptable competency framework focusing on the competency requirements for marine meteorological and oceanographic services	Management Committee through an ad hoc task team	ASAP
9.01	Assign one member to oversee the overall activities in capacity development	Management Committee	ASAP
9.06	Work with interested Members/Member States to encourage development of formal education and training, notably graduate, masters' and Ph.D. research programmes on marine meteorology and oceanography	Management Committee	Intersessional period
9.07	Assess the effectiveness of training courses, workshops and capacity building efforts by the Commission and associated bodies	Management Committee	Intersessional period
9.09	Work with PA Coordinators to ensure that all training activities would be incorporated with a framework to enhance competencies of national meteorological and oceanographic institutions	Responsible member of Management Committee	Intersessional period
9.10	Organize a survey for national forecasters and related operators to help identifying qualification and competency requirements and associated training needs	Management Committee	Intersessional period
10.01, 10.07, 10.08, 10.09	Keep relevant publications regarding technical regulations and recommendations under review and advise on future updates as necessary	JCOMM Groups and Expert Teams	Intersessional period
10.06	Prepare proposals for further amendments of these Technical Regulations in parallel with the implementation of intersessional workplan	Expert Teams and Secretariat	Intersessional period
11.02	Endure necessary coordination for the Commission to be a full partner in the discussion on the requirements for a broad suite of coastal, biological and biogeochemical observations	Management Committee	ongoing
11.05	Explore further collaboration, including possibility of establishing formal relations with IUGG, EEA, LME	Management Committee and Secretariat	Intersessional period

11.06	Keep relations with other programmes and organizations under regular review, particularly for identified joint activities	Management Committee	Intersessional period
12.1.3	Finalize JCOMM Strategy, keep it under review and revise as necessary; publish revised JCOMM Strategy Document in electronic form on JCOMM website	Co-presidents and Management Committee	ASAP
12.2.2	Establish a JCOMM Operating Plan 2013-2016, aligned with the adopted JCOMM work programme and the Operating Plans of WMO and IOC	Management Committee and Secretariat	ASAP
12.2.4	Establish an ad hoc group to consult, and facilitate Members / Member States on improved in-kind and financial support for JCOMM activities	Management Committee and Secretariat	Intersessional period
12.2.5	Review JCOMM priorities, and establish a mechanism for external review	Management Committee and Secretariat	Intersessional period
12.2.6	Plan and continuously review workplan to maintain and strengthen JCOMM collaboration with governments, academic and NGOs (like GEO)	Management Committee	Intersessional period
12.4.2	Oversee specific activities and projects that would be implemented through time-bound task teams	Management Committee	Intersessional period
12.4.7	Ensure succession plans for key posts	Programme Areas	Intersessional period
13.02 & 13.03	Continue the scientific and technical workshop, include the presentations in final publication online, and shape objectives and work programmes in an achievable way	Secretariat and PA chairs and Expert Teams	Intersessional period
<b>Secretariat actions</b>			
<b>Reference</b>	<b>Task</b>	<b>By whom</b>	<b>Target</b>
6.2.1(i)	Promote resource mobilization to achieve a regular review of the WMO and IOC Publications dealing with instrument standards and practices	Secretariat	Ongoing
6.2.3	Initiate a consultation amongst JCOMM members by correspondence in order to have the RMIC established by the WMO and IOC Executive Bodies as early as possible; and establish coordination mechanism in each region	Secretariat	Intersessional period
7.3.5	Prepare agreements for the establishment of a Partnership Centre for IOC/IODE ODP in Obninsk as an 'in kind' contribution of the Russian Federation into the activities of IOC and JCOMM	Secretariat	ASAP
8.2.4	Hold the 8 <sup>th</sup> JCOMM-TCP training workshop on storm surge and wave forecasting for the South/East African and West Indian Ocean countries	Secretariat in support of ETWCH	2012
8.2.6	Extend and invitation to the working groups and/or task teams of the Intergovernmental Coordination Group of the Tsunami Early Warning and Mitigation Systems(ICG/TEWS), in scientific and technical support for monitoring/predictions relevant for coastal hazard forecasting and warning services	Secretariat in coordination with ETWCH	ongoing

8.3.1	Update the Manual on Marine Meteorological Services according to ice information in SafetyNET bulletins, and include the list of abbreviations for ice information in the Guide on Marine Meteorological Services	Secretariat	ASAP
8.3.2	Keep appropriate references to WWMIWS and to the METAREA Coordinators including all publications on JCOMM website ( <a href="http://www.jcomm.info/GMDSS">http://www.jcomm.info/GMDSS</a> )	Secretariat	Interseasonal period
8.4.8	(upon the development of the competency requirements for marine meteorological and oceanographic services) use the developed standards and related materials to update the part IV of the WMO-No.558 (Training in the field of marine meteorology), and to develop education and training programmes	Secretariat	Interseasonal period and ongoing
8.5.2 (also 6.4.2 and 7.5.1)	Update and document workplans, and implement them in a seamless manner	Expert Teams and Secretariat	Interseasonal period
9.04	Use OceanTeacher Global Classroom as much as possible for JCOMM training courses	Secretariat and Programme Area Coordinators	Ongoing
9.05	Continue organizing capacity development initiatives, including: Training courses on the Ocean Data Portal (ODP), Training courses on ocean and marine meteorology data management including cross-discipline introductory courses, Workshops for Port Meteorological Officers (PMOs), Workshops on marine instrumentation and deployment through RMICs, Training workshops on ocean observations and modelling, JCOMM-TCP Training workshops on storm surge and wave forecasting, Training workshops on application of satellite products to marine forecasting, Training workshops on sea ice analysis, Workshops on maritime safety services and marine service quality management.	Secretariat in coordination with Programme Area Coordinators and contributing Members / Member States	Interseasonal period
10.01	Keep the Manual on Marine Meteorological Services and the Guide to Marine Meteorological Services as up-to-date as possible	Secretariat	Interseasonal period
12.2.1	Compile work programme in an appropriate structure and include it as an Annex to this Report	Secretariat	ASAP
12.5.1	Investigate the possibility of convening the the fifth session of JCOMM in Indonesia	Secretariat, co-president and Indonesia	ASAP
13.03	To assemble and publish on the web presentations at the Science and Technology Workshop (24-25 May 2012) into a JCOMM Technical Report	Secretariat	ASAP
<b>Observations Programme Area</b>			
<b>Reference</b>	<b>Task</b>	<b>By whom</b>	<b>Target</b>
5.2.2	Ensure that the ocean observational requirements for the GNWP, HRNWP, SIAF, and Climate applications and services are also included in the OPA-IG	OPA	Ongoing

5.2.3.i 6.15	Continue to evaluate the quality of wave observations, and the development of cost-effective wave observations from drifters through the DBCP-ETWCH Pilot Project on Wave Measurement Evaluation and Test from Moored Buoys (PP-WET) and the DBCP Pilot Project on Wave Measurement from Drifters (PP-WMD) respectively Continue capacity efforts to enhance in situ global wave observing capability	OPA, DBCP & ETWCH	Ongoing
5.3.1	Lead the intersessional activities to document JCOMM non-climate requirements, taking into account an integrated use of available products derived from in situ and remotely sensed data	TT-SAT	JCOMM-5
6.01	Continue developing the composite observing system to address non-climate requirements expressed through WMO Rolling Review of Requirements	OPA	Ongoing
6.02	Address legacy recommendations of the Pilot Project during the next intersessional period (JCOMM/TR-No. 48) as JCOMM's contribution to WIGOS implementation	OPA & DMPA	Intersessional period
6.03	Engage fully with the establishment of Global Framework for Climate Services (GFCS) and establish a dialogue any additional observing requirements GFCS might in due course identify	OPA	Ongoing
6.0.4.bis	Improve observations in high latitudes and in marginal seas, and engage further with operational agencies to sustain ocean observations	OPA	Intersessional period
6.05	Provoke in forging links with the remote sensing community for the overall benefit of ocean observation	OPA	ASAP
6.13	Continue to investigate all possible means to recruit to additional ocean observing platforms (e.g. rigs & platforms)	DBCP & OPA	Ongoing
6.14	Continue PANGEA capacity development efforts and contribute to the capacity developments	OPA and Members/Member States	Ongoing
6.25	Achieve synergies in the use of common deployment opportunities, working with all OPA networks and the proposed JCOMMOPS Ship Coordinator	OCG	Ongoing
6.33 6.16	Engage proactively with World Ocean Council "Smart Ocean/Smart Industries" workshop, in order to expand the role and scale of ocean industry participation in all aspects of oceanographic and marine meteorological observation and services	OPA	Ongoing
6.34	Continue efforts with GHRSSST, to develop a dialogue with the satellite communities to better understand their needs, to define a realistic set of in situ requirements, and to initiate pilot projects to demonstrate the value of new synergies	OPA	Ongoing
6.1.1	Continue proactively engaging with the WMO Rolling Review of Requirements process in setting its goals and metrics for implementation	OCG	Ongoing
6.1.1	Develop further capacity in maintaining metrics and drawing up metrics by Essential Ocean Variables (EOV) and by individual Members/Member States, as well as by platform type	OPA through JCOMMOPS & OSMC	Ongoing

6.2.1(iii)	Develop guidelines for marine instrument intercomparison, publish them as a JCOMM Technical Report, and provide input to the CIMO Guide accordingly	OPA	Intersessional period
6.3.1	Work in concert with individual panels to provide overall guidance of the JCOMMOPS workplan and budget	OCG	Intersessional period
6.3.3	Initiate contact with other observing systems and communities in order to expand JCOMMOPS scope	OCG	ASAP
6.23	Define global Argo mission to include all areas in the ocean where depth are more than 2,000 m including marginal seas and high latitudes, which will imply a need for more than 3,000 floats and a new target will be defined	Argo Steering Team	Intersessional period
6.12	Continue engagement with global satellite community	DBCP	Ongoing
6.29	Take an active role in the forum with the objective of realizing more cost-effective and efficient satellite data collection from autonomous ocean observing platforms	OPA and DMPA	ASAP
6.30	Finalize JCOMM Cookbook and publish it as a JCOMM Technical Report	OPA and DMPA	ASAP
6.31	Promote the establishment and publication of access routes to the authoritative data sets for the observing system elements under its coordination	OPA and DMPA	Ongoing
6.32	Engage with new ocean observing communities, especially those using sub-surface gliders and surface wave gliders, to ensure the benefits of working with JCOMM were well appreciated	OPA	ASAP
6.22	Continue to work with Principal Investigators on specific issues and to increase the number of reference stations	OceanSITES	Ongoing
6.16 6.33	Continue dialogue with ship operators including World Ocean Council	SOT	Ongoing
6.19	Develop a common and robust standard for call-sign masking with expert bodies such as WMO CBS	SOT	ASAP
7.2.13	Consider urgently the masking scheme, and to accelerate the development of encryption or similar schemes, that could replace the current masking scheme and overcome the difficulties in quality controlling ship data in climate databases while also addressing the ship operators' security concerns	OPA and DMPA	ASAP
6.0.27	Support GO-SHIP programme and explore possible synergies with other ship-based activities	IOCCP, the SOT and Members/Member States	Intersessional period
<b>Data management programme area</b>			
<b>Reference</b>	<b>Task</b>	<b>By whom</b>	<b>Target</b>
7.03	Continue to collaborate in the development of IODE ODP	DMPA	Ongoing
7.03	Continue efforts in integrated in situ/satellite data management system, and improve the integration and comparison of satellite and in situ data, e.g. address the climatic and non-climatic requirements for in situ and satellite data, and consider data homogenization and interoperability issues	DMPA	Ongoing



7.04	Review Oceanographer's Cookbook for Submitting Ocean Data in Real Time and Delayed Mode, continue to consider end-user requirements	DMPA	Ongoing
7.04	Finalize the BUFR Master Table 10	DMPA	Intersessional period
7.06	Lead the development of the MCDS in close cooperation with IODE	DMPA	Intersessional period
7.07	Review the Data Management Plan and its implementation details, and update them as needed	DMPA	Intersessional period
7.09	Review the webpage of DMPA and update as needed	DMPA	ASAP
7.10 & 7.2.2	Organize the fourth JCOMM Workshop on Advances in Marine Climatology (CLIMAR-IV) around 2014, and the fourth MARCDAT in 2016	DMPA	Intersessional period
7.1.5	Follow up on the implementation of the recommended standards by Members/Member States	DMPA	Ongoing
7.3.2	Continue the work on comparison of semantic metadata profiles (Marine Community Profile – MCP –, SeaDataNet1 Common Data Index – CDI –, and the WMO Core Profile) and make recommendations for better interoperability between ODP and WIS	ETDMP	Ongoing
7.2.4	Review and update the MCDS strategy and to develop an implementation plan (including performance indicators for participating centres) for achieving the Vision for a new MCDS	ETMC, with IODE, ODP TT of IODE/JCOMM ETDMP and other partners	Intersessional period
7.2.8	Establish a broader JCOMM Pilot Project on IVAD to extend the scope of the mechanism to link community-developed adjustments back to the individual marine reports with wider participation	ETMC	Intersessional period
7.2.11	Revisit and possibly restructure the project of Extreme Waves Dataset, with a simpler (less costly to implement) initial design and product	ETMC and ETWCH	Intersessional period
7.2.12	Work with SAMOS to further develop the partial catalogue of digital observations made by research vessels (R/Vs)	ETMC	Intersessional period
7.2.14	Develop a strategy for further encouragement and coordination of data rescue	ETMC	Intersessional period
7.2.15	Investigate and promote possible cooperation between EEA and JCOMM and its relevant groups and ET in GMES and sustainable access to in situ marine data	All Programme Areas	Intersessional period
7.3.3	Continue to work on the interoperability of WIS/WIGOS and IODE ODP as these systems further develop and evolve, and take the work of WIGOS as an interface of cooperation between the WMO WIS and the IODE ODP	IOC/IODE and WIGOS	Ongoing
7.4.1	Develop synergies between ODP and WIS, especially in terms of (i) WMO and IOC data policies, (ii) implementation of ODP and the implementation of WIS nodes so as to avoid duplication	DMPA	Intersessional period
12.4.5	Develop an overall long-term strategy and propose a new structure for the Data Management Programme Area (DMPA), focusing on the specific main issues	DMCG (with Management Committee and IODE Committee)	Intersessional period

<b>Services and Forecasting Systems Programme Area</b>			
<b>Reference</b>	<b>Task</b>	<b>By whom</b>	<b>Target</b>
5.2.4	Continue to review and update the set of operational data requirements to support met-ocean applications, and continue to update WMO/CBS Rolling Review of Requirements (RRR) and Statement of Guidance (SoG) accordingly	SFSPA	Ongoing
5.4.5	Take lead in coordinating the Joint JCOMM-WCRP project on Coordinated Ocean Wave Climate Projections (COWCLIP), with a view to including wave information in greater detail in the IPCC Fifth Assessment Report (AR-5)	ETWCH	2014
5.4.6	Develop a coordination framework for operational coupled seasonal climate forecast systems, with relevant international groups and seasonal forecasting community	SFSPA (through ETOOFS) and DMPA	ASAP
8.1.1	Complete first Guide to Operational Ocean Forecasting System, with content contributions of writers and reviewers from Members/Member States	ETOOFS	Intersessional period
8.1.2 & 8.2.5	1) Keep contents of Guide to Wave Analysis and Forecasting, the JCOMM Guide to Storm Surge Forecasting under review and cross-referenced with other Manuals and References; and, 2) revise Guide to Wave Analysis and Forecasting.	ETWCH	Intersessional period
8.1.3	Continue collaboration with ESA GlobeWave project in implementing components of wave forecast verification scheme	ETWCH	Ongoing
8.1.4	Continue collaboration to develop next generation metrics for Operational Ocean Forecast Systems	ETOOFS and GODAE	Ongoing
8.1.6	Continue to review and update requirements for key variables of ocean forecasting systems, with a view to including requirements for coastal ocean forecasting and coupled climate forecasting systems	ETOOFS and JCOMM Contact for CBS/RRR Ocean Applications	Ongoing
8.1.9	1) Work with identified partners to develop a coordination framework to support ocean and marine observing, modelling and service requirements for operational coupled seasonal climate forecast systems; 2) identify the best approach for the relevant coordination, and prepare a recommendation specifying the role of JCOMM to facilitate the implementation	ETOOFS with relevant groups	Intersessional period
8.1.10	Identify activity leader on marine environmental emergencies, lead international coordination for meeting service requirements for marine environmental emergency response	ETOOFS and ETMSS	Intersessional period
8.1.11	Continue to assist initiatives for capacity building, including workshops on operational ocean forecasting as well as wave and storm surge forecasting.	ETOOFS and ETWCH	Ongoing
8.2.2	1) Develop proposals to include information on complex sea states, and associated terminology in weather and sea bulletins to be disseminated through Safety NET and NAVTEX; 2) Ensure broad participation in and input to the proposals from Members/Member States; 2) amend and update the respective part of the WMO Manual on Marine Meteorological Services and the WMO Catalogue on MetOcean Object Classes and Attributes	ETMSS and ETWCH	Ongoing

8.2.3	Continue joint effort with the WMO Tropical Cyclone Programme (TCP) on the series of JCOMM-TCP training workshop, with a view to developing the Storm Surge Watch Scheme	ETWCH	Ongoing
8.2.6	Extend activities in scientific and technical support for monitoring and predictions relevant for coastal hazard forecasting and warning services	ETWCH	ongoing
8.2.7	Continue to develop and maintain an Extreme Wave Dataset	ETWCH & ETMC	Ongoing
8.2.7	1) Coordinate the development of storm surge climatologies as a measure of risk assessment for marine hazards, and; 2) assist Members/Member States in developing their own databases and hazard analysis, in view of its important potential contribution to the GFCS	ETWCH and ETMC, in coordination with GLOSS	Intersessional period
8.2.8	Collaborate closely with other Teams and relevant external organizations/programmes, to create synergies by aligning new activities with existing ones	ETWCH	Intersessional period
8.2.10	Investigate potential positive synergies between CIFDP and GODAE Ocean View Science Team	Secretariat and SCG	Ongoing
8.2.15	Act as JCOMM focal point for WMO DRR and work with ETWCH members to carry our relevant activities, including: 1) participation in the DRR Expert Advisory Group on Hazard/Risk Analysis; 2) contribution to the new operational guidelines for Multi-Hazard Early Warning Systems (MHEWS) based on the Guide to Storm Surge Forecasting; 3)endure linkage between ETWCH activities to the WMO/DRR programme.	ETWCH chairperson	Intersessional period
8.3.2	Continue working with IHO and IMO to update the joint Manual on MSI and IMO Resolution A.705 (17)	ETMSS	ongoing
8.3.4	Continue to maintain and extend as appropriate WMO sea ice technical documentation, in cooperation with the International Ice Charting Working Group	ETSI	Ongoing
8.3.5	Conduct online surveys more often (2 years) with the support of the Issuing Services, and use these surveys to gather additional user requirements	ETMSS and Secretariat	Intersessional period
8.3.7	1) Continue working on the definition of Object Catalogues for the provision of numerical information for mariners, as a set of IHO S-1xx formats, and broadcasting MSI in text format; 2) explore issuing MSI in text format that can be displayed on ENC systems	ETSI and ETMSS	Ongoing
8.3.10	Continue to contribute to the development of IMO e-Navigation, by providing input on weather and ice safety related to Polar Code development	ETMSS and ETSI	Ongoing
8.3.11	Develop guidelines for advisories for volcanic ash floating on the sea surface	ETMSS	Intersessional period
8.3.12	Interact with IHO to identify possible measures to provide appropriate navigational warnings for mariners, against anticipated solar magnetic storms during the peak solar activity period (2012-2013)	ETMSS	ASAP
8.3.14	Continue to develop MPERSS beyond the current minimum requirements to provide tracking for objects adrift.	ETMSS, ETSI, Arctic METAREA Coordinators	Ongoing
8.3.16	Develop a full strategy for JCOMM activities in cooperation with IMO, IAEA and other relevant bodies, identify and implement actions as appropriate, following Recommendation 4 (JCOMM-4)	ETMSS, ETOOFS, and Secretariat	Intersessional period

<b>JCOMM requests and recommendations to external bodies and to Member / Member States</b>			
<b>Reference</b>	<b>Task</b>	<b>By whom</b>	<b>Target</b>
4.08	Contribute extrabudgetary funding for JCOMM, and in-kind contributions for the coming intersessional period	Members/Member States	Ongoing
5.1.1	Revisit the requirements for upper ocean thermal observations, including relevant JCOMM bodies and experts from the Observations Coordination Group in the review	OOPC	Intersessional period
5.1.3	Implement the JCOMM-related actions called for in the GCOS Implementation Plan and satellite supplement updates	Members/Member States	Ongoing
5.2.5	Ensure that all ocean observations related actions of EGOS-IP be properly addressed	Members/Member States	WMO EC-65 (2013) and ongoing
6.2.1	Invite a review of Terms of Reference in order to fully incorporate ocean instrumentation in its mandate	HMEI	Intersessional period
6.2.1	Consider establishing a Memorandum of Understanding with the Association for Hydro-Meteorological Equipment Industry (HMEI) in order to strengthen co-operation with manufacturers	IOC	Intersessional period
5.1.3	Implement actions called for in the GCOS Implementation Plan and satellite supplement updates (2010), through JCOMM coordination	Members/Member States	Ongoing
5.2.3	Make precipitation measurements from moored buoys, including coastal moorings, tropical moorings, and OceanSITES	Members/Member States	Ongoing
5.2.3	Install barometers on all newly deployed drifters; and are encouraged to deploy more autonomous AWS on ships	Members/Member States	Ongoing
5.2.5	Ensure that all ocean observations related actions which are part of the EGOS-IP should be properly addressed once the new EGOS-IP is approved by the WMO Executive Council (in principle EC-65 in 2013)	Members/Member States	Ongoing
6.04	Commit towards achieving and sustaining the initial implementation goals of the in situ observing system	Members/Member States	Ongoing
6.07 & 6.2.4	Consider offering new RMIC facilities addressing observing instrument best practices and standards, especially within Regional Association III (South America), Regional Association V (Southwest Pacific), and Regional Association VI (Europe), and to coordinate with existing RMICs	Members/Member States	ASAP
6.08 & 6.18 6.3.4	Contribute to or enhance existing level of support to JCOMMOPS	Members/Member States	ASAP
6.10	Support DBCP's pilot projects to ensure a consensus-based approach to the development of the global buoy network	Members/Member States	Ongoing
6.10	Extend sea level pressure observations to data sparse areas and in particular the South West Indian Ocean	Members/Member States	Ongoing
6.16	Encourage shipping companies to implement the VOSclim standard as widely as possible among VOS fleets	Members/Member States	Ongoing
6.17	Work with the SOT to develop and strengthen PMO services	Members/Member States	Ongoing
6.18	Continue support for routine oceanographic observations from SOOP in complement to the Argo programme, and encourage more comprehensive implementation of other en route oceanographic measurements systems (e.g. Ferrybox, XCTDs, ADCPs, TSGs, CPRs)	Members/Member States	Ongoing

6.20	Contribute to the GLOSS Core Network (GCN) as outlined in the 2012 GLOSS Implementation Plan, especially to meet the requirement for all GCN stations to report data in near-real time and to continuously measure geodetic changes using the Global Navigation Satellite System	Members/Member States	Ongoing
6.24	Contribute to float deployments and to the JCOMMOPS Argo Information Centre in order to maintain and strengthen this capability	Members/Member States	Ongoing
6.26	Contribute actively to the work of IOCCP, including to project office which recently had left IOC secretariat	Members/Member States	Ongoing
6.28	Prioritize contributions towards Capacity Development workshops and other activities, and to seek guidance as necessary from the OPA chair as to how best to target their effort in support of the global endeavor in better observing the oceans	Members/Member States	Ongoing
6.2.1(ii)	Facilitate proactively the collection, sharing, distribution (including in real-time and through appropriate archives), and discovery of instrument/platform metadata. In particular, the depth of the SST (Sea Surface Temperature) and SSS (Sea Surface Salinity) measurements should be reported as accurately as possible to assist in the generation of satellite products	Members/Member States	Ongoing
6.2.1(v)	Promote the International Oceanographic Data and Information Exchange (IODE)/JCOMM Standards process, seek harmonization of standards between WMO and IOC, and ensure that such processes are fully documented	Members/Member States	Intersessional period
6.2.2	Additional Members/Member States to assist in the development of technology through deployment, testing of prototypes, and evaluation of wave measuring instruments	Members/Member States	Ongoing
6.2.2	Facilitate and enhance the provision of wave data through the Global Telecommunication System (GTS) as well as File Transfer Protocol (FTP)	National Meteorological and Hydrological Services (NMHSs)	Intersessional period
6.3.2	Support "Ship Logistics Coordinator" project and ensure its sustainability if successful	Members/Member States	Ongoing
6.4.1	Cooperate with African Members / Member States in the framework of equitably shared operational programmes	Developed Members/Member States	Ongoing
7.05	Collect, distribute and record instrument/platform metadata together with the ocean observational data, and adopted Recommendation 7/1 (JCOMM-4)- Provision of Ocean/Instrument Metadata	Members/Member States	Ongoing
7.08	Consider implementing QMSs for ocean data centres and data management systems if that was not already the case	Members/Member States	Intersessional period
7.1.3 & 7.1.4	Participate actively in submitting standard proposals through the ODS process for wide adoption, and reviewing the candidate standards	Members/Member States	Intersessional period
7.2.7	Participate in the discussions regarding the development of the MCDS strategy and implementation plan with a view to offering MCDS DAC or GDAC functions as appropriate	France, Canada, and other parties performing the functions of DACs and/or GDACs or similar	Intersessional period
7.2.14	Continue supporting data rescue activities	Members/Member States	Ongoing
7.3.4	Participate actively in ODP and pursue interoperability with ODP	Members/Member States, and relevant systems	Intersessional period

7.4.1	Support and participate actively in the process on enhancing interoperability between NODCs and the WIS (e.g. through contributing data-sets to ODP)	Members/Member States	Ongoing
7.4.2	Take maximum benefit from the network of data centres (DCPCs) under development for the collection and dissemination of marine data and products	Members/Member States	Ongoing
7.4.2	Demonstrate compliance as DCPCs with CBS through secretariat	JCOMM candidate DCPCs	Ongoing
7.4.3	Consider registering relevant national data or centres and services as NCs and establish regional and sub-regional mechanisms for the exchange of marine related data and products	Members/Member States	Interseasonal period
8.1.3	1) (for those Members/Member States operating wave forecasting) participate in the wave forecast verification scheme; 2) Make maximum use of wave forecast verification scheme for marine forecasting purposes	Member/Member States	ongoing
8.1.5	Contribute to the establishment of Ocean Extremes Monitoring System, in both ocean observations and modelling	Members/Member States	Interseasonal period
8.1.8	Place the highest priority on missions that will contribute altimetry observations suitable for ocean forecasting systems, and empower science teams to complete the necessary Cal/Val to minimize the delay in product delivery	Space agencies	ongoing
8.2.5	Participate in the time-bound demonstration projects addressing regional issues of concern, in close cooperation with relevant programmes	Members/Member States	Interseasonal period
8.2.11	Work closely with the Project Steering Group (PSG) to implement CIFDP in respective country/region, and document the established procedures and best practices to guide other interested Members/Member States once the project was successful	CIFDP NCTs	Interseasonal period
8.2.12	Consider participating in the CIFDP, potentially in partnership with organizations focused on coastal zone management	Developing country Members/Member States with concerns of coastal inundation	Interseasonal period
8.2.13	Implement the CIFDP to ensure data availability between involved national institutions for coastal inundation forecasting and warning	Members/Member States	Interseasonal period
8.3.1	follow the agreement of METAREAs XVII-XXI in the exchange and preparation of GMDSS sea ice information	Members/Member States Provide MSI	Interseasonal period
8.3.2	Disseminate all MSI prepared for GMDSS on the GTS	Members/Member States	ASAP
8.3.6	Disseminate all MSI prepared for the GMDSS on the GTS, and to provide Meteo-France (henri.savina@meteo.fr) with the appropriate metadata	Members/Member States	ASAP
8.3.7	Continue broadcast of MSI in text format	Members/Member States broadcasting MSI	Ongoing
8.3.8	Implement a Quality Management System that include provisions of Maritime Safety Services	Members/Member States	ASAP and ongoing
8.3.9	Report annually on self-assessment, using the templated prepared by the ETMSS	Issuing Services or METAREA Coordinators	Annually and ongoing
8.4.3	Actively share experiences for the establishment of best practices for enhancing the development and implementation of a QMS, and take into account the benefit of adhering to ISO/IEC-17025	Members/Member States	Interseasonal period

8.4.6	Undertake demonstration projects leading to the implementation of QMSs for marine meteorological and oceanographic services	Members/Member States, in coordination with the activity leader on QMS and SCG	Intersessional period
8.4.7	Apply the developed framework of practice described in the new QM Guide for the development and implementation of the QMS	Members/Member States	ASAP and ongoing
8.4.10	(in the adoption of IODE-QMF at the IODE Committee in 2013) promote quality management and standards in compliance with both WMO and IODE Quality Management Framework	IODE	2013 and ongoing
9.03	Coordinate with WMO and UNESCO/IOC to develop partnership among distance learning programmes	Members/Member States	ASAP and ongoing
12.4.6	Ensure that appointed experts were allowed sufficient time and resources within their national work programme to complete allocated tasks in support of the Commission	Members/Member States	Intersessional period





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## ANNEX II

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to paragraph [5.4.7](#) of the general summary

**PROPOSED TERMS OF REFERENCE FOR  
JOINT CAGM/JCOMM TASK TEAM ON WEATHER, CLIMATE AND FISHERIES**

(agreed as final draft at International Workshop on Climate and Oceanic Fisheries,  
3–5 October 2011, Rarotonga)

Joint CAgM/JCOMM Task Team on Weather, Climate and Fisheries

- (a) To review the current data collection by JCOMM on marine meteorology, to assess how these data meet the current needs of the sustainable management in fisheries; encourage and assist fisheries vessels to make and report relevant marine meteorological and ocean observations to the WMO system; and, as appropriate, work with other JCOMM expert teams to develop climate services for fisheries based on the available marine climate data;
- (b) To review and evaluate the effects of climate and climate variability on seasonal to decadal time scales on fisheries;
- (c) To evaluate and document currently available information on the impacts of climate change on fisheries;
- (d) To identify risk assessment or management evaluation tools that incorporate climate variability in order to improve the sustainable management of fisheries;
- (e) To review the effects of agricultural practices on coastal fisheries;
- (f) To submit reports in accordance with timetables established by the OPAG/PA Coordination Group and/or Management Committee of CAgM/JCOMM.



## ANNEX III

to paragraph [7.4.2](#) of the general summaryLIST OF CANDIDATES - WIS DCPC FROM JCOMM<sup>1</sup> AS OF MAY 2012

Member or Organization and Centre	Associated Technical Commission or Constituent Body	Centre's Principal Function	Proposed Principal Associated GISC	Congress Designation	Endorsed by CBS
Australia (Melbourne)	JCOMM	Tsunami Warning Service	Melbourne	Yes (Conditional)	Under Review with GISC Melbourne
Croatia (Zagreb)	JCOMM	Marine Meteorological Centre	WE-VGISC (Offenbach)	Yes (Conditional)	Under review by ET-GDDP
Germany (Hamburg)	JCOMM	Global Collection Centre	WE-VGISC (Offenbach)	Yes	Yes
Qatar	JCOMM	Qatar Meteorological Department DCPC and Gulf Marine Center		No	No
Russian Federation (Obninsk)	JCOMM	NODC and GDC	Moscow	Yes (Conditional)	Not submitted to ET-GDDP
United Kingdom of Great Britain and Northern Ireland (Exeter)	JCOMM	Marine Observations Centre	WE-VGISC Exeter	Yes	Yes
United Kingdom of Great Britain and Northern Ireland (Exeter)	JCOMM	Specialized Ocean and Wave Centre	WE-VGISC Exeter	Yes	Yes
United States of America (Ashville)	CCI	GOSIC	Washington	Yes (Conditional)	Not submitted to ET-GDDP
United States of America (Washington)	JCOMM	NODC	Washington	Yes (Conditional)	Not submitted to ET-GDDP

<sup>1</sup> The complete list is available from <http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=iss-wis-centres>



## ANNEX IV

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to paragraph [12.1.2](#) of the general summary

### EXECUTIVE SUMMARY FOR A STRATEGY FOR JCOMM 2013–2016

The Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) was established by its parent Organizations, the World Meteorological Organization and the Intergovernmental Oceanographic Commission (of UNESCO), in 1999, to coordinate worldwide marine meteorological and oceanographic services and their supporting observational, data management and capacity building programmes.

As expressed in the strategic planning documents of WMO and IOC, urgent social and economic drivers need targeted improvements in weather, climate, water, oceanic and related environmental information and services. At the same time, while the future state of the oceans remains uncertain, there is a need to ensure that society and policymakers are better informed of the impact of oceans on humankind and vice versa. JCOMM has developed a vision, objectives and work programme which respond directly to these considerations.

JCOMM coordinates, and develops and recommends standards and procedures for a fully integrated marine observing, data management and services system that uses state-of-the-art technologies and capabilities; is responsive to the evolving needs of all users of marine data and products; and includes an outreach programme to enhance the national capacity of all maritime countries. The long-term objectives for JCOMM are: (i) to enhance the provision of marine meteorological and oceanographic services; (ii) To coordinate the development, enhancement and delivery of climate services as a contribution to the Global Framework for Climate Services; (iii) to coordinate the enhancement and long-term maintenance of an integrated global marine meteorological and oceanographic observing and data management system, within the context of GOOS and WIGOS/WIS and as a contribution to the GEOSS; and (iv) to manage the evolution of an effective and efficient programme, embracing all maritime Members/Member States.

Fundamental to the Strategic Planning Documents of WMO and IOC are agreed Strategic Priorities, with associated sets of Expected Results and Actions, respectively. The work of JCOMM over the period 2013 to 2016 will contribute to WMO and IOC Strategic Priorities in several overlapping but complementary ways.

During the period 2013–2016, the Commission will leverage on its core competencies to address specific priority areas: GFCS implementation, disaster risk reduction, WIGOS implementation and capacity development. These correspond closely with the organizational priorities specified by WMO and IOC in their respective strategic plans.

The Commission will also give special attention to education and training, and technology transfer initiatives on marine meteorological and oceanographic data, products and services that respond to the needs of, and build capacity in, the developing countries with particular emphasis on the Least Developed Countries (LDC) and Small Island Developing States (SIDS). Additionally, the Commission will support cooperation among WMO, IOC and other UN Agencies that are members of UN-Oceans, the International Hydrographic Organization (IHO), the International Council for Science (ICSU) and other governmental and non-governmental organizations, the private sector as well as user organizations, on matters related to marine meteorology and oceanography.

JCOMM's work will be accomplished through a Management Committee and three programme areas (Observations, Data Management, and Services and Forecasting Systems), and their subsidiary expert and task teams. The JCOMM strategy includes an increased emphasis on communications, both internal within JCOMM and external with marine users, partners and

stakeholders. JCOMM Capacity Development requirements will not be addressed by any single Programme Area but by each Programme Area individually, focussed on its own implementation needs and concerns.

Receiving feedback from marine users is fundamental to the successful implementation of the JCOMM work programme. Some mechanisms to evaluate programme performance and satisfaction of marine users and stakeholders already exist, and strengthened mechanisms will be essential to help provide regular feedback and guide the evolution of JCOMM.

JCOMM has an ambitious and complex work programme. It holds the prospect of considerable potential benefits to all Members/Member States in the long-term operation of a coordinated, integrated, global oceanographic and marine meteorological observing, data management, and forecasting and services system. The implementation of the Commission's work programme will be a long-term, complex process, necessitating a phased, iterative and cost-effective approach over the period.

## APPENDIX I

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### LIST OF PARTICIPANTS

#### 1. Officers of the session

Co-President Peter Dexter (Australia)

#### 2. Representatives of JCOMM Members/Member States

##### Angola

Francisca A.L. Pires Delgado Principal Delegate  
Domingas Nsaku Delegate

##### Argentina

Alicia Guadalupe Cejas Principal Delegate  
Ariel Troisi Delegate

##### Australia

Peter Dexter Principal Delegate  
Neal Moodie Alternate  
Gregory Reed Delegate

##### Azerbaijan

Sahib Khalilov Principal Delegate

##### Bangladesh

M. Alimullah Miyan Principal Delegate

##### Belgium

Michail Myrsilidis Principal Delegate

##### Brazil

Alaor Moacyr Dell' Antonia Junior Principal Delegate  
Emma Giada Matschinske Alternate

##### Bulgaria

Georgi Kortchev Principal Delegate  
Atanas Palazov Alternate

##### Canada

Savithri Narayanan Principal Delegate  
Al Wallace Alternate  
Sylvain de Margerie Delegate  
John Parker Delegate  
Val Swail Delegate

**Chile**

Luis Vidal Lema Principal Delegate

**China**

Hong Wang Principal Delegate  
 Jixin Yu Alternate  
 Zhi Chen Delegate  
 Mingsen Lin Delegate  
 Shaohua Lin Delegate  
 Zhongwen Gao Delegate  
 Jingli Sun Delegate  
 Cuiying Tian Delegate  
 Hua Wang Delegate  
 Hui Wang Delegate  
 Yuan Wang Delegate  
 Aina Wu Delegate  
 Jing Xu Delegate  
 Sheng Xu Delegate  
 Ting Yu Delegate  
 Qin Zeng Delegate  
 Haiying Zhang Delegate

**Croatia**

Ivan Čačić Principal Delegate  
 Krešo Pandžić Delegate  
 Vlasta Tutiš Delegate

**Denmark**

Erik Buch Principal Delegate

**Ecuador**

Edwin Pinto Uscocovich Principal Delegate  
 Carlos Zapata Cortez Delegate

**Egypt**

Mohammed Ismail Mohammed Moustafa Principal Delegate  
 Adel Ahamd Mohamed Mosbah Alternate

**Finland**

Marja Aanio-Frisk Principal Delegate  
 Kimmo Tikka Delegate

**France**

Laurent Perron Principal Delegate

**Germany**

Bernd Brügge Principal Delegate  
 Gudrun Rosenhagen Delegate



**Greece**

Michail Myrsilidis  
Athanasia Iona

Principal Delegate  
Delegate

**Hong Kong, China**

Hing-yim Mok

Principal Delegate

**India**

Gopalakrishna Vissa

Principal Delegate

**Indonesia**

Nelly Forida Riama  
Juriani Nurhayati

Principal Delegate  
Delegate

**Ireland**

Trevor Guymmer

Principal Delegate

**Italy**

Nadia Pinardi  
Giovanni Coppini  
Gabriele Nardone  
Fabio Raicich

Principal Delegate  
Delegate  
Delegate  
Delegate

**Japan**

Hideyuki Sasaki  
Yoshiaki Kanno  
Nadao Kohno  
Satoshi Ogawa

Principal Delegate  
Alternate  
Delegate  
Delegate

**Kuwait**

Khaled Al-Banaa

Principal Delegate

**Libya**

Eshtewi Rabha

Principal Delegate

**Malaysia**

Lim Ze Hui

Principal Delegate

**Mauritius**

Mohamudally Beebeejaun

Principal Delegate

**Mexico**

Miguel Angel Reyes Martinez  
Carlos Rodolfo Torres Navarrete

Principal Delegate  
Delegate

**New Zealand**

Peter Kreft Principal Delegate

**Nigeria**

Juliana E. Ukeje Principal Delegate  
Louis E. Edafienene Alternate

**Peru**

Atilio Aste Evans Principal Delegate

**Portugal**

Carlos Ventura Soares Principal Delegate

**Republic of Korea**

Goan-Young Park Principal Delegate  
Jang-Won Seo Alternate  
Sung-Hyup You Delegate  
Ji-Eun Seo Delegate  
Myoung-Hwan Ahn Delegate  
Yongseob Lee Delegate  
Yong-Seong Kang Delegate  
Eun-Young Kim Delegate  
Young-Sang Suh Delegate  
Joon-Soo Lee Delegate  
Young Huh Delegate  
Seok Jae Kwon Delegate  
Moon Sik Suk Delegate

**Russian Federation**

Valeriy Martyschenko Principal Delegate  
Boris Kubay Delegate  
Nikolai Mikhailov Delegate  
Alexander Postnov Delegate  
Vasily Smolyanitskiy Delegate  
Alexander Studenetskiy Delegate

**Saudi Arabia**

Badee Ali Khayyat Principal Delegate

**Slovenia**

Ivan Čačić Principal Delegate

**Singapore**

Peter Dexter Principal Delegate

**South Africa**

Johan Stander Principal Delegate

**Sweden**

Irène Lake	Principal Delegate
Patrick Gorringe	Alternate

**Thailand**

Songkran Agsorn	Principal Delegate
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**Togo**

Adoté Blim Blivi	Principal Delegate
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**Turkey**

Ömer Polatkan	Principal Delegate
Yüksel Yağan	Alternate

**United Kingdom of Great Britain and Northern Ireland**

Trevor Guymer	Principal Delegate
Jon Turton	Alternate
Nick Ashton	Delegate
David Meldrum	Delegate

**United Republic of Tanzania**

Agnes Kijazi	Principal Delegate
Michael John Likunama	Alternate

**United States of America**

Margarita Gregg	Principal Delegate
Candyce Clark	Delegate
Richard Crout	Delegate
Ming Ji	Delegate
Jennifer Lewis	Delegate
Kevin R. Schexnayder	Delegate
Scott Woodruff	Observer

**3. Scientific lecturers**

Neville Smith	Australia
Won-Tae Kwon	Republic of Korea

**4. Representatives of International Organizations****European Global Ocean Observing System (EuroGOOS)**

Hans Dahlin

**European Environment Agency (EEA)**

Giovanni Coppini  
Nadia Pinardi

## International Union of Geodesy and Geophysics (IUGG)

Stefania Sparnocchia

## European Meteorological Network (EUMETNET)

Steven Noyes

### 5. Other Meeting Attendees

Abdulla All-Mannai	(Qatar)
Yongsoo Gang	(Republic of Korea)
Won-Suk Han	(Republic of Korea)
Sung Doo Hong	(Republic of Korea)
Muna Husain	(Kuwait)
Hyohyuc Im	(Republic of Korea)
Sung-Tae Jang	(Republic of Korea)
Kwi-jun Jeong	(Republic of Korea)
Ning Jia	(China)
Eui Sik Jung	(Republic of Korea)
Moon-Seon Kang	(Republic of Korea)
Seonghwa Kang	(Republic of Korea)
Tae-Soon Kang	(Republic of Korea)
Dee Hyuan Kim	(Republic of Korea)
Won-Tae Kwon	(Republic of Korea)
Byung-Gul Lee	(Republic of Korea)
Yongkook Lee	(Republic of Korea)
Byunghwan Lim	(Republic of Korea)
Ali Juma Mafimbo	(Kenya)
Hong Bae Moon	(Republic of Korea)
Soo-Yong Nam	(Republic of Korea)
Min Oh	(Republic of Korea)
Han Won-Suk	(Republic of Korea)
Seung-Buhm Woo	(Republic of Korea)
Jing Xu	(China)

### 6. IOC Officer

Sang-Kyung Byun	Chair
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## APPENDIX II

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### AGENDA

- 1. OPENING OF THE SESSION**
- 2. ORGANIZATION OF THE SESSION**
  - 2.1 Consideration of the report on credentials
  - 2.2 Adoption of the agenda
  - 2.3 Establishment of committees
  - 2.4 Other organizational matters
- 3. REPORT BY THE CO-PRESIDENTS OF THE COMMISSION**
- 4. REVIEW OF DECISIONS OF THE GOVERNING BODIES OF WMO AND IOC RELATED TO THE COMMISSION**
- 5. SCIENTIFIC AND OPERATIONAL REQUIREMENTS**
  - 5.1 GOOS-GCOS requirements for climate observations
  - 5.2 Operational requirements and WMO rolling review of requirements
  - 5.3 Requirements for Integrated Data Products
  - 5.4 Climate services
  - 5.5 Others
- 6. IN-SITU AND SATELLITE OBSERVING SYSTEMS**
  - 6.1 JCOMM OPA implementation goals
  - 6.2 Instruments and Methods of Observation
  - 6.3 Coordinated technical support for observing programmes
  - 6.4 Future priority for the Observation Programme Area (OPA)
- 7. DATA MANAGEMENT, INCLUDING INFORMATION SYSTEMS AND DATA EXCHANGE**
  - 7.1 Standard setting and documentation
  - 7.2 Marine Climatology, including New Marine Climate Data System
  - 7.3 Data Management practices
  - 7.4 WIS and designation of DCPCs
  - 7.5 Future priority for the Data Management Programme Area (DMPA)
- 8. MARINE METEOROLOGICAL AND OCEANOGRAPHIC SERVICES AND FORECASTING SYSTEMS**
  - 8.1 Forecasting Systems and Services
  - 8.2 Supports for Disaster Risk Reduction, particularly in coastal zones
  - 8.3 Safety-related Marine Meteorological Services
  - 8.4 Quality Management
  - 8.5 Future priority for the Services and Forecasting Systems Programme Area (SFSPA)
- 9. CAPACITY DEVELOPMENT AND TECHNOLOGY TRANSFER**
- 10. REVIEW OF TECHNICAL REGULATIONS OF INTEREST TO THE COMMISSION, INCLUDING GUIDES AND OTHER TECHNICAL PUBLICATIONS**

**11. RELATIONSHIP WITH OTHER PROGRAMMES AND BODIES**

- 11.1 Programmes and bodies of WMO and IOC
  - 11.1.1 Other WMO Technical Commissions and Programmes
  - 11.1.2 Other IOC Programmes
- 11.2 Organizations and bodies
  - 11.2.1 UN system agencies
  - 11.2.2 Non-UN system organizations and Programmes
  - 11.2.3 Industry and commerce
  - 11.2.4 Other

**12. JCOMM PROGRAMME AND PLANNING**

- 12.1 WMO and IOC Strategic Planning and the JCOMM Strategy
- 12.2 Future work programme and operating plan
- 12.3 Review of previous resolutions and recommendations of the Commission and of relevant resolutions of the governing bodies of WMO and IOC
- 12.4 Establishment of groups and expert teams and nomination of rapporteurs
- 12.5 Date and place of the fifth session

**13. SCIENTIFIC AND TECHNICAL WORKSHOP - IMPROVING MARINE AND OCEAN DATA PRODUCTS FOR SCIENCE AND SOCIETY: THE ROLE OF JCOMM****14. ELECTION OF OFFICERS****15. CLOSURE OF THE SESSION**

## APPENDIX III

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### LIST OF ABBREVIATIONS AND ACRONYMS

AARI	Arctic and Antarctic Research Institute (Russian Federation)
ABCD	Access to Biological Collection Data
ABE-LOS	IOC Advisory Body on the Law of the Sea
ACCC	Adaptation to Climate Change in the Coastal Zones of West Africa Project
ACCESS	African Centre for Climate and Earth System Science
ACMAD	African Centre of Meteorological Applications for Development (Niamey, Niger)
ACSYS	Arctic Climate System Study
ACT	Alliance for Coastal Technologies
ADCP	Acoustic Doppler Current Profiler
ADOS	Autonomous Drifting Ocean Station
AG	DBCP Action Groups
AIC	Argo Information Center
ALD	UNESCO Appointment of Limited Duration
AMDAR	Aircraft Meteorological Data Relay
AMOC	Area Meteorological and Oceanographic Coordinators
AMSA	Arctic marine Shipping Assessment
AoA	Assessment of Assessments
AODCJF	Australian Ocean Data Centre Joint Facility
AOF	Arctic Observing Forum
AOML	NOAA Atlantic Oceanographic and Meteorological Laboratory (USA)
AOPC	Atmospheric Observation Panel for Climate
AP	Air Pressure
AR	Assessment Report
Argo	Array for Real-time Geostrophic Oceanography programme
Argo	Argo Profiling Float Pilot Project
ASAP	As Soon As Possible
ASAP	Automated Shipboard Aerological Programme
ASCLME	Agulhas and Somali Current Large Marine Ecosystem
AS/NZS	Australian and New Zealand Standard for Occupational Health and Safety Management Systems
ASPeCT	Antarctic Sea Ice Processes & Climate
AST	Argo Steering Team
ATOVS	Advanced TIROS operational vertical sounder (Satellite)
AWS	Automatic Weather Stations
BATHY	Report of bathythermal observation (FM 63–XI Ext. BATHY)
BCLME	Benguela Current Large Marine Ecosystem
BILKO	UNESCO Virtual global faculty for remote sensing
BM	Background Material
BODC	British Oceanographic Data Centre
BOM	Bureau of Meteorology (Australia)
BSIM	Baltic Sea Ice Meeting
BUFR	Binary Universal Form for Representation of Meteorological Data
CACGP	International Commission on Atmospheric Chemistry and Global Pollution
CADC	China Argo Data Centre
CAeM	Commission for Aeronautical Meteorology
CAgM	Commission for Agricultural Meteorology

Cal/Val	Calibration/Validation
CARIBE-EWS	Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions
CARTWS	Caribbean Tsunami Warning System
CAS	Commission for Atmospheric Sciences (WMO)
CASO	Climate of Antarctica and the Southern Ocean
CB	Capacity Building
CBD	Convention on Biological Diversity
CBS	Commission for Basic Systems (WMO)
CCI	Commission for Climatology (WMO)
CCLME	Canary Current Large Marine Ecosystem
CDI	SeaDataNET Common Data Index
CDMP	NOAA Climate Database Modernization Program
CEOS	Committee on Earth Observation Satellites
Cg	Congress (WMO)
CGMS	Coordination Group for Meteorological Satellites
CGPS	GPS at Tide Gauges
CHAMP	CHALLENGING Mini-Satellite Payload
ChloroGIN	Chlorophyll Ocean Global Integrated Network
CHMI	Czech Hydrometeorological Institute
CHy	Commission for Hydrology (WMO)
CIFDP	Coastal Inundation Forecasting Demonstration Project (JCOMM, CHy)
CIMO	Commission for Instruments and Methods of Observation (WMO)
CIS	Canadian Ice Service
cliC	Climate and Cryosphere (WCRP)
CLIMAR	Workshop on Advances in Marine Climatology (JCOMM)
CLIMAT	Report of monthly means and totals from a land station
CLIMAT TEMP	Report of monthly means and totals from an ocean weather station
CLIVAR	Climate Variability and Predictability programme (WCRP)
CIMDEV	Climate for Development in Africa
CLS	Collecte Localisation Satellites (France)
CM	MCSS Contributing Member
CM	Consultative Meeting for High-Level Policy on Satellite Matters
CMIP	Coupled Model Intercomparison Projects (WVRP)
CMM	Commission for Marine Meteorology (superseded by JCOMM)
CMOC	Centres for Marine Meteorological and Oceanographic Climate
COCOS	EU Carbon Observing System Coordination
CODATA	Committee on Data for Science and Technology
COMET	Cooperative Programme for Operational Meteorology, Education and Training
COMSAR	Sub-Committee on Radiocommunications and Search and Rescue (IMO)
CONOPS	WIGOS Concept of Operations
COOP	Coastal Ocean Observations Panel
COP	Conference of Parties
COPEPOD	Coastal & Oceanic Plankton Ecology, Production & Observation Database
COPES	Coordinated Observation and Prediction of the Earth System
CORE	Coordinated Ocean-ice Reference Experiment
COWCLIP	Coordinated ocean Wave Climate Projections
CPPS	Comision Permanente del Pacifico Sur
CPR	Continuous Plankton Recorders
CPRNW	Committee for Promulgation of Radio Navigational Warnings (IHO)
CRC	Cyclic Redundant checks
CREX	Character form for the Representation and exchange of Data (FM 95–XII CREX)



CRP	Coordinated Research Project
CSA	Canadian Space Agency
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSW	Catalogue Search for the Web
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
CTD	Conductivity, Temperature and Depth
CWP	Community White Paper
DAC	Data Assembly Centre
DAMOCLES	Developing Arctic Modelling and Observing Capabilities for Long-term Environmental Studies
DAR	Data Discovery, Access and Retrieval service (WMO/WIS)
DAR	Data Discovery, Access and Retrieval
DART	Deep-ocean Assessment and Reporting of Tsunami (buoy)
DB	Data Buoy
DBCP	Data Buoy Cooperation Panel (WMO-IOC)
DB-TAG	E-SURFMAR Data Buoy Technical Advisory Group
DCPC	Data Collection and Production Centres (WMO/WIS)
DCS	Data Collection System
DHA	UN Department of Humanitarian Assistance
DiGIR	Distributed Generic Information Retrieval
DM	Data Management
DMAC	IOOS Data Management and Communications (USA)
DMCG	Data Management Coordination Group (JCOMM)
DMP	Data Management Practices
DMPA	Data Management Programme Area (JCOMM)
DMQC	Data Management Quality Control
DOI	Digital Object Identifier
DORIS	Doppler Orbitography Integrated by Satellite
DRA	Development and Regional Activities
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DUE	Data User Element
DWD	Deutscher WetterDienst
E2E	End-to-End Data Management
E2EDM	End-to-End Data Management
EB	DBCP Executive Board
EBD	Equivalent Buoy Density
EC	Executive Council
EC	European Commission
EC WG WIGOS-WIS	Executive Council working Group on WIGOS and WIS (WMO)
ECDIS	Electronic Chart Display Information System
ECMWF	European Centre for Medium-Range Weather Forecasts
EC-PORS	Executive Council Panel on Polar Observations, Research and Services (WMO)
ECV	Essential Climate Variables
EDIOS	European Directory for Initial Ocean and Observing Systems
EDMED	European Directory of Marine Environmental Data
EEA	European Environment Agency
EEZ	Exclusive Economic Zone
EGC	Inmarsat Enhanced Group Call
EGOS-IP	Implementation Plan for the Evolution of Global Observing Systems
EMSA	European Maritime Safety Agency
ENC	Electronic Navigational Charts

ENSO	El Niño/Southern Oscillation
EO	Earth Observation
EOS	Earth Observation Summit
EOV	Essential Ocean Variable
EPAC	CAS Environmental Pollution and Atmospheric Chemistry (WMO)
EPS	Ensemble Prediction System
ER	Expected Results
ERA	Emergency Response Activities (WMO)
ESA	European Space Agency
E-ASAP	European Automated Shipboard Aerological Programme
E-SURFMAR	Surface Marine programme of the Network of European Meteorological Services, EUMETNET
ESSP	Earth System Science Partnership
ET	Expert Team
ET/AWS	CBS/IOS Expert Team on Requirements for Data from Automatic Weather Stations (WMO)
ET/DRC	CBS Expert Team on Data Representation and Codes (WMO)
ET/EGOS	CBS/IOS Expert Team on the Evolution of the Global Observing System (WMO)
ETCCDI	Joint CLIVAR/CCI/JCOMM Expert Team on Climate Detection and Indices
ET-CTS	CBS Expert Team on WIS-GTS, Communication Techniques and Structure (WMO)
ETDMP	Expert Team on Data Management Practices (JCOMM)
ET-DRC	CBS Expert Team on Data Representation and Codes (WMO)
ET-EGOS	CBS Expert Team on the Evolution of the Global Observing System (WMO)
ET-ELRF	Expert Team for Extended Long-Range Forecasting
ETMAES	Expert Team on Marine Accident Emergency Support (JCOMM)
ETMC	Expert Team on Marine Climatology (JCOMM)
ETMSS	Expert Team on Maritime Safety Services (JCOMM)
ETOOFS	Expert Team on Operational Ocean Forecast System (JCOMM)
ETRP	Education and Training Programme (WMO)
ET-SAT	CBS Expert Team on Satellite Systems (WMO)
ETSI	Expert Team on Sea Ice (JCOMM)
ET-SUP	CBS Expert Team on Satellite Utilization and Products (WMO)
ETWCH	Expert Team on Waves and Coastal Hazards Forecast Systems (formally ETWS)
ET-WISC	CBS Expert Team on WIS GISCS and DCPCs (WMO)
ETWS	Expert Team on Wind Waves and Storm Surges (JCOMM)
EUCOS	EUMETNET Composite Observing System
EUMETNET	Network of European Meteorological Services
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EuroGOOS	European GOOS
EuroSITES	European integrated network of open ocean multidisciplinary observatories
EVC	Essential Climate Variable
E/W	East/West
EWS	Early Warning System
FAD	Fish Aggregation Device
FAO	Food and Agriculture Organization
FG	First Guess Field
FGDC	Federal Geographic Data Committee (USA)
FTP	File Transfer Protocol
GAW	Global Atmosphere Watch
GCC	Global Collecting Centre (of MCSS)
GCLME	Guinea Current Large Marine Ecosystem

GCMD	Global Change Master Directory
GCN	GLOSS Core Network
GCOS	Global Climate Observing System
GCOS-IP	Global Climate Observing System Implementation Plan
GCW	Global Cryosphere Watch
GDAC	Global Data Assembly/Acquisition Centre
GDAC-DB	Global Data Assembly/Acquisition Centre for Drifting Bouys
GDP	Global Drifter Programme
GDPFS	CBS Global Data Processing and Forecasting System (WMO)
GDSIDB	Global Digital Sea Ice Data Bank
GEBCO	General Bathymetric Chart of the Oceans
GE-BICH	Group of Experts on Biological and Chemical Data Management and Exchange Practices
GEF	Global Environment Facility
GEO	Group on Earth Observations
GEOHAB	Marine Geological and Biological Habitat Mapping
GEOSS	Global Earth Observation System of Systems
GEWEX	Global Water Cycle Experiment
GESAMP	Group of Experts on Scientific Aspects of Marine Environmental Protection
GFCS	Global Framework for Climate Services
GFO3	Geosat Follow-On 3
GFZ	GeoForschungsZentrum Potsdam
GGODS	Global Open Oceans and Deep Seabed
GHRSSST	GODAE High Resolution SST
GIS	Geographical Information System
GISC	Global Information System Centres (WMO/WIS)
GLOBEC	Global Ocean Ecosystem Dynamics
GLOSS	Global Sea-level Observing System
GLOSS-GE	GLOSS Group of Experts
GMDSS	Global Maritime Distress and Safety System (IMO)
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigations Satellite Systems
GNWP	Global Numerical Weather Prediction
GOCE	Gravity field and steady-state Ocean Circulation Explorer
GODAE	Global Ocean Data Assimilation Experiment (GOOS)
GODAR	Global Oceanographic Data Archaeology and Rescue
GOHWMS	Global Tsunami and other Ocean-related Hazards Early Warning and Mitigation System (IOC)
GOOS	Global Ocean Observing System (IOC-WMO-UNEP-ICSU)
GOS	Global Observing System (WMO)
GO-SHIP	Global Ocean Shipbased Hydrographic Investigations Panel
GOSUD	Global Ocean Surface Underway Data Pilot Project
GOV	GODAE Ocean View
GOVST	GODAE Ocean View Science Team
GPS	Global Positioning System
GRA	GOOS Regional Alliance
GRACE	Gravity Recovery and Climate Experiment
GRAME	Global and Regional Assessments of the Marine Environment
GRAMED	Global and Regional Assessments of the Marine Environment Database
GRF	GOOS Regional Forum
GSC	GOOS Steering Committee
GSICS	Global Space-based Inter-Calibration System
GSN	Global Societal Needs

GSOP	CLIVAR's Global Synthesis and Observations Panel
GSSC	GOOS Scientific Steering Committee
GTN-R	GCOS Global Terrestrial for River Discharge
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunication System (WMO/WWW)
GTSP	Global Temperature and Salinity Profile Programme
GUAN	GCOS Upper-Air Network
HAB	Harmful Algal Bloom (IOC)
HARON	Hydrological Applications and Run-Off Network
HF	High Frequency
HFA	Hyogo Framework for Action 2005-2015
HMEI	Association of Hydro-Meteorological Equipment Industry
HPTE	High Profile Training Event
HQ-GDMSC	High Quality Global Data Management System for Climate
HSST	Historical Sea Surface Temperature
HY-2A	Hai Yáng-2A (Space Mission)
IABP	International Arctic Buoy Programme
IAEA	International Atomic Energy Agency
IAEA-MEL	IAEA Marine Environment Laboratories
IAOOS	Integrated Arctic Ocean Observing System
IASC	International Arctic Science Committee
IAW	Interactive Weather Analysis
IBPIO	International Buoy Programme for the Indian Ocean
ICAM	Integrated Coastal Area Management
ICAO	International Civil Aviation Organization
ICES	International Council for the Exploration of the Sea
ICG	Intergovernmental Coordination Group
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (IOC)
ICG/TEWS	Intergovernmental Coordination Group of the Tsunami Early Warning and Mitigation Systems
ICG-WIGOS	Inter-Commission Coordination Group on WMO Integrated Global Observing System
ICG-WIS	Inter-commission Coordination Group on the WMO Information System
ICOADS	International Comprehensive Ocean-Atmosphere Data Set (USA)
ICS	International Chamber of Shipping
ICSU	International Council for Science
ICT-IOS	CBS Implementation-Coordination Team on the Integrated Observing System
ICTT-QMF	Inter Commission Task Team on Quality Management Framework (WMO)
ID	Identification Number
IEC	International Electrotechnical Commission
IFREMER	Institut français de recherche pour l'exploitation de la mer – French Research Institute for Exploitation of the Sea
IFSMA	International Federation of Shipmasters' Associations
IGBP	International Geosphere-Biosphere Programme
IGDDS	Integrated Global Data Dissemination Service (satellite)
IGFA	International Group of Funding Agencies for Global Change Research
I-GOOS	The intergovernmental IOC-WMO-UNEP Committee for GOOS
IGOS	Integrated Global Observing Strategy
IGOS-Cryo	Integrated Global Observing Strategy Theme on Cryosphere
IGOSS	WMO-IOC Integrated Global Ocean Services System (superseded by JCOMM)
IGS	International GNSS Service

IGST	International GODAE Steering Team
IHB	International Hydrographic Bureau
IHO	International Hydrographic Organization
IICWG	International Ice Charting Working Group
IMB	Ice Mass Balance
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research
IMEI	International Mobile Equipment Identity
IMMA	International Maritime Meteorological Archive
IMMSC	International Met-ocean Maritime Services Conference
IMMT	International Maritime Meteorological Tape
IMO	International Maritime Organization
IMOP	Programme for Instruments and Methods of Observation (WMO)
IMOS	Integrated Marine Observing System
IMSC	International Met-ocean Safety Conference
IMSO	International Mobile Satellite Organization
INCOIS	Indian National Centre for Ocean Information Services
INGV	National Earthquake Centre (Rome, Italy)
Inmarsat	International Maritime Satellite Organization
INSPIRE	Infrastructure for Spatial Information in Europe
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IOCCP	International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange (IOC)
IOH	Institute of Hydrology
IOI	International Ocean Institute
IOOS	Integrated Ocean Observing System (USA)
IOS	Integrated Observing Systems
IOTWS	Indian Ocean Tsunami Warning and Mitigation System (IOC)
IP	Implementation Plan
IPAB	International Programme for Antarctic Buoys
IPCC	Intergovernmental Panel on Climate Change (WMO, UNEP)
IPET-MI	CBS Inter Programme Expert Team on Metadata Implementation (WMO)
IPY	International Polar Year (2007-2008)
IR	Infrared
ISABP	International South Atlantic Buoy Programme
ISDM	Integrated Science Data Management (Canada, formerly MEDS)
ISDR	International Strategy for Disaster Risk Reduction
ISO	International Organization for Standardization
IT	Information Technology
ITP	International Tsunameter Partnership
ITRF	International Terrestrial Reference Frame
ITSU	International Coordination Group for the Tsunami Warning System in the Pacific (IOC)
ITU	International Telecommunication Union
IUCN	International Union for Conservation of Nature
IUGG	International Union of Geodesy and Geophysics
IVAD	ICADS Value-Added Database
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JC	Joint Committee
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM in situ Observing Platform Support Centre
J-EPB	JCOMM Electronic Product Bulletin
JMA	Japan Meteorological Agency

JPOI	Johannesburg Plan of Implementation
JSC/CAS	WCRP Joint Scientific Committee (JSC) and the WMO Commission for Atmospheric Sciences (CAS)
JSTC	Joint Steering Committee
JTA	Joint Tariff Agreement (Argos)
KMA	Korean Meteorological Administration
KORDI	Korea Ocean Research and Development Institute
LAM	Limited Area Model
LC/LP	London Convention/London Protocol
LDC	Least Developed Country
LEO	Low Earth Orbiting
LME	Large Marine Ecosystem
LOI	Letters of Intent
LTT	Long-term Time series
LUT	Local User Terminal (Argos)
MAES	Marine Accident Emergency Support
MAN	Management Committee (JCOMM)
MAP	Madrid Action Plan
MARCDAT	Workshop on Advances in the Use of Historical Marine Climate Data
MARPOL	International Convention for the Prevention of Pollution from Ships
M&E	Monitoring and Evaluation
MC	Marine Climatology
MCDS	Marine Climate Data System
MCP	Marine Community Profile
MCS	Marine Climatological Summary
MCSS	Marine Climatological Summaries Scheme
MedGOOS	Mediterranean GOOS
MEDI	Marine Environmental Data Information Referral Catalogue
MEDS	Marine Environmental Data Service (Canada, now ISDM)
MEOP	Marine Mammal Exploration of the Oceans Pole to Pole
MEPC	Marine Environment Protection Committee (IMO)
MERSEA	Marine Environment and Security for the European Area
MESL	Environmental Studies Laboratory
METAREA	Meteorological Area
META-T	Water Temperature instrument/platform Metadata Pilot Project (JCOMM)
METOP	Meteorological Operational satellites of the EUMETSAT Polar System (EPS)
MIM	MERSEA Information Management
MIO	Marine Information Objects
MMI	Marine Metadata Interoperability Project
MMSM	Marine Meteorological Services Monitoring
MOC	Meridional Overturning Circulation
MOFS	Met-Ocean Forecasts and Services
MOU	Memorandum of Understanding
MPERSS	Marine Pollution Emergency Response Support System (JCOMM)
MR	Meeting Report
MQCS	Minimum Quality Control Standards
MSC	Maritime Safety Committee (IMO)
MSC	Meteorological Services of Canada
MSI	Maritime Safety Information
MSS	Maritime Safety Services
MT10	BUFR Master Table number 10 (Oceanographic Data)
NASA	National Aeronautics and Space Administration
NAVOCEANO	Naval Oceanographic Office (USA)

NAVTEX	International system for reception of marine safety information
NBDP	Narrow-Band Direct-Printing
NC	National Centres (WMO/WIS)
NCAR	National Center for Atmospheric Research
NCDC	National Climatic Data Centre (USA)
NCDDC	NOAA National Coastal Data Development Center (USA)
NCEP	NOAA National Center for Environmental Prediction (USA)
NCOSM	National Centre of Ocean Standards and Metrology
NCT	National Coordination Team
NDACC	Network for the Detection of Atmospheric Composition Change
NDBC	NOAA National Data Buoy Center (USA)
NDG	NERC DataGrid
NEAMTWS	North Eastern Atlantic, the Mediterranean and connected seas Tsunami Warning System (IOC)
NERC	Natural Environment Research Council
NESDIS	NOAA National Environmental Satellite Data and Information Service (USA)
NetCDF	Network Common Data Form
NFP	National Focal Point
NGO	Non-Governmental Organization
NIOT	National Institute of Ocean Technology (India)
NMA	National Administration of Morocco
NMDIS	National Marine Data and Information Service (China)
NMHS	National Meteorological (and Hydrological) Service
NMS	National Meteorological Service
NOAA	National Oceanic and Atmospheric Administration (USA)
NODC	IODE National Oceanographic Data Centre (IOC)
NOP	Numerical Ocean Prediction
NPDBAP	DBCP-PICES North Pacific Data Buoy Advisory Panel
NPOESS	National Polar-orbiting Operational Environmental Satellite System (USA)
NPP	Nuclear Power Plant
NSF	National Science Foundation (USA)
NSIDC	National Snow and Ice Data Centre (USA)
NTC	National Tidal Centre (Bureau of Meteorology, Australia)
NW	North-Western
NW/E	North/West/East
NWP	Numerical Weather Prediction
NWS	National Weather Service (USA)
OASIC	International multidisciplinary Ocean - Atmosphere - Sea Ice - Snowpack programme
OBIS	Ocean Biogeographical Information System
OBS	Observations Department (WMO)
OC	Ocean Colour
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	Observations Coordination Group (JCOMM)
OCO	NOAA Office of Climate Observation (USA)
ODAS	Ocean Data Acquisition Systems, Aids and Devices
ODASMS	ODAS Metadata Service (JCOMM)
ODIN	Oceanographic Data and Information Network (IODE of IOC)
ODINAFRICA	Ocean Data and Information Network for Africa (IODE of IOC)
ODINBlackSea	ODIN for the Black Sea (IODE of IOC)
ODINCARSA	ODIN for the Caribbean and South America (IODE of IOC)

ODP	Ocean Data Portal (IODE of IOC)
ODS	IODE-JCOMM Ocean Data Standards Pilot Project
OGC	Open Geospatial Consortium
OGP	International Association of Oil and Gas Producers
OIT	Ocean Information Technology Pilot Project
OOFS	Operational Ocean Forecasting Systems (JCOMM)
OOPC	Ocean Observations Panel for Climate (GCOS-GOOS-WCRP)
OPA	Observations Programme Area (JCOMM)
OPA-IG	Observations Programme Area Implementation Goals
OPAG	Open Programme Area Group
OPeNDAP	Open-source Project for a Network Data Access Protocol
OPRC-HNS	Oil Pollution Preparedness, Response and Cooperation – Hazardous and Noxious Substances (IMO)
OPSC	Observing Programme Support Centre
OPSCOM	Argos Operations Committee
OSCAR	Ocean Surface Current Analyses – Real-time
OSE	Observing System Experiment
OSMC	NOAA Observing System Monitoring Center (USA)
OSSE	Observing System Simulation Experiment
OST	Ocean Surface Topography
OSTM	Ocean Surface Topography Mission (Jason-2)
OSTST	Ocean Surface Topography Science Team
OT	OceanTeacher
OVWST	Ocean Vector Winds Science Team
PA	Programme Area (JCOMM)
PANGEA	Partnerships for New GEOSS Applications
PGC	Principal GTS Co-ordinator (DBCP)
PIC	Pacific Island Country
PIC	Polar Information Commons
PICES	North Pacific Marine Science Organization
PICO	Panel for Integrated Coastal Observations (IOC)
PIRATA	Pilot Research Moored Array in the Tropical Atlantic
PMEL	NOAA Pacific Marine Environmental Laboratory (USA)
PMO	Port Meteorological Officer
PMOC	Principal Meteorological or Oceanographic Centres responsible for quality control of buoy data (DBCP)
PMT	Platform Messaging Transceivers
PO	Project Office
POGO	Partnership for Observation of the Global Oceans
POL	Proudman Oceanographic Laboratory (UK)
PP	Pilot project
PP-JSG	Pilot project Joint Steering Group
PP-WET	Pilot Project on Wave measurement Evaluation and Test from moored buoys (JCOMM)
PP-WMD	Pilot Project on Wave Measurement from Drifters (JCOMM)
PRNW	IHO Sub-Committee for Promulgation of Radio Navigational Warnings (IHO)
PSG	Project Steering Group
PSMSL	Permanent Service for Mean Sea Level
PTC	Meeting of the Presidents of Technical Commissions
PTT	Platform Transmitter Terminal (Argos)
PTWS	Pacific Tsunami Warning System (IOC)
PWS	Public Weather Services (WMO)
QA	Quality Assurance



QARTOD	Quality Assurance of Real-Time Oceanographic Data
QC	Quality Control
QMF	Quality Management Framework (WMO)
QMS	Quality Management Systems
RA	Regional Association (WMO)
RADAR	Radio Detection and Ranging
RAMA	Indian Ocean Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction
RARS	Regional ATOVS Retransmission System
R&D	Research and Development
RBM	Results-based Management
RECLAIM	REcovery of Logbooks And International Marine data project
REOS	CLIVAR Repository for Evaluating Ocean Simulations
RIC	Regional Instrument Centre
RM	MCSS Responsible Member
RMIC	Regional Marine Instrument Centre
RMS	Root Mean Square
RNODC	Responsible National Oceanographic Data Centre (IODE of IOC)
RNODC/DB	Responsible National Oceanographic Data Centre for Drifting Buoys (IODE of IOC)
RNWP	Regional Numerical Weather Prediction
ROOS	Regional Ocean Observing System
RRC	Regional Radiation Centre
RRR	CBS Rolling Review of Requirements (WMO)
RSMC	Regional Specialized Meteorological Centre (WMO)
R/SSC-CM	Regional Specialized Satellite Centres for Climate Monitoring
RTC	Regional Training Centre
R/V	Research Vessels
SADC	South African Development Community
SAMOS	Shipboard Automated Meteorological and Oceanographic System
SAMS	Scottish Association for Marine Science
SAON	Sustaining Arctic Observing Networks
SAON-IG	Sustaining Arctic Observing Networks Initiating Group
SAR	Search and Rescue
SAR	Synthetic Aperture Radar
SAT	Site Acceptance Test
SAWS	South African Weather Service
SBA	Societal Benefit Area
SBD	Short Burst Data
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCAR	Scientific Committee on Antarctic Research (ISCU)
SCG	Services Coordination Group (JCOMM)
SCOPE-CM	Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring
SCOR	Scientific Committee on Ocean Research
SDR	Satellite Data Requirements
SeaDataNET	Pan-European infrastructure for Ocean & Marine Data Management
SEARCH	US Study of Environmental Arctic Change
SEAS	Shipboard Environmental (data) Acquisition System (NOAA)
SEREA	Scientific Educational Resources and Experience Associated with the Deployment of Argo
SFSPA	Services and Forecasting Systems Programme Area
SG	Steering Group

SG-MEDI	Steering Group for MEDI (IODE of IOC)
SG-ODSPP	Steering Group for the Ocean Data Standards Pilot Project (JCOMM)
SHOM	Service Hydrographique et Océanographique de la Marine (France)
SI	Sea Ice
SI	System of Units
SIAF	Seasonal to Inter-annual Forecast
SIDS	Small Island Developing State
SIGRID	Sea Ice Grid (WMO)
SIO	Scripps Institution of Oceanography (University of California, USA)
SL	Sea Level
SLP	Sea Level Pressure
SOA	State Oceanic Administration
SOBP	Southern Ocean Buoy Programme
SOC	Southampton Oceanographic Centre
SOC	Specialized Oceanographic Data Centre (of former IGOSS, now JCOMM)
SOCAT	Surface Ocean CO <sub>2</sub> Atlas Project
SOG	Statements of Guidance
SOLAS	International Convention for the Safety of Life at Sea
SOLAS	Surface Ocean-Lower Atmosphere Study
SOO	Ship Of Opportunity
SOOP	Ship-Of-Opportunity Programme
SOOPIP	Ship-of-Opportunity Programme (SOOP) Implementation Panel (JCOMM)
SOOS	Southern Ocean Observing System
SOP	Standard operating procedure
SOT	Ship Observations Team (JCOMM)
SP	Strategic Plan
SPA	Services Programme Area (JCOMM)
SRU	Search and retrieval via URL
SSH	Sea surface Height
SSM/I	Special Sensor Microwave Imager
SSO	Single Sign On
SSS	Sea Surface Salinity
SST	Sea-Surface Temperature
SSWS	Storm Surge Watch Scheme
ST	Strategic Thrusts
STIP	Stored Tiros Information Processing
SVP	Surface Velocity Programme (of TOGA and WOCE, replaced by GDP) drifter
SVP-B	SVP barometer drifter
SVP-BS	SVP drifter with salinity
SVP-BTC	SVP drifter with temperatures in depth
SVP-BW	SVP Abarometer and wind at a drifter
SVW	Surface Vector Wind
SWFDDP	Severe Weather Forecasting and Disaster Risk Reduction Demonstration Project
SWFDP	Severe Weather Forecasting Demonstration Project
SWH	Significant Wave Height
TAO	Tropical Atmosphere Ocean Array
TAO	Tropical Atmosphere Ocean network of tropical moorings
TC	Technical Coordinator
TCP	Tropical Cyclone Programme (WMO)
TD	Technical Document
TDC	Table Driven Code
TDCF	Table Driven Code Forms

TECO-WIS	Technical Conference on the WIS
TEP	Thematic Portals
TEPCO	Tokyo Electric Power Company
TESAC	Temperature, salinity and current report from a sea station (FM 64–XI Ext. TESAC)
TGBM	Tide Gauge Benchmark
TIGA	Tide Gauge Benchmark Monitoring Project
TIP	Tiros Information Processing
TIP	Tropical Moored Buoys Implementation Panel
TNC	Tsunami National Contacts
TOGA	Tropical Atmosphere and Global Ocean programme
TOL	Top Level Objectives
TOR	Terms of Reference
TOWS-WG	Working Group on Tsunami and Other Hazards Related to Sea-Level Warning and Mitigation Systems (IOC)
TR	Technical Report (JCOMM)
TRACKOB	Report of marine surface observation along a ship's track (FM 62–VIII Ext. TRACKOB)
TRITON	Triangle Trans-Ocean buoy network
TSG	ThermoSalinoGraphs
TSMAD	Transfer Standard Maintenance and Applications Development
TT	Task Team
TT-CB	DBCP Task Team on Capacity-Building
TT-DM	DBCP Task Team on Data Management
TT-DMVOS	Task Team on Delayed Mode Voluntary Observing Ship data
TT-IBPD	DBCP Task Team on Instrument Best Practices & Drifter Technology Developments (merged the TT-QM and TT-TD)
TT-MB	DBCP Task Team on Moored Buoys
TT-OPD	Task Team on Ocean Products Development
TT-QM	DBCP Task Team on Quality Management (now merged into TT-IBPD)
TTR	Task Team on Resources
TTR	Training-Through-Research
TT-SAT	Task Team on Satellite Data Requirements
TT-TD	DBCP Task Team on Technological Development (now merged into TT-IBPD)
TWPF	Tsunami Warning Focal Points
TWS	Tsunami Warning System
UHSLC	University of Hawaii Sea Level Centre
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organization
UN-OCHA	United Nations Office for Coordination of Humanitarian Affairs
URD	User Requirement Document
URL	Uniform Resource Locator
USA	United States of America
USD	United States Dollar
UTC	Universal Time Coordinated

VAR	Value Added Reseller
VCP	Voluntary Cooperation Programme (WMO)
VGISC	Virtual GISC (Europe)
VHF	Very High Frequency
VL	Virtual Laboratory
VLIZ	Flanders Marine Institute
VOF	Voluntary Observing Fleet
VOS	Voluntary Observing Ship (JCOMM)
VOSCLIM	Voluntary Observing Ship Climate Project (JCOMM)
VTS	Vessel Track System
WCC	World Climate Conference
WCP	World Climate Programme (WMO)
WCRP	World Climate Research Programme (WMO/IOC/ICSU)
WDC	ICSU World Data Centre
WDIP	WIGOS Development and Implementation Plan
WDS	Weather and Disaster Risk Reduction Services Department (WMO)
WESTPAC	West Pacific
WG	Working Group
WGCM	Working Group on Coupled Modelling
WGCV	Working Group on Calibration and Validation (CEOS)
WGNE	Working Group on Numerical Experimentation
WGSIP	Working Group on Seasonal to Interannual Prediction
WIGOS	WMO Integrated Global Observing Systems
WIGOS-IP	WMO Integrated Global Observing Systems Implementation Plan
WIS	WMO Information System
WMO	World Meteorological Organization (UN)
WOC	World Ocean Council
WOCE	World Ocean Circulation Experiment
WOD	World Ocean Database
WP	Working Paper
WRC	World Radiation Centre
WS	Wind Waves and Storm Surges
WSSD	World Summit on Sustainable Development
WWMIWS	World-Wide Met-ocean Information and Warning Service (WMO-IMO)
WWW	World Weather Watch (WMO)
XBT	Expendable Bathythermograph
XCTD	Expandable Conductivity, Temperature and Depth profiling system
XML	Extensible Markup Language

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