EXPERT TEAM ON MARINE CLIMATOLOGY
FOURTH SESSION

Ostend, Belgium
26-28 November 2012

FINAL REPORT

JCOMM Meeting Report No. 94

Group Photo

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

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NOTES

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C O N T E N T S

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EXECUTIVE SUMMARY

The fourth session of the Expert Team on Marine Climatology (ETMC) was held at the Project Office of the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Ostend, Belgium, from 26 to 28 November 2012. Members of the Task Team on the Marine Climate Data System (MCDS) were also invited to the meeting as MCDS was high in the agenda for this meeting.

The main goals of the meeting were to address guidance from the fourth session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), which was held in Yeosu, Republic of Korea, from 23 to 31 May 2012, and advance the team work programme during this JCOMM intersessional period according to JCOMM-4 priority activities for the Data Management Programme Area (DMPA) during this period. In particular, an important goal of the meeting was to review the development of the new MCDS as a follow up of the modernization of the Marine Climatology Summaries Scheme (MCSS) (established in 1963), and agree on the MCDS strategy and implementation plan.

The Chairperson, Ms Nicola Scott (United Kingdom) presented an overview of the activities of the ETMC since its third session, and also recalled some issues that will have to be resolved by the Team during the meeting, and provided guidance to the Team regarding relevant JCOMM Data Management Programme Area (DMPA) priority activities:

The Chair of the IODE-JCOMM Data Management Practices (ETDMP), Dr Sergey Belov (Russian Federation) reported on recent activities of the ETDMP, including the IODE Ocean Data Portal (ODP), the JCOMM-IODE Ocean Data Standards Process (ODS), and the management of metadata, and provided guidance on interactions with the ETMC regarding the development of the MCDS.

The Team reviewed the current operation/activities of the Global Collecting Centres (GCCs) operated by the United Kingdom and Germany, including the 2011 GCC annual report, which marks the 18th year of GCC operation. It reviewed the current operations and activities of all Responsible Members (RMs). The Team agreed that it would be useful to provide a template to facilitate the comparison of the activities of the RMs.

The Team reviewed the requirements of the WMO-IOC-UNEP-ICSU Global Ocean and Climate Observing Systems (GOOS and GCOS) for climate datasets. It recognized that having an assessment of the observing system performed routinely would be beneficial, both for those implementing the components of the observing system and for those monitoring the completeness of the observing system. The Team recommended reviewing the climate requirements for the marine (atmospheric and oceanic) component of the observing system and relate them to the scientific justification for the requirements and the size of signals expected. A set of formulae for measuring the health of the observing system should also be developed.

The meeting noted the recent developments with regard to the Global Framework for Climate Services (GFCS), and the outcome of the Extraordinary Session of the World Meteorological Congress (Cg-Ext.(2012)). The Team agreed that the development of the MCDS will be one important element of JCOMM's contribution to the GFCS.

The Team recommended to strengthen the links between JCOMM and the WMO Commission for Climatology (CCl), in particular with regard to the development of the MCDS, through the ETMC in particular.

The meeting reviewed JCOMM-4 decisions and guidance with regard to the MCDS and reviewed the MCDS Vision and Strategy, as well as the Implementation Plan for the MCDS. The meeting agreed to submit the draft Strategy to the JCOMM Data Management Coordination Group (DMCG) (consultation by email), the Management Committee (Paris, Jan. 2013), and then to the IODE-22 (Ensenada, Mexico, 11-15 March 2013) for their review and approval. The meeting

reviewed JCOMM-4 Recommendation 2 on the MCDS in order to clarify a number of cases where the text was considered insufficiently clear and too open for interpretation. It reviewed the data-flow diagram for the MCDS, and agreed with a new version, which better highlights the role of the IODE.

The meeting reviewed and clarified the potential contributions and roles of the various actors and stakeholders in the MCDS, particularly concerning foreseen Data Acquisition Centres (DACs), Global Data Assembly Centres (GDACs), and Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs), as well as the network of IODE National Oceanographic Data Centres (NODCs) and the ICSU World Data System (WDS). The meeting agreed that the Terms of Reference for the DACs and GDACs could be proposed at a later stage, and eventually included in a revised version of the MCDS Implementation Plan, and submitted to JCOMM-5. The meeting advised on the DAC and GDAC establishment, including process and evaluation. The meeting reviewed the tasks of the CMOCs (esp. mirroring, Summaries), and discussed the evaluation of candidate CMOCs, including evaluation criteria, and performance indicators for CMOCs once established. The meeting clarified the scope of the CMOCs.

The meeting reviewed the status of the International Maritime Meteorological Tape (IMMT) format and Minimum Quality Control Standard (MQCS). It concurred with the GCC recommendations that the changes to IMMT format and MQCS checks be in effect as IMMT-5 and MQCS-7 for general use as soon as is possible.

The Team reviewed the BUFR[1] (and other) templates for surface marine data, noting that migration to table driven codes for marine data shall be in principle be completed by the end of 2012. The Team reviewed the outstanding issues with regard to data preservability, and agreed to re-activate the ad hoc group working on the issue, while refreshing its membership. It requested the ad hoc group to make further proposals to the seventh Session of the JCOMM Ship Observations Team (SOT), Victoria, Canada, April 2013, especially regarding practices to be included in the Guide to Marine Meteorological Services and in the Manual on Codes.

The Team reviewed the use of electronic logbooks (e-logbooks), and recommended to expedite the agreement on a common dew point temperature algorithm for use in all e-logbooks (varying coefficients for the algorithm used could still be entered by the PMOs in the e-logbooks, and recorded in Pub47[2]). In addition, the ETMC should continue to monitor the algorithms being use, and the settings within TurboWin and e-logbooks should be preserved and the changes tracked.

The Team emphasized again that incorporating un-masked Voluntary Observing Ship (VOS) Global Telecommunication System (GTS) data historically eventually into key climate databases remains a critical requirement for marine climatology in order to support not only the oceanographic and marine meteorological research community but also the climate services community.

The team discussed the status of developments for a Higher Level Quality Control Standard (HQCS) by Germany. It requested the UK GCC and the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) to test the first version of the HQCS.

The Team was updated on the status of the ICOADS, including status of the International Maritime Meteorological Archive (IMMA) format, the proposal for an “advanced” (bias adjusted) ICOADS, potential linkages with satellite data, and CMOC nomination plans and progress. The Team strongly agreed that the future of ICOADS needs to be securely established. It also agreed to continue work towards establishment of a broader JCOMM Pilot Project on ICOADS Value Added Database (IVAD).

The Team reviewed latest developments within JCOMM regarding the management of instrument-platform metadata from ocean observing platforms, and their requirements for Marine

1 FM 94 BUFR GTS format: Binary Universal Form for Representation of meteorological data
2 WMO Publication No. 47, International List of Selected, Supplementary and Auxiliary Ships – http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm

Climatology. The Team emphasized again the importance of the rescue of historical buoy and "ODAS" metadata—including from ocean rigs and platforms—which may be at risk of permanent loss due to media degradation, organizational changes.

The Team was informed about national and international activities to recover data and metadata, from historical ships' logbooks and other international marine data and metadata rescue activities. It noted with concern that the successful public-private partnership Climate Database Modernization Program (CDMP) of the US National Oceanic and Atmospheric Administration (NOAA) was dramatically scaled back in 2010, and eventually discontinued in fiscal year 2012. The Team agreed to continue to seek ways to develop an improved international data rescue strategy with collaboration between ETMC, GFCS, and CCl.

The Team reviewed the history of the marine ship code, and discussed sea-ice and wave and storm surge data climatologies. The Team agreed that efforts ought to be made to undertake scans of the in situ archives at various national centres to identify observations to feed into the global extreme wave event archive.

The Team established a Preliminary Organising Committee for the fourth JCOMM Workshops on Advances in Marine Climatology (CLIMAR-4), tasked in particular to recommend a location and date for CLIMAR-4 (action; CLIMAR-4 Preliminary Organizing committee; Apr. 2013

The Team discussed information exchange, including consideration of Publications of interest to marine climatology (WMO No. 8, 100, 558, 471, and JCOMM TR No. 13). It agreed that now a joint ETMC and MCDS website is required and that this would now be better hosted from the JCOMM domain.

Before concluding the meeting, the Team reviewed action items from the previous ETMC meeting, and advised on pending issues.

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANIZATION OF THE SESSION

1.1 Opening

1.1.2 The Fourth Session of the JCOMM Expert Team on Marine Climatology (ETMC) was opened by Ms Nicola Scott (United Kingdom), Chair of the Expert Team, at 0900 hours on Monday, 26 November 2012, at the Project Office of the International Oceanographic Data and Information Exchange (IODE) of the Intergovernmental Oceanographic Commission of UNESCO (IOC). Members of the Task Team on the Marine Climate Data System (MCDS) were also invited to the meeting as much discussion during this session was planned to address the Strategy and Implementation Plan for the MCDS.

1.1.3 The World Meteorological Organization (WMO) Secretariat representative welcomed the participants to the Session on behalf of the Secretary-General of WMO, Mr Michel Jarraud, and the Executive Secretary of the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Dr Wendy Watson Wright.

1.1.4 Peter Pissierssens welcomed the participants to the IODE Project Office, recalled the history of the establishment of this office in Ostend, Belgium in 2005, and summarized the basic activities of the office.

1.2 Adoption of the agenda

1.2.1 The Team adopted the agenda for the Session on the basis of the Provisional Agenda prepared by the Secretariats in consultation with the Chair and vice-Chair of the ETMC. The agenda for the Session is provided in ***Annex I***.

1.3 Working arrangements

1.3.1 The Secretariat representative provided information on the working hours of the meeting and some practical arrangements for the meeting.

1.3.2 Participants were reminded that all working documents were made available through the JCOMM web site. Ms Scott invited all participants to introduce themselves briefly. The list of participants is available as ***Annex II***.

2. JCOMM ASPECTS AND REPORTS

2.1 Report by the ETMC Chairperson

2.1.1 The Chairperson, Ms Nicola Scott (United Kingdom) presented an overview of the activities of the ETMC since its third session (ETMC-3, Melbourne, Australia, 8-12 February 2010).[3] She recalled that as a major thrust of the intersessional work, ETMC and the JCOMM Data Management Coordination Group (DMCG) initiated development of the new Marine Climate Data System (MCDS) as a follow up of the modernization of the Marine Climatology Summaries Scheme (MCSS) (established in 1963) and as a consequence this Fourth Session of ETMC was meeting also with the Task Team on MCDS (TT-MCDS). During the intersessional period, work undertaken included:

- Creation and proposal to JCOMM-4 of the MCDS vision, Implementation Plan and CMOC Terms of Reference
- Proposal of the Data Acquisition Centre (DAC) and Global Data Assembly Centre (GDAC)

3: Mr Scott Woodruff was ETMC Chairperson until JCOMM-IV in May 2012, hence the joint preparation of this written report.

Terms of Reference and establishment process
- Migration of the Cross Cutting Task Team on Delayed Mode VOS Data (TT-DMVOS) and the ETMC Task Team on Marine Meteorological and Oceanographic Climate Summaries (TT-MOCS) work into the TT-MCDS
- Adoption at JCOMM-4 of the updated 5th version of the International Maritime Meteorological Tape (IMMT-5) format and the 7th version of the Minimum Quality Control Standard (MQCS-7)
- Third workshop on Advances in the Use of Historical Marine Climate Data, MARCDAT-3, in Frascati, Italy, in May 2011
- Ongoing collaboration within the 'International Comprehensive Ocean-Atmosphere Data Set (ICOADS) Partnership' and on development of the ICOADS Value Added Database (IVAD)
- Continued development of the Higher Level Quality Control Standard (HQCS) for integration and use within the MCDS
- Production of Global Collecting Centre (GCC) quarterly exchange dataset also in the IMMA format

2.1.2 The Chairperson also recalled some issues that will have to be resolved by the Team, including:

- Ship callsign masking has been an outstanding issue for ETMC and the marine community for some time. ETMC are pursuing both short term (real callsign release dates) and long-term (callsign encryption) solutions to this problem.
- Preservation of Voluntary Observing Ship (VOS) data, particularly in light of the soon to be migrated real-time BUFR[1] format, is a continuing issue for ETMC. A paper has been produced by an *ad hoc* task team to suggest ways to ensure originally reported data preservation.
- ICOADS funding is a concern for the marine community and ETMC to ensure the availability and support for this much needed dataset.

2.1.3 She recalled the two priorities decided by the fourth Session of JCOMM (JCOMM-4, Yeosu, Republic of Korea, 23-31 May 2012) for the Data Management Programme Area (DMPA) for the current JCOMM intersessional period (2012-2017) that directly relate to the activities of the ETMC:

(i) 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);

(ii) Organize the fourth JCOMM Workshop on Advances in Marine Climatology (CLIMAR-4), possibly in 2014, and the fourth International workshop on Advances in the Use of Historical Marine Climate Data (MARCDAT-4), possibly in 2016.

2.1.4 Ms Scott provided the following guidance to the Team regarding those priority activities that relate to marine climatology:

- Working towards to full Implementation of the MCDS vision by 2020 and by the continued collaboration of ETMC, TT-MCDS and the DMCG
- Creation of a combined ETMC/MCDS website by the end of 2013 by Chair & Vice-chair of ETMC and the JCOMM Secretariats
- Helping to ensure the future of ICOADS
- Creation of the extreme wave dataset via the establishment of a pilot project to develop the necessary technological framework and encourage contributions from other countries. To be co-led by Mr Val Swail and Mr Scott Woodruff. Development of a Pilot Project by April 2013 and Pilot Project completion of initial dataset by 2015.
- Continuation of the Marine Climate Workshops. A preliminary organising committee to be established by the end of 2012 to manage and run CLIMAR-4 by 2014.

- Progress towards resolving the outstanding callsign masking issues including implementation of callsign encryption
- Development of an improved international data rescue strategy with collaboration between ETMC, the Global Framework for Climate Services (GFCS) and the WMO Commission for Climatology (CCl)
- Data preservation issues relating to migration of real-time transmission to BUFR[1]
- Continued development of the Research Vessel Digital Observation Catalogue led by Mr Shawn Smith

2.1.5 The Team noted that the membership of the Task Team on the Marine Climate Data System (TT-MCDS) was established by the ETMC Chair in late 2011 following consultation of the Team via email.

2.2 JCOMM-4 outcome and priorities for the Data Management Programme Area (DMPA)

2.2.1 The DMPA coordinator, Mrs Sissy Iona presented an overview of the fourth JCOMM Session outcomes and priorities for the Data Management Programme Area, with a specific focus on the decisions of the Committee related to the (development) planning and implementation of the new Marine Climate Data System (MCDS).

2.2.2 She pointed out that interoperability is the key element in a global data system that consists of different functions, approaches and services provision and the success of the new MCDS is highly dependent on it.

2.2.3 In this regard, she recalled the joint JCOMM-IODE Expert Team on data Management Activities (ETDMP) activities and its future work as well as IODE cooperation with other key data management projects such as SeaDataNet[4] and the IODE Ocean Data Portal (ODP) on:

- Ocean Data Standards and Best Practices Project,
- Metadata management,
- Quality management framework for IODE National Oceanographic Data Centres (NODCs)
- IODE ODP further development and evolvement

2.2.4 Finally she informed about the JCOMM-4 decision for the OPA, together with the DMPA, to promote the establishment and publication of access routes to the authoritative data sets for the observing system elements and the relation of this decision with on-going activities of the GOOS Steering Committee to develop with JCOMM and other partners an implementation plan to address the challenge of real time data flow homogenization and interoperability. The above activities are directly related to the MCDS flow of real time data to the climate archives and should be taken into consideration in the future work of MCDS. The ETMC recognized this need, and as a first step towards documenting the MCDS (real-time and delayed mode) data flow, an assessment will be made of the present monitoring and data management arrangements for the observing in situ networks coordinated by the JCOMM Coordination Group (OCG). This should also contribute to an evolving consideration of addressing variable-based requirements for the observing system (***action; OPA Chair; ASAP***).

2.2.5 The Team noted that the recommendations of the ETMC regarding the development of the MCDS will have to be submitted to the twenty-second Session of the IODE (IODE-22, Ensenada, Mexico, 11-15 March 2013).

2.3 Data Management Practices

2.3.1 The Chair of the IODE-JCOMM Expert Team on Data Management Practices (ETDMP), Dr Sergey Belov (Russian Federation) reported on recent activities of the ETDMP. He explained in

4 Pan-European infrastructure for Ocean & Marine Data Management

particular that the ETDMP is working with the following Task Teams:

- The Task Team for Ocean Data Standards (ODS), which achieved the following (i) best practices procedures agreed during Ad-Hoc ODS Meeting in April 2012; (ii)standard for 'Date and Time' has been published as an IOC/UNESCO Manuals and Guides No. 54(2); Quality Control (QC) Flags standards submission was made by the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH); additional standards (i.e. Latitude, Longitude and Altitude, Units, etc.) have been identified for submission (iii) ToRs for Ocean Data Standards and Best Practices (ODSBP) drafted for consideration;
- The Task Team on metadata management, which was tasked to compare semantic metadata profiles (MCP, SeaDataNet common Data Index – CDI –, WMO Core) and make recommendations for better interoperability. Progress has been made with regard to defining a structure and performing profile comparisons. The Task Team was also instructed to consider Ocean Data Acquisition Systems (ODAS) metadata and legacy recommendations from the Water Temperature Instrument/Platform Metadata Pilot Project (META-T). Regarding the latter, this work was completed and legacy recommendations were made.

IODE Ocean Data Portal (ODP)

2.3.2 Dr Belov reported that the work on the IODE Ocean Data Portal (ODP) has been focused on two main aspects: to invoke new data providers from National Oceanographic Data Centres (NODCs), Designed National Agencies (DNAs), and other IODE related projects and development of ODP V2. During the reported period four data providers were connected – the Integrated Marine Observing System (IMOS, Australia), NODC (USA), Integrated Science Data Management (ISDM, Canada) and the Met Office (UK). Despite the slow growth of the data providers a significant contribution has been made for the Global Temperature and Salinity Profile Programme (GTSPP) and Argo projects by the US National Oceanographic Data Centre (NODC) and Integrated Science Data Management (ISDM, Canada). In addition, collaboration on Argo data has been established with the French Research Institute for Exploitation of the Sea (IFREMER) to provide access to the Argo FTP index. At present ODP is giving access to 100 datasets with over 1 000 000 profiles from 9 NODCs/DNAs (13 data providers registered).

2.3.3 The IODE ODP has been an active partner in the JCOMM Pilot Project for the WMO Integrated Global Observing System (WIGOS). This Pilot Project has been an important contribution to the development of WIGOS and the WMO Information System (WIS). Due to the important synergies between ODP and the Pilot Project, a joint Steering Group was established. The Pilot Project concluded its work in December 2010. Its legacy includes documentation on instrument best practices and standards, the establishment of regional marine instrument centres, integration of marine data sets through interoperability with the WIS, and promoting quality management and standards. A list of legacy recommendations was included in the Pilot Project Report[5]. Following the IODE-20 recommendation to provide interoperability arrangements with the SeaDataNet (SDN) project, draft technical specifications of the IODE ODP and SDN interoperability have been created. In the document it was proposed to focus the challenge of interoperability between SDN and ODP based on the portal-to-portal interaction scheme.

2.3.4 The Team noted with appreciation that the National Oceanographic Committee of the Russian Federation had agreed to offer to IOC/IODE to establish an IOC Project Office for IODE ODP. Taking account the formal requirements related to Project Offices as well as the offer of Russia the title of such "office" was changed to "IOC Project Support Centre for IODE ODP". The official opening of the Office is targeted in early 2013. Later Russian Federation change the title of this new structure into the "Partnership Centre for IODE ODP".

5 ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-48-JCOMM-PP-WIGOS/J-TR-48-WIGOS-PP-JCOMM-Report.pdf

Outcomes of the ETDMP-3

2.3.5 The Team noted the following outcome of the third Session of the ETDMP (ETDMP-3), which was held in Ostend, Belgium, from 16 to 19 October 2012.

2.3.5.1 The ETDMP considered the need to clearly define the terms "standard" and "best practice" and decided as follows:

> Standard[6]: *A document established by consensus and approved by a recognized body that provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context*
>
> Best Practise[7]: A **best practice** is a method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark.

2.3.5.2 The ETDMP-3 meeting concluded that there are many possible definitions of "best practices". For now the ETDMP agreed to use the above as a working definition.

Ocean Data Standards process (ODS)

2.3.5.3 The Team noted the following outcome of the ETDMP-3 regarding the ODS:

- The ETDMP stressed that the Quality Assurance of Real Time Oceanographic Data (QARTOD) manuals referred to above could be excellent candidates for submission to the ODSBP.

- The ETDMP recommended to include QARTOD[8] in the list of relevant communities to be addressed by ODSBP, as referred to in the draft terms of reference of the ODSBP (see agenda item 3.1)

Metadata

2.3.5.4 Regarding the management of metadata, The ETDMP-3 recommended that attention should be given to providing a "clearinghouse service" that will inform users about existing controlled vocabularies and similar authority systems so as to avoid that groups will continue creating new such systems.

2.3.5.5 The ETDMP-3 also outlined the following tasks for the 2012-2014 intersessional period:

- 4.4.1 – Survey existing commonly used controlled vocabularies for platform types, organizations, projects, instruments, and keywords to establish recommendations for available resources.

  Deliverable: Prioritized list of recommended existing, available controlled vocabularies for at least the following descriptive elements: platform types, organizations, projects, instruments, and keywords.

- 4.4.3 – Task team to learn more about the Simple Knowledge Organization System (SKOS), Marine Metadata Interoperability program, and/or other existing tools for controlled vocabulary content management.

  Deliverable: Report summarizing capabilities of existing tools for controlled vocabulary content management.

6 ISO/IEC Guide 2:1996, definition 3.2, which defines a standard - source: http://www.etsi.org/WebSite/Standards/WhatIsAStandard.aspx
7 source: http://en.wikipedia.org/wiki/Best_practice
8 Quality Assurance of Real Time Oceanographic Data (USA)

Recommendations of ETDMP-3 regarding the IODE Ocean Data Portal (ODP)

2.3.5.6 The Team noted the following recommendations of ETDMP-3 regarding the ODP:

- The IODE Quality Management Framework (QMF) will be a significant "engine" for ODP and IODE data system operation. According to the IODE QMF requirements, the NODC accreditation process should take into account that the NODCs will also contribute to the IODE ODP: (i) data and products submission into IODE data system; and (ii) carrying out the functions of regional, specialized, or national ODP nodes. These are the deliverables identified in IOC Strategic Plan for ODP and IODE data system.

- The ETDMP stressed the importance of presenting a well-populated portal to IODE-22. It was recognized that, unless this would be achieved, the future of ODP would be uncertain.

- The ETDMP agreed on the following actions: (i) present linkage between SDN and ODP at IODE-22 (this may allow direct link to data, provided that the new SDN ISO profile is available before the end of 2012); (ii) transfer of user credentials creating a "circle of trust" between ODP and SDN (after IODE-22).

2.3.6 The Team noted that the ODP and WIS could also play a role in the MCDS by providing part of the required infrastructure for the distribution of the marine meteorological and oceanographic climate data (see agenda item 4).

2.4 Report of the Global Collecting Centres (GCCs)

2.4.1 The Team reviewed the current operation/activities of the Global Collecting Centres (GCCs) operated by the United Kingdom and Germany.

2.4.2 The Team recalled that the two Global Collecting Centres (GCCs) for JCOMM's Marine Climatological Summaries Scheme (MCSS) were set up to improve data flow and quality of delayed-mode Voluntary Observing Ships (VOS) data by Recommendation 11 / CMM-11 (Lisbon, April 1993). Since then both Germany and the United Kingdom have been operating the GCCs. The current activities of the GCCs are reported through the GCC annual reports[9]. The 2011 GCC annual report marks the 18th year of GCC operation. The Team noted the following:

- The number of observations received in the years 2010 and 2011 were 489.117 and 640.649 respectively, much less than the years before, (normally around 1 million observations). In the first half of 2012 the GCCs have already received over 1 million records and in the first three quarters 1.366.587 observations. This fluctuation in contributions results from a variety of Contributing Member (CM) issues including software, staff and technical problems.

- The number of contributing countries has remained at 20 Members during the last three years. The other 6 CMs are still having problems submitting their data. Due to the kind work of the DWD in Germany, some CMs, including Israel, Sweden, Greece and Canada, have been able to successfully contribute data to the GCCs.

- The majority of data received by the GCCs arrive by email and anonymous FTP transfer. All data are contributed in IMMT format, in the years 2010 and 2011 over 90% in IMMT-3, but in the first 9 months of this year 50% of the observations were received already in the more recently adopted (effective 1 January 2011) IMMT-4 format.

9 http://www.wmo.int/pages/prog/amp/mmop/gcc-reports.html

- The majority of observations continue to be of good quality. Less than 0.1 % of the data were rejected by the MQCS, mostly due to duplicated data. Problems with on-land positions have been on the decrease representing a very small percentage of total data in the last three years. Some issues with wrong positions or invalid dates were noted while comparing with the archive and GTS data. Most of these mistakes were resolved after consulting with the CM.

- 822.446 observations from VOSClim class ships were received and processed by the GCCs during the period January 2010 to September 2012. This makes up 60% of the data received by the GCCs from the VOS fleet in this period, but only 46% of the VOS Climate (VOSClim) observations contained the VOSClim defined additional elements. 9 of the 10 Contributing Members with registered VOSClim ships submitted observations and 68.449 observations from non-VOSClim registered ships were received with the VOSClim defined additional elements.

- As of 1st January 2011, IMMT-4 and MQCS-6 was the preferred format and quality standard for use by delayed-mode VOS observations (see agenda item 5.1).

- Subsequently (following JCOMM-4) the Minimum Quality Control (MQC) software for CMs was updated to MQCS-7 and the 5th version is available through the WMO website[10].

- Both GCCs have been identified as DCPCs for the WIS and are able to provide nearly 17.7 millions MQCS-checked and flagged observations received by the GCCs from 1996 to 2012. Additionally all contributed original records are saved and available[11].

- DWD continues to make progress in the development of a new standardised Higher Quality Control Standard (HQCS) (see agenda item 5.5). The goal is a uniform checking of all types of VOS observations, easy handling, documented steps and graphic demonstration of erroneous values and simple ways of correction. A revised and improved land-sea mask will soon be available and Climatological checking with ERA[12]-Interim-data have led to satisfying results.

2.4.3 The Team thanked the GCCs for their contributions to the Marine Climatological Summaries Scheme (MCSS).

2.4.4 The full report by the GCCs is provided in ***Annex VII***.

2.5 Report of the Responsible Members (RMs)

2.5.1 The Team recalled that according to the principles of the MCSS, regulated in the *Manual on Marine Meteorological Services* (WMO-No. 558) and *Guide to Marine Meteorological Services* (WMO-No. 471), the oceans and seas are divided into eight areas of responsibility for the purpose of preparing the marine climatological summaries, with a view to continued international cooperation regarding the collection, archiving and exchange of marine data.

2.5.2 Mr Eric Freeman (USA) reported on behalf on the current operations and activities of all Responsible Members (RMs) – Germany; Hong Kong, China; India; Japan; the Netherlands; the Russian Federation; the United Kingdom, and the United States of America. The Team noted with appreciation that all eight Responsible Members had submitted a written report to this Session. Full reports by the Responsible Members are provided in ***Annex VIII***.

10 http://www.wmo.int/pages/prog/amp/mmop/mqc_soft.html
11 http://gisc.dwd.de/GISC_DWD/toExtendedSearch.do
12 European Centre for Medium-Range Weather Forecasts (ECMWF) Re-Analysis

2.5.3 The Team discussed current deficiencies, and considered possible further improvements of the data exchange system and changes in the roles of the RMs, in light of the development of the Marine Climate Data System (MCDS). The Team suggested that the MCSS could evolve in such a way as to encourage the Responsible Members to switch to Data Acquisition Centres (DACs) for regional specialized data sets and/or to Global Data Assembly Centres (GDACs) for global specialized data sets.

2.5.4 The Team agreed that it would be useful to provide a comparison of the activities of the RMs. The Team recommended to promote such inter-comparisons for the various MCDS centres (DACs, GDACs) that will be established, and requested the ETMC Chair to propose a template for that (***action; ETMC Chair; end 2013***).

3. REQUIREMENTS

3.1 Review the GOOS and GCOS requirements for climatological data sets

3.1.1 Dr David Berry (UK) reported on the requirements of the WMO-IOC-UNEP-ICSU Global Ocean and Climate Observing Systems (GOOS and GCOS) for climate datasets, as presented in the WMO database[13] of user requirements. The GCOS Progress Report (GCOS 2009) and Implementation Plan (GCOS 2010) for the global Observing System for Climate were also reviewed.

3.1.2 Based on the review and discussion the Team recognized that the many of the components of the observing system were close to completion based on their current targets. Whilst recognizing that these initial targets were useful for the initial stage of implementing a Global Observing System for Climate the Team also noted that the link between these targets and the requirements for climate datasets was unclear.

3.1.3 The Team were presented with an example showing how the completeness of the in situ component of the observing system could be measured against the GOOS and GCOS requirements for climate datasets. The Team noted that this was a basic initial assessment and that further work was needed to further develop the metrics against which to measure the completeness of the observing system.

3.1.4 The Team recognized that having an assessment of the observing system performed routinely would be beneficial, both for those implementing the components of the observing system and for those monitoring the completeness of the observing system.

3.1.6 **The meeting made the following recommendations**:

(i.) That the ETMC in collaboration with GCOS, GOOS and the appropriate panels (i.e. AOPC[14] and OOPC[15]) review the climate requirements for the marine (atmospheric and oceanic) component of the observing system and relate them to the scientific justification for the requirements and the size of signals expected;

(ii.) That the ETMC in collaboration with OCG, GCOS, GOOS and the appropriate panels (i.e. AOPC and OOPC) and with advice from the scientific community develop and recommend an agreed on set of formulae for measuring the health of the observing system;

(iii.) That the health of the observing system should be routinely assessed.

13 http://www.wmo.int/oscar
14 Atmospheric Observation Panel for Climate
15 Ocean Observations Panel for Climate

3.1.7 The Team tasked David Berry to lead the ETMC efforts in this regard, liaise with the OCG, JCOMM *in situ* Observations Programme Support Centre (JCOMMOPS) and the Observing System Monitoring Centre (OSMS) and report on the developments to the ETMC Chair (***action; D. Berry; ETMC-5***).

3.1.8 The Team reviewed the status of the Framework for Ocean Observing (FOO[16]), which has inspired the reform of GOOS structures as a follow up of the OceanOBS'09 conference. It noted that the Essential Climate Variables (ECVs) — together with an emerging new system of Essential Ocean Variables (EOVs) — are serving to define observing plans at the highest level. Considerable technical details reside behind each scheme of essential variables. Although the EOVs are not yet fully defined and in some cases may overlap with ECVs, they will represent societal needs for ocean parameters driven by high-level international conventions, for example, for biodiversity or sustainable development.

3.1.9 Continuing efforts by the JCOMM Data Management (DMCG) and Observation (OCG) Coordination Groups and their expert teams and panels are necessary to ensure data flow and interoperability for the in situ observational networks. The Team agreed that the new Marine Climate Data System (MCDS) could be seen as one mechanism to do this (e.g. interoperability with WIS and ODP is built in MCDS). The Team recommended to make sure that Essential Ocean Variables (EOV) will be considered for the MCDS.

3.2 Global Framework for Climate Services (GFCS)

3.2.1 The meeting noted the recent developments with regard to the Global Framework for Climate Services (GFCS), and the outcome of the Extraordinary Session of the World Meteorological Congress (Cg-Ext.(2012)), which was held in Geneva from 29 to 31 October 2012.

3.2.2 The Team noted that Global Framework for Climate Services will bring together providers of climate services, researchers and users to make sure that the information provided by meteorologists and climate scientists is understandable and relevant to climate-sensitive activity. The initial focus will be on improved service delivery for disaster risk reduction, health, water management, agriculture and food security.

3.2.3 The Team agreed that the development of the Marine Climate Data System (MCDS) will be one important element of JCOMM's contribution to the GFCS (see agenda item 4).

3.2.4 The Team noted that Dr Peter Dexter (Australia) was representing JCOMM at the WMO Executive Council (EC) Task Team on WMO Policy for International Exchange of [Climate] Data and Products to support the implementation of the GFCS. The Team invited the ETMC Chair to liaise with Dr Dexter as needed and make sure that the ETMC data policy requirements are taken into account by the EC Task Team (***action; ETMC Chair; ongoing***).

3.3 Existing and potential linkages with the WMO Commission for Climatology (CCl)

3.3.1 Ms Karolin Eichler (WMO Secretariat) reported on existing and potential linkages with the WMO Commission for Climatology (CCl). Ms Eichler presented and summarized the structure of the Commission for Climatology (CCl), especially its Open Panels of CCl Experts (OPACEs) number 1 and 2 that guide the development and implementation of data and monitoring projects. She also reported on their objectives and activities.

3.3.2 The Team noted that presently the main connection point from JCOMM to the CCL is the Joint CCl/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI) that among others develops and publicizes indices and indicators of climate variability and change

16 http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=7430&lang=en

from the surface and sub-surface ocean to the stratosphere. One of the activities of the ETCCDI is organizing workshops to increase the capacity in local climate data specialists. The concept and goals of these workshops were mentioned.

3.3.3 Other potential connection points are the International Climate Assessment and Data initiatives, the Expert Team on Climate Data Management Systems, the Task Team on Data Rescue, as well as CCl activities regarding development of global surface temperature data sets.

3.3.4 In addition, and related to the development of the MCDS, the Team noted that the CCl High Quality Global Data Management System for Climate (HQ-GDMSC) which is still in a concept phase will give the chance for further collaboration. Its purpose and components were presented to the Team.

3.3.5 While noting that the MCDS is in an advanced stage of development compared to the HQ-GDMSC, the Team agreed that strong collaborations will have to be put in place between the HQ-GDMSC and the MCDS. The WMO statement of the world climate will also benefit from input from JCOMM, for example on the basis of marine climate summaries.

3.3.6 The meeting recognized that JCOMM has representation on the ETCCDI, but that this representation did not cover the whole scope of MCDS relevant issues to be discussed. The Team recommended that in order to strengthen the links between JCOMM and CCl, in particular with regard to the development of the MCDS, that JCOMM and the ETMC in particular should be represented as needed in CCl Expert Teams, Groups, and CCl Session, as appropriate in particular to understand the overview of CCl activities and to recommend to JCOMM a more focused representation by CCl in MCDS and MCDS in CCl discussions. The meeting recommended that the chair(s) of the TT-MCDS, with assistance from the Secretariat, contact the chair of relevant CCl Expert Team or Group to request to attend the next scheduled relevant CCl meeting (***action; Chair TT-MCDS; ASAP***).

4. MARINE CLIMATE DATA SYSTEM (MCDS)

4.0.1 The meeting reviewed JCOMM-4 decisions and guidance with regard to the new Marine Climate Data System (MCDS). In particular, the meeting noted the following JCOMM-4 decisions:

(i) The Commission requested ETMC in close cooperation with the International Oceanographic Data and Information Exchange (IODE) and the Ocean Data Portal (ODP) Task Team of the IODE/JCOMM Expert Team on Data Management Practices (ETDMP), and other appropriate partners such as the ICSU World Data System to review and update the Marine Climate Data System (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 the JCOMM Data Management Programme Area (DMPA).

(ii) The Commission decided that China and Germany which both offered to operate Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs) could begin filling the role of CMOCs on a trial basis immediately.

(iii) 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.

(iv) 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.

(v) The Commission invited France and Canada, and other parties currently performing the functions of Data Acquisition Centres (DACs) and/or Global Data Assembly Centres (GDACs) or similar (e.g. Global Collecting Centres [GCCs], Argo, OceanSITEs, Global Temperature and Salinity Profile Programme [GTSPP], Global Drifter Programme [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 GDACs 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.

4.1 Vision and Strategy

4.1.1 The ETMC Chair, Ms Nicola Scott (UK) provided an overview of the Vision and Strategy of the Marine Climate Data System (MCDS) following ETMC efforts to modernize the Marine Climatological Summaries Scheme (MCSS), and JCOMM-4 Recommendation 2 on the Marine Climate Data System (MCDS), which provides for the Vision, and the draft strategy for the MCDS.

4.1.2 The meeting reviewed the draft MCDS Strategy following JCOMM-4 guidance. While realizing that consensus could not be reached during the limited time of the ETMC-4 meeting, the Team set up a small group, comprised of Ariel Troisi (Argentina), Sissy Iona (Greece), Nicola Scott (UK), and Gudrun Rosenhagen (Germany), tasked to review again and update the MCDS Strategy on behalf of the Team, taking into account the discussions at this meeting (***action; task group on strategy; 10 Jan. 2013***). The updated strategy, to be approved by the ETMC Chair, shall then be included in the final report of this ETMC-4 meeting by mid-January 2013 as ***Annex IV***. The meeting agreed to submit the draft Strategy to the JCOMM Data Management Coordination Group (DMCG) (consultation by email), the Management Committee (Paris, Jan. 2013), and then to the IODE-22 (Ensenada, Mexico, 11-15 March 2013) for their review and approval (***action; Secretariat; 15 Jan. 2013***).

4.1.3 The meeting reviewed JCOMM-4 Recommendation 2 in order to clarify a number of cases where the text was considered insufficiently clear and too open for interpretation. Changes were made resulting in a proposed new version of the Recommendation that will be submitted to IODE-22 together with the version that was adopted by JCOMM-4 and the annotations. The Team requested its members to provide answers to the outstanding questions, and further clarifications (see ETMC-4 Doc 4(2)) to Peter Pissierssens (IOC Secretariat) by the end of 2012 (***action; ETMC members; 31 Dec 2012***), who was tasked to finalize the document for inclusion in the final report of this ETMC-4 meeting as ***Annex IX***. These changes do not modify the intent of Recommendation 2 (JCOMM-4) and they offer clarifications.

4.1.4 The Team also requested the ETMC Chair to prepare a working document as well as a draft Recommendation for JCOMM-5, taking into account the documented clarifications and revisions, and based on experiences during the intersessional period (***action; ETMC Chair; JCOMM-5***).

4.1.5 The Team reviewed the data-flow diagram for the MCDS from the perspective of the IODE community as shown in figure 1 below. It was recommended that the figure be used for IODE-22.

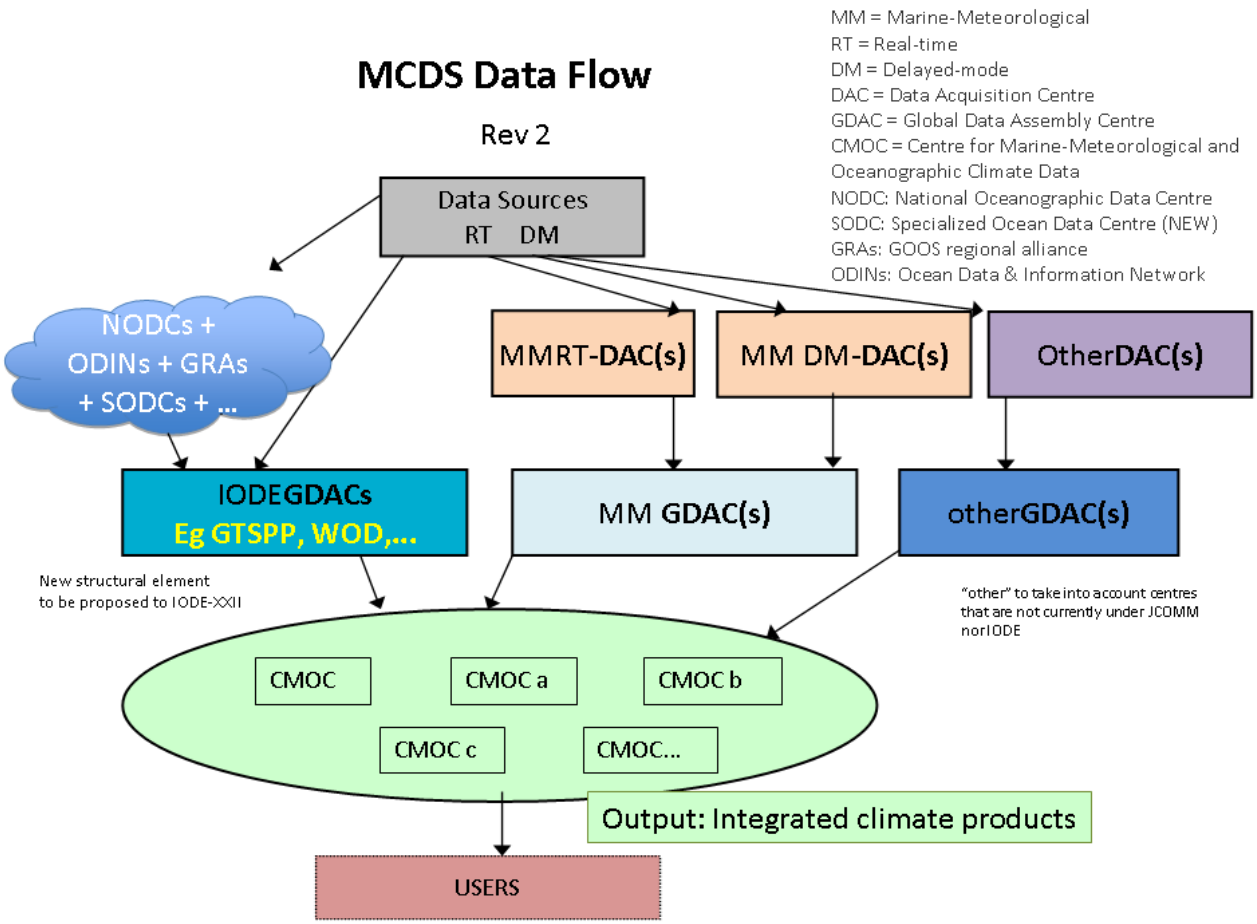

Figure 1: The MCDS Data Flow.

4.1.6 In particular, the Team agreed with the following:

- MCDS is dedicated to support climate applications, including climate monitoring, research, and services;
- CMOCs integrate ocean and marine meteorological data; they generate the required products within their scope; products can be aggregated data sets, and integrated climatologies, etc.;
- CMOC data and products are discoverable and accessible through ODP and WIS;
- The IODE may wish to establish GDACs to provide data to CMOCs;
- Versioning of MCDS data-sets and products will have to be managed (e.g. NODCs provide version 1; GDAC, ODIN[17], GRA[18], … provide version 2, …). The Team invited the DMCG and IODE to address the issue of versioning, look at specific versioning schemes that exist, and make recommendations in this regard for the MCDS (***action; IODE & DMCG; ASAP***). The Team invited its members to provide documentation they are aware of on versioning to the DMCG Chair for further consideration (***action; ETMC members; ASAP***).

4.1.7 While acknowledging that marine meteorological data-sets and products under MCDS will have to comply with WMO Resolution 40 (Cg-12), and oceanographic ones with the IOC Resolution XXII-6, IOC Oceanographic Data Exchange Policy, the Team agreed that the issue of data policy will have to be resolved for the integrated products. The Team also recalled that a specific data policy for the GFCS is currently under discussion, and will have to be followed. The Team agreed that a specific MCDS data and products policy will have to be defined along those lines (***action; ETMC; JCOMM-5***).

17 IODE Ocean Data and Information Network
18 GOOS Regional Alliance

4.2 Potential Contributions and Roles

4.2.1 The meeting particularly reviewed the potential contributions and roles of the various actors and stakeholders in the MCDS, particularly concerning foreseen Data Acquisition Centres (DACs), Global Data Assembly Centres (GDACs), and Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs), as well as the network of IODE National Oceanographic Data Centres (NODCs) and the ICSU World Data System (WDS).

Role of the International Oceanographic Data and Information Exchange (IODE) in the MCDS

4.2.2 The Team recalled that JCOMM in response to the increasing need for more and higher quality data and improved services from the scope of the climatic change research welcomed in its fourth Session the development of a new Marine Climate Data System (MCDS) up to 2020 and approved the establishment of a network of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data-CMOCs through Recommendation 2 (JCOMM-4).

4.2.3 It was recalled that the new system is going to be built on existing efforts of already organized data systems and will bring together historical and new met-ocean data, enhance the data streams from the observations to the users and provide high quality data and services. The system will be driven by common data management rules to ensure integrity and universal interoperability.

4.2.4 The CMOCs and the IODE network of NODCs are foreseen to be two core components in the new MCDS structure. There are areas where the two systems operate in a complementary way but there are areas where strong overlapping exists. Thus proper coordination and synergies are needed with clearly defined roles and responsibilities so as not to duplicate efforts unnecessarily, not to reduce respective operations and eventually the two systems to benefit from each other.

4.2.5 The Team noted that:

- CMOCs (and/or GDACS, DACs) are not necessarily national data centers. The responsibility of individual national met-ocean activities and systems remains national duties.
- CMOCs operate parallel to the NODCs network but they should not be doing the same tasks. CMOCs provide additional services.
- CMOCs provide combined data and added-value products services that are not covered by NODCs (and vice-versa).
- CMOCs do not substitute the international roles and responsibilities of IODE within regional, global or international data assembly. They remain under IODE responsibility.
- CMOCs can integrate data from projects outside the responsibility of the NODCs network, like satellite data.

4.2.6 The Team agreed that strong cooperation between CMOCs and IODE activities will be needed to ensure that they provide complementary not competing functions and services. In particular, the Team agreed on the following for the following aspects:

System harmonization: Pre-requirement for the consistency and coherence of the new multidisciplinary system will be the use of harmonized approaches from the observation to its end scope. The system will be driven by common data management rules with common standards and protocols that will be coordinated by IODE and JCOMM.

Interoperability: ETDMP will provide guidance for realizing interoperability within the MCDS distributed system and between MCDS and with WIS and ODP.

Data sources: IODE projects (GTSPP[19], GOSUD[20], OBIS[21], etc) and other partners such as the ICSU World Data System – WDS may contribute data to MCDS.

QMF: MCDS will deliver data and services under a specific Quality Management Framework (QMF) that will be developed in collaboration with IODE, and that will also comply with the WMO QMF. In parallel, IODE is participating to the accreditation process of prospective CMOCS regulating thus the data management requirements.

Linkages and cooperation: Strong similarities exist with analogous efforts such as the European Marine Observations and Data Network (EMODNET), which is based on SDN (data management infrastructure), MyOcean (implementation of GMES[22] Marine Service) and EuroGOOS (to further the goals of GOOS). IODE can promote that the necessary links will be maintained for a successful linking of MCDS with EMODNET and others similar systems worldwide.

4.2.7 The Team noted that the IODE is planning to associate its activities with the research and observation community and expand its services to them so as to enable the research groups that wish to start a new project and need a data management plan, to look for methodologies already used by other projects or centers rather than re-inventing these themselves. As these projects may have different scales and needs defined by different Frameworks and Directives, the assessment of their data information could be used as a tool to describe how well these frameworks are described and how well their implementations are working. This could be considered as a contribution to the Framework for Ocean Observations in the Global Framework Climate Services.

4.2.8 The Team acknowledged that ongoing work on the common elements of the MCDS Vision and ODP and the results of the ETMC-4 meeting will be further considered during the IODE-22 Session, March 2013.

Role of National Oceanographic Data Centres (NODCs) in the MCDS

4.2.9 Margarita Gregg (USA) reported on the perspective of the NODCs regarding the development of the MCDS, as outlined below:

1. One key contribution from the IODE National Oceanographic Data Centres to the Marine Climate Data System (MCDS) is through a) aggregation and quality control of near-real time and delayed-mode surface and subsurface data from multiple data sources and b) generation of subsurface climatologies for a variety of key essential ocean variables as defined by the GOOS Steering Committee.

2. There are several programmes that aggregate and quality control subsurface ocean data. For example, the IOC and JCOMM sponsored Global Temperature-Salinity Profile Programme (GTSPP) provides essential, sub-surface climate variables of temperature and salinity profile data with documented quality flags and internationally agreed quality. The World Ocean Database (WOD) is a collection of ocean profile and plankton historical and recent data that is scientifically quality controlled and aggregated into a common format (see sec. 4.2.12 for further information). This product utilizes all available national and international data subsurface data from sources such as Argo, international tropical moored buoys, coastal buoys, etc. Currently there is a proposal to expand WOD to include underway data that would contribute to the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). The NODCs can provide expertise in quality control of surface and subsurface data. Through IODE programmes such as Ocean Data Standards and GE-BICH, the IODE can propose quality control routines and provide data with quality control flags. The recent IODE GE-BICH QC Workshop (Oct 22 - 25, 2012) drafted a set of

19 Global Temperature and Salinity Profile Programme (GTSPP)
20 Global Ocean Surface Underway Data (GOSUD) Project
21 IODE Ocean Biogeographic Information System (OBIS)
22 Global Monitoring for Environment and Security (GMES)

proposals for a two-tiered quality control flag system which could be adopted by JCOMM. The goal will be to provide a single overarching set of profile data with the best set of corrections and quality control. This would include providing the most current data based on the most current scientific research. For instance, users will be able to acquire XBT and MBT data with any one of nine-twelve published corrections all the time keeping track of original data.

3. Once we have an agreed "authoritative" data set, the NODC's can provide mean climatological fields for different time periods, different resolutions, regional and global for different research needs with the most current set of data, corrections, bias corrections, and quality control. Both the data and the products would be available to the climate community without restrictions.

4.2.10 The Team agreed with the following:

- JCOMM standards for Higher Level Quality Control (HLQC) will have to be defined at some point (***action; German GCC; 2014***);
- The WOD could be proposed as the authoritative data-set for ocean sub-surface data;

Role of the World Data System (WDS) in the MCDS

4.2.11 The Team noted that the International Council of Science World Data System (ICSU/WDS) replaced the former ICSU World Data Centres and Federation of Astronomical and Geophysical data analysis Services (FAGS) following the decision of the ICSU General Assembly in 2008.

4.2.12 The Team recalled that the World Data Centre (WDC) for Oceanography-Silver Spring is a component of the ICSU World Data System. The WDC acts as an archive for oceanographic data from the international scientific community (originators' data) and distributes such data without restriction. In addition, the WDC produces WOD (as discussed above), which is the world's largest collection of ocean profile-plankton data available internationally without restriction with all data quality-controlled and in one common format. The WOD is available online at www.nodc.noaa.gov. WDC also produces other products (e.g., the "World Atlas" series) and also makes these products available online.

4.2.13 A key element in the IOC Strategy for oceanographic data and information exchange is the permanent long-term data archiving centre for all data. Thus, a major and long-term commitment of the IODE Programme is the long-term accessibility and archival of oceanographic data, meta-data and information to safeguard present and future holdings against loss or degradation.

4.2.14 Also, a key element within the MCDS operation is the long term archive in support of the climatic archives and the production of value added marine climate data sets.

4.2.15 In March 2012, the Inter-sessional working group for updating the IOC Strategic Plan for Oceanographic Data and Information Exchange (2012-2015) of March 2012, noted that there will be now 3 data flows: one involves the IODE NODCs that used to contribute data to the WDCs, a second involving the MCDS and CMOCs, and a third involving the new WDS (where WDC for Oceanography has applied as WDC). It is not yet well clear how all these will interact with each other, while it was noted that IODE had been accepted as a network member of the WDS.

4.3 MCDS Data Centres

4.3.1 Data Acquisition Centres (DACs), ToR and establishment process, candidates

4.3.1.1 The meeting agreed that the Terms of Reference (ToR) for the DACs and GDACs should be adopted by JCOMM-5 (***action; ETMC; JCOMM-5***). In the meantime, candidate DACs and GDACs shall perform on a trial basis using the existing draft Terms of Reference (ETMC-4 Doc. 4.3.1), and subsequent revisions.

4.3.1.2 The meeting advised on the DAC establishment, including process and evaluation. In particular, the Team agreed that the DAC evaluation committee should be comprised of at least three members, at least one from IODE, and at least one from JCOMM (WMO side). The evaluation should also be unanimous in its decisions. The conclusions of the Team in this regard will be reflected in the revised Implementation Plan (see item 4.4). The Team agreed that the following aspects will also have to be considered:

- Data types and how they fit with the DAC functions;
- What centre will be undertaking the functions of DAC for some specific data types;
- Consideration of marine meteorological and/or oceanographic climate data (contrary to CMOC, where it's both marine meteorological and oceanographic climate data);
- Updating the DMCG ToR to address the role of the DMCG for the evaluation of DAC, GDACs, and CMOCs. The Team recommended that the JCOMM Management Committee (MAN) make recommendations in this regard in order for the DMCG to be able to address this task on an interim basis (***action; MAN; May 2013***).

4.3.1.3 The Team agreed that in the IODE framework the MCDS DAC function is provided by the NODCs, and that it was therefore not necessary to establish IODE DACs for oceanographic data.

4.3.1.4 The meeting identified the following potential candidates for acting or upgrading as DACs (see also ***Annex X*** for the ETMC proposed list of candidates):

- The MCSS Contributing and Responsible (see sec. 4.3.3.3 below) Members;
- Responsible National Oceanography Centre for Drifting Buoys (RNODC/DB, operated by ISDM[23], Canada);
- Specialized Oceanography Centre for Drifting Buoys (SOC/DB, operated by Météo France);
- The former ODAS Metadata Service (ODASMS, operated by NMDIS[24], China);
- The Global Drifter Programme DAC (operated by NOAA/AOML[25], USA);
- Shipboard Automated Meteorological and Oceanographic System (SAMOS) data center.

4.3.2 Global Data Assembly Centres (GDACs), ToR and establishment process, candidates

4.3.2.1 The meeting advised on the GDAC establishment, including process and evaluation. In particular, as for the DACs, the Team agreed that the GDAC evaluation committee should be comprised of at least three members, at least one from IODE, and at least one from JCOMM (WMO side). The evaluation should also be unanimous in its decisions. The conclusions of the Team in this regard will be reflected in the revised Implementation Plan (see item 4.4 for the ETMC proposed list of candidates).

4.3.2.2 The Team agreed that the aspects to be considered as detailed under paragraph 4.3.1.2 above for the DACs are equally valid for the GDACs.

4.3.2.3 The meeting identified the following potential candidates for acting or upgrading as GDACs (see also ***Annex X***):

- The MCSS Global Collecting Centres (GCCs, operated by the UK and Germany)
- Argo GDAC (operated by Coriolis, France and FNMOC[26], USA)

23 Integrated Science Data Management, Canada
24 National Marine Data and Information Service, China
25 NOAA Atlantic Oceanographic and Meteorological Laboratory, USA

- OceanSITEs GDAC (operated by NDBC, USA)
- GTSPP GDAC (operated by NODC, USA)
- GOSUD GDAC (operated by IFREMER, France)

4.3.3 Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs), ToR, including tasks (esp. mirroring, Summaries), future role of Responsible Members (RMs), ICOADS partnership, performance indicators for existing centres, and evaluation criteria for candidates.

4.3.3.1 The meeting reviewed the tasks of the CMOCs (esp. mirroring, Summaries), and discussed the evaluation of candidate CMOCs, including evaluation criteria, and performance indicators for CMOCs once established. The meeting agreed that the MCDS Strategy should be updated to include the evaluation criteria and performance indicators (see items 4.1 and 4.4). The meeting agreed to submit the proposed evaluation criteria and performance indicators to the JCOMM Data Management Coordination Group (DMCG) (consultation by email), the Management Committee (Paris, Jan. 2013), and then to the IODE-22 (Ensenada, Mexico, 11-15 March 2013) for their approval.

4.3.3.2 The meeting recalled JCOMM-4 decision that China and Germany could begin filling the role of CMOCs on a trial basis immediately. Once/if the evaluation criteria and performance indicators will be approved by IODE-22, the meeting acknowledged JCOMM-4 guidance that the CMOC proposals of China and Germany should undergo evaluation accordingly. In the event of subsequent successful evaluation of the proposals from China and Germany, JCOMM-4 has recommended to request the Management Committee to work by correspondence with Members / Member States 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.

4.3.3.3 The meeting discussed the future role of the MCSS Responsible Members (RMs) in the MCDS framework. The meeting recommended eventually integrating the functions and geographic areas of responsibility of the RMs into Data Acquisition Centres (DACs) and declaring the RMs obsolete. This proposal is reflected in the new MCDS Implementation Plan (see item 4.4) and required updating the WMO Technical Regulation (i.e. WMO No. 471, and 558).

4.3.3.4 The meeting discussed emerging partnership arrangements with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS), and the foreseen future role of the ICOADS in the MCDS framework (see also item 6.1). The meeting recalled that JCOMM-4 had underlined *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 day), 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[27]) scientific assessments of climate, global analyses of temperature, and atmospheric reanalysis*. *In this context, it greatly welcomed a statement by the US that it remained committed to the continued vitality of ICOADS through the US 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 US that ICOADS would eventually be formalized as a CMOC under the MCDS.*

4.3.3.5 The meeting encouraged the USA to consider submitting an application for the ICOADS to become a CMOC.

4.3.3.6 The Team agreed that the role of the NODCs and National Meteorological and Hydrological Services (NMHSs) in the MCDS should be highlighted (e.g. as proposed in figure 1

26 Fleet Numerical Meteorology and Oceanography Center (USA)
27 Intergovernmental Panel on Climate Change (IPCC)

above). There is also a need to highlight what are the unique roles and responsibilities of each type of centre to avoid overlap.

4.3.3.7 In particular, the ETMC clarified the scope of the CMOCs for the following aspects:

- CMOCs can be global and/or regional;
- CMOCs integrate data sources from GDACs, NODCs, and Marine Meteorological DACs;
- CMOCs provide data management for marine meteorological and[28] oceanographic climate data and products;
- Products are served via ODP and/or WIS;
- CMOCs must be open to collaborations internationally to develop and improve continuously the data-sets under its mandate;
- There may be the need to establish multi-organizational CMOCs building on strong partnerships between different agencies – possibly on a multi-national basis – providing specific functions of the CMOCs (e.g. added value QC; bias correction; integration of satellite data; data rescue, etc.).

4.3.3.8 The Team noted that additional resources might be needed for allowing visits of evaluation committee members to candidate centres, but noted such resources have not been budgeted, and that resource mobilization might be needed.

4.3.3.9 The Team reviewed the proposed accreditation process for CMOCs (see ETMC-4 doc. 4.3.3, rev. 1), including evaluation criteria and performance indicators for the CMOCs. Noting that one of the original goals of the MCDS was to formalize in the JCOMM framework the widely used and trusted authoritative ICOADS, the Team agreed that the ICOADS could be used as a pilot for defining the criteria.

4.3.3.10 The Team suggested that results-based management (RBM) scheme should be utilized by CMOCs candidates and existing CMOCs as part of the evaluation and review process respectively. This will allow for streamlining the annual performance evaluation of individual CMOCs.

4.3.3.11 The Team requested Ms. Shaohua Lin (China), Ms Gudrun Rosenhagen (Germany), Scott Woodruff (USA), and Margarita Gregg (USA) to provide comments on the accreditation process to Bob Keeley (Canada) (***action; S. Lin, G. Rosenhagen, S. Woodruff, M. Gregg; 31 Dec. 2012***) — as well as inviting possible comments from other interested members of ETMC. In turn, the Team requested Mr Keeley to take these comments into account and provide an updated version of the accreditation process for review and approval by the ETMC Chair, the DMCG Chair, the Management Committee board (Paris, Jan 2013), and then the IODE-22 (***action; R. Keeley; 15 Jan. 2013***).

4.4 Implementation Plan

4.4.1 The meeting reviewed and partly updated the draft MCDS Implementation Plan taking into account the draft MCDS strategy discussed under item 4.1, JCOMM-4 guidance, and the outcome of the ETMC discussions in this regard. The new draft MCDS Implementation Plan is provided in ***Annex V***. The meeting agreed to submit the draft Implementation Plan to the JCOMM Data Management Coordination Group (DMCG) by email and then to the IODE-22 (Ensenada, Mexico, 11-15 March 2013) for their review (***action; Secretariat; 31 Jan.2013***).

5. FORMATS AND QUALITY CONTROL

5.1 Status of the IMMT and MQCS

28 The concept of integration between marine meteorological and oceanographic data will be effectively taken into account through the evaluation criteria for the CMOCs, taking the ICOADS as an example.

5.1.1 The Team recalled that the GCCs have responsibility for the upkeep of the International Maritime Meteorological Tape (IMMT) format and Minimum Quality Control Standard (MQCS). After careful review of the IMMT format & the MQCS guidelines, which were adopted by JCOMM-3 in November 2009, only minor amendments/additions have been made to produce the next versions (5 & 7 respectively).

5.1.2 As of 1st January 2011, IMMT-4 and MQCS-6 were the preferred format and quality standard for use by delayed-mode VOS observations and in the first 9 months of 2012 already 50% of the records were reported in this format. The most notable differences from IMMT-3 and MQCS-5 were the inclusion on a VOSClim & Automatic Weather Station (AWS) indicator, International Maritime Organization (IMO) number, relative humidity and new definitions of observation platform. The next versions of IMMT and MQCS (IMMT-5 & MQCS-7) with their minor changes came in effect in June 2012 per JCOMM-4 decision.

5.1.3 The Team noted that more and more VOS ships are using the updated Dutch electronic logbook software, TurboWin, with the latest version 5.0 and therefore the output IMMT-4. The USA are also updating their SEAS e-logbook software, both are using the recent version 7 of MQCS. The Met Office has proposed further developments and improvements to the next version of TurboWin and if incorporated will help improve quality and consistency of future observations.

5.1.4 The MQC-software for CMs was also updated. The 4th version was distributed in March 2011 and the 5th version is available at http://www.wmo.int/pages/prog/amp/mmop/mqc_soft.html.

5.1.5 The Team agreed that in future CMs should continue to check the delayed-mode VOS observations with the revised version of MQCS prior to submission to the GCCs (soon to be GDACs within the new Marine Climate Data System (MCDS) structure). This will help to increase data quality as any data corrections are best done close to the data source.

5.1.6 The Team also agreed that for the GCCs (and GDACs within the new MCDS framework) the MQC should be “phased-out”. In the near future checks will be done with the newly developed and standardized HQCS (see Doc. 5.5) before archival with the CMOCs. The requirements and proposals for the future quality control and data flow are included in the updated Implementation Plan of the MCDS (see Doc 4.4)

5.1.7 The Team concurred with the GCC recommendations that the changes to IMMT format and MQCS checks be in effect as IMMT-5 and MQCS-7 for general use as soon as is possible.

5.2 Review of the BUFR[1] (and other) templates for surface marine data

BUFR[1] Templates

5.2.1 The Team recalled that WMO Commission for Basic Systems (CBS) migration to table driven codes for marine data shall be in principle be completed by the end of 2012. The Team recognized that progress with regard to the development and updating of the required BUFR templates for marine meteorological and oceanographic data has been limited since the third ETMC Session (ETMC-3, Melbourne, Australia, 8-12 February 2010). The ETMC recommendations agreed at ETMC-3 remain valid (see ETMC-3 doc 4, and ETMC-3 final report, section 4.2 for details, as well as SOT-6 final report, paragraphs 9.2.4.4 to 9.2.4.6).

5.2.2. The Team noted that plans are underway for sharing tools for BUFR encoding/decoding software within the oceanographic community, and example of BUFR reports have been produced for training purposes (there have been recorded in the IODE OceanTeacher). It was also noted that JCOMM-4 requested the DMPA to keep the “Cookbook for submitting ocean data in real-time and delayed mode” under review, and continue to keep the BUFR templates for ocean data under review so that they continue to take end-user requirements into account. Highlighting the

importance of BUFR, JCOMM-4 further requested the DMPA to finalize the BUFR Master Table 10 (Oceanographic Data).

5.2.3 The Team noted that JCOMM has engaged a process for the rationalization of BUFR sequences for marine data in order to provide some standardization and consistency for the reporting of specific ocean variables and their metadata between the different types of ocean observation platforms reporting in BUFR format (e.g. same sequence for data and metadata for Sea Surface Temperature (SST) observations from VOS, moorings, drifters, tide gauges, etc.). Details were provided to the Team in Appendix D of ETMC-4 doc 5.2.

5.2.4 See also agenda item 5.4 (and corresponding ETMC-4 preparatory document) relating to the provision of encrypted ship's call sign (ship masking) within the BUFR template for VOS data.

Preservability of marine data

5.2.5 Regarding the issue of preservability of the real-time data, the Team recalled that it had established a small *ad hoc* group at ETMC-3 to address each of the following levels:

1. Observing practices and the recording of the observations on-board the ship.
2. Transmission of the observations in real-time from ship to shore. While it was not proposed to standardize the format(s) used for the transmission of VOS data from ship to shore, the Team felt that it would be useful to provide guidance regarding the elements that should be transmitted, on a variable-by-variable basis.
3. Transmission of the observations in real-time onto the GTS in BUFR format.

5.2.6 The Team noted that the *ad hoc* group had produced a report (Appendix B of ETMC-4 doc 5.2) that was then submitted to the sixth Session of the Ship Observations Team (SOT-6, Hobart, 11-15 April 2011). The Team noted the outcome of the SOT-6 discussions in this regard.

5.2.7 Recalling the problems that have been noted with regard to the preservability of marine data encoded in BUFR, the Team recognized that there has not been sufficient validation of the existing BUFR templates for marine meteorological and oceanographic data, and agreed that the ICOADS should have been involved in the validation.

5.2.8 The Team thanked the *ad hoc* group for its work, and noting outstanding issues, agreed to re-activate it, and to refresh its membership. The Team selected the following people to be part of the refreshed *ad hoc* group: Gudrun Rosenhagen (Germany), Shawn Smith (USA), David Berry (UK), Nicola Scott (UK), and Scott Woodruff (USA).

5.2.9 The Team requested the *ad hoc* group to address the SOT-6 decisions, and to make further proposals to the SOT-7 (Victoria, Canada, April 2013), especially regarding practices to be included in the *Guide to Marine Meteorological Services* (WMO 2001a) (i.e. for the part describing the VOS Scheme) and in the *Manual on Codes* (WMO 1995, 2001c) (***action; ad hoc group; April 2013***).

5.2.10 The Team noted that there is not BUFR template for the reporting of CTD[29] measurements made by ships. It further noted that Bob Keeley (Canada) and Joaquin Trinanes (USA) have discussed a BUFR template for CTD data, which may have to be submitted to the CBS Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM). The Team thanked both for their efforts in this regard, and invited David Berry (UK) to coordinate with Joaquin Trinanes in the view to submit the template to the DMPA Task Team on Table Driven Codes (TT-TDC) for their review, and further submission to the CBS (***action; D. Berry; ASAP***).

5.2.11 However, the Team noted that the TT-TDC had currently no Chair, and was not active. It requested the Secretariat to investigate for the nomination of a new chair in consultation with the

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Chair of DMCG (***action; Secretariat; ASAP***). The Team noted with appreciation that David Berry (UK)) was willing to become a member of the TT-TDC, and that the US National Data Buoy Centre (NDBC) was about to nominate someone to become a member.

5.2.12 The Team noted that a useful document is being prepared by Bob Keeley and Scott Woodruff on BUFR issues and issues to be addressed by the users of the ocean data. The Team advised that the document should be posted on the IODE OceanTeacher once available (***action; S. Woodruff & R. Keeley; ASAP***).

5.3 Review of electronic logbooks

5.3.1 H. Y. Mok (Hong-Kong, China) reported on the use of on electronic logbook (e-logbooks) in the framework of their use in marine climatology. Members operating the VOS have been encouraged to use e-logbooks. At present, there are three main types of e-logbooks – OBSJMA (developed by the Japan Meteorological Agency [JMA]), SEAS (developed by NOAA) and TurboWin (developed by KNMI[30]).

5.3.2 On request by the fourth Session of the JCOMM Ship Observations Team (SOT-4, Geneva, Switzerland, 16-21 April 2007), the Task Team on Instruments Standards of SOT was requested to conduct an inter-comparison of the three types of e-logbooks and the results and recommendations were presented and discussed at SOT-5. The significant variations between the three e-logbooks were related to the algorithms for calculating the dew point temperature, the true wind speed and direction, and MSL pressure, as well as the coding of swell. The Team further discussed the recommendations made by the inter-comparison at ETMC-3. Among the others, the Team endorsed that the algorithm for calculating dew point temperature be standardized between e-logbooks according to WMO technical regulations and approved by ETMC.

5.3.3 The Team noted that since operation, there have been a number of modifications of the three types of e-logbooks. The modifications were mainly on user-friendliness, hardware and OS compatibility and quality check capability enhancement, as well as changes in the algorithms for the calculation of meteorological quantities.

5.3.4 The Team noted that the details on the modifications in each new version and the version number of the e-logbook version used for each ship observation are important information for using the ship observations in marine climatology.

5.3.5 In view of 5.3.1, 5.3.2, 5.3.3, and 5.3.4 above, it is essential that amendments on codes and formats be carefully coordinated and accommodated in a timely fashion in the e-logbooks.

5.3.6 Processes and mechanisms currently used to modify e-logbooks, and to document, archive, and harmonize the computational algorithms (e.g. for computed quantities such as dew point temperature) include:

(i) The Chair of the SOT Task Team on Instruments Standards was asked at ETMC-3 to review the dew point temperature algorithms currently in use in consultation with ETMC with a view to eventually getting agreement on a common algorithm for use in all e-logbooks;
(ii) For climate applications, SOT members developing and maintaining e-logbooks have been encouraged to preserve the source code of historical versions of e-logbook systems and the types and versions of the algorithm used to calculate dew point temperature in each of the e-logbook types should be archived for historical reference;
(iii) A webpage at the WMO website has been set up for documenting algorithms used for the calculation of dew point temperature using e-logbooks, and the

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manufacturers have been invited to provide the present and past versions of their e-logbook algorithms, along with their periods of validity to WMO Secretariat for posting on the WMO website;

(iv) WMO Members were informed in January 2010 of the SOT-ETMC recommendations regarding the coding of swell and dew point temperature by mean of a circular letter. A letter was also sent to the three e-logbook manufacturers;

(v) The VOS focal points have to keep comprehensive records on the type and version used, along with their periods of validity, by each VOS and each year the VOS focal points have to complete a report for JCOMM SOT listing all the electronic logbooks in use on their ships and the information will be available at WMO Pub47 metadata;

5.3.7 The meeting noted that

(i) a common dew point temperature algorithm for use in all e-logbooks is still outstanding;

(ii) Information on the algorithms used for the calculation of dew point temperature using the present versions of e-logbooks has been posted onto the WMO website. The same algorithm is used for all versions of the same type of e-logbook;

(iii) a field (logE) exists in Pub47 metadata to provide the e-logbook used on board each VOS and each year.

5.3.8 **The meeting made the following recommendations**:

(i.) Expedite the agreement on a common dew point temperature algorithm for use in all e-logbooks (allowing for a variable psychometric coefficient to be entered by the PMOs in the e-logbooks, and recorded in Pub47);

(ii.) ETMC should continue to monitor the algorithms being used;

(iii.) The settings within TurboWin and e-logbooks should be preserved and the changes tracked.

5.3.9 **The meeting decided on the following action items**:

(i.) To contact the Chair of the SOT Task Team on Instrument Standards, Mr Henri Kleta (Germany) and seek clarification on recommendation (i.) above (***action; D. Berry; Apr. 2013***);

(ii.) To coordinate and discuss with the manufacturers of the three types of e-logbooks to agree on a common dew point temperature algorithm for use in all e-logbooks (***action; ETMC Chair; ASAP***);

(iii.) To contact the SOT to address the recommendation (ii.) above and ask SOT to request software developers to act upon it (***action; N. Scott; Apr. 2013***).

5.3.10 Finally, the meeting noted recently discovered problems in the SEAS surface meteorological delayed-mode archive. Comparisons between the real time transmissions and corresponding delayed-mode surface observations produced by the SEAS software revealed differences between the two sources although they should to be identical. The US VOS in coordination with NOAA/AOML is working to correct the problems with the delayed-mode portion of the software and hope to have a corrected SEAS version available soon. A backwards compatible fix for the erroneous delayed-mode surface data held in the NOAA/NCDC archive is also being investigated and it is hopeful that the data can be corrected in the future and will once again be suitable for use in climatological applications.

5.4 Ship call sign masking (including encode proposal)

5.4.1 The Team recalled that following concerns expressed by ship owners and masters with regard to ship's identification and position being made available via public websites, the WMO Executive Council adopted Resolution 27 (EC-LIX) authorizing Members, under certain conditions, to mask the identification of the ship from Voluntary Observing Ship (VOS) reports being exchanged in real-time. Several masking schemes[31] have now been implemented by Members in accordance with this Resolution.

5.4.2 The Team emphasized again that incorporating un-masked VOS GTS data historically[32] eventually into key climate databases including the International Comprehensive Ocean-Atmosphere Data Set (ICOADS), and Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs) remains a critical requirement for marine climatology in order to support not only the oceanographic and marine meteorological research community but also the climate services community. This remains a significant challenge.

5.4.3 The Team noted the proposal from the former ETMC Chair, Scott Woodruff (USA), and Eric Estes (USA) (Appendix A of ETMC-4 doc 5.4) for the encrypting of ship's call sign as part of VOS real-time GTS reports. The Team also noted that the proposal has been presented to the sixth Session of the JCOMM Ship Observations Team (SOT-6), Hobart, Australia, 11-15 April 2011, and discussed.

5.4.4 The Team concurred with the decisions of SOT-6 (see section 6.6 of JCOMM Meeting Report No. 84), and urged the SOT and the Data Management Programme Area (DMPA) Task Team on Table Driven Codes (TT-TDC) to speed up the development of a proposal so that the corresponding and required BUFR template for VOS data can be passed to the Commission for Basic Systems (CBS) Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) (***action; DMCG; ASAP***).

5.4.5 The Team noted that some of the ships operated in the JCOMM framework for the making of marine meteorological and oceanographic observations were operating under both the Voluntary Observing Ship (VOS) scheme and the Ship of Opportunity Programme (SOOP). The Team invited the Secretariat to approach the Chair of the SOOP Implementation Panel (SOOPIP) to indicate whether some of those ships data are also masked and to investigate solutions in that case to make sure that un-masked data eventually reach the international archives (***action; Secretariat; mid-2013***).

5.5 Stage of HQCS

5.5.1 The team discussed the status of developments for a Higher Level Quality Control Standard (HQCS) by Germany. The requirement to define and develop a more advanced QC system was one of the significant tasks of the former TT-DMVOS. A first proposal of the HQCS by the GCCs was agreed upon by the participants of ETMC-3 in 2010. The future HQCS is proposed for operation by the GCCs (and other centres soon to be GDACs) prior to data archival, and is anticipated to be primarily based on an automated system comprising a variety of advanced QC measures.

5.5.2 The new HQCS aims at using unified checks for different data types and formats, an easy handling of data checking, reproducibility (traceability) of QC stage and graphical display of erroneous values as well as simple methods to correct the data.

5.5.3 The HQCS can be applied to both near-real-time and past collected (and possibly historical) data as appropriate.

31: Implemented schemes include (i) SHIP: the generic "SHIP" letters are used in place of the ship's call sign within GTS VOS reports, while unmasked data are distributed to authorized legitimate users through a secured parallel system (this scheme is used by Japan, USA, and Canada), and (ii) MASK: using SOT managed unique ship identifiers in place of the original ITU callsign (this scheme is used by Australia, and E-SURFMAR). The long term universally accepted solution (ENCODE) is foreseen to propose the encryption of the ship's call sign within VOS GTS reports using the BUFR code.

32 : i.e. primarily back to ~Dec. 2007 when masking accelerates in available GTS data.

5.5.4 Besides a number of the additional element comparisons and many more time-sequence checks, the proposed system includes:

- Position Tests :
  On land-positions: For including in the on-land position check a new ocean-land mask with a spatial resolution of 0.01 degrees lat/long has been developed. It takes into account the need for including navigable rivers especially with the increase of automated observations as the number of records from river and harbour positions is increasing.

  Course and way: Plausibility test of the ships' positions

- Climatology Tests: Comparisons of measurements and reanalysis data are included for sea temperature, air temperature, due point temperature and SL pressure. According to the proposal of ETMC-3, the 30-year ECMWF climatology ERA40 should be used for this purpose. However, the climatology proved to be too coarse for this purpose. Comprehensive tests with ERA Interim data showed much better results.

- Near-neighbouring Tests: Comparisons with data of neighbouring platforms.

5.5.5 The first test version of HQCS is almost ready with completion due during 2013.

5.5.6 Data comparisons with model data (such as the ECMWF model) and satellite data are considered as an aspirational target for the future of QC, with development and implementation thought to be some years from now.

5.5.7 The Team requested the UK GCC and the ICOADS to test the first version of the HQCS (***action; GCC/UK & ICOADS; mid-2013***).

6. DATA AND METADATA: ARCHEOLOGY AND ARCHIVAL

6.1 Status of and linkages with the ICOADS

Funding update & international task sharing

6.1.1 The Team was updated on budgetary changes in NOAA emerging in late 2011, which forced the US-based core team to restructure the ICOADS program. Under this restructuring the NOAA National Climatic Data Center (NCDC) is assuming the overall ICOADS leadership role, encompassing both near real-time (NRT) and delayed-mode (DM) updates, with the US National Center for Atmospheric Research (NCAR) continuing its key support role at both update scales—and the NOAA Earth System Research Laboratory (ESRL; formerly the lead organization) is discontinuing involvement. The NRT component is already progressing well, with a new blended product based on a combination of GTS data from NCDC and the NOAA National Centers for Environmental Prediction (NCEP)—which will resolve some callsign masking and provide other advantages in data quality and completeness—anticipated for prototype availability by early 2013.

6.1.2 However an expanded group of collaborators could be very helpful particularly on the DM update side, in crucial support of a wide range of research activities reliant on regular ICOADS historical updates, such as analyses of sea surface temperature (SST) and other Essential Climate Variables (ECVs), atmospheric re-analyses, and international assessments of climate change. To strengthen ICOADS therefore, and distribute the risk of incurring serious future setbacks for this worldwide valued program, a series of teleconferences has been held (four so far, spanning July-Nov. 2012) to discuss long-term proposals for adding new international members to the core ICOADS team (e.g. potentially in association with the GCCs in Germany and UK). In the near term as a priority we hope to establish a viable pathway forward to complete a next major historical

update (Release 2.6), following along from Release 2.5 (Woodruff et al. 2011), by around the start of 2014, for which June 2013 has been established as the tentative input data cutoff.

The International Maritime Meteorological Archive (IMMA) format

6.1.3 The Team reviewed the development and status of the International Maritime Meteorological Archive (currently IMMA0) format (ICOADS 2010), which is in wide use for storing historical and contemporary marine data for ICOADS, and now also offered quarterly by the GCCs as an alternative to the IMMT format. The Team discussed extensive improvements now being implemented in prototype form and planned for final adoption (as IMMA1) for Release 2.6 around early 2014 (Woodruff et al. 2012; see also Doc. 6.3). Among these, a variety of changes are being implemented to bring IMMA into closer agreement with recent IMMT formats. Related to these format evolution issues, Appendix A of ETMC document No. 6.1 describes a potential ETMC and GCC activity, i.e. proposed development of a new state-of-art historical IMMT archive, which could potentially also benefit ICOADS through the provision of optimally reconstructed IMMA1 records.

Proposal for "advanced" (bias adjusted) ICOADS

6.1.4 The Team discussed work underway in the US on an ICOADS Value-Added Database (IVAD) project—funded for three years (FY2011-13) by the NOAA Climate Program Office—seeking to capitalize on the work of community experts who have worked on specific variables and time periods to enhance homogeneity across observing systems, estimate the uncertainty of observations, and improve QC. In the past, these activities have typically resulted in analyzed (gridded) datasets, but IVAD seeks to make the underlying observations used in these improved datasets readily available to all ICOADS users. The Team noted that the IMMA format would serve as the underpinning for IVAD (see Woodruff et al. 2012). IVAD will provide a mechanism to link community-developed adjustments back to the individual marine reports in ICOADS.

6.1.5 A new IMMA field, the Unique Record ID (*UID*), which is being permanently affixed to all existing and future incoming ICOADS records, forms a key linkage component for the IVAD, and should also provide many other benefits (e.g. help facilitate a feedback mechanism on individual ICOADS records from reanalysis projects). The Team discussed how possibly additional large observational archives (e.g. WOD) might possibly benefit from cross-linking any unique record tracking systems similar to UID (see also further Background below).

6.1.6 In addition, JCOMM-4 had requested ETMC to establish a broader JCOMM Pilot Project on IVAD to extend the scope of these efforts with wider participation. While many details remain to be fleshed out and suitable funding across the international groups would need to be identified, a Concept Plan has been drafted to help guide this proposed expanded project (Smith et al. 2011).

Potential linkages with satellite data

6.1.7 In terms of potential linkages with satellite data, a prototype project was untaken to match ICOADS observations with satellite data collections using a web services approach. The project successfully demonstrated the feasibility of such an approach and was presented at MARCDAT-3 in Frascati Italy, May 2011. Appendix B provides a report with more details.

CMOC nomination plans/progress

6.1.8 JCOMM-4 had greatly welcomed a statement by the US that it remained committed to the continued vitality of ICOADS through NCDC and NCAR—in conjunction with potential new national/international partnership arrangements. Additionally it was envisioned by the US at JCOMM-4 that ICOADS would eventually be formalized as a CMOC under the MCDS. As discussed above however the longer-term plans and resourcing for ICOADS are still under development, and in view of the challenging near-term budgetary outlook in the US for NOAA (as well as potentially for other US agencies including the National Science Foundation, which funds NCAR)—no specific CMOC commitment can be made at this time by the US. Moreover in view of

the likelihood of fruitful international partnerships for ICOADS moving forward, the Team noted that any future CMOC application may need to be structured multi-nationally.

6.1.9 **The meeting made the following recommendations**:

(i.) The Team agreed generally on the proposal for Development of a Renovated Historical State-of-Art IMMPC/IMMT (AND Resultant IMMA1) Archive, under the leadership of the GCCs who will also invite the active participation of the remaining RMs

(ii.) The Team strongly agreed that the future of ICOADS needs to be securely established;

(iii.) The Team agreed to continue work towards establishment of a broader JCOMM Pilot Project on IVAD seeking to extend the scope of these efforts with wider participation, building on the results of the 3-year NOAA/CPO-funded effort ending in 2013.

6.2 **Instrument/Platform metadata** (including agenda items 6.2.1: Status of the WMO Ship Catalogue (WMO-No. 47); 6.2.2: Buoy metadata; and 6.2.3: Rig and platform metadata issues)

6.2.1 The Team reviewed latest developments within JCOMM regarding the management of instrument-platform (I-P) metadata from ocean observing platforms, and their requirements for exchange in real-time and delayed mode. The Team recalled that the proper management of I-P metadata, as well as that of higher-level forms of metadata,[33] is an important component of the integration effort promoted by the WMO Integrated Global Observing System (WIGOS). Standardization is necessary for all data and associated metadata so that the measurements from individual systems can be integrated into accurate and coherent data sets that allow for the development of unbiased, homogeneous long-term time-series.

6.2.2 The meeting recalled that JCOMM-4 urged Members/Member States to collect, distribute and record I-P metadata together with the ocean observational data, and adopted Recommendation 1 (JCOMM-4) – Provision of Ocean/Instrument Metadata. This requirement was also stressed by JCOMM-4 as part of the development of the Marine Climate Data System (MCDS) and adopted Recommendation 2 (JCOMM-4) on the MCDS (see ***Annex IX***, and Appendix B of doc 4).

6.2.3 The Team reviewed the metadata requirements for Marine Climatology. It recalled that at its third Session it had recommended an initial test of the scope and usability of Ocean Data Acquisition System (ODAS) metadata obtained from the ODAS Metadata Service (ODASMS) — as well as the operation of the web-based interface (e.g. if it permits efficient large-scale metadata transfers) — by means of a comparison with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) sample marine reports (from buoys, etc.). While noting that the test had not been completed due to unanticipated practical obstacles, the Team acknowledged that it was not relevant anymore, following JCOMM-4 decision as part of Recommendation 2 (JCOMM-4) to declare the ODASMS obsolete, and 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 Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs) on a trial basis and report on the results to JCOMM through the Management Committee (noting that as part of their functions, CMOCs "*must make datasets, and corresponding metadata, maintained as part of its scope available, and discoverable through the WIS and/or IOC/IODE ODP*"). The management of metadata is also one of the deliverables (i.e. #7) of the MCDS Strategy.

6.2.4 The Team noted with appreciation that the trial CMOC in China is establishing a collaboration with the trial GDAC for drifting buoys in Canada for the management of both drifting

1: Snowden et al. (2010) distinguish between three major levels of metadata: Instrument-Platform (I-P), Provenance-Lineage (P-L), and Collection-Discovery (C-D).

buoy data and metadata. China has also undertaken some technical developments to enhance the IT network, and improve access via the Internet to the data-sets held by the trial CMOC.

6.2.5 The Team emphasized again the importance of the rescue of historical buoy and "ODAS" metadata—including from ocean rigs and platforms—which may be at risk of permanent loss due to media degradation, organizational changes, etc. The Team invited the JCOMM Observations Coordination Group (OCG) to request JCOMM observations Panels and associated programmes to make sure that those metadata are properly rescued (***action; OCG; ongoing***).

6.2.6 In recognition of continuing misunderstandings owing to the lack of a precise and common understanding of the "ODAS" terminology, the Team proposes that terminology for metadata categories and repositories essentially be abandoned, instead in the future recommending the adoption of more precise platform/programme nomenclature (e.g. "rig and platform metadata" as listed in Table 1).

6.2.7 The Team recalled the legacy recommendations of the Water Temperature Metadata Pilot Project (Meta-T), and agreed with the recommended strategy to include as much metadata as is practically available at the time of Global Telecommunication System (GTS) encoding in the BUFR[1] templates. The design of BUFR templates is of primary importance to the overall management and distribution of data and metadata (see also agenda item 5.2).

6.2.8 The Team reviewed the different mechanisms in place for the collection of I-P metadata from different types of ocean observing platforms as described in Table 1. In general, because of increasing convergence of instrumentation and observing practices between platforms managed by SOT versus by the Data Buoy Cooperation Panel (DBCP), it would seem highly desirable that the metadata managed by both groups eventually evolve towards being as consistent and interoperable as possible, thus benefiting also downstream marine climatology users and other applications. An important element of this convergence is the greater adoption of Automatic Weather Stations (AWS) by VOS, and inherent overlaps as well with automated or high-resolution Research Vessel (R/V) measurements.

Platform type	***J-Ops***	***Current I-P metadata status and archive(s)***	***Issues/Comments***
VOS	**X**	WMO Publication No. 47 (Pub. 47; 1955-); http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm); informal (more timely) version available via E-SURFMAR [34] (http://esurfmar.meteo.fr/doc/vosmetadata/index.php)	Long considered essential for marine climatological blending activities, owing to the large variations in ship types, instrument exposures, etc. Longstanding issues of timely updating of the official version at WMO.
SOOP ships	**X**	Basic metadata collected by JCOMMOPS on a yearly basis through the SOOP annual Expendable BathyThermograph (XBT) survey[35] using dedicated format[36].	Some of the SOOP ships are also VOS and their metadata recorded in Pub47.
ASAP ships		WMO Publication No. 9, Volume A, *Observing Stations, and WMO Catalogue of Radiosondes*[37].	Ship-specific metadata not currently included; SOT looking at options.
Research vessels (R/Vs) and		Managed independently through each individual programme, whether national or coordinated in some way internationally (e.g.	No JCOMM-managed integration effort at this point. Some R/Vs contribute to VOS and SOOP, so

34 Surface Marine programme of the Network of European Meteorological Services, EUMETNET
35 http://www.jcommops.org/soop/soop_report.html
36 http://www.jcommops.org/doc/metadata/submission_format.html
37 http://www.wmo.int/pages/prog/www/ois/volume-a/vola-home.htm
38 Shipboard Automated Meteorological and Oceanographic System (http://samos.coaps.fsu.edu/html/). As part of ICOADS, selected R/V metadata for 1990-98 associated with the SAMOS program (deck 740, *Research Vessel (R/V) Data Quality-Evaluated by FSU/COAPS*) were transformed into a Pub47-like form and blended into Release 2.5 (Woodruff et al. 2011).
39 http://www.ferrybox.com/

Platform type	*J-Ops*	*Current I-P metadata status and archive(s)*	*Issues/Comments*
other ships		SAMOS[38], FerryBox[39], GO-SHIP[40]).	there may be overlap in metadata records between several programmes.
Drifting buoys	**X**	Collected and archived by the Global Drifter Programme (http://www.aoml.noaa.gov/phod/dac/dirall.html).	No JCOMM-managed integration effort at this point.
Moored buoys	**X**	Currently managed at the national programme level.	DBCP agreed on content needing to be collected [41] . NDBC is now developing a NetCDF SIF (standard input format) for moored buoy metadata. Once the SIF is agreed then metadata submission collection could begin.
OceanSITES	**X**	Collected and archived by OceanSITES [42] Project Office; programme-specific netCDF format also used and recorded by each programme contributing to the OceanSITEs.	Some overlap with the moored buoy programme.
Argo floats	**X**	Collected and archived by the Argo GDACs; programme-specific NetCDF format used.	
Tide gauges		Basic metadata managed by GLOSS.	Some tide gauges also report meteorological measurements (e.g. wind speed and directions, air temperature, water temperature, barometric pressure, relative humidity and conductivity/salinity), for which metadata, if available, presently have no agreed management or integration scheme.
Tsunameters		Basic metadata managed by International Tsunameter Partnership (ITP)	International Tsunameter Partnership (ITP) looking at this issue.
Gliders		Managed at the national programme level.	No JCOMM-managed integration effort at this point.
Rigs and platforms		NMDIS currently managing available "ODAS" metadata, but the effectiveness of that system was never demonstrated, and the on-line system is no longer available.	There are plans to integrate the management of some "ODAS" or other metadata as part of the trial CMOC.
Marine Mammals		No coordinated mechanism; managed individually by each marine mammal programme at the national level.	Not currently managed under JCOMM. Further investigations needed.

Table 1. Overview of current I-P metadata collection and archival across major JCOMM observational platform types. If marked "**X**" the ***J-Ops*** column indicates that some more basic metadata (e.g. VOS and SOOP ships, Argo floats) are also managed by JCOMMOPS.

6.3 Oceanographic data and metadata integration issues (XBT fall rate equation, SSS, etc.)

6.3.1 To help support a variety of marine climatological applications, the Team recalled that data from oceanographic profiling instruments are an important supplement to near-surface data. Similarly to how ICOADS provides access to the most complete and extensive collection of surface marine meteorological data available today, access to the world's largest collection of oceanographic data is provided through the World Ocean Database (WOD) (US NODC). For

40 Global Ocean Ship-Based Hydrographic Investigations Program
41 http://www.jcommops.org/dbcp/data/metadata.html
42 OCEAN Sustained Interdisciplinary Timeseries Environment observation System

periodic major ICOADS delayed-mode updates moreover, near-surface temperature profile measurements have routinely been selected from WOD, and blended into ICOADS.43

6.3.2 The Team recognized however that data from different oceanographic temperature instrument types have different characteristics, which can create time- and space-dependent biases. For reference, the following selection procedure is currently used for ICOADS, as was reviewed at ETMC-3 (2010):

> "For the latest ICOADS Release 2.5 [Woodruff et al. 2011], near-surface profile temperatures were selected from the depth closest to 4m and ≤10m. In previous Releases the scheme started at the shallowest depth in a profile and used the first temperature value at any depth ≤3m. Neither approach is ideal. Better schemes, which could be instrument-type dependent, might be needed. The general impact across all profile types for derived SST from the WOD is that 5% more SST were recovered in ICOADS (7.1 M) and average depth of SST estimate increased from approximately 0.2 to 2.2 meters."

6.3.3 The Team discussed questions that have arisen in the past few years about the practicality and desirability of including in ICOADS sea surface salinity (SSS), which like SST is among the GCOS Essential Climate Variable (ECVs) at the ocean surface.[44] From a scientific standpoint, convenient and consolidated access requirements for these data are becoming increasingly critical especially with the launch last year of the Aquarius mission. Moreover, saving SSS so that it is conveniently available coincident with other surface measurements as part of ICOADS adds value to it in conjunction with these other elements. With these urgent requirements in mind, ICOADS is in the early stages of developing and implementing a near-surface oceanographic attachment (attm), which will form a new component of the flexible and extensible International Maritime Meteorological Archive (IMMA) format used for ICOADS (see Appendix A of ETMC-4 preparatory document No. 6.3). In this regard, the Team noted longstanding efforts (e.g. through the Group for High-Resolution SST [GHRSST]) to agree on what constitutes "SST" (e.g. skin or foundation values[45]). Similar disagreements undoubtedly will arise in seeking to determine an optimal "SSS." Since ICOADS cannot resolve these arguments, the Team emphasized the need to ensure that sufficient metadata are provided to support analyses of the data, in order to facilitate to the extent practical experimentation with a variety of potential approaches.

6.3.4 Similarly there is an increasing need for enhanced access to near-surface pCO2 (another ECV) and nutrient measurements. These data are available among the profiles of the WOD, and more and more often now from underway-towed instruments and flow water analysis systems. For example, US NODC routinely archives data streams from Global Ocean Surface Underway Data (GOSUD; http://www.gosud.org), Shipboard Oceanographic and Meteorological System (SAMOS; http://samos.coaps.fsu.edu/html/), Rolling Deck to Repository (R2R; http://www.rvdata.us), and other R/V and underway programs. Presently, however, these near-surface data are not being integrated into a single, readily accessible dataset, including uniform QC, sampling rates, etc. The Team discussed how ICOADS could also be the logical place to provide convenient and consolidated access as well to these non-physical (i.e. primarily chemical and/or biological data) near-surface oceanographic data. While in the early stages of development, and noting that new resources and partnerships may need to be established to support such an expanded effort, additional data structures to hold and provide to users these additional ocean data elements were outlined to the meeting (see Appendix A of ETMC-4 preparatory document No. 6.3).

6.3.5 The Team also briefly reviewed recent work seeking to resolve XBT fall-rate equation biases. E.g. at the MARCDAT-3 Workshop (Frascati, Italy, 2-6 May 2011) Dr Viktor Gouretski

43: As also noted in Doc. 6.4, coordination following EMTC-III confirmed that all profile data digitized and exchanged under the Global Oceanographic Data Archaeology and Rescue (GODAR) initiative are added to the WOD. Thus as long as ICOADS continues to process all WOD data types, any GODAR marine near-surface meteorological data associated with the profiles will become part of ICOADS.

44: Ref.: http://www.wmo.int/pages/prog/gcos/index.php?name=EssentialClimateVariables. Among the other oceanic surface ECVs listed, ICOADS presently includes sea state and sea ice elements, but does not include sea level, surface current, ocean colour, carbon dioxide partial pressure (pCO2), ocean acidity, or phytoplankton.

45: Ref.: https://www.ghrsst.org/ghrsst-science/sst-definitions/

presented a detailed analysis and described recent advances in bias identification and sophisticated correction approaches in the ocean temperature data obtained from XBTs and Mechanical BathyThermographs (MBTs). Biases in recorded XBT profiles were traced to fall-rate and possibly independent temperature sensor biases, which differ from one manufacturer to another and might depend on ocean state, ship characteristics, and observational details.

6.3.6 **The meeting made the following recommendations**:

(i.) While recognizing the that necessary new resources and potential new partnerships would first need to be identified, the Team agreed with the general goal of exploring the feasibility of using ICOADS—including the IMMA format specifically—as the vehicle for making readily available to users a selected variety of near-surface oceanographic and underway data and metadata (including SSS and extending to some non-physical variables). These data and metadata would be extracted initially from the WOD, but eventually also (but again contingent on resources) from a wider variety of source archives. These actions are being developed in recognition of the fact that SSS (for example) is one ECV for which there is no home where all such measurements can currently be found.

(ii.) While it will be valuable activity to integrate these urgently required near-surface observations from a variety of observing systems (Rec (i) above), the Team also recommended that the initiative must ensure that it has captured sufficient metadata (e.g. associated with SSS).

(iii.) The Team reviewed the outline of the proposed "Near-surface" oceanographic (*Nocn*) attachment to the IMMA format, and recommended that a maximum allowable depth be proposed.

6.3.7 The Team requested Margarita Gregg (USA) to investigate what is the best way to get expert opinion on the recommendation (iii) above (***action; M. Gregg; mid-2013***).

6.4 International marine data and metadata recovery

6.4.1 RECovery of Logbooks and International Marine data (RECLAIM) and related projects (ACRE[46], GODAR[47], HISKLIM[48], HISTOR[49], etc.)

6.4.1.1 The Team was informed about national and international activities to recover data and metadata, from historical ships' logbooks and other international marine data and metadata rescue activities. A major negative development since the last ETMC meeting was that NOAA's successful public-private partnership Climate Database Modernization Program (CDMP) was dramatically scaled back in 2010, and eventually discontinued in fiscal year 2012.[50]

6.4.1.2 A positive development on the other hand, while only indirectly related to JCOMM interests, was the initiation in late 2010 of the International Surface Temperature Initiative (ISTI)[51], which is seeking to provide access from initial rescued source data images all the way to the related products and analyses created after digitization. The complex issue of image distribution and management is crucial, and allows us to make the case of how data rescue is part of a

46 Atmospheric Circulation Reconstructions over the Earth
47 Global Oceanographic Data Archaeology and Rescue
48 HIStorical CLIMate (the Netherlands)
49 Digitization of historical navigation logbooks and meteorological ship journals (Germany)
50 CDMP ended as a result of U.S. congressional decisions to remove earmarks from the 2011 budget. Since 2000 when it was initiated, the program had supported NOAA's efforts (operating across all NOAA Line Offices) to preserve and enhance the availability of valuable climate and many other types of environmental data—potentially at risk of permanent loss due to media degradation or other factors.
51 http://www.surfacetemperatures.org/databank/data-rescue-task-team

continuum from data rescue to data management to distribution to analysis.[52] Additionally, starting around 2010 a small number of "citizen science" projects were initiated, including the highly successful OldWeather project (see Table 2 for further information).

6.4.1.3 Partially in recognition of the sudden loss of the widely valued USA-operated CDMP programme, JCOMM-4 (2012, Yeosu, Republic of Korea) recommended in regard to data rescue:
"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 (CCl)—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."

6.4.1.4 Also recently in the direct context of GFCS, the Team noted that Dandin et al. (2012) discussed the vital importance of data rescue.

6.4.1.5 Under this general JCOMM-4 guidance, the Team discussed the need to further promote and enhance such activities. OldWeather and a variety of other known continuing activities clearly related to marine meteorology are listed in Table 1.

6.4.1.6 The Team recalled that the recovery of historical marine meteorological (as well as oceanographic) data from research vessels (R/Vs) should be considered as part of international marine data rescue. Under an ETMC-3 (2010) action, Shawn Smith has prepared a preliminary catalogue of historical R/V marine observations (available in Annex H of Woodruff et al. 2012), and the Team agreed to continue to work with the Shipboard Automated Meteorological and Oceanographic System (SAMOS[53]) initiative to further develop this catalogue in time.

6.4.1.7 Generally in terms of oceanographic data and metadata rescue, the Global Oceanographic Data Archaeology and Rescue (GODAR[54]) initiative represents a critical continuing activity. Coordination following EMTC-3 (2010) confirmed that all profile data digitized and exchanged under GODAR are added to the World Ocean Database (WOD). Thus as long as ICOADS continues to process all WOD data types, any GODAR marine near-surface meteorological data associated with the profiles will become part of ICOADS (see also Doc. 6.3).

6.4.1.8 **The meeting made the following recommendations**:

(i.) Following along from the JCOMM-4 guidance, the Team agreed to continue to seek ways to develop an improved international data rescue strategy with collaboration between ETMC, GFCS, and CCl

(ii.) The Team recommended continued development, under Shawn Smith's leadership, of the Research Vessel Digital Observation Catalogue

Acronym	*Project URL*	*Activity/nationality*	*Status notes/references*
ACRE	http://www.met-acre.org	Atmospheric Circulation Reconstructions over the Earth	ACRE both undertakes and facilitates the recovery of historical instrumental surface terrestrial and marine global weather observations to underpin 3D weather reconstructions spanning the last 200-250 years for climate applications and impacts needs

52 The Environmental Document Access and Display System (EDADS), which formed a central CDMP capability, is being transitioned into a replacement system (EV2) that may be accessible within NOAA only. Therefore public access to that vast archive of images and associated metadata (14.3TB, including also many data types not relevant to JCOMM) is now severely limited.
53 http://samos.coaps.fsu.edu/html/
54 http://www.nodc.noaa.gov/General/NODC-dataexch/NODC-godar.html

			worldwide (see Allan et al. 2011).
RECLAIM	http://icoads.noaa.gov/reclaim/	RECovery of Logbooks And International Marine data	Wilkerson et al. (2011), Woodruff et al. (2012). As this activity was formerly largely CDMP-funded, new development work has slowed since around early 2010 but is continuing at a reduced level with a southern ocean regional in association with ACRE.
ERA-CLIM (WP-2)	http://www.era-clim.eu/about/new1/	European Reanalysis of Global Climate Observations	Stickler et al. (2011): Project partners include: Univ. of Bern (lead), Russian Inst. for Hydrological and Meteorological Information (RIHMI), Météo-France (see also Dandin et al. 2012), Univ. of Lisbon, the ACRE initiative via the MetOffice Hadley Centre and Univ. del Pacífico (Chile).
HISKLIM	http://www.knmi.nl/research/climate_services/hisklim.html	HIStorical CLIMate (Netherlands)	Netherlands-based project focused on shore-based observations, however some other types of data are also being added. Digitization is needed and information will be made available to RECLAIM. Some ship route reconstruction is underway. The Dutch national archives include some Dutch East India Company data.
HISTOR		Digitization of historical navigation logbooks and meteorological ship journals (Germany)	Some data are becoming available and digitization continues. Presented via this poster at MARCDAT-3 workshop: ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-59-MARCDAT-III/posters/Pos12-Gloeden-Histor.pdf
OldWeather	http://www.oldweather.org	Old Weather is one of a suite of projects produced, maintained and developed by the Citizen Science Alliance (http://www.citizenscienceallliance.org) and accessible online through Zooniverse (https://www.zooniverse.org).	Old Weather began in 2010. Since then 16,400 volunteers transcribed 1.6M weather observations from British Royal Navy (World War I-era; ~1914-23) logbooks (see Wilkerson et al. 2012, also: http://www.noaanews.noaa.gov/stories2012/20121022_oldweatherprojectlaunch.html). A new project under OldWeather is digitizing Arctic area logbooks from the U.S. National Archives (Showstack, 2012).
(Canadian Data Rescue)		Hudson Bay and remote location historical data (Canada)	Hudson Bay and remote location historical data are being recovered.

Table 2: Overview of known national and international data (and metadata) rescue activities closely related to marine meteorology.

6.4.2 Lloyds commercial ship particulars

6.4.2.1 The Team recalled the proposal discussed at the previous ETMC meeting to access Lloyds commercial ship "particulars" (platform metadata, available back to 1764) in coordination with the International Maritime Organization (IMO). The goal was to augment metadata records from Pub. 47 by adding e.g. ship dimension and tonnage information, to improve our understanding of data biases in ICOADS, and provide better estimates of random errors.

6.4.2.2 The Team recalled action No. 45 from the previous ETMC meeting to produce some statistics on ship sizes over time based on the Lloyds data that were purchased by NOC. The Team noted that the information purchased by NOCS from Lloyds on further examination seems unlikely to be suitable for meaningful statistics to be calculated prior to 1970. However there are now many imaged issues of Lloyd's Register of Shipping available online[55], some of which contain annual summaries of tonnage which may prove useful.

6.4.2.3 Regarding action No. 46, to explore feasibility of using the Lloyds Educational Trust mechanism for possibly accessing historical Lloyds particulars in digital form, the Team noted that the ETMC original contact at IMO on this matter left that organization and consequently there has been no further progress towards approaching the Lloyds Educational Trust. The Team agreed to keep this general matter under review in case it can be reinvigorated at some future date, and invited Scott Woodruff to follow up in this regard and report at the next ETMC Session (***action; S. Woodruff; ETMC-5***).

6.5 History of the marine ship code

6.5.1 The Team recalled that under past ETMC actions, JMA (including some imaging preparation support from NOAA's Climate Database Modernization Program) compiled and maintained a website documenting the history of the GTS SHIP code (now FM13; Manual on Codes changes only through 5 Nov 2003), of the IMMPC[56]/IMMT formats (only through IMMT-3; effective 1 Jan 2007), and of the MQCS (only through MQCS-5, also effective 1 Jan 2007).

6.5.2 That website also included imaged final reports of sessions of JCOMM and its WMO predecessor organization the WMO Commission for Marine Meteorology (CMM) (1952-75), and from the WMO Commission for Synoptic Meteorology (CSM) and its successor WMO organization the Commission for Basic Systems (CBS) (1953-2006). That very useful work (plus other links and information) has now been migrated permanently to a new WMO webpage for Preservation of marine data and metadata, and related materials. The Team noted however the need to update with any more recent updates to FM13, and more recent updates to IMMT and MQCS.

6.5.3 Following on from this work, ETMC-2 had agreed to seek out past editions and supplements to the Manual on Codes (WMO-No. 306), and potentially expand this task to other marine codes. A survey was completed on WMO-No. 306 under the leadership of Frits Koek (KNMI) and is still available on Google Docs[57] but should be preserved.

6.5.4 Additionally ETMC-3 had requested the Secretariat to investigate whether a policy could be set up to preserve previous versions of the Manual on Codes.

6.5.5 The Team agreed to continue to work on those issues, and consider the related outstanding ETMC-3 actions (***action; ETMC; ETMC-5***).

6.6 Sea-ice climatology

6.6.1 The Team recalled that previously, JCOMM-2 had also recommended that ETMC explore how oceanographic and sea-ice climatologies could be coordinated with the marine meteorological data, so that the results could be viewed as an integrated product. That earlier guidance was considered in development of ToR of the former TT-MOCS, which advice should still be borne in mind by ETMC, including possibly in eventual resolution of the future of the outdated Marine Climatological Summary (MCS) products from the MCS, and in possible future continuing collaboration with the Expert Team on Sea Ice (ETSI). The Team noted that ETSI was previously

55 http://www.lr.org/about_us/shipping_information/Lloyds_Register_of_Ships_online.aspx
56 International Maritime Meteorological Punch Card
57 https://docs.google.com/spreadsheet/ccc?key=0Al_lu5KXJvjgdEJodDdPZFVkanUwYlY4SzBxVUVsX3c&hl=en_GB#gid=0

represented on ETMC, but is not anymore.

6.7 Wave and storm surge data

6.7.1 Status of the global extreme wave event archive

6.7.1.1 While the ETMC is leading the development of the Extreme Waves Data Set (EWDS), the Team recalled the strong cooperation with the JCOMM Expert Team on Waves and Coastal Hazards Forecasting Systems (ETWCH) in this regard, as the ETWCH also plays a substantial role. The Team noted that JCOMM-4 had requested the ETMC and the ETWCH to revisit and possibly restructure the project, with a simpler (less costly to implement) initial design and product. JCOMM-4 also endorsed the tentative suggestion from ETMC and the former Expert Team on Wind-Waves and Storm Surges (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.

6.7.1.2 The Team agreed that efforts ought to be made to (i) undertake scans of the in situ archives at the National Oceanographic and Climatic Data Centers (NODC and NCDC, USA), the National Data Buoy Center (NDBC, USA), the International Comprehensive Ocean-Atmosphere Data Set (ICOADS, USA), and the Integrated Science Data Management (ISDM, Canada), and (ii) to independently scan the Global Collecting Centres (GCCs) data sets in the United Kingdom and Germany.

6.7.1.3 The Team also noted that (i) the International Association of Oil and Gas Producers (OGP) Metocean Committee has also expressed interest in scanning their own databases, which contains comprehensive records of wave observations; and (ii) Oceanweather has scanned, and continues to scan, the GlobWave altimeter data base and is developing a global data set from that, which can be included in EWDS. Oceanweather made a presentation to the GlobWave User Consultation Meeting November 8 in Lisbon recommending that a mechanism be considered for the ongoing scan of the altimeter data base for contribution to the EWDS.

6.7.1.4 The Team requested Scott Woodruff in consultation with ETWCH experts to follow up on such databases scanning activities, and possibly approach other partners in order to maximize the number of databases to be scanned. This could be realized by mean of a Pilot Project for scanning data sets, with the EWDS to be a component of ICOADS, likely in an IMMA format. The Team requested Scott Woodruff to make a proposal for such a Pilot Project to the ETMC (***action; S. Woodruff, V. Swail; mid-2013***).

6.7.2 Potential for calculation of wave monthly summaries

6.7.2.1 The team recalled the discussion at the previous ETMC session, and recommendations from CLIMAR and MARCDAT workshops regarding the possible production of wave monthly summaries (e.g. using the wave data from ships and buoys in ICOADS).

6.7.2.2 Noting that resources will be required to develop the methodology and construct the summaries, the Team agreed that the wave climate summaries issue could not make substantial progress until the situation of ICOADS is clarified and well on track.

6.7.2.3 The Team requested ETWCH to collaborate in developing the plan for a storm surge climatology, and requested Scott Woodruff to act as the ETMC liaison with the ETWCH. The Team agreed that the ETWCH storm surge questionnaire should be updated and extended, and that links should be established with eSurge[58], and Global Sea Level Observing System (GLOSS) for developing the plan for storm surge climatology. (***action; S. Woodruff, K. Horsburgh; ongoing***).

58 www.storm-surge.info

7. MARINE DATA AND CLIMATOLOGY WORKSHOPS, AND RECOMMENDATIONS

7.1 Continuity and coordination for marine climatology issues (including ICOADS) has been promoted by two series of meetings that began over a decade ago. The JCOMM Workshops on Advances in Marine Climatology (CLIMAR) were held in Vancouver, Canada, 1999, Brussels, Belgium, 2003, and Gydnia, Poland, 2008. Alternating approximately biennially with CLIMAR, the Workshops on Advances in the Use of Historical Marine Climate Data (MARCDAT) have been held in Boulder, USA, 2002, Exeter, UK, 2005, and Frascati, Italy, 2011. Following a JCOMM-4 recommendation, it was proposed continuing both successful workshop series with a CLIMAR-4 around 2014, followed as appropriate in approximately two years by a MARCDAT-4.

7.2 Noting the recommended continuation of the alternating climate data workshop series and the successful outcome of MARCDAT-3 in Frascati, Italy, May 2011, the meeting agreed that the next CLIMAR (i.e. CLIMAR-4) should be held before the end of 2014. The Team discussed potential for locations, including *Canada*, China, and Indonesia.

7.2 The Team established a Preliminary Organising Committee for CLIMAR-4 comprised of Scott Woodruff (USA, interim lead), Nicola Scott (UK), Val Swail (Canada, to be confirmed), David Berry (UK), Gudrun Rosenhagen (Germany), and another representative of the CLIMAR framework (which is wider in scope than JCOMM). The Team requested the Preliminary Organizing Committee to recommend a location and date for CLIMAR-4 (***action; CLIMAR-4 Preliminary Organizing Committee; Apr. 2013***).

7.3 In addition, closer to the dates proposed for the workshop, the Team requested the Preliminary Organizing Committee to recommend a broadened final Organizing Committee, including as warranted additional members possibly representing other communities and scientific research interests, to organize the scientific programme for the meeting as well as overseeing the workshop logistics (***action: Preliminary Organizing Committee; Mid. 2014***).

8. INFORMATION EXCHANGE, INCLUDING MANUALS, GUIDES AND OTHER TECHNICAL PUBLICATIONS

8.1 Guide to the Applications of Marine Climatology

8.1.1 The Team recalled that a digitized version of the original version of the Guide to the Applications of Marine Climatology (WMO 1994) was imaged by CDMP a few years ago, and has recently been made available by WMO on-line. This is the “static” part of the Guide; the Team noted as a matter for its continuing evaluation of the possible need for a full update in the future of this static part.

8.1.2 In 1999 CLIMAR99 (or “CLIMAR-1”) then led to publication of: WMO, 2003: Advances in the Applications of Marine Climatology—The Dynamic Part of the WMO Guide to the Applications of Marine Meteorology (WMO/TD-No. 1081 TR No. 13).

8.1.3 Revision 1 (June 2005) of the dynamic part was published in the International Journal of Climatology as an outcome from CLIMAR-2 (Brussels 2003), and then made freely available on the WMO website after two years (per agreement with the publisher).

8.1.4 Revision 2 of the dynamic part, a similar selection of papers from CLIMAR-3 (Gdynia, Poland, 2008) was published 15 June 2011 in another special issue of the International Journal of Climatology, which the Team noted after two years (i.e. in 2013) should similarly be made freely available on the WMO website. The Team requested Scott Woodruff to liaise with Sergey Gulev (Russian Federation) in the view to get his support for making this revision available via the JCOMM and WMO websites by the end of the two-year period (***action; S. Woodruff; June 2013***).

8.1.5 Another update to the dynamic part can hopefully be achieved through a similar outcome from the proposed CLIMAR-4 (~2014) (***action; CLIMAR-4 Organizing Committee; 2014***).

8.2 Review of the Manual on and Guide to Marine Meteorological Services (WMO-No. 558 and 471)

8.2.1 The Team discussed proposals on amendments to the *Manual on Marine Meteorological Services* (WMO-No. 558; 1990), and the *Guide to Marine Meteorological Services* (WMO-No. 471; 2001a), as appropriate. The Team realized that substantial changes will have to be made to both publications in the context of the MCDS development.

8.2.2 The Team set up a small task team comprised of Nicola Scott (UK, lead), David Berry (UK), Eric Freeman (USA), Sissy Iona (Greece) to review these publications in light of the MCDS development. The Task team shall also liaise with the TT-MCDS in this regard. The task team was invited to propose an outline of the new technical regulations as soon as possible, as well as a workplan for filling out the relevant sections of these WMO Publications (***action; task team on WMO 471/558; JCOMM-5***).

8.3 Review of the Guide to Climatological Practices (WMO-No. 100).

8.3.1 Ms Karolin Eichler (WMO Secretariat) reported on the purpose and history of the Guide to Climatological Practices (WMO No. 100). The main purpose of this publication is to provide guidance and assistance to WMO Members in developing national activities linked to climate information and services. It was first published in 1960 and the work on the 3rd edition started in 1990. It was finalized in 2010 when it was approved by CCl. The latest edition describes basic principles and modern practices in the development and implementation of all climate services; methods and best practices in climatology as well as it includes references to other technical guidance and information sources. The guide refers to the special needs in handling data types like marine data, satellite data, upper-air data, etc. whenever it is needed.

8.3.2 Recalling discussion at previous ETMC meetings regarding the Guide, the team agreed that no further input from ETMC was required at this point.

Other publications

8.3.3 The Team noted that following CBS recommendation, instrument practices from the WMO Manual on Codes (WMO No. 306) are being migrated to the WMO Guide to Meteorological Instruments and Methods of Observation (WMO No. 8). The Team agreed that it should also be engaged in this exercise, and invited its members to provide feedback to the Chair of the SOT Task Team on Instrument Standards, Mr Henri Kleta (Germany) (a copy of the current version of the SOT proposal can be obtained from the Secretariat) (***action; ETMC members; ASAP***). The Team also invited its members to consider attending the forthcoming SOT meeting (Victoria, Canada, April 2013) in order to bring the ETMC perspective on the ship observational and reporting practices (***action; ETMC members; Apr. 2013***).

8.3.4 The Team expressed concerns about preservation of WMO Publications, and invited the WMO Secretariat to address the issue, and to report at the next ETMC Session (***action; Secretariat; ETMC-5***).

8.4 ETMC / MCDS Website(s)

8.4.1 The Team reviewed the status of marine climatology related web-pages on the following websites:

- JCOMM website: http://www.jcomm.info/etmc

- Marine climatology community website: http://www.marineclimatology.net
- ETMC website on the ICOADS: http://icoads.noaa.gov/etmc/

8.4.2 The meeting noted with appreciation the support provided by NOAA to host the ETMC website over the past years. However, the group agreed that now a joint ETMC and MCDS website is required and that this would now be better suited hosted from the JCOMM domain. The new website is to be the central point for information, news and events related to ETMC & MCDS. Plans for the layout of the combined website and an MCDS logo are already underway. The Team agreed that the main MCDS documents currently under discussion (e.g. strategy, implementation plan, clarification of Recommendation 2 (JCOMM-4), CMOC evaluation process) should also be made available via the website with access restricted to TT-MCDS and ETMC members.

8.4.3 The Team recommended that the ETMC Chair and Vice-Chair (and TT-MCDS co-chairs) lead this work with the first version due for launch before the end of 2013 (***action; N. Scott, G. Rosenhagen; end 2013***).

9. REVIEW OF ACTION ITEMS

9.1 The Chair of the ETMC presented the action plan from the Third ETMC Session, Melbourne, Australia, February 2010 and the MCDS Workshop, Hamburg, November/December 2011. The tables presented focused on actions and recommendations that were still underway. The key items were discussed during the meeting. Pending action items from ETMC-3, as well as action items arising from this ETMC-4 session are reflected in ***Annex 3***.

10. CLOSURE OF THE SESSION

10.1 In light of the MCDS developments, and partnership with the IODE in this regard, the Team agreed that its membership should be expanded so that the oceanographic community is better represented. The Team recalled that per JCOMM Resolution 4 (JCOMM-4), the ETMC membership *includes 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. 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.* The Team requested the Co-Chairs of IODE to consider whether the membership of the ETMC should be expanded and to make recommendation in this regard to the JCOMM Co-Presidents *(**action; IODE Co-Chairs; 15 Jan 2013**).*

10.1 Ms Scott thanked all for participating and for their comments and support to the ETMC, as well as the Secretariat. This has been a challenging meeting which helped to clarify all the issues. She stressed that there is still a substantial amount of work to be completed during this JCOMM intersessional period (2012-2017), especially by the Task Team on the Marine Climate Data System (MCDS). The Team thanked the IODE Project Office for the great facilities and support provided for and during the Session.

10.2 The Fourth Session of the JCOMM Expert Team on Marine Climatology (ETMC-4) closed by 16:50 hours on Wednesday 28 November 2012.

ANNEX I

AGENDA

2. ORGANIZATION OF THE SESSION

1.1 Opening
1.2 Adoption of the agenda
1.3 Working arrangements

2. JCOMM ASPECTS AND REPORTS

2.1 Report by the ETMC Chairperson
2.2 JCOMM-4 outcome and priorities for the Data Management Programme Area (DMPA)
2.3 Data Management Practices
2.4 Report of the Global Collecting Centres (GCCs)
2.5 Report of the Responsible Members (RMs)

3. REQUIREMENTS

3.1 Review the WMO-IOC-UNEP-ICSU Global Ocean Observing System (GOOS), and the WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS) requirements for climatological data sets
3.2 Global Framework for Climate Services (GFCS)
3.3 Existing and potential linkages with the WMO Commission for Climatology (CCl)

4. MARINE CLIMATE DATA SYSTEM (MCDS)

4.1 Vision and Strategy
4.2 Potential Contributions and Roles
4.3 MCDS Data Centres
    4.3.1 Data Acquisition Centres (DACs), ToR and establishment process, candidates
    4.3.2 Global Data Assembly Centres (GDACs), ToR and establishment process, candidates
    4.3.3 Centres for Marine Meteorological and Oceanographic Climate Data (CMOCs), ToR, including tasks (esp. mirroring, Summaries), future role of Responsible Members (RMs), ICOADS partnership, performance indicators for existing centres, and evaluation criteria for candidates.
4.4 Implementation Plan

5. FORMATS AND QUALITY CONTROL

5.1 Status of the International Maritime Meteorological Tape (IMMT) format and the Minimum Quality Control Standard (MQCS)
5.2 Review of the BUFR (and other) templates for surface marine data
5.3 Review of electronic logbooks
5.4 Ship call sign masking (including encode proposal)
5.5 Stage of HQCS

6. DATA AND METADATA: ARCHEOLOGY AND ARCHIVAL

6.1 Status of and linkages with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS)
    6.1.1 Funding update & international task sharing
    6.1.2 The International Maritime Meteorological Archive (IMMA) format
    6.1.3 Proposal for “advanced” (bias adjusted) ICOADS
    6.1.4 Potential linkages with satellite data

6.1.5 CMOC nomination plans/progress

6.2 Instrument/Platform metadata
- 6.2.1 Status of the WMO Ship Catalogue (WMO-No. 47)
- 6.2.2 Buoy metadata
- 6.2.3 Rig and platform metadata issues

6.3 Oceanographic data and metadata integration issues (XBT fall rate equation, SSS, etc.)

6.4 International marine data and metadata recovery
- 6.4.1 RECovery of Logbooks and International Marine data (RECLAIM) and related projects (ACRE, GODAR, HISKLIM, HISTOR, etc.)
- 6.4.2 Lloyds commercial ship particulars

6.5 History of the marine ship code

6.6 Sea-ice climatology

6.7 Wave and storm surge data
- 6.7.1 Status of the global extreme wave event archive
- 6.7.2 Potential for calculation of wave monthly summaries

7. MARINE DATA AND CLIMATOLOGY WORKSHOPS, AND RECOMMENDATIONS

8. INFORMATION EXCHANGE, INCLUDING MANUALS, GUIDES AND OTHER TECHNICAL PUBLICATIONS

8.1 *Guide to the Applications of Marine Climatology*

8.2 Review of the *Manual on* and *Guide to Marine Meteorological Services* (WMO-No. 558 and 471)

8.3 Review of the *Guide to Climatological Practices* (WMO-No. 100).

8.4 ETMC / MCDS Website(s)

9. REVIEW OF ACTION ITEMS

10. CLOSURE OF THE SESSION

ANNEX II

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ANNEX III

ACTION ITEMS FROM ETMC-4

No.	*Ref.*	*Action*	*By*	*Deadline*
1	2.2.4	To address variable-based requirements for the observing system	OPA Chair	ASAP
2	2.5.4	To promote inter-comparisons for the various MCDS centres (DACs, GDACs) that will be established, and to propose a template for that	ETMC Chair	end 2013
3	3.1.7	To lead the ETMC efforts, liaise with the OCG, JCOMMOPS and OSMS, and report on the developments to the ETMC Chair regarding (i) reviewing requirements for the marine component of the observing system, (ii) developing and recommending an agreed on set of formulae for measuring the health of the observing system	D. Berry	ETMC-5
4	3.2.4	To liaise with Dr Dexter as needed and make sure that the ETMC data policy requirements are taken into account by the EC Task Team on WMO Policy for GFCS	ETMC Chair	ongoing
5	3.3.6	With assistance from the Secretariat, to contact the chair of relevant CCl Expert Team or Group to request to attend the next scheduled relevant CCl meeting	Chair TT-MCDS	ASAP
6	4.1.2	Small group, comprised of Ariel Troisi (Argentina), Sissy Iona (Greece), Nicola Scott (UK), and Gudrun Rosenhaguen (Germany), to review again and update the MCDS Strategy on behalf of the Team, taking into account the discussions at this meeting	A. Troisi, S. Iona, N. Scott, G. Rosenhaguen	10 Jan. 2013
7	4.1.2	To submit the draft Strategy to the JCOMM Data Management Coordination Group (DMCG) (consultation by email), the Management Committee (Paris, Jan. 2013), and then to the IODE-22 (Ensenada, Mexico, 11-15 March 2013) for their review and approval	Secretariat	15 Jan. 2013
8	4.1.3	To provide answers to the outstanding questions regarding Recommendation 2 (JCOMM-4), and further clarifications (see ETMC-4 Doc 4(2)) to Peter Pissierssens (IOC Secretariat) by the end of 2012, who was tasked to finalize the document for inclusion in the final report of this ETMC-4 meeting as an annex	ETMC members	31 Dec 2012
9	4.1.4	To prepare a working document as well as a draft Recommendation for JCOMM-5, taking into account the documented clarifications and revisions, and based on experiences during the intersessional period	ETMC Chair	JCOMM-5
10	4.1.6	To address the issue of versioning, look at specific versioning schemes that exist, and make recommendations in this regard for the MCDS	IODE & DMCG	ASAP
11	4.1.6	To provide documentation they are aware of on versioning to the DMCG Chair for further consideration	ETMC members	ASAP
12	4.1.7	To define a specific MCDS data and products policy	ETMC	JCOMM-5
13	4.2.10	To define JCOMM standards for Higher Level Quality Control (HLQC)	German GCC	2014
14	4.3.1.1	To adopt Terms of Reference for the DACs and GDACs by JCOMM-5	ETMC	JCOMM-5
15	4.3.1.2	To make recommendation regarding updating the DMCG ToR to address the role of the DMCG for the evaluation of DAC, GDACs, and CMOCs in order for the DMCG to be able to address this task on an interim basis	MAN	May 2013
16	4.3.3.11	To provide comments on the accreditation process to Bob Keeley (Canada)	S. Lin, G. Rosenhaguen, S. Woodruff, M.	31 Dec. 2012

No.	Ref.	Action	By	Deadline
			Gregg	
17	4.3.3.11	To take comments from action above into account and provide an updated version of the accreditation process for review and approval by the ETMC Chair, the DMCG Chair, the Management Committee board (Paris, Jan 2013), and then the IODE-22	R. Keeley	15 Jan. 2013
18	4.4.1	To submit the draft Implementation Plan to the JCOMM Data Management Coordination Group (DMCG) by email and then to the IODE-22 (Ensenada, Mexico, 11-15 March 2013) for their review	Secretariat	31 Jan.2013
19	5.2.9	To address the SOT-6 decisions, and to make further proposals to the SOT-7 (Victoria, Canada, April 2013), especially regarding practices to be included in the Guide to Marine Meteorological Services (WMO 2001a) (i.e. for the part describing the VOS Scheme) and in the Manual on Codes (WMO 1995, 2001c)	G. Rosenhagen, S. Smith, D. Berry, N. Scott, S. Woodruff	April 2013
20	5.2.10	To coordinate with Joaquin Trinanes in the view to submit the CTD BUFR template to the DMPA Task Team on Table Driven Codes (TT-TDC) for their review, and further submission to the CBS	D. Berry	ASAP
21	5.2.11	To investigate for the nomination of a new TT-TDC chair in consultation with the Chair of DMCG	Secretariat	ASAP
22	5.2.12	To post the document on BUFR issues on the IODE OceanTeacher once available	S. Woodruff & R. Keeley	ASAP
23	5.3.9	To contact the Chair of the SOT Task Team on Instrument Standards, Mr Henri Kleta (Germany) and seek clarification on recommendation to expedite the agreement on a common dew point temperature algorithm for use in all e-logbooks (allowing for a variable psychometric coefficient to be entered by the PMOs in the e-logbooks, and recorded in Pub47))	D. Berry	Apr. 2013
24	5.3.9	To coordinate and discuss with the manufacturers of the three types of e-logbooks to agree on a common dew point temperature algorithm for use in all e-logbooks	ETMC Chair	ASAP
25	5.3.9	To contact the SOT to address the recommendation the ETMC should continue to monitor the algorithms being use, and ask SOT to request software developers to act upon	N. Scott	Apr. 2013
26	5.4.4	to speed up the development of a proposal so that the corresponding and required BUFR template for VOS data can be passed to the CBS IPET-DRMM	DMCG	ASAP
27	5.4.5	To approach the Chair of SOOPIP to indicate whether some of the VOS&SOOPIP ships data are also masked, and to investigate solutions in that case to make sure that un-masked data eventually reach the international archives	Secretariat	mid-2013
28	5.5.7	To test the first version of the HQCS	GCC/UK & ICOADS	mid-2013
29	6.2.5	To request JCOMM observations Panels and associated programmes to make sure that the rigs & platform metadata are properly rescued	OCG	ongoing
30	6.3.7	To investigate what is the best way to get expert opinion on the proposed “Near-surface” oceanographic (Nocn) attachment to the IMMA format, and maximum allowable depth	M. Gregg	mid-2013
31	6.4.2.3	To explore feasibility of using the Lloyds Educational Trust mechanism for accessing the historical collection of International Maritime Organization (IMO)	S. Woodruff	ETMC-5
32	6.5.5	To continue to work on the history of the marine ship code issues, and consider the related outstanding ETMC-3 actions	ETMC	ETMC-5
33	6.7.1.4	To make a proposal to the ETMC for a Pilot Project for scanning databases that contain extreme wave	S. Woodruff, V.	mid-2013

No.	Ref.	Action	By	Deadline
		data	Swail	
34	6.7.2.3	To collaborate in developing the plan for a storm surge climatology)(Scott Woodruff acting as the ETMC liaison with the ETWCH); to extend and update the ETWCH storm surge questionnaire, and establish links with eSurge[59], and Global Sea Level Observing System (GLOSS) for developing the plan for storm surge climatology.	S. Woodruff, K. Horsburgh	ongoing
35	7.2	CLIMAR-4 preliminary organizing committee (S. Woodruff, N. Scott, V. Swail, D. Berry, G. Rosenhaguen) to recommend a location and date for CLIMAR-4	CLIMAR-4 Preliminary Organizing committee	Apr. 2013
36	7.3	To recommend a broadened final Organizing Committee, including as warranted additional members possibly representing other communities and scientific research interests, to organize the scientific programme for the meeting as well as overseeing the workshop logistics	CLIMAR-4 Preliminary Organizing committee	Mid. 2014
37	8.1.4	To liaise with Sergey Gulev (Russian Federation) in the view to get his support for making this revision of the dynamic part of the guide to the applications of marine climatology available via the JCOMM and WMO websites by the end of the two year period	S. Woodruff	June 2013
38	8.1.5	To achieve another update to the dynamic part of the guide to the applications of marine climatology from the proposed CLIMAR-4 (~2014)	CLIMAR-4 Organizing Committee	2014
39	8.2.2	To review the WMO 471 & 558 publications in light of the MCDS development, liaise with TT-MCDS, and propose an outline of the new technical regulations as soon as possible, as well as a workplan for filling out the relevant sections of these WMO Publications	N. Scott, D. Berry, E. Freeman, S. Iona	JCOMM-5
40	8.3.3	To provide feedback to the Chair of the SOT Task Team on Instrument Standards, Mr Henri Kleta (Germany) regarding the instrument practices from the WMO No. 306 that are being migrated to the WMO No .8 (a copy of the current version of the SOT proposal can be obtained from the Secretariat)	ETMC members	ASAP
41	8.3.3	To consider attending the forthcoming SOT meeting (Victoria, Canada, April 2013) in order to bring the ETMC perspective on the ship observations practices	ETMC members	Apr. 2013
42	8.3.4	To address the issue of preserving the WMO Publications, and to report at the next ETMC Session	Secretariat	ETMC-5
43	8.4.3	To lead the ETMC/MCDS Website work with the first version due for launch before the end of 2013	N. Scott, G. Rosenhaguen	end 2013
44	10.1	To consider whether the membership of the ETMC should be expanded and to make recommendation in this regard to the JCOMM Co-Presidents	IODE Co-Chairs	15 Jan 2013

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PENDING ACTION ITEMS FROM ETMC-3

No.	*Ref.*	*Action*	*By*	*Status*
8	3.1.2	to develop a template for documenting the requirements for long-term marine surface physical observations	S. Woodruff/E. Kent	No progress to date on this item owing to other commitments, but it is suggested this matter be kept under review by ETMC in case it can be reinvigorated at some future date.
9	3.1.4	to consider the potential for routine assessment of data adequacy in support of the periodic reviews of GOOS/GCOS	Formerly TT-MOCS; now under TT-MCDS	Ongoing
13	4.2.6	to address each of the 3 levels for real-time data preservability, and make proposals to the SOT regarding practices to be included in the Guide to Marine Meteorological Service (i.e. for the part describing the VOS Scheme) and the Manual on Codes	F. Koek, *ad hoc* group	Ongoing Preservability report submitted to SOT-6 and some recommendations made. Frits Koek distributed a draft proposal for review amongst the *ad hoc* task team during Nov 2012.
17	4.4.4	to investigate with maritime companies the feasibility of releasing the unmasked data after a period of time to be agreed upon without impacting substantially ship security	Japan	JMA contact ship owners at every opportunity to encourage them to release unmasked data on an agreement reached between JMA and ship owners. However, the progress is slow, because many ship owners are still concerned about the threat of piracy. Some ship owners have agreed to the release of the real callsign after 90 days but many do not want the real callsign ever released (even in delayed mode). Discussions continue.
22	5.1.9	to contact the RTMC and address the issue of RTMC providing monitoring data for all VOS to the DAC for extended integration into ICOADS, including extending to buoy data and investigating the potential for populating the model comparison fields using archived data	S. Woodruff	UKMO extended the VOSClim data feed to all VOS and Buoy data beginning in June 2011, and it was agreed that these data (including model comparison fields) could be utilized for ICOADS. Also a backlog of these files exists back to 2000 at NOCS, and they will be transferred to NCDC for archiving and eventual incorporation as well into ICOADS.
23	5.2.4	to consider all user requirements and work towards the production of a flexible future format, including convergence and interoperability with IMMA	TT-DMVOS	Ongoing: Now part of MCDS Implementation Plan
45	6.3.2.2	to produce some statistics on ship sizes over time based on the Lloyds data that were purchased by NOC	E. Kent	The information purchased by NOCS from Lloyds on further examination seems unlikely to be suitable for meaningful statistics to be calculated prior to 1970. However there are now many issues of Lloyd's Register of Shipping available online, some of which contain annual summaries of tonnage which may prove useful.
46	6.3.2.2	to explore feasibility of using the Lloyds Educational Trust	S. Woodruff	Our original contact at IMO on this matter left that

No.	Ref.	Action	By	Status
		mechanism for accessing the historical collection of IMO numbers		organization and consequently there has been no further progress towards approaching the Lloyds Educational Trust, but it is suggested this matter be kept under review by ETMC in case it can be reinvigorated at some future date."
47	6.4.2	to investigate whether a policy could be set up to preserve previous versions of the manual on codes	Secretariat	No progress; still under consideration in a wider context
48	6.4.2	to provide paper and/or scanned/e-versions of national versions of the manual on codes to the CMDP (contact: E. Freeman), as well as past official versions of the WMO Manual on Codes to the WMO Secretariat for inclusion in the marine climatology pages of the WMO web site	ETMC members	Pub 306 versions were never imaged, but we made a very good stab at noting every edition and supplement still physically in existence at various institutions. The following is a link to this document: https://docs.google.com/spreadsheet/ccc?key=0Al_lu5KXJvjgdEJodDdPZFVkanUwYlY4SzBxVUVsX3c&hl=en_GB#gid=0 Between KNMI, NCDC, Scott and Liz, I think we have most of this collection and could possibly stitch things together at some point in the future to note the evolution of the manual on codes. Unfortunately, with CDMP no longer in service, scanning of these will be delayed until we can find another volunteering agency to take that on.
56	6.5.2.2	to prepare a white paper documenting the initial proposal and rationale for a Pilot Project to initiate wave climate summaries, addressing both technical (e.g. guidelines on algorithms to be developed to compute the summaries) and resource issues	S. Woodruff	Excerpt from MARCDAT-3 Final Report (JCOMM-TR-59-MARCDAT-3: "Some of the scientific and practical considerations regarding the calculation of wave summaries for ICOADS have been discussed (Gulev, S. et al., 2011: Prospects for ICOADS Wind Wave and Swell Summaries, report in preparation). That report primarily discusses wave observations from VOS, but it should be borne in mind that ICOADS also includes some wave measurements from moored buoys."
58	6.5.2.2	to draft terms of reference for the steering team of the wave climate summaries Pilot Project, and to organize a special session to discuss this Pilot Project proposal at MARCDAT-3	MARCDAT-3 organizing committee	Jun 2010 Special session at MARCDAT-3 organized. The MARCDAT-3 consensus was that wave and swell summaries would be worth producing, if ICOADS project resources could be located to add them to the regular product mixture. No specific agreement was reached on the specific variables that should be summarized (again as practical), but extending the scope of these very basic, but important, benchmark products was thought to be important. Issue: cannot not make substantial progress until the situation of ICOADS is clarified and well on track. ETWCH to collaborate on developing the plan for a storm

No.	Ref.	Action	By	Status
				surge climatology.
60	7.1.8	to analyse the lessons learned from the proposed pilot projects (wave summaries, bias correction) once completed (hopefully by Aug 2011), and to propose appropriate changes for the modernization of the MCS part of the MCSS to the Manual and Guide on Marine Meteorological Services by the end of 2011 in view to have those changes eventually submitted to JCOMM-4	Formerly TT-MOCS; now under TT-MCDS	Ongoing, since it was decided not to proceed within the originally proposed timeframe with the two pilot projects. However several important incremental changes and updates in the Manual and Guide, with regard to the MCS part of the MCSS, were successfully proposed to JCOMM-4.

ANNEX IV

UPDATED MCDS STRATEGY

UPDATED JCOMM STRATEGY TO REALIZE THE VISION FOR A NEW MARINE CLIMATE DATA SYSTEM (MCDS)

VERSION 2.0 (ABRIDGED)
JANUARY 2013

CONTENTS

EXECUTIVE SUMMARY

This document outlines a DRAFT Strategy and Implementation Plan, as approved by the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) Expert Team on Marine Climatology (ETMC), to realize the Vision by 2020 for a new Marine Climate Data System (MCDS) — replacing the legacy Marine Climatological Summaries Scheme (MCSS). It will act as a starting point for discussions with IOC/IODE and other appropriate partners (such as ICSU World Data System) for the production of a broadly endorsed Strategy and Implementation Plan for the MCDS.

The MCDS will include the following elements:

- An integrated data-flow for the collection of marine-meteorological and oceanographic data and metadata, including real-time and delayed-mode data and metadata from *in situ* ocean observation platforms;
- Continued data rescue, and global sharing of historical records of marine-meteorological and oceanographic data archived worldwide;
- Quality Management, Higher Level Quality Control, bias correction, and comparison with satellite and meteorological and oceanographic model gridded fields to be applied to all MCDS archived data;
- Archival of the relevant data and metadata made available to end users on a free and unrestricted basis managed by a network of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs). Data will be discoverable through the WMO Information System (WIS) and the IOC Ocean Data Portal (ODP);
- Realisation and provision of state of the art marine climate and statistical products via a flexible and interactive user interface.
- Well-defined and documented data management structure for existing and new data within JCOMM.
- Much-improved timescales for data availability, in particular, data originating from the Global Telecommunication System (GTS) to be available by defined timescales.
- The storage and accessibility of a comprehensive data/metadata historic guide to JCOMM data, including details of past data codes/formats (decodes, dates used, any updates made), metadata regarding whole datasets etc.

This builds on continuing JCOMM efforts to modernize the MCSS—established in 1963—addressing identified issues, and taking into account new sources of historical marine-meteorological and oceanographic climate data, as well as state of the art data management techniques. The goal is to develop a standardized international data management system across JCOMM, integrating collection, rescue, quality control, formatting, archiving, exchange, and access—for marine-meteorological and oceanographic real-time and delayed-mode data and associated metadata of known quality, and products that satisfy the needs of WMO and IOC applications. In particular, ocean data requirements for long term climate monitoring, and climate services are to be addressed.

The compiled coherent data sets comply with the WMO Global Integrated Observing System (WIGOS) framework for quality management, data accessibility and being fully interoperable with the WMO Information System (WIS) and the IOC Ocean Data Portal (ODP).

The document describes the rationale and scope for the proposal, and provides detailed information on nine key deliverables. This includes roles and responsibilities and a detailed implementation plan between 2011 and 2020, together with the list of the required resources.

THE STRATEGY

1. Introduction and Vision

This document provides the strategy for realizing the Vision of a new Marine Climate Data System (MCDS) by 2020 that will address the requirements of WMO and IOC Applications for marine-meteorological and oceanographic climatological data.

Vision

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 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 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 (CCl).

This system is expected to improve timescales for met-ocean climate data availability, and 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.

2. Background

The Marine Climatological Summaries Scheme (MCSS), established in 1963 (Resolution 35, Cg-4), has as its primary objective the international exchange, quality control and archival of delayed-mode marine climatological data, in support of global climate studies and the provision of a range of marine climatological services. Eight Members/Member States (Germany; Hong Kong, China;

India; Japan; Netherlands; Russian Federation; United Kingdom; and USA) were designated as Responsible Members (RMs) to gather and process the data, including also data from other Contributing Members (CMs) worldwide; and to regularly publish Marine Climatological Summaries (MCS) for representative areas, in chart and/or tabular forms. Two Global Data Collecting Centres (GCCs) were established in 1993 one in Germany and the in the United Kingdom to facilitate and enhance the flow and quality control of the data. Eventually all data are to be archived in the appropriate archives, including the International Comprehensive Ocean-Atmosphere Data Set (ICOADS), a collection of all available surface marine observations dating from the late 1600s to present.

The MCSS has represented the core of the work of the Expert Team on Marine Climatology (ETMC) to date, and ties together two important functions:

(a) Delayed-mode (DM) Voluntary Observing Ship (VOS) Data Management;
(b) The production of the MCSS (tabular/graphical) Summaries (MCS).

Partly due to the longevity of the overall Scheme, the two separate functions, but particularly the data management component (a.), possess a variety of strengths. On the other hand, as JCOMM seeks to define a new, overall data management strategy, plus the establishment of new linkages between other WMO Commissions, including for Climatology (CCl) and Basic Systems (CBS), a review and restructuring of the MCSS is needed.

The Second Session of the JCOMM Data Management Coordination Group (DMCG-2, Geneva, Switzerland, 10-12 October 2006) and the Second session of the JCOMM Expert Team on Marine Climatology (ETMC-2, Geneva, Switzerland, 26-27 March 2007) acknowledged the need to modernize the current Marine Climatological Summaries Scheme (MCSS) and two task teams were established and commenced operations to investigate and initiate the work required:

The Task Team on Delayed-Mode Voluntary Observing Ship Data (TT-DMVOS): The Global Collecting Centres (GCCs) were identified as co-chairs of TT-DMVOS with a cross-cutting membership from both the JCOMM Observations Programme Area (OPA) and the Data Management Programme Area (DMPA), representing a new active area of collaboration. The TT-DMVOS considered the relationship between data available in real-time and that available in delayed-mode. User requirements for both data streams were considered, as well as some of the wider issues around the provision of data climate applications.

The Task Team on Marine-meteorological & Oceanographic Climatological Summaries (TT-MOCS): This task team was set up to improve the management of preparing marine climate summaries and to identify modern user requirements. A JCOMM questionnaire in 2005 provided information regarding the potential customer base and purposes of the MCS products. However, these justifications need to be more broadly agreed upon, to the extent that the MCS products will be managed and officially sanctioned by the ETMC and JCOMM, as opposed to produced and offered nationally. JCOMM also recommended that the ETMC explore how oceanographic and ice climatologies could be coordinated with the marine-meteorological data, so that the results could be viewed as an integrated product.

The Third Session of JCOMM (JCOMM-3, Marrakech, Morocco, 4-11 November 2009) noted with appreciation that a modernization of the MCSS had been initiated, and it endorsed the activities proposed by the DMCG and provided further guidance (see section 4.1 for details below).

The Third Session of the ETMC (ETMC-3, Melbourne, Australia, 8-12 February 2010) noted the substantial progress made by the TT-DMVOS with regard to the definition of the data-flow part of the modernization of the MCSS, including higher level quality control, and the use of co-located first guess field data from Numerical Weather Prediction (NWP), as well as satellite data.

Following the MARCDAT-3 workshop (Frascati, Italy, 2-6 May 2011), it was proposed to merge the TT-DMVOS and TT-MOCS into one single Task Team on the Marine Climate Data System (TT-

MCDS). The Vision for the new Marine Climate Data System (MCDS) was taking into account the recommendations from the two Task Teams and the ETMC as well as lessons learned.

The Workshop for the new Marine Climate Data System (Hamburg, Germany, 28 November–2 December 2011) reviewed the proposed Vision for the MCDS, and proposed a draft Strategy responding to this Vision, as well as an initial Implementation Plan. It further proposed establishing a network of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs). If formally appointed by JCOMM the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) could be integrated.

The strategy was also reviewed by the JCOMM Expert Team on Marine Climatology (ETMC) and the IODE officers and the vision submitted to JCOMM-4 for approval, and the strategy for review. Both, the strategy and the implementation were proposed to and well received by JCOMM-4, (Yeosu, Republic of Korea, 28-31 May 2012).

3. Rationale

The development of a new MCDS is essentially proposed to modernize the MCSS and address the following issues in order to better comply with current requirements of WMO and IOC Applications. Particularly those of the Global Framework for Climate Services (GFCS), the WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS), as well as the climate requirements of the WMO-IOC-UNEP-ICSU Global Ocean Observing System (GOOS) for well documented (with metadata), high quality, consistent, coherent, historical marine observation data sets.

There are a number of issues to be resolved in order to better address the requirements:

For historical reasons, the current MCSS is essentially dealing with Delayed-Mode Voluntary Observing Ship (VOS) Data (DMVOS). However, in the last thirty years, other sources of non-delayed-mode marine data such as data buoys, profiling floats, and satellites have become available, and specific Data Acquisition Centres (DACs) and Global Data Assembly Centres (GDACs) have been developed. Some coordination is required between these activities in order to provide an overall view on the current practices, and data formats used. The new MCDS should integrate all relevant observations.

The Marine Climate Summaries (MCS) as standardized decades ago through the MCSS are no longer produced by most of the Responsible Members, and the extent to which they are used is believed to be minor. Moreover there are now many new statistical and graphical products that better serve the end user needs. MCDS should take this into account and develop replacement MCS.

When JCOMM was established in 1999, the functions of the IODE Responsible Oceanographic Data Centre for Drifting Buoys (RNODC/DB) and those of the IGOSS Specialized Oceanography Centre for Drifting Buoys (SOC/DB) overlapped and required action. These two functions contribute to the data collection, processing, quality control, and archiving of drifting buoy data, and are relevant to the MCDS. Although each Centre provides slightly different services, there are areas of duplication, which need to be better integrated. The Global Drifter Programme (GDP) Data Assembly Centre (DAC) also provides functions that complement those of the RNODC/DB, and SOC/DB, and that would benefit from integration in the MCDS.

JCOMM-3 recognized that metadata are important in a number of domains including climate applications and research (e.g. bias correction), permitting amongst other things the correct interpretation of data, ensures traceability of standards, enhanced coherence of data records and facilitates quality monitoring activities. JCOMM-3 therefore stressed that its Members/Member States should routinely provide metadata content on a routine basis and adopted Recommendation 7.1/1 (JCOMM-3) – Provision of ODAS (JCOMM Ocean Data

Acquisition System) and Water Temperature Metadata. Metadata should be promptly submitted to the ODAS Metadata Service, however, in practice the Service is not working effectively because it is dedicated to metadata and lacks links with data. It would be preferable, and more effective if the ODAS Metadata Service (ODASMS) could be integrated into the MCDS, and the existing Centre operate as a CMOC to serve both data and metadata.

ICOADS is widely used and trusted internationally by marine climate data users. However, ICOADS has not yet been formally recognized by JCOMM and its parent organizations, WMO and IOC. Becoming formally internationalized, as well as establishing similar centres in other countries that could replicate and augment their data, would facilitate the sharing of new international datasets ultimately aligning all (where possible) climate data types within JCOMM and standardizing the data management.

Because of modern practices in the marine climate community, it is now feasible to develop a set of individual marine reports that are adjusted (or corrected) in a manner that best represents our current state-of-the-art. For example the adjustments to ship data could include (but are not limited to) ship heating, Beaufort wind adjustments, height adjustment, adjustments for known instrument variations (e.g., bucket vs. intake SST), and improved Quality Assurance (QA) and Quality Control (QC) procedures (e.g. incorrect platform ID vs. type). The ETMC has developed a proposal for ICOADS to realize this, and there would be benefit for end user applications to include this into the proposed MCDS. To begin developing this work, the USA (NOAA, NCAR and Florida State University) was recently funded by the NOAA Climate Program Office under a 3-year proposal (FY2011-13) to create an ICOADS Value-Added Database (IVAD).

Quality control procedures have dramatically improved in recent years but some standardization for higher-level quality control is needed, and the practices have to be documented. For example, it is now possible for quality monitoring purposes to compare ocean observation with co-located first guess field data from Numerical Weather Prediction (NWP), as well as satellite data.

4. Scope, proposal and deliverables

4.1 JCOMM guidance

This proposal follows the recommendations and guidance from JCOMM-3 as reproduced below:

The Commission noted with appreciation that a modernization of the Marine Climatological Summaries Scheme (MCSS), originally established in 1963, had been initiated, and it endorsed the proposed activities as described at http://www.jcomm.info/MCSS-mod. In order to guide modernization efforts over the upcoming intersessional period, including exploring possibilities for interoperability, such as via the IMMA format, with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS), the Commission requested the DMPA, through the ETMC, to undertake the following actions:

(a) With the Ship Observations Team (SOT), to continue to develop and agree on detailed proposals for the future international marine data-flow, including Higher Quality Control Standard (HQCS), as well as questions of format and QC interoperability;

(b) To continue to consider:

(i) Making products more readily discoverable through product and services level metadata, and accessible through the use of modern web services technologies;

(ii) Integration of oceanographic and ice climatologies together with marine-meteorological information;

(c) Develop appropriate documents describing the modernization progress and amendments regarding the IMMT-III format and version V of Minimum Quality Control Standards to be proposed for the Manual on Marine-Meteorological Services and the Guide to Marine-Meteorological Services and to be implemented for all data collected as from 1 January 2011;

(d) To undertake the modernization, to continue to implement the revised data management scheme and the end user product development, and continue to review the value and effectiveness of these modernization steps.

4.2 The proposal

The modernization of the Marine Climatological Summaries Scheme (MCSS) will be fully integrated in to the new Marine Climate Data System (MCDS), and will be fully documented in the appropriate WMO and IOC Publications, e.g.:

- WMO No. 558 – *Manual on Marine Meteorological Services*: Part I, Chapter 5 to be renamed to "Marine Climate Data System", and corresponding annexes to be renamed, replaced, deleted, or new annexes added as needed;
- WMO No. 471 – *Guide to Marine Meteorological Services*: Chapter 3 to be replaced and corresponding annexes to be renamed, replaced, deleted, or new annexes added as needed;

New elements will be added into the MCDS to consider those climate requirements, which are not covered by the modernized MCSS, and in particular ocean data management as governed through the IODE.

In line with the vision detailed in section 1, the MCDS will include the following elements:

- An integrated data-flow for the collection of marine-meteorological and oceanographic data and metadata, including real-time and delayed-mode data and metadata from *in situ* ocean observation platforms;
- Continued data rescue, and global sharing of historical records of marine-meteorological and oceanographic data archived worldwide;
- Quality Management, Higher Level Quality Control, bias correction, and comparison with satellite and met./ocean model gridded fields to be applied to all MCDS archived data;
- Archival of the relevant data and metadata made available to end users on a free and unrestricted basis managed by a network of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOC). Data will be discoverable through the WMO Information System (WIS) and the IOC Ocean Data Portal (ODP);
- Realisation and provision of state of the art marine climate and statistical products via a flexible and interactive user interface.
- Well-defined and documented data management structure for existing and new data within JCOMM.
- Much-improved timescales for data availability, in particular, data originating from the GTS to be available by defined timescales.
- The storage and accessibility of a comprehensive data/metadata historic guide to JCOMM data, including details of past data codes/formats (decodes, dates used, any updates made), metadata regarding whole datasets etc.

An Implementation Plan has been developed to respond to the Strategy. The Implementation Plan focuses on sub-deliverables that can be easily achievable (e.g. VOS data-flow, former RNODC/DB and current SOC/DB integration, CMOC(s)). An updated Implementation Plan was agreed at ETMC-4.

4.3 Deliverables

The proposal includes the following deliverables:

Deliverable 1 - Data-flow

Description:	An integrated and well structured data-flow to include not only delayed-mode VOS data but other sources of marine-meteorological and oceanographic data for use in climatological applications. This deliverable includes (i) a modernized VOS data-flow; (ii) the contribution of RNODC/DB and SOC/DB to the MCDS; and (iii) the contribution of the various specialized Data Acquisition Centres (DACs) and Global Data Assembly Centres (GDACs) (GMBA, Argo, OceanSITES, IODE Projects such as GOSUD, GTSPP, GODAR etc.) to the MCDS. The management of ocean data is realized in cooperation and synergy with the IODE. Existing and relevant data systems are listed in Annex E of the complete draft MCDS strategy document (see JCOMM MR No. 90).
Implemented through:	GDACs, DACs
Tasks:	Define the data-flow template proposal, with details of generic roles and responsibilities. For all relevant data types use the data-flow template to display compliance with the proposed structure. Update relevant chapters of the WMO and IOC Publications, and relevant IOC Manuals and Guides to reflect new corresponding obligations of Members/Member States as well as guidance to them respectively.
Target dates:	2014 (Step#1, DMVOS, RNODC/DB & SOC/DB), then (Step#2, other ocean data, e.g. GOSUD, OceanSITES, GLOSS, GTSPP, Argo)

Deliverable 2 – Quality Control

Description:	Update the Minimum Quality Control Standard (MQCS) for VOS data. Document quality control procedures used for other types of data, and then standardize, if needed, minimum QC procedures. Develop a Higher Level Quality Control for all types of appropriate marine-meteorological and oceanographic data.
Implemented through:	DACs, GDACs, CMOCs, and other partners (e.g. ICSU for the World Data System)
Tasks:	Propose an update of MQCS to JCOMM-4 (MQCS-7). Refine the Higher Level Quality Control (HLQC) proposal, and document it (e.g. as new JCOMM Technical Report). Update relevant chapters of the WMO and IOC Publication accordingly to reflect obligations of Members/Member States as well as guidance to them respectively. Update or create new IOC Manual & Guide if needed
Target date:	2016

Deliverable 3 – Value added marine climate data

Description: The overall goal of the activity is to develop a set of individual marine reports that are adjusted (or corrected) in a manner that best represents our current state-of-the-art. This will include consideration of establishing interoperable *in situ* and satellite climatologies and products (e.g. SST data from GHRSST). This links naturally with the WMO Information System, and the development of interoperability arrangements with WIS through WIGOS. For example, the adjustments could include (but are not limited to) ship heating, Beaufort wind adjustments, height adjustment, adjustments for known instrument variations (e.g., bucket vs. intake SST), improved QA/QC procedures (e.g. incorrect platform ID vs. type).

Implemented through: CMOCs, and other partners (e.g. ICSU for the World Data System)

Tasks: Establish Pilot Project and Steering Team for value added ICOADS
Run Pilot Project for creation of a value-added ICOADS version (e.g., bias corrected), and make recommendations
Document procedures, and how the data should be interpreted through a new JCOMM Technical Report.

Target date: 2014 (first step)

Deliverable 4 – Data Exchange Protocols

Description: Agree on data collection and exchange protocols and formats (e.g. IMMA, netCDF)

Implemented through: GDACs, CMOCs

Tasks: TT-MCDS to investigate requirements and possible options for a data exchange format(s).
Ensure selected format(s) is flexible enough to meet foreseeable future requirements
If needed, propose new format(s) to JCOMM
Develop software to convert historical formats into the new format(s) and make it freely available
Update relevant chapters of the WMO and IOC Publications to reflect new preferred format(s).

Target date: 2016

Deliverable 5 - Co-located data

Description: Consideration of the use of co-located model field, reanalysis of historical data, and satellite data for use within the Higher Quality Control Standard (HQCS) for in situ data

Implemented through: CMOCs

Tasks: Propose an ad-hoc task team to investigate requirements and feasibility.

Target date: 2016

Deliverable 6 - CMOC

Description: Development of a global network of WMO-IOC Centres for Marine-meteorological and Oceanographic Climate Data (CMOCs) that are fully interoperable with the WMO Information System (WIS) and the IOC Ocean Data Portal (ODP), are 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 (CCl). A candidate CMOC will follow the procedures described in the appropriate WMO and IOC Publications, and

(i) contribute to WMO and IOC Applications for example by rescuing, collecting, processing, quality control, archiving, sharing, distributing, and mirroring worldwide marine-meteorological and oceanographic data and metadata according to procedures documented in the appropriate WMO and IOC Publications;
(ii) advise Members/Member States internationally in response to enquiries regarding standards and best practices for example on the data rescue, collection, processing, quality control, archival, distribution, and mirroring of marine-meteorological and oceanographic data, metadata, and products, preferably by referring to the JCOMM/IODE Ocean Data Standards (and best practices) (pilot) project and its publications and/or the MCDS web site;
(iii) make data sets, and corresponding metadata, within the confines of its scope available, and discoverable through the WIS and/or IODE ODP;
(iv) must communicate and liaise closely (with meetings as required) within the network; particularly on the development and application of quality processes and procedures, and on progress with their defined tasks
(v) operate appropriate data processing and quality control procedures, and generate the required products within its scope;
(vi) closely cooperate with the network of other CMOCs in the rescue, exchange, processing, and archival of marine-meteorological and oceanographic data and metadata, such that the set of data and products offered from the CMOC network is mutually consistent when accessed from any individual Centre; and
(vii) 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.

Implemented through: CMOC(s)

Tasks:
Agree on Terms of Reference for CMOC, governance and approval process for establishing new CMOCs, content of statement of compliance.
Draft Recommendation to be submitted to JCOMM-4 for approval.
Candidate CMOC(s) to submit statements of compliance.
Candidate CMOCs to collaborate between themselves and share data.
Agree on data exchange protocols and formats.
Update relevant chapters of the WMO and IOC Publications, accordingly to reflect obligations of Members/Member States as well as guidance to them respectively.

Target date: 2012, 2016, 2020, …

Deliverable 7 - Metadata

Description:	Integration of the ODAS Metadata Service (ODASMS) with the relevant data which can be realized through integrating the ODASMS into a CMOC. The storage and accessibility of a comprehensive metadata guide to JCOMM data (e.g. WMO Publication No. 47).
Implemented through:	CMOCs
Tasks:	Agree on metadata collection and exchange format(s). Investigate metadata rescue (e.g. buoy metadata) Members to submit metadata together with their data submissions through GDACs or CMOC(s) (if no DAC/GDAC available for collecting the type of data). Develop an easily accessible comprehensive metadata guide, including details of past data codes/formats (decodes, dates used, any updates made), metadata regarding whole datasets etc. CMOCs to include metadata management as part of their activities. Update relevant chapters of the WMO No. 558, and 471, and IOC Manuals and Guides accordingly to reflect obligations of Members/Member States as well as guidance to them respectively.
Target date:	Drifters and selected moorings (e.g. GMBA) 2014, ODAS 2016, Guide 2020

Deliverable 8 - Interoperability

Description:	Full interoperability of MCDS with the WIS and ODP
Implemented through:	GDACs, CMOC(s)
Tasks:	CMOC(s) to develop or maintain interoperability with the WIS and ODP. GDACs to develop interoperability with the WIS and ODP. CMOC(s) to possibly apply as WIS National Centres (NCs) or Data Collection and Production Centres (DCPCs). Harmonization of the MCDS functionalities with the WIS and the other IOC data systems
Target date:	2014

Deliverable 9 - MCS

Description:	Marine Climate Summaries (MCS)
Implemented through:	TT-MCDS and ETMC (standards), and CMOCs (implementation)
Tasks:	Define roles and responsibilities for producing MCSs (e.g. CMOC) on a minimal requirement basis. Update relevant chapters of the WMO and IOC Publications (in particular WMO No. 558, and 471) accordingly to reflect obligations of Members/Member States as well as guidance to them respectively.
Target date:	2016

5. Roles and responsibilities

To develop the MCDS, an ETMC Task Team on MCDS is being established. Terms of Reference and membership of the Task Team are listed in Annex C of the complete draft MCDS strategy document (see JCOMM MR No. 90). The Task Team will be required to coordinate with appropriate WMO and IOC bodies, and with the Expert Team on Marine Climatology (ETMC), as well as the centres implementing specific functions of the MCDS in particular.

Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)

- JCOMM will be invited to approve the recommendations (technical regulations, establishment of specific components contributing to the MCDS, governance) passed to it by the MCDS Task Team through the Expert Team on Marine Climatology (ETMC), the Data Management Coordination Group (DMCG), and the Management Committee (MAN). Those recommendations will then be passed to the WMO and IOC Executive Bodies for approval. Progress will be reported regularly to the ETMC, DMCG, and MAN.

- The JCOMM Observations Programme Area (OPA), its Coordination Group (OCG), and its Observations Panels, in collaboration with CBS, will assist in the development of best practices and standards, and ensure that the flow of real-time and delayed-mode observations will eventually be provided through the MCDS, the WIS and partner ocean data systems. This includes collaborations with the Data Buoy Cooperation Panel (DBCP), the Ship Observations Team (SOT), the Global Sea Level Observing System (GLOSS), and the Ocean Sustained Interdisciplinary Timeseries Environment observation System (OceanSITES).
- JCOMM shall communicate on the benefits of the MCDS (e.g. through dedicated web pages, JCOMM Newsletter, communications during JCOMM meetings).

JCOMM Associated Programmes

- Ocean Observations Programmes associated to JCOMM such as Argo, IOC's International Ocean Carbon Coordination Project (IOCCP), and GO-SHIP will be invited to contribute to the MCDS.

IOC (of UNESCO) Committee for the International Oceanographic Data and Information Exchange (IODE)

- The IODE Committee will assist in the development of MCDS, in particular for standards (see list in Annex D of the complete draft MCDS strategy document (see JCOMM MR No. 90)), documentation, and accreditation process, for example through the joint IODE-JCOMM Ocean Data Standards (ODS) development and accreditation process.

- The JCOMM-IODE Expert Team on Data Management Practices (ETDMP) will provide guidance for realizing interoperability of the MCDS with the Ocean Data Portal (ODP).

- The JCOMM-IODE Global Ocean Surface Underway Data Pilot Project (of IODE, JCOMM) (GOSUD) will be consulted, and invited to contribute its data to the MCDS.

- The JCOMM-IODE Global Temperature and Salinity Profile Programme (GTSPP) will be consulted, and invited to contribute its data to the MCDS.

- The IODE Global Oceanographic Data Archaeology and Rescue (GODAR) will be consulted, and invited to contribute to the MCDS

- IODE will assist to contribute ocean biological data of interest to climate application to the MCDS (e.g. Ocean Bio-Geographical Information System - OBIS).

WMO Commission for Basic Systems (CBS)

- CBS is responsible, in particular, for the cooperation with Members, other technical commissions and relevant bodies in the development and operation of the required integrated data systems in response to requirements of all WMO Programmes and opportunities provided by technological developments. The development of the WIS is undertaken in the framework of the CBS. Interoperability with the WIS being a key deliverable of the activity, consultation with the CBS will be required as appropriate.

WMO Commission for Climatology (CCl)

- A coordinated approach between JCOMM and the CCl to marine and environmental data and data management, including data rescue must be promoted as part of the MCDS developments. This includes collaborative development of required interoperability standards and systems for data exchange; collaboration on WIGOS, and GCOS/GOOS (to ensure best practices in observational systems serving the climate program); in developing climate indices and defining and monitoring extremes; and in capacity building and training. This can essentially be realized through linkages between the ETMC and the Open Panel of CCl Experts (OPACE) on Climate Data Management (OPACE-1), e.g. the Expert Team on Climate Database Management Systems (ET-CDBMS).
- High Quality Global Data Management System for Climate (HQ-GDMSC)

WMO Members and IOC Member States

In addition, building on existing systems, MCDS development will require coordination and contributions with/from WMO Members and IOC Member States, including (see also Table 1) these planned general roles, which in many cases are foreseen to initially simply harmonize existing activities into the new framework:

- Data Acquisition Centres (DACs): Centres receiving data from various JCOMM data sources in agreed formats in delayed-mode and/or real-time
  (a) Delayed-mode DACs (DM-DAC) – Receiving data from a specific data source in delayed-mode, applying agreed MQC, investigating problems when required and forwarding of data to the appropriate GDAC
  (b) Real-time DACs (RT-DAC) – Existing GTS Centres receiving data from real-time sources

- Global Data Assembly Centres (GDACs): Selected centres combining data of all streams, but typically of one specific platform type (e.g. ships vs. buoys) from their appropriate DACs. Their role is to establish a unique, complete dataset (including metadata), perform agreed quality checks and forward the data and metadata with flags to the CMOC(s) in agreed formats. Data from both, delayed-mode and real-time should be compared and linked. It is mandatory that the GDACs are registered as WIS DCPCs.

- JCOMM Centres for Marine-meteorological and Oceanographic Climate Data (CMOCs): All data (original and QC'd) and metadata received from GDACs are forwarded to the suitable CMOC, which collectively will serve to make broader collections of JCOMM data widely available, integrating data from multiple platform types. CMOCs may act as a mirroring network of data stores, applying HQCS, making datasets available to the user interface and advising member/members states when appropriate (see CMOC Terms of Reference for further information). Data and metadata are stored in line with defined JCOMM standards to ensure data integrity and universal interoperability.

- JCOMM improved data access: Universal data access system for searching, downloading, displaying and analysis of JCOMM data and products. This interface (which may be largely

based on a formalization of existing data access systems) provides a flexible tool with variable privileges for all users to manipulate the data. In particular, the tool must allow:
  - Interactive searching by element, time, location, geographical feature, data type
  - Fast and easy downloading into various codes and formats
  - Interactive displays – maps, tables – allowing GIS layering
  - Versatile analysis to generate and visualise standardised and bespoke climatological products and statistics in suitable forms

- ICOADS which is managed by the USA will be invited to contribute to the MCDS as a CMOC;

- The operators of the various ocean data centres, DACs and GDACs concerned:

  - Canada (GTSPP, RNODC/DB)
  - France (Argo GDAC, SOC/DB, GOSUD)
  - USA (Argo GDAC, OceanSITEs, GTSPP, GOSUD)
  - UK Permanent Service for Mean Sea Level (PSMSL)
  - European projects such as SeaDataNet, and MyOcean

- The ODASMS which is operated by China will be invited to consider enhancing the service and integrating it within a CMOC;

- Other potential actors

Table 1: Proposed MCDS roles of specialized centres.

Marine Climate Data System (MCDS), roles of specialized centres (draft)
04/11/2011)

	Sources	**DAC**	**GDAC**	**CMOC**	**Comment**
Current examples	RT (GTS, netCDF) DM (IMMT, netCDF)_ Metadata: JCOMMOPS, Pub47	DM-DACs (e.g.CMs) SOC/DB GDP DAC ODASMS Coriolis RT-RCs	GCCs RNODC/DB Argo GDACs OceanSITES GDACs GTSPP GOSUD	NODCs and NCDCs (if applicable) WDCs WOD/WOA ICOADS	
Data types (specific platform types, all, value added)	Observation platform	Observation platform	Observation platform(s)	Many obs. platforms	"Many obs. Platforms" to be discussed and defined for the MCDS, noting that longstanding divisions of responsibility have been established, e.g. among the World Data Centres (WDCs) between Oceanography and Meteorology.
Produce data & metadata	x				
Collect RT		x			
Collect DM		x			
Collect metadata		x			
Minimum QC (MQC)		x	x		
Format data for DACs (e.g. IMMT)		x	x		
Produce co-located data		x	x		
Format data for GDAC		x	x		
Combine data, metadata, QC flags, co-located (specific platform type)			x		
Produce Discovery Metadata			x		
Higher Level QC (HQC)			x	x	
Combine data, metadata, QC flags, co-located (many platform types)				x	
Mirror with other similar centres				x	
Data (and metadata) rescue					
Format data (and metadata?) for specialized access				x	
Format data (and metadata) for archival (e.g. IMMA) and for open access (e.g. netCDF)				x	
Added value & bias correction				x	
Produce marine climate summaries				x	
Long term archive				x	Probably NODC/NCDCs and WDCs (now operating within the new World Data System, WDS), provide internationally the most formal long-term archival, probably with national variations outside of the WDS though. In USA e.g. NOAA has a formal role and houses WDCs

6. Data Policy and Software Licensing and Usage Rights Requirements

All components of the MCDS must make all the data, metadata, and products falling within the scope of the MCDS timely, free and unrestricted available to the international community in a way consistent with:

(a) WMO Resolution 40 60 (Cg-12) - WMO policy and practice for the exchange of meteorological and related data and products including guidelines on relationships in commercial meteorological activities;

(b) Resolution IOC-XXII-661 - IOC Oceanographic Data Exchange Policy;

CMOC must make all the data, metadata, and products falling within the scope of the CMOC network available to the international research community in a way consistent with WMO Resolution 40 (Cg-12) and IOC Resolution IOC-XXII-6. Where applicable software should also be made open and freely available.

The data policy for the integrated products as well as the GFCS data policy which is currently under discussion must be followed also.

7. Quality Management

The MCDS is planning to include appropriate Quality Management (QM) for all of its deliverables. By promoting standards, documenting them as part of appropriate WMO and IOC Publications, as well as documenting its procedures, the MCDS will ensure that the required data quality standards are met and sustained for all WMO and IOC programme requirements.

The goal is to facilitate improved data management including collection of relevant delayed-mode data, data rescue, data processing, and quality control, value adding, archival, data exchange and data retrieval capabilities.

The MCDS is therefore promoting the development and implementation of Quality Management Systems (QMS) for each of its components, in compliance with the WMO and IOC quality policies, including the WMO Quality Management Framework (QMF) and the IODE QMF. It is recommended to compile at the national level, regulatory documentation produced in a way consistent with the eight Quality Management Principles 62 developed under ISO Technical Committee 176 (TC176): User / customers focus, Leadership, Involvement of people, Process approach, System approach to management, Continual improvements, Factual approach for decision making, and Mutually beneficial supplier relationships. This may lead in some instances to the certification of such QMS related to the relevant MCDS data and products. ISO 9001 certification will not be mandatory, as some of the meteorological and / or oceanographic centres contributing to the MCDS might wish to comply with other standards than ISO.

8. Capacity development

The use of the IODE OceanTeacher and a dedicated MCDS website for sharing this documentation is something to be considered.

60: Full text of the Resolution can be found at http://www.wmo.int/pages/about/Resolution40_en.html . The Resolution in particular states that "as a fundamental principle of WMO, and in consonance with the expanding requirements for its scientific and technical expertise, WMO commits itself to broadening and enhancing the free and unrestricted (non-discriminatory and without charge) international exchange of meteorological and related data and products."

61 : Full text of the resolution can be found at http://www.ioc-goos.org/ioc-xxii-6 . The Resolution is particularly promoting the timely, free and unrestricted access to all data, associated metadata and products.

62: http://www.iso.org/iso/iso9000-14000/understand/qmp.html

In a way consistent with the WMO and IOC strategies for Capacity Building, training materials about MCDS will shared using modern technology such as e-learning, e.g through the IODE project office, and WMO Regional Training Centres.

CMOCs can be a mechanism used for assisting developing countries in rescuing their data, and developing their own capacities for the management of ocean climate data.

9. Standards, protocols and formats

If necessary, the MCDS will require the updating of existing standards and the development of new ones as described in the table in Annex C in cooperation with the JCOMM/IODE Ocean Data Standards (and best practices) (pilot).

10. Implementation plan

The detailed initial implementation plan responding to this strategy, with proposed steps for each deliverable, actors and deadlines is provided in the ETMC-4 report.

11. Resources

The table in Annex A of the complete draft MCDS strategy document (see JCOMM MR No. 90) provides some information on the preliminary resources required to develop and operate the future MCDS.

ANNEX A

RESOURCES

The table below provides some information on the resources required to develop and operate the future MCDS.

Coordination of the overall activities will be made by email, but face to face meetings of experts will still be required although the financial resources required for the following activities cannot be estimated at this point. WMO and IOC Secretariats will strive to identify appropriate resources to be committed in support of these developments. This table will be refined as the implementation of the MCDS progresses.

No.	*Activity*	*Year(s)*	*Supported by (examples)*	*Comment*
	MCDS kick-off workshop, Nov./Dec. 2011	2011	WMO	
	ETMC-4 Session & TT-MCDS-1, 2012	2012	WMO	Some other sources of funding to be found; or participants to attend self funded
	TT MCDS workshop, 2014	2014	TBD	In conjunction with ETMC-5 or other event
	ETMC-5 Session, 2014	2014	WMO	Some other sources of funding to be found; or participants to attend self funded
	ETMC-6 Session, 2016	2016	TBD	
	TT-MCDS workshop, 2018	2018	TBD	In conjunction with ETMC-6 or other event
	ETMC-7 Session, 2018	2018	TBD	
	Deliverable 1 - Data-flow / DMVOS (Step 1)	2012	UK, Germany	
	Deliverable 1 - Data-flow / DMVOS (Step 2)	2012-2016	UK, Germany	
	Deliverable 1 – Data-flow / RNODC/DB & SOC/DB	2012	Canada, France	
	Deliverable 1 – Data-flow / GDACs – Argo	2012-2020	France, USA	
	Deliverable 1 – Data-flow / GDACs – OceanSITES	2012-2016	France, USA	
	Deliverable 1 – Data-flow / GDACs – GOSUD	2012-2016	France, USA	
	Deliverable 1 – Data-flow / GDACs – GTSPP	2012-2020	USA, Canada	
	Deliverable 1 – Data-flow / GDACs – GLOSS	2012-2016	UK, USA	
	Deliverable 2 – Quality Control	2012-2016	UK, Germany	
	Deliverable 3 – Value added marine climate data	2012-2020	USA	
	Deliverable 4 – Data Exchange Protocols	2011-2016	TBD	
	Deliverable 5 – Co-located data	2012-2016	UK, Germany, USA	
	Deliverable 6 – CMOC / ICOADS	2012	USA	
	Deliverable 6 – CMOC / Other ?	2012-2020	Members/Member States	
	Deliverable 7 – CMOC / China	2012 – 2016	China	ODASMS to be integrated
	Deliverable 8 – Interoperability	2012-2014	Members/Member States operating	

			CMOC	
	Deliverable 9 – MCS	2012-2016	Members/Member States operating CMOC	

ANNEX B

TERMS OF REFERENCE AND MEMBERSHIP OF THE ETMC TASK TEAM ON THE MARINE CLIMATE DATA SYSTEM (MCDS)

The Task Team on the Marine Climate Data System (TT-MCDS) replaces (i) the Cross Cutting DMPA-OPA Task Team on Delayed-Mode VOS Data (TT-DMVOS), and (ii) the DMPA/ETMC Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS).

The Task Team shall work during the period 2011 to 2020 on the following tasks:

1. Continue the work of the two TT-DMVOS and TT-MOCS Task Teams to realize the modernization of the Marine Climatological Summaries Scheme (MCSS);
2. Propose a Vision for 2020 for the future Marine Climate Data System (MCDS) to ultimately replace the existing MCSS;
3. Propose a Strategy for the realisation of the Vision, to be submitted to JCOMM Management Committee (MAN) through the Data Management Coordination Group (DMCG), taking into consideration the draft strategy that is provided as background document to JCOMM-4.
4. Propose an Implementation Plan for the realisation of the Strategy to MAN through DMCG;
5. Guide and follow the development of the MCDS according to the Implementation Plan, and if necessary propose adjustments to the Implementation Plan;
6. Report regularly to the ETMC and ETDMP as appropriate;
7. Develop a MCDS website and actively promote the MCDS within the marine community.

Membership of the Task Team includes individuals from JCOMM and other partners (e.g. IODE, ICSU) with expertise in the field of marine-meteorological and oceanographic climate data:

- Nicola SCOTT (Co-Chairperson, and GCC UK)
- Gudrun ROSENHAGEN (Co-Chairperson, and GCC Germany)
- Sissy Iona (DMCG Chair, IODE Co-Chair)
- Shawn SMITH (SOT/SOOP)
- Eric FREEMAN (RM and VOSClim DAC)
- Elizabeth C. KENT (RM)
- Frits B. KOEK (RM)
- Hing-Yim MOK (RM)
- Scott WOODRUFF (RM)
- Mizuho HOSHIMOTO (RM)
- Heike HAAR (GCC Germany)
- Bruce SUMNER (Associated Member, HMEI)
- Joel HOFFMAN (SOC/DB)
- Sylvain de MARGERIE (RNODC/DB)
- Shaohua LIN (ODASMS)
- Loic Petit de la VILLEON (GOSUD)
- Charles SUN (GTSPP)
- Mukuria KIMANI (JCOMM DMCG, Kenya)
- Akihiro SETA
- Karsten SHEIN
- (membership to be reviewed)

ANNEX C

MARINE CLIMATE DATA SYSTEM (MCDS) STANDARDS

This table provides a list of standards required to operate the MCDS, and provides information on current versions, purpose and scope, where these standards are published, what MCDS components should be using them, responsible bodies for maintaining them, and target dates for the implementation of new versions.

Standards	***Current Version (date)***	***Description***	***Published in***	***Relevant components***	***Body responsible***	***Target date for new version(s)***
MCDS	n/a	This standards provides for the overall Technical Regulations of the MCDS, and its components.	WMO 558, 471	All	JCOMM63	2016, 2020
IMMT	IV (2009)	The International Marine-Meteorological Tape (IMMT) format is used for the collection of delayed-mode VOS data, including appropriate observations, metadata, and quality control fields.	WMO 558, 471	GCCs, RMs, CMs, then DACs, GDACs	JCOMM[63]	2012, 2016, 2020
MQCS	VI (2009)	Minimum Quality Control Standard (MQCS) is used for the quality control of delayed-mode VOS data.	WMO 558, 471	GCCs, RMs, CMs, then DACs, GDACs	JCOMM[63]	2012, 2016, 2020
HQCS	n/a	This standard provides for Higher Level Quality Control (HQCS) of appropriate delayed-mode marine-meteorological data.	WMO 471	GCCs, RMs, CMs, then GDACs, CMOCs	JCOMM[63]	2012, 2016, 2020
IMMA		The International Maritime Meteorological Archive (IMMA) data format is used for the archival and distribution of marine-meteorological and oceanographic data at ICOADS (present), and CMOC (future)	WMO 471	ICOADS, then CMOC	USA then JCOMM[63]	2016, 2020
MCS	(1963?)	This provides for a standardization of Marine Climate Summaries (MCS) as produced by CMOC.	WMO 471	CMOC	JCOMM[63]	2016, 2020
ODAS metadata	(1999)	This standard provides for a format for the collection and exchange of Ocean Data Acquisition Systems (ODAS) metadata	WMO 471	CMOC	JCOMM[63]	2016, 2020

63: Formats developed and recommended by the ETMC

ANNEX D

ACRONYMS

CBS	Commission for Basic Systems (WMO)
CCl	Commission for Climatology (WMO)
Cg	Congress (WMO)
CLIMAR	International Workshops on Advances in Marine Climatology (JCOMM)
CM	Contributing Member (MCSS)
CMOC	Centre for Marine-meteorological and Oceanographic Climate Data (JCOMM)
DCPC	(WIS) Data Collection and Production Centres
ETMC	Expert Team on Marine Climatology (JCOMM)
DAC	Data Acquisition Centre
DBCP	Data Buoy Cooperation Panel (JCOMM)
DM	Data Management
DM	Delayed-mode
DMCG	Data Management Coordination Group (JCOMM)
DMPA	Data Management Programme Area (JCOMM)
DMVOS	Delayed-Mode VOS Data
ECV	Essential Climate Variable
ETDMP	Expert Team on Data Management Practices (JCOMM/IODE)
ETMC	Expert Team on Marine Climatology (JCOMM)
GCC	Global Collecting Centre (MCSS)
GCOS	Global Climate Observing System (WMO-IOC-UNEP-ICSU)
GDAC	Global Data Assembly Centre
GDP	Global Drifter Programme
GFCS	Global Framework for Climate Services
GHRSST	Group for High Resolution SST
GLOSS	Global Sea Level Observing System (JCOMM)
GMBA	Global Moored Buoy Array
GODAR	Global Oceanographic Data Archaeology and Rescue (IODE)
GOOS	Global Ocean Observing System (IOC-WMO-UNEP-ICSU)
GOSUD	Global Ocean Surface Underway Data Pilot Project (of IODE, JCOMM) (JCOMM/IODE)
GTS	Global Telecommunication System (WMO)
GTSPP	Global Temperature and Salinity Profile Programme (JCOMM/IODE)
HLQC	Higher Level Quality Control
HQCS	Higher Quality Control Standard
HQ-GDMSC	High Quality Global Data Management System for Climate
ICOADS	International Comprehensive Ocean-Atmosphere Data Set (USA)
ICSU	International Council for Science
IEC	International Electrotechnical Commission
IGOSS	WMO-IOC Integrated Global Ocean Services System (replaced by JCOMM in 1999)
IMMA	International Maritime Meteorological Archive
IMMT	International Marine-Meteorological Tape
IOC	Intergovernmental Oceanographic Commission of UNESCO
IOCCP	International Ocean Carbon Coordination Project (IOC)
IODE	International Oceanographic Data and Information Exchange (IOC)
ISO	International Organization for Standardization
IVAD	ICOADS Value-Added Database
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
MAN	Management Committee (JCOMM)
MARCDAT	International Workshop on Advances in the Use of Historical Marine Climate Data (JCOMM)
MCDS	Marine Climate Data System

MCS	Marine Climate Summaries
MCSS	Marine Climatological Summaries Scheme
NC	(WIS) National Centre
NCAR	National Center for Atmospheric Research (USA)
NMHS	National Meteorological and Hydrological Service
MQCS	Minimum quality Control Standard
NOAA	National Oceanic and Atmospheric Administration (USA)
NWP	Numerical Weather Prediction
OBIS	Ocean Bio-Geographical Information System (IODE)
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	Observations Coordination Group (JCOMM)
ODAS	Ocean Data Acquisition Systems
ODASMS	ODAS Metadata Service (JCOMM)
ODP	Ocean Data Portal (IODE)
OPA	Observations Programme Area (JCOMM)
OPACE	Open Panel of CCl Experts
QA	Quality Assurance
QC	Quality Control
QMF	Quality Management Framework
RA	WMO Regional Association
RC	Receiving Centre
RM	Responsible Member (MCSS)
RT	Real-time
RNODC	Responsible Oceanographic Data Centre (IODE)
RNODC/DB	RNODC for Drifting Buoys
RT-RC	Real-time Receiving Centre
SOC	Specialized Oceanography Centre (JCOMM)
SOC/DB	SOC for Drifting Buoys
SOT	Ship Observations Team (JCOMM)
SST	Sea Surface Temperature
ToR	Terms of Reference
TT-DMVOS	Task Team on Delayed-Mode VOS Data (JCOMM)
TT-MCDS	Task Team on Marine Climate Data System (ETMC)
TT-MOCS	Task Team on Marine-meteorological & Oceanographic Climatological Summaries (ETMC)
UNEP	United Nations Environment Programme
UNESCO	United National Educational, Scientific and Cultural Organization
VOS	Voluntary Observing Ship Scheme
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization (UN)

ANNEX V

UPDATED MCDS IMPLEMENTATION PLAN
(as of 21st December 2012)

No.	*Deliver-able*	*Action*	*By*	*Lead or catalyst*	*Deadline*	*Comments*
1		Develop appropriate MCDS website and promotional material to make the system widely known within the marine community	ETMC	G. Rosenhagen	Ongoing	*(taken from TT-DMVOS WP)* Oct '12: GCCs developing MCDS logo
2		Agree on ToR for the new TT-MCDS.	TT-MCDS	S. Woodruff	08/2011	Done
3		Organise MCDS preparatory workshop.	ETMC, TT-DMVOS, Secretariat	E. Charpentier	11/2011	Done
4		Propose draft Rec to JCOMM-4 on MCDS.	ETMC	S. Woodruff	11/2011	Done
5	6	Make proposal for Terms of Reference for CMOC, governance and approval process for establishing new CMOC, content of statement of compliance.	Workshop MCDS, ETMC	S. Woodruff	11/2011	Done
6	6	Germany and China submit Statements of Compliance and Commitment for CMOCs	China and Germany	G. Rosenhagen S. Lin	02/2012	Done
7	6	Germany and China to operate CMOC on a trial basis	JCOMM-4	G. Rosenhagen S. Lin	05/2012	Done
8	6	Canada and France to operate GDACs on a trial basis	JCOMM-4	S. de Margerie J. Rolland	05/2012	Done
9		Approve JCOMM-4 Recs regarding MCDS.	JCOMM-4	Co-Presidents	05/2012	Done
10	2	Propose update of MQCS (& IMMT) to JCOMM-4 (MQCS-7).	GCCs	N. Scott G. Rosenhagen	05/2012	Done and MQCS-7 now adopted
11	4	Propose a new ad hoc task team for Data Exchange Protocols (DEP*).	ETDMP	S. Belov	2012	
12		Finalize relevant documentation to IODE-22: MCDS Strategy MCDS Implementation Plan CMOC Evaluation Criteria	ETMC, DMCG, Secretariat	P. Pissierssens	12/2012	
13		The IOC Strategic Plan for Oceanographic Data and Information Exchange www.iode.org/strategy	Secretariat	P. Pissierssens	Jan 2013, then IODE-22	
14	1	Define Terms of Reference for IODE GDACs	IODE	A. Troisi / S. Iona	IODE-22 (for IODE GDACs)	Started
15		IODE-22 to:	IODE-22	A. Troisi / S.	3/2013	

No.	Deliver-able	Action	By	Lead or catalyst	Deadline	Comments
		Approve MCDS Strategy Review draft MCDS Implementation Plan Agree on CMOC Evaluation Criteria		Iona		
16	1	Identify Centres already carrying out similar roles. Identify existing tasks at each Centre consistent with the MCDS structure and highlight any tasks not already being done.	VOS: GCC / ETMC Buoy: DBCP / ETMC Ocean Data: ? DMCG / IODE Others:…	G. Rosenhagen / N. Scott	Mid-2013	
17	1	Each data-type to create a work plan to make steps to introduce tasks and roles (if necessary) within routine processing to align with MCDS Structure.	VOS: GCCs Buoy: ISDM, AOML, Meteo France Ocean Data: ? Others:…	G. Rosenhagen / N. Scott	VOS: mid-2013 Buoy: mid-2013 Ocean Data: ? Others:…	
18	1	Action individual data-type work plans (task 17) within agreed timescales.	All	G. Rosenhagen / N. Scott	(see data type work plans for details)	
19	6	DMCG and JCOMM Management Committee to evaluate CMOC proposals from China and Germany, and seek approval of CMOCs China and Germany through fast track procedures (consultation of JCOMM and IODE in writing)	DMCG, MAN	JCOMM Co-Presidents	Sep. 2013	
20	6	Other Candidates to submit Statement of Compliance for CMOC (e.g. ICOADS, etc)	Candidate CMOCs	E. Freeman	2013	More centres encouraged to apply.
21	1	Develop and refine dataflow proposal, with roles and responsibilities of the different actors.	OCG to lead VOS: GCCs Buoy: ISDM, AOML, Meteo France Ocean Data: DMCG in coop with IODE Others:…	N. Scott / C. Clark	2013 VOS: 11/2011 Buoy: 11/2011 Ocean Data: 2015 Others:…	 Done (VOS) Done (Buoy)
22	1	Create dataflow diagrams to show compliance with	DMCG to lead	N. Scott / S.	2013	

No.	Deliver-able	Action	By	Lead or catalyst	Deadline	Comments
		proposed structure.	VOS: GCCs Buoy: ISDM, AOML, Meteo France Ocean Data: DMCG in coop with IODE Others:…	Iona		Done (VOS)
23	2	Document (in a standard way) current minimum quality controls standards used by existing centres across JCOMM and submit to ETMC.	DACs (or potential DACs)	G. Rosenhagen	2013	
24	2	Refine, document & test a Higher QC (HLQC) for use by all atmospheric JCOMM data types. Submit standard to ETDMP (for Ocean Data Standards process).	DWD	G. Rosenhagen	2013	
25	4	Investigate requirements and possible options for data exchange format(s) (for use across MCDS).	TT-DEP* (inc CMOCs)	S. Woodruff	2013	
26		Compile required changes to WMO No. 558 and 471 for modernised VOS data flow, and draft JCOMM-4 Rec.	ETMC, Secretariat	N. Scott	12/2013	underway
27	1	Update relevant chapters of the relevant WMO/IOC Publications to reflect new structure for **VOS Data**. When possible provide a further update of the appointed roles and responsibilities of the different actors across the DAC/GDAC network (clearly aligning similarities and highlighting differences).	VOS: GCC / ETMC	N. Scott	2013	
28	4	Agree on data collection and processing formats for **VOS Data**	VOS: GCCs, RMS, CMs	S. Woodruff	2013	
29	6	Define how Centres will 'mirror' data holdings.	S. Woodruff, G. Rosenhagen, S. Iona N. Scott, E. Freeman, S. Lin	E. Freeman	2013	
30	6	Develop synchronized data holdings with harmonised quality management.	Candidate CMOC(s)	E. Freeman	2013, and ongoing	
31	6	If successful evaluation, and approved by JCOMM and IODE, CMOCs China and Germany to be established as CMOCs by WMO and IOC Executive Bodies	WMO & IOC ECs	Secretariat	Mid-2014	
32	1	Existing Centres 'mapped' to MCDS roles to submit Statement of Compliance' for a DAC/GDAC applicable to	DACs / GDACs	N. Scott	2014	

No.	Deliver-able	Action	By	Lead or catalyst	Deadline	Comments
		their relevant data platform to WMO/IOC *(any missing DAC/GDAC roles can be applied for by any Program/Centre meeting the Capabilities & Functions for that role).*				
33	1	Appointed DACs & GDACs regularly liaise with other MCDS Centres (and potential candidates) as part of the defined MCDS framework.	DACs / GDACs	N. Scott	Late 2014, ongoing	
34	2	Compare all minimum QCs submitted, highlight differences and recommend a MQC standard for MCSD general/future use. Submit standard to ETDMP (for Ocean Data Standards process).	TT-MCDS	G. Rosenhagen	2014	
35	4	Propose new data format(s) (if necessary) and/or define which formats are being used in the various areas of MCDS (for data collection & exchange).	TT-DEP* (inc CMOCs)	S. Woodruff	2014	
36	5	Propose & establish an ad-hoc task team for use of co-located model & satellite data (CMSD**) within HLQC.	TT-MCDS	G. Rosenhagen	2014	
37	8	CMOC to develop interoperability with the WIS and ODP, to ensure harmonisation of the MCDS functionalities with the WIS and ODP.	CMOC s	S. Belov	2014	
38	8	GDACs to develop interoperability with the WIS and ODP, and possibly apply as WIS NCs or DCPCs.	GDACs	S. Belov	2014	
39	4	Agree on data collection and processing formats for **Buoy Data**	Buoy: ISDM, AOML, Meteo France	S. Woodruff	2014	
40	4	Agree on data collection and processing formats for **Ocean Data**	Ocean Data: ETDMP	S. Woodruff	2014	
41	8	If necessary, CMOCs to apply as WIS National Centres (NC) or Data Collection and Production Centres (DCPC)	CMOCs	H.Y. Mok	2014	
42	2	Update relevant (or create new if needed) WMO & IOC Publications with details of standardised HLQC.	HLQC: ETMC	N. Scott	2014	
43	1	Update relevant chapters of the relevant WMO/IOC Publications to reflect new structure for **Buoy Data**. When possible provide a further update of the appointed roles and responsibilities of the different actors across the DAC/GDAC network (clearly aligning similarities and highlighting differences).	Buoy: DBCP / ETMC	N. Scott	2014	
44	2	Update relevant (or create new if needed) WMO & IOC Publications with details of standardised MCDS MQC	MQC: ETMC	N.Scott	2015	
45	1	Update relevant chapters of the relevant WMO/IOC	Ocean Data:	N. Scott	2015	

No.	*Deliver-able*	*Action*	*By*	*Lead or catalyst*	*Deadline*	*Comments*
		Publications to reflect new structure for **Ocean Data**. When possible provide a further update of the appointed roles and responsibilities of the different actors across the DAC/GDAC network (clearly aligning similarities and highlighting differences).	ETDMP			
46	3	Establish Pilot Project & Steering Team for value-added ICOADS (IVAD).	ETMC	S. Woodruff	2015	Currently utilising the ICOADS partnership forum for discussion and planning of IVAD (Dec '12).
47	4	Develop software to convert historical formats to MCDS format(s) and make freely available.	GDACs / CMOCs	M. Hoshimoto	2015	
48	4	Agree on data collection and processing formats for **Other Data Types**	Others data types	S. Woodruff	2015	
49	4	Update relevant chapters of WMO & IOC Publications to reflect the MCDS preferred formats.	ETMC	N. Scott	2016	
50	5	Investigate requirements and feasibility for possible use of co-located data in the new HLQC. Feedback findings to ETMC.	TT-CMSD**	G. Rosenhagen	2016	
51	7	Agree on metadata collection and exchange format(s).	ODASMS, CMOC(s)	S. Woodruff	2016	
52	7	Members to submit metadata together with their data submissions through DACs, GDACs or CMOC(s).	Members / Member States	S. Woodruff	2016, then ongoing	
53	7	CMOC(s) to include metadata management as part of their activities.	CMOCs	E. Freeman	2016	
54	7	Investigate metadata rescue (e.g. for buoy metadata)	CMOC(S)	S. Woodruff	2016	
55	7	Update relevant chapters of the WMO and IOC Publications accordingly to reflect metadata obligations of Members/Member States as well as guidance to them respectively.	TT-MCDS, ETMC, ETDMP	N. Scott	2016	
56	9	Agree on some minimum requirements for the production of MCS.	CMOC, ETMC, ETDMP	D. Berry	2016	
57	9	Define roles and responsibilities for producing MCSs (e.g. CMOC).	CMOC, ETMC, ETDMP	D. Berry	2016	
58	9	Update relevant chapters of the WMO and IOC Publications to reflect MCS obligations of Members/Member States as well as guidance to them respectively.	CMOC, ETMC, ETDMP	D. Berry	2016	
59	6	Update relevant chapters of the WMO and IOC	TT-MCDS,	N. Scott / E.	2016	

No.	*Deliver-able*	*Action*	*By*	*Lead or catalyst*	*Deadline*	*Comments*
		Publications to reflect obligations of CMOC Members/Member States as well as guidance to them respectively.	ETMC, ETDMP	Freeman		
60	1	Update relevant chapters of the relevant WMO/IOC Publications to reflect new structure for **Other MCDS Data Types**. When possible provide a further update of the appointed roles and responsibilities of the different actors across the DAC/GDAC network (clearly aligning similarities and highlighting differences).	Others:…	N. Scott	2016	
61		Propose draft Rec to subsequent JCOMM Session on MCDS.	ETMC	N. Scott	JCOMM-5: 2017	
62		Compile required changes to relevant WMO & IOC Publications for MCDS for submission to subsequent JCOMM and IODE Sessions.	Secretariat	E. Charpentier	JCOMM-5: 2017	
63		Define Terms of Reference for DACs & GDACs	ETMC, ISDM, AOML, Meteo France	N. Scott	JCOMM-5:2017	
64	1	Define and document the formal appointment and approval process for establishing DACs / GDACs, including template Statement of Compliance.	ETMC, ISDM, AOML, Meteo France	N. Scott	JCOMM-5:2017	Started
65	2	Once approved by JCOMM, HLQC to be used by all atmospheric GDACs.	GDACs	G. Rosenhagen	2017 (after JCOMM-5)	
66	3	Run Pilot Project for creation of IVAD (e.g. bias corrected) and make recommendations.	PP Steering Team	S. Woodruff	2020	
67	3	Document procedures and detail how data within IVAD are to be interpreted (use a new JCOMM Technical Report).	ETMC	S. Woodruff	2020	
68	7	Develop a easily accessible comprehensive metadata guide including details of past date codes/formats (decodes, dates formats used, any updates made…) and metadata regarding whole datasets etc.	CMOC(s)	S. Woodruff	2020	

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ANNEX VI

EVALUATION CRITERIA FOR CMOCS

BACKGROUND

JCOMM-4 adopted Resolution 2 with Annex 2 having to do with a Marine Climate Data System (MCDS) and with an entity called a CMOC. The Resolution required the development of accreditation criteria for new CMOCs and evaluation criteria for previously accredited CMOCs. This document provides these criteria. Questions regarding the background for the discussion and adoption of Resolution 2 should reference JCOMM documents, and subsequent documents from MCDS meetings.

It is accepted that the criteria presented here are a first attempt to clarify how CMOCs will be assessed. The intention is to make the accreditation and evaluation processes as transparent as possible. It is recognized that the process laid out here will put additional burdens on staff who already volunteer activities to support the international data systems. Both the criteria and the process are likely to require alterations as experience is gained. Required changes will need the same formal approval process by JCOMM and IODE as these criteria undergo.

ACCREDITATION PROCESS FOR A NEW CMOC

The agency proposing to host a CMOC must follow the procedures listed here. They must prepare a document that clearly addresses all of the obligations (i.e. capabilities, functions and a commitment of a minimum time period of operation), capabilities and corresponding functions described in Annex 2 to Recommendation 2 of JCOMM-4. Explicitly, this should include descriptions of the proposed outcomes/outputs (services, products) and how are these contributing to WMO and IOC requirements for managing marine-meteorological and oceanographic climatological data. The proposing agency should also describe what their annual report will contain.

To conduct an accreditation of a proposed CMOC, a committee will be formed of at least three members appointed by the JCOMM DMCG. Terms of Reference for the Accreditation Committee are found below.

Further actions will proceed as described in Annex 3 to draft Recommendation 2 (JCOMM-4)

Accreditation Criteria

Annex 2 and 3 to Recommendation 2 of JCOMM-4 are quite extensive in describing the obligations, capabilities and functions for a CMOC. The following criteria have been devised to test these conditions. They are presented in the form of questions, for which a simple “yes” or “no” is possible. Generally, if there is uncertainty in achieving a “yes” response, the criterion should be judged as unmet.

1. Does the scope of activities (rescuing, collecting, controlling quality, calibration and bias correction, processing, archiving, sharing, distributing and mirroring data, metadata and information, products and services) have any unnecessary overlaps with existing activities of an agency operating within the JCOMM data system, with activities of an IODE NODC, with the High Quality Global Data Management System for Climate, with an existing World Data System centre, or with some other well established data management activity? If so, is the added value of the overlap activity well explained and does it warrant the establishment of the CMOC?
2. If the scope of activities is regional, is there evidence of support from Member/Member States from the region (e.g. expressions of support)?
3. Does the proposal for the CMOC explain clearly how its activities will be coordinated with

other relevant, existing systems (such as with well described procedures, letters of cooperation, expressions of support from major data providers)?
4. Is the proposed CMOC activity well defined, scientifically sound (e.g. supported by a publication record), and does it fill a clearly articulated and real gap in formal WMO or IOC data management activities?
5. Are the variables to be treated not GCOS ECVs? If they are ECVs, is the added value that the proposal brings to management of these variables sufficient to warrant the overlap and the creation of a CMOC?
6. Are the processes for assessing and assigning quality indicators well documented and is this documentation easily available?
7. Will the proposed procedures ensure that the quality within all of the CMOC data sets are internally consistent?
8. Are there any restrictions on access to the data, metadata and information served by the proposed CMOC? If so, do these go against the spirit of free and unrestricted access?
9. Are the infrastructure, experience, financial resources and assigned staff for the proposed CMOC sufficient to meet the planned operations?
10. Interoperability means the data, metadata and information are widely visible and available through the WIS and/or ODP. Will this interoperability function be met by the proposed CMOC?
11. Does the CMOC proposal clearly describe the data domains of its operations in type(s) of data, geographic, and temporal coverage?
12. Are there any domain specific procedures to be applied by the proposed CMOC? If so, is their purpose (such as enhancing interoperability, ensuring data quality and consistency, improving access, improving coordination, or other functions) well described, useful and is documentation of these procedures easily available?
13. Are the proposed choices for procedures, standards and best practices to be followed suitable and adequate for data quality and management? Where applicable do they use procedures of the Ocean Data Standards and Best Practices Catalogue? If not, will they propose a new standard or best practice for consideration?
14. Is there a clear description of what the CMOC will undertake to “mirror” their processes, data and metadata? Is there evidence (e.g. a letter of agreement) of a cooperative arrangement with an existing CMOC or another established and ongoing data management system for this mirroring?
15. Is the mirroring process sufficiently robust to be reliable and timely?
16. Are the proposed methods of version control for data sufficient so that identical copies of data may be distinguished from near identical copies?
17. Are the proposed methods of version control for metadata sufficient to distinguish different versions of metadata?
18. Are the proposed methods of version control for processes sufficient so that data users can be certain about the processing steps through which data have passed?

Annual Reporting and Performance indicators

These are intended to be used to demonstrate that the CMOC is meeting its obligations and functions. The CMOC will report in writing to the chair of DMCG annually no later than 31 Jan of each year. The report can be structured in any way so long as the information listed here is all included. Other information that is helpful in informing on the operations of the CMOC in the past year is welcome. Reports should be limited to 20 pages or less.

1. Provide statistics on the type and volume of data processed in the past year and compare this to previous years of operation. If reprocessing of data already received in a previous year is included in these statistics, provide an explanation of the reasons for the reprocessing.
2. If CMOC operations have been changed to include new kinds of data, metadata and products or to exclude previously handled items, provide an explanation for the changes.
3. Provide statistics on the type and volume of data, metadata and products actually served in the past year and compare this to previous years of operation. If there have been changes

in serving operations, provide an explanation. Ensure that data and information served through ODP and WIS are clearly described.
4. Describe the mirroring functions of the CMOC both for its own data and metadata and in support of another CMOC. Provide statistics to demonstrate the robustness and timeliness of the mirroring operations.
5. Provide information to describe the coordination activities undertaken with other CMOCs, IODE NODCs, with the High Quality Global Data Management System for Climate, with an existing World Data System centre or with another established data management system.
6. Describe any changes in infrastructure or staff in the past year.
7. If one or more variables are GCOS ECVs, describe the coordination activities in cooperation with the data system handling the ECV and explain the value added operations provided by the CMOC for these variables.
8. Provide an updated list of documentation for quality management, standards or best practices as practised at the CMOC. Highlight those produced or updated in the past year and describe how all documentation is made available.
9. Has there been any noticeable changes in aspects (e.g. Quality, timeliness, new instrumentation, etc.) of the data received and processed in the past year compared to other years. If so, describe the change and explain the reason. Describe any actions taken as a result of this change.
10. Have there been any changes in access restrictions to the data, metadata, products or services. If so, explain them.
11. Provide statistics by type of data on the spacial and temporal coverage of the data managed by the CMOC during the past year and contrast these to previous years.
12. Describe any changes in processing of data or information during the past year. Explain why these changes were made.
13. Describe how the activities of this CMOC reflect common procedures employed by others in the CMOC network.
14. Describe any interactions with other individuals or organizations where the CMOC responded with assistance or provided advice regarding standards and best practices (e.g. on data rescue, collection, processing, archival, and distribution of marine- meteorological and oceanographic data, metadata, and products) to Member/Member States.
15. Provide, as appropriate, a list of citations, or statements from users that show usage of the CMOC operations, products or services.
16. Provide statistics or descriptions of the mirroring process that demonstrates it is functioning as described in the original proposal for the CMOC.

THE EVALUATION REVIEW PROCESS FOR AN EXISTING CMOC

Annex 3 to draft Recommendation 2 (JCOMM-4) states that the performance of an existing CMOC will be reviewed once every 5 years by the DMCG. This review will be conducted by a committee of at least 3 members appointed by the DMCG. It may be necessary for one or more members of the review committee to visit the CMOC. In this case, it is expected that the CMOC will finance the visit.

A review committee will be formed of at least three members appointed by the JCOMM DMCG. Terms of Reference for the Review Committee are found below.

Further actions will proceed as described in Annex 3 to draft Recommendation 2 (JCOMM-4)

5 Year Review Criteria

1. Is the objective of the CMOC or scope of activities (rescuing, collecting, processing, archiving, sharing, distributing and mirroring data, metadata and information, products and services) of the CMOC still relevant given any changes that may have taken place in the management of met-ocean data in the past 5 years?
2. Is the coordination of CMOC activities with other CMOCs and existing systems functioning at

a sufficient level? Has the CMOC been active in coordination activities and meetings in the CMOC network?

3. Is the infrastructure and assigned staff continuing to support CMOC operations adequately? Have there been any improvements over the past 5 years to enhance operations?
4. Is there any documented community support from groups outside the CMOC network for the operations of the CMOC?
5. Have there been any changes in GCOS ECV designations that impact the operations of the CMOC? Does the CMOC continue to demonstrate added value to managing GCOS ECVs?
6. Do the processes used for quality management continue to be sufficient?
7. Has the CMOC provided written reports on or before 31 Jan of each year of its operation?
8. Are there any changes to restrictions on access to the data, metadata and information, products or services? If so, do these go against the spirit of free and unrestricted access?
9. Interoperability means the data, metadata and information are widely visible and available through the WIS and ODP. Is this interoperability function being met? Have other interoperability operations been established?
10. Are the data domains still clearly described in type of data, geographic and temporal coverage?
11. Do the data and information management procedures applied (such as enhancing interoperability, ensuring data quality and consistency, improving access, improving coordination, or other functions of a CMOC) continue to be well described and useful?
12. Does the scope of activities have any overlaps with existing activities of IODE NODCs, with the High Quality Global Data Management System for Climate, with an existing World Data System centre or another well established data management activity? If so, is the added value of the overlap well described and warrants the continuing operations of the CMOC?
13. Do the procedures, standards and best practices that are followed continue to be suitable and adequate for defining data quality and management? If the standards or best practices chosen at the time of accreditation or the last review were not part of the JCOMM Catalogue of Standards and Best Practices, has a proposal been made to the Catalogue to incorporate the new procedures?
14. Does the mirroring arrangement with another CMOC, or another established and ongoing data management system continue to function in an appropriate, robust and timely manner?
15. Is the documentation of the accreditation evaluation and annual reviews easily available?
16. Are the quality processes and procedures of the existing CMOC appropriately in agreement with the rest of the CMOC network?
17. Are the methods of version control for data, metadata, products and processes sufficient for a user to adequately distinguish differences between versions?

ANNEX 1 OF ANNEX VI

Terms of Reference of the CMOC Accreditation Committee

To conduct an accreditation of a candidate CMOC, an independent committee will be formed of at least three members appointed by the JCOMM DMCG.

The Committee shall:

1. Elect a chair;
2. Review the document submitted by the CMOC candidate, with special attention to the accreditation criteria. The proposal will be judged against each of the criterion and will be scored as described in the document on establishing a CMOC. To receive accreditation, a proposal needs to satisfy the committee that all criteria are fully met; there must be unanimity among committee members;
3. Decide what expressions of support and from which groups are appropriate for a proposal (criteria #2, #3). The rationale will be explained in the committee report;
4. If required, designate someone to consult and/or undertake a visit of the candidate CMOC in order to (i) inform the candidate about possible elements to be clarified, and seek clarification, (ii) verify specific functions and capabilities of the candidate CMOC, (iii) negotiate needed changes to the proposal, and (iii) submit a report back to the committee with recommendations within the time period specified in Resolution 2 and its annexes;
5. Prepare a written report of their evaluation that explains the results. In particular, if the proposal is deemed insufficient to pass one or more criteria, the committee will explain their reasons and may suggest a possible remedy.
6. Submit the report to the DMCG and to the authors of the proposal.
7. Upon request, provide copies of the proposal and evaluation report to any JCOMM or IODE member requesting it.

The Chair of the Committee shall:

- Report the results of the evaluation to the DMCG.

Membership:

- IODE Representative
- JCOMM Representative (WMO side)
- Other representative(s) as needed

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ANNEX 2 OF ANNEX VI

TERMS OF REFERENCE OF THE REVIEW COMMITTEE FOR AN EXISTING CMOC

To conduct the review of an existing CMOC, an independent committee will be formed of at least three members appointed by the JCOMM DMCG.

The Committee shall:

1. Elect a chair;
2. Review the annual reports from the CMOC under review. The reports will be used to evaluate if the CMOC is continuing to meet all of the criteria used in the original evaluation. If there have been changes in the accreditation criteria, these will also be used. As necessary, the committee may seek additional information from the CMOC on its activities. The committee may also wish to read the report of the accreditation committee and any previous CMOC reviews. All of these documents should be made available by the CMOC.
3. If required, designate someone to consult and/or undertake a visit of the CMOC in order to (i) inform the CMOC about possible elements to be clarified, and seek clarification, (ii) verify specific functions and capabilities of the candidate CMOC, (iii) negotiate needed changes to the proposal, and (iv) submit a report back to the committee with recommendations within the time period specified in Resolution 2 and its annexes;
4. Prepare a written report of their evaluation that explains the results. In particular, if the proposal is deemed insufficient to pass one or more criteria, the committee shall explain their reasons and may suggest a possible remedy.
5. The committee may suggest enhancements (e.g. new or improved products) to operations of the CMOC though the CMOC is not obligated to implement these.
6. Submit the report to the DMCG and to the authors of the proposal.
7. Upon request, provide copies of the proposal and evaluation report to any JCOMM or IODE member requesting it.

The Chair of the Committee shall:

- Report the results of the evaluation to the DMCG.

Membership:

- IODE Representative
- JCOMM Representative (WMO side)
- Other representative(s) as needed

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ANNEX VII

REPORT BY THE GLOBAL COLLECTING CENTRES (GCCS)

1. INTRODUCTION

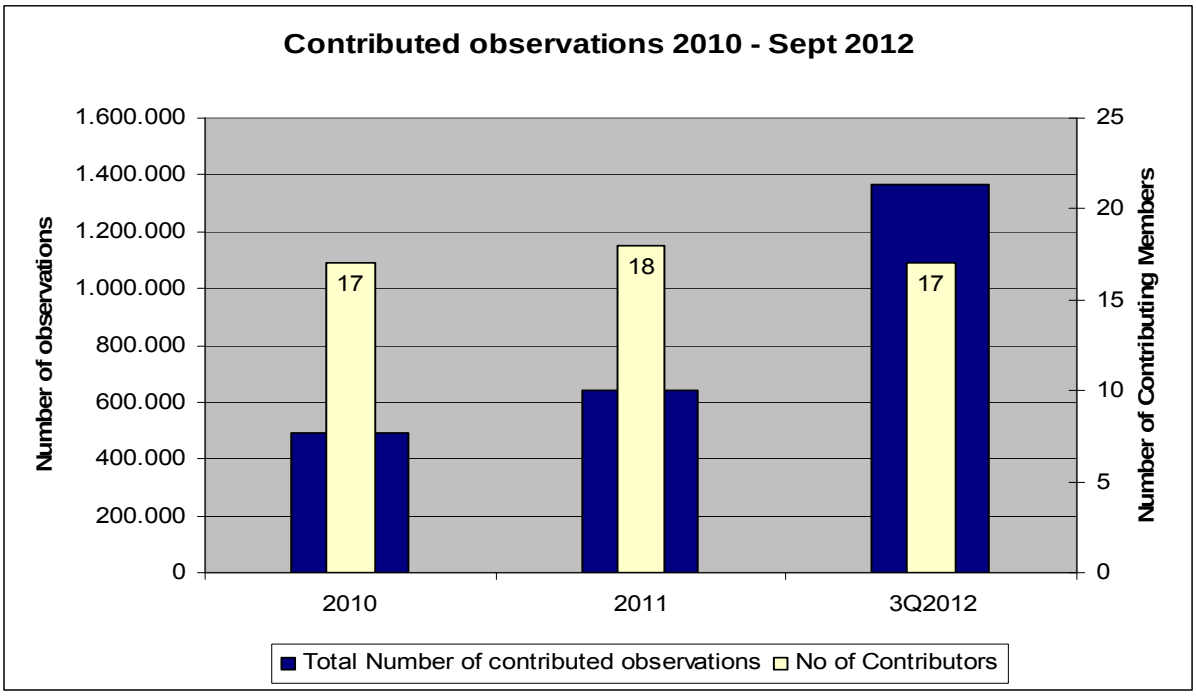
The two Global Collecting Centres (GCCs) for JCOMM's Marine Climatological Summaries Scheme (MCSS) were set up to improve data flow and quality of delayed-mode Voluntary Observing Ships (VOS) data by Recommendation 11 / CMM-11 (Lisbon, April 1993). Since then both Germany and the United Kingdom have been operating the GCCs. The current activities of the GCCs are reported through the GCC annual reports.
(http://www.wmo.int/pages/prog/amp/mmop/gcc-reports.html)

2. GCC REPORT

2.1 VOS Data Volumes

The last GCC annual report of 2011 marks the 18th year of GCC operation. The number of observations received in the years 2010 and 2011 were 489.117 and 640.649 respectively, much less than the years before, (normally around 1 million observations). In the first half of 2012 the GCCs have already received over 1 million records and in the first three quarters 1.366.587 observations (Fig. 1). This fluctuation in contributions results from a variety of Contributing Member (CM) issues including software, staff and technical problems.

***Figure 1**: Number of observations and active Contributing Members in the last three years*



The number of contributing countries has remained at 20 Members during the last three years. The other 6 CMs are still having problems submitting their data (Fig. 2). Due to the kind work of the DWD in Germany, some CMs, including Israel, Sweden, Greece and Canada, have been able to successfully contribute data to the GCCs.

***Figure 2**: Number of observations by CMs for the last three years*

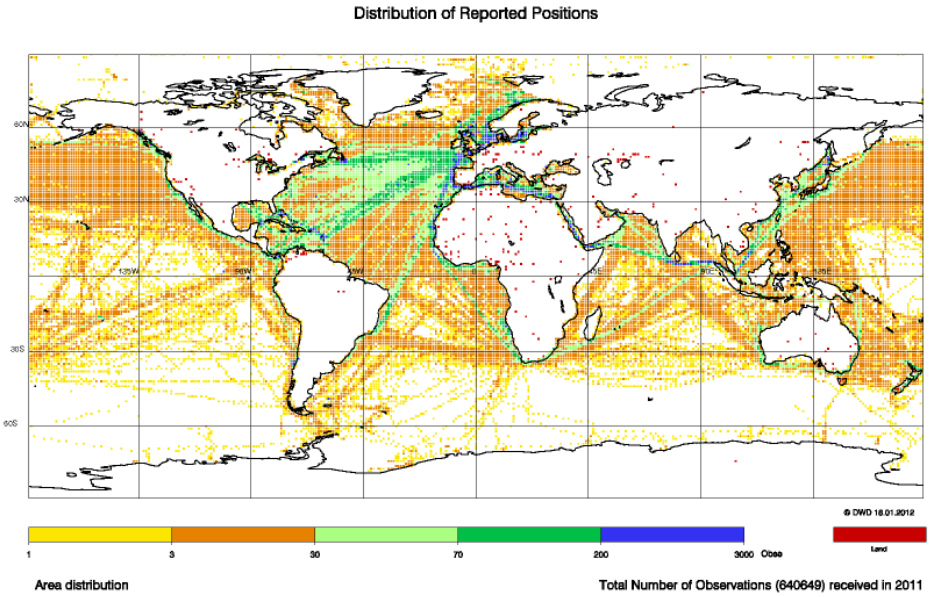
Number of CM Observations 2010 - Sept 2012			
Country Name	**2010**	**2011**	**till Sept 2012**
Argentina			
Australia	10.617	9.967	
Brazil			
Canada		9.645	400.690
Croatia			
France		39.048	271.334
Germany	192.214	130.575	181.689
Greece	45.203		530
Hong Kong, China	1.285	2.471	1.399
India	911	2.270	620
Ireland	2.257	340	1.217
Israel	7.020	12.517	4.332
Japan	37.959	8.127	13.647
Kenya			
Malaysia	1.583	339	1.191
Netherlands	38.567	85.517	40.859
New Zealand	8.326	11.920	5.170
Nigeria			
Norway			285.993
Poland	640	520	
Russian Federation	40.195	40.102	30.080
Singapore			
South Africa	1.174	253	648
Sweden	25.203	33.024	
United Kingdom	70.865	243.438	125.653
USA	5.098	10.576	1.535
Total	**489.117**	**640.649**	**1.366.587**

The majority of data received by the GCCs arrive by email and anonymous FTP transfer. All data are contributed in IMMT format, in the years 2010 and 2011 over 90% in IMMT-3, but in the first 9 months of this year 50% of the observations are received already in the newly adopted IMMT-4 format.

2.2 VOS Data Quality

The majority of observations continue to be of good quality. Less than 0.1 % of the data were rejected by the MQCS, mostly due to duplicated data. The 2011 areal distribution map (Fig. 3) shows the main shipping lanes between continents with much data concentrated at the coasts. The locations of observations reported erroneously on-land are highlighted in red. Problems with on-land positions have been on the decrease representing a very small percentage of total data in the last three years. Some issues with wrong positions or invalid dates were noted while comparing with the archive and GTS data. Most of these mistakes were resolved after consulting with the CM.

***Figure 3**: Distribution of observations received in 2011*



2.3 VOSClim Class Data

822.446 observations from VOSClim class ships were received and processed by the GCCs during the period January 2010 till September 2012. This makes up 60% of the data received by the GCCs from the VOS fleet in this period, but only 46% of the VOSClim observations contained the VOSClim defined additional elements. 9 of the 10 Contributing Members with registered VOSClim ships submitted observations and 68.449 observations from non-VOSClim registered ships were received with the VOSClim defined additional elements (Fig. 4).

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Figure 4*: VOSClim class observations submitted by CMs for the last three years*

Total Number of Observations from VOSClim-Ships / Number of Observations with VOSClim-Elements from VOSClim-Ships / Number of Observations with VOSClim-Elements from not listed ships Jan 2010 - Sept 2012

Country Name	2010			2011			2012 (Sept)		
Australia	2.721	2.506	274	3.330	2.760	0	0	0	0
Canada	0	0	0	9.644	0	0	400.248	0	0
France	0	0	0	37.968	37.711	1.080	211.977	211.977	56.037
Germany	21.376	20.965	0	13.861	13.094	0	22.132	20.849	152
India	357	0	0	464	0	0	102	0	0
Japan	21.417	21.417	3,608	2.733	2.733	0	3.061	3.061	0
Netherlands	9.971	6.505	898	24.500	10.240	2.002	11.996	7.600	1.423
New Zealand	943	762	0	256	255	45	1.048	643	6
United Kingdom	10.613	8.067	1,524	46.896	37.359	20.348	32.163	28.755	10.831
USA	0	0	0	0	0	0	0	0	0
9 of 10 Countries	**67.398**	**60.222**	**6.304**	**139.652**	**104.152**	**23.475**	**682.727**	**272.885**	**68.449**

3. HIGHLIGHTS & ISSUES

3.1 Formats and Standards

As of 1st January 2011, IMMT-4 and MQCS-6 was the preferred format and quality standard for use by delayed-mode VOS observations. The most notable differences from IMMT-3 and MQCS-5 are the inclusion on a VOSClim & AWS indicator, IMO number, relative humidity and new definitions of observation platform. The next version of the IMMT & MQCS format and standard (IMMT-5 and MQCS-7) were adopted at JCOMM-4 in May 2012 and are in effect from June 2012. These include only minor updates of wording and QC limits.

The MQC-software for CMs was updated to MQCS-7 and the 5th version is available at http://www.wmo.int/pages/prog/amp/mmop/mqc_soft.html.

3.2 Data Management and Quality of Climate Observations JCOMM Wide

3.2.1 MCDS

The new concept of the Marine Climate Data System (MCDS) was first devised and presented by the GCCs at the JCOMM Ship Observation Team meeting, Hobart, Australia, April 2011 and then shortly after also presented at the Marine Climate Data Workshop, MARCDAT-3, Frascati, Italy, May 2011. The proposed vision was well received and a MCDS workshop was soon planned for late 2011 in Hamburg.

The two GCCs met twice in August 2011 and September 2012 to discuss and plan the future of the Marine Climate Data System (MCDS) and how this should align with other climate data within JCOMM.

A MCDS workshop in November/December 2011 in Hamburg, Germany, explored the idea of defining a generic data flow structure with defined roles and tasks to be applied to all data types across JCOMM for the management of their climate data. As a result of the discussions a MCDS vision for 2020 and implementation plan were proposed and endorsed by JCOMM-4. The new JCOMM task team on the Marine Climate Data System (TT-MCDS) was formed and absorbs the work and tasks of the TT-DMVOS & TT-MOCS. (see Docs 4. – 4.4. for more information)

3.2.2 DCPCs
Both GCCs have been identified as DCPCs for the WIS and are able to provide nearly 17.7 millions MQCS-checked and flagged observations received by the GCCs from 1996 to 2012. Additionally all contributed original records are saved and available. (http://gisc.dwd.de/GISC_DWD/toExtendedSearch.do)

3.2.3 HQCS
DWD continues to make progress in the development of a new standardised Higher Quality Control Standard (HQCS) (see Doc. 5.5). The goal is a uniform checking of all types of VOS observations, easy handling, documented steps and graphic demonstration of erroneous values and simple ways of correction. A revised and improved land-sea mask is soon available and Climatological checking with ERA-Interim-data have led to satisfying results.

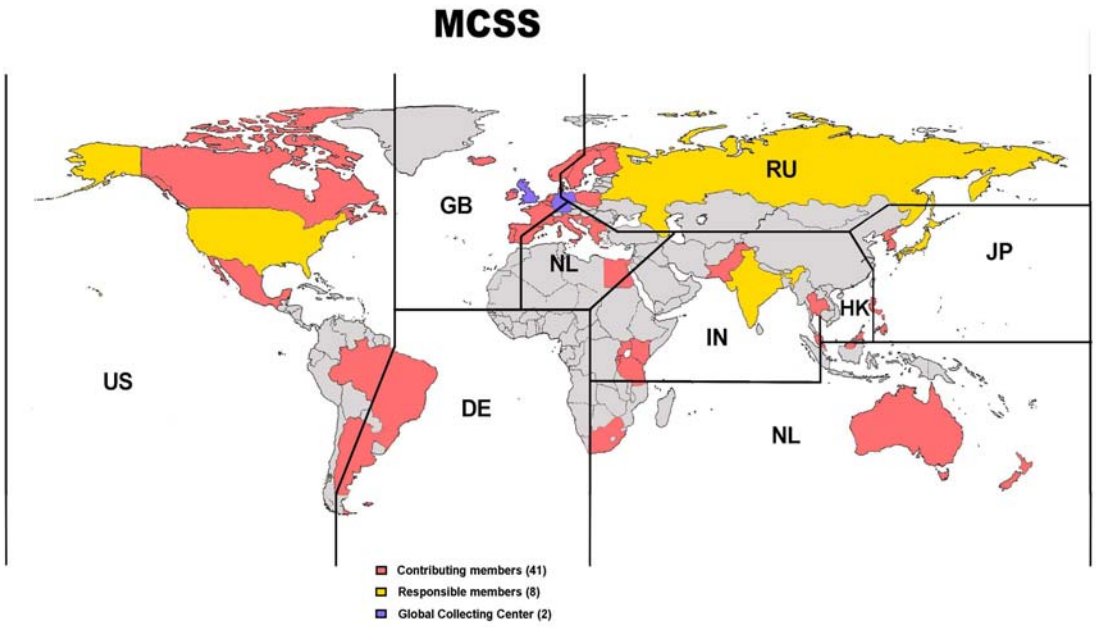
ANNEX VIII

REPORTS BY THE RESPONSIBLE MEMBERS (RMS)

AREA OF RESPONSIBILITY AND RESPONSIBLE MEMBERS UNDER THE MARINE CLIMATOLOGICAL SUMMARIES SCHEME

Eight Responsible Members:

Germany
Hong Kong, China
India
Japan
Netherlands
Russian Federation
United Kingdom
United State



REPORTS BY RESPONSIBLE MEMBERS (GERMANY; HONG KONG, CHINA; INDIA; JAPAN; NETHERLANDS; RUSSIAN FEDERATION; UNITED KINGDOM; UNITED STATES OF AMERICA)

REPORT OF RESPONSIBLE MEMBER - GERMANY

1. INTRODUCTION AND BACKGROUND

Germany is one of eight responsible members of the Marine Climatological Summaries Scheme (MCSS) and is responsible for the South Atlantic Ocean between 20°N and 90°S.

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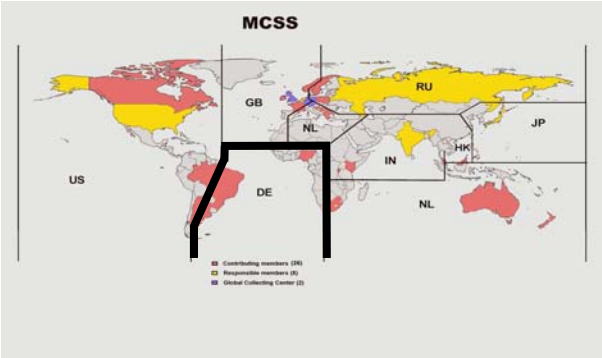

Figure 1: Area of responsibility, Germany

To ease the selections the number of observations and plots in this document refer to an area which spans from 20°N to 90°S and from 80°W to 20°E.

In 1963, by WMO Resolution 35, CG-4, the International exchange of delayed-mode marine climatological data was established to feed the Marine Climatological Summaries Scheme (MCSS). Since than Germany acts as CM and RM.

In 1993, by WMO Resolution 11, CMM-11; two Global Collecting Centres (GCCs) were established, one of it in Germany to facilitate and enhance the flow and quality control of the data. The GCCs are collecting, processing and distribution all delayed marine Voluntary Observing Ship (VOS) data.

In Germany the GCC is a DCPC within the GISC DWD. This meets the international plans (ETMC and SOT) of modernizing the delayed mode VOS data management.

The Centre in charge of the MCSS in the Germany is the Marine Climatological Monitoring Centre (MMC) of Deutscher Wetterdienst (DWD) in Hamburg.

Contact:

Gudrun Rosenhagen, email: Gudrun.Rosenhagen@dwd.de, tel: 0049-69-8062-6200
Head of unit
Vice chair of ETMC
Co-chair of TT-MCDS
National focal point on SOT

Wolfgang Gloeden, email: Wolfgang.Gloeden@dwd.de, tel: 0049-69-8062-6220
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Marine data management

Heike Haar, email: Heike.Haar@dwd.de, tel: 0049-69-8062-6216
GCC Data Manager
Member of TT-MCDS and ETMC

Address:
Deutscher Wetterdienst
Maritime Klimaüberwachung (KU24)
Bernhard-Nocht-Str. 76
20359 Hamburg
Germany

2. ACTIVITIES OF GERMANY AS MCSS CONTRIBUTING MEMBER (CM)

Following numbers of observations were contributed from ships of the German VOS fleet during the last three years:

	2010		2011		2012 (until Oct)	
	No. of Ships	**No. of Obs.**	**No. of Ships**	**No. of Obs.**	**No. of Ships**	**No. of Obs.**
Selected Ships	423	89.413	284	49.145	536	169.759
Supplementary Ships						
Auxiliary Ships	5	1.063	2	138	6	1.963
Automated Stations	17	91.048	14	81.292	15	76.861
Total	**445**	**181.524**	**300**	**130.575**	**557**	**248.583**

Table 1

The number of active ships within the German VOS fleet did not vary very much during the last years. Although there is a permanent change in the fleet, the number of withdrawn ships that do not further participate as VOS is nearly equal to the number of new recruited ships:

German VOS fleet, active ships	
Year	*No. of active ships in GTS*
2010	666
2011	674
2012	670

Table 2

German VOS fleet, registered ships (31.10.2012)			
Type of platform	*Manual*	*Automated*	*total*
Auxiliary	23	-	*23*
Selected	673	17	*690*
VOSClim	55	2	*57*
Total	***751***	***19***	***770***

Table 3

All the manual generated observations are produced using the TurboWIN software. After the MQC has been applied by the Port Meteorological Officers (PMO) the data is forwarded to the quality control group, where the national High Quality Control (HQC) is performed. The HQC runs automatically and sets flag to all data. Observations which failed the QC are checked manually and corrected if possible, or confirmed by a flag.

All data is sent to the GCCs, immediately after it has passed the QC. The annual numbers of observation sent to the GCCs for the period 2010 to October 2012 by year are shown in Figure 2 below.

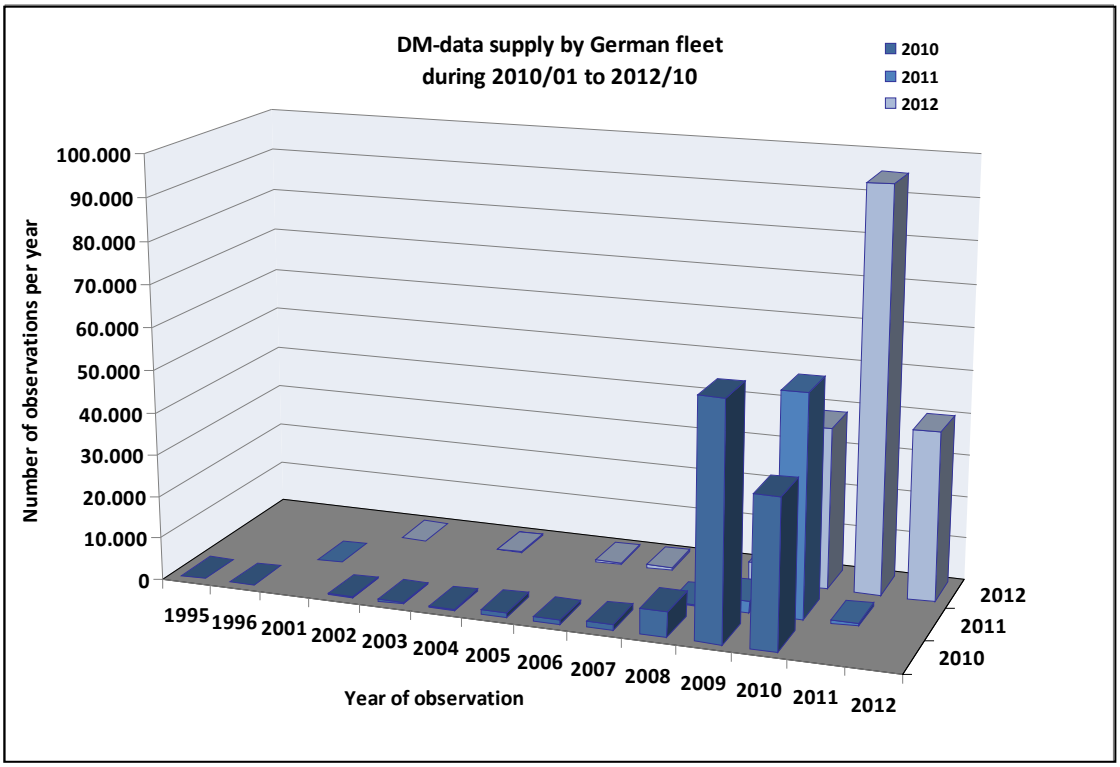


Figure 2

The oldest observation received from German VOS by the PMO during 2010 - Oct. 2012 was from May 1995. Most of the delayed mode data is from the past year. More and more manual observations are transmitted also near real-time via GTS, whereas data from automatic weather stations is in total available there. This is a fast growing data source.
The number of observations per month (DM- and RT-data) supplied by the German fleet is shown in Figure 3.

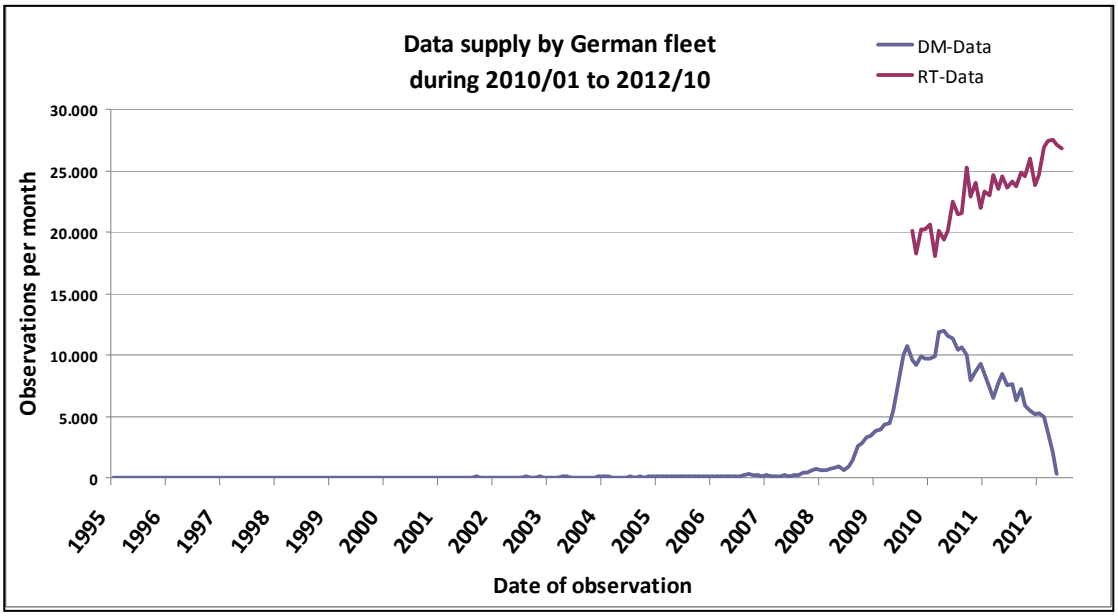


Figure 3

In the next years, the total number of ships joining the German VOS fleet will slightly decrease, because of sorting out of ships, which do not contribute. In parallel the number of ships supplied with an automatic weather station will rise, especially those with measurements of sea level pressure only contributed via satellite and GTS.

3. ACTIVITIES OF GERMANY AS MCSS RESPONSIBLE MEMBER (RM)

3.1 Data Processing

From 2010 to Oct. 2012 the RM Germany received 187.598 observations within the area of its responsibility from the GCCs. Data was originated by 18 different contributing members, with a minimum of two observations from CM India up to a maximum of 65.495 observations from CM Germany (see Figure 4). The oldest observation was from 1995 with rising numbers of observation up to a maximum of 51.236 out of the year 2011 (see Figure 5).

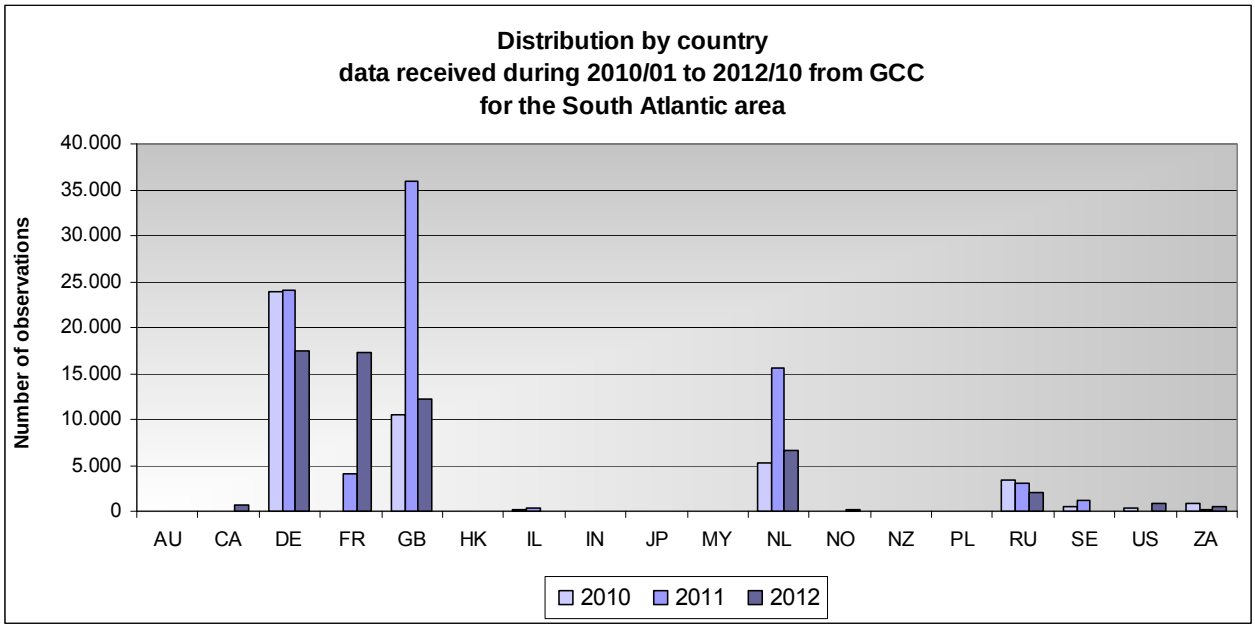


Figure 4

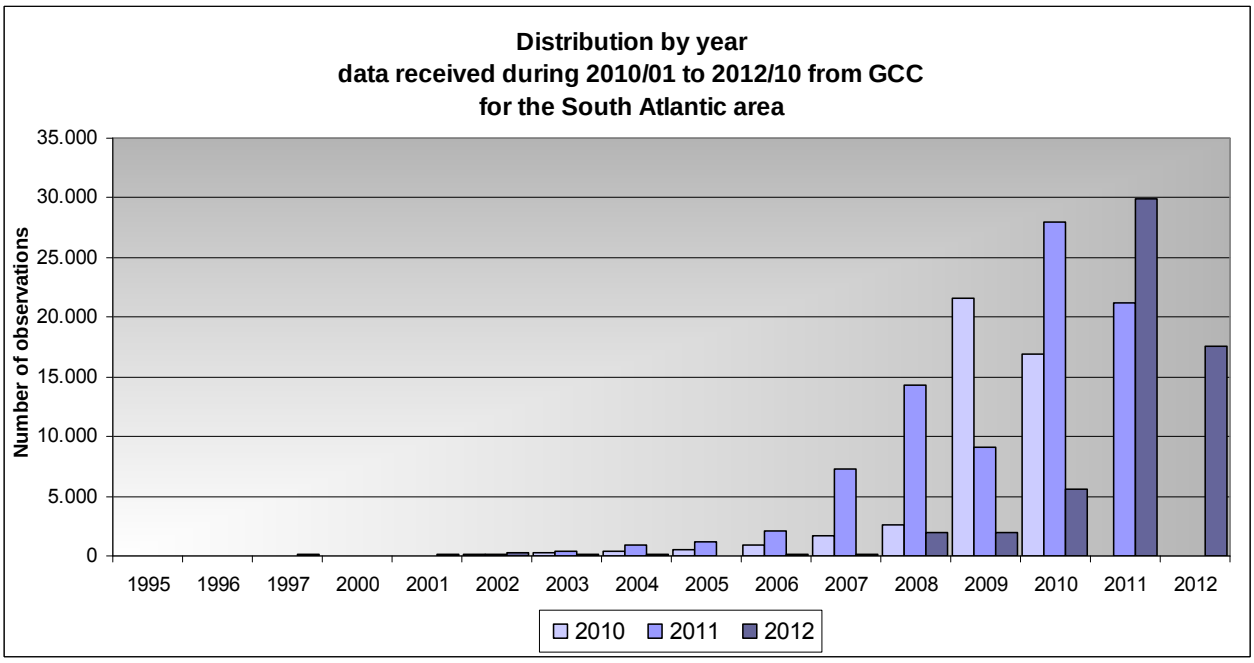


Figure 5

The RM Germany accepts data in all versions of IMMT. All input data is saved in original format. After this the data is converted into a national format for further checking and archiving. We don't use the MQC-Software, but the MQCS is an integrated part within our QC.

The areal distribution of all incoming data during 2010 to 2012 is shown in Figure 6. Note some scattered on-land positions, which have been corrected during quality control activities.

Areal distribution
data received during 2010/01 to 2012/10 from GCC
for the South Atlantic area

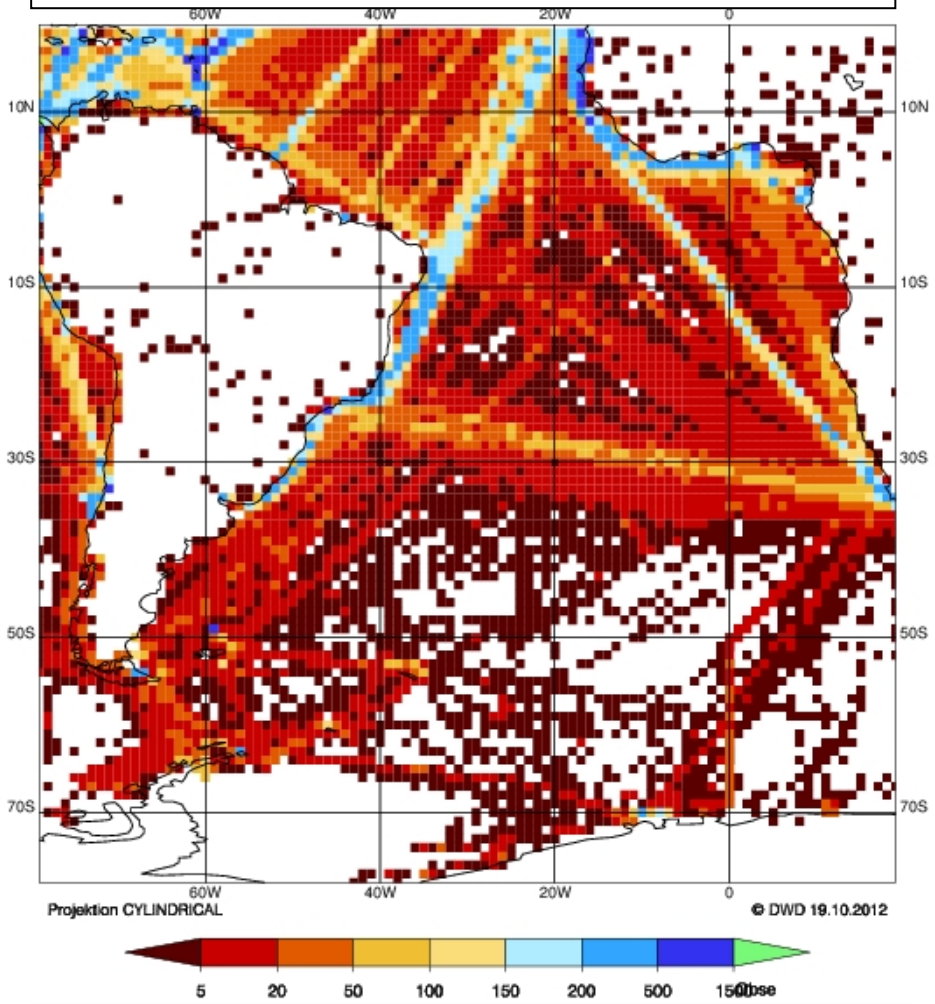


Figure 6: Total number of observations: 187.598
From date: 22. May 1995
Until date: 06. September 2012

The received observations were checked by our national QC, which includes the following steps:

Date/time check, duplicate check, land check,platform position / speed check,
limit check, internal check, sequence check, climatological check

Data is flagged by an automatic routine, striking values are corrected manually, if possible.

The German GCC supports some countries, including Canada, Greece, Israel and Sweden to be able to successfully contribute their data to the MCSS. The DWD helps by digitizing observations from paper logbooks and developed a software to convert records from FM13-Ship code into the IMMT4-Format.

3.2 Climatological Summaries

No climatological summaries have been produced in in the years 2010, 2011, and 2012.
The last summaries were produced for the decade 1981 – 1990.

3.3 Archives

Actually there are 7.050.387 observations in the delayed mode archive of the German area of responsibility.

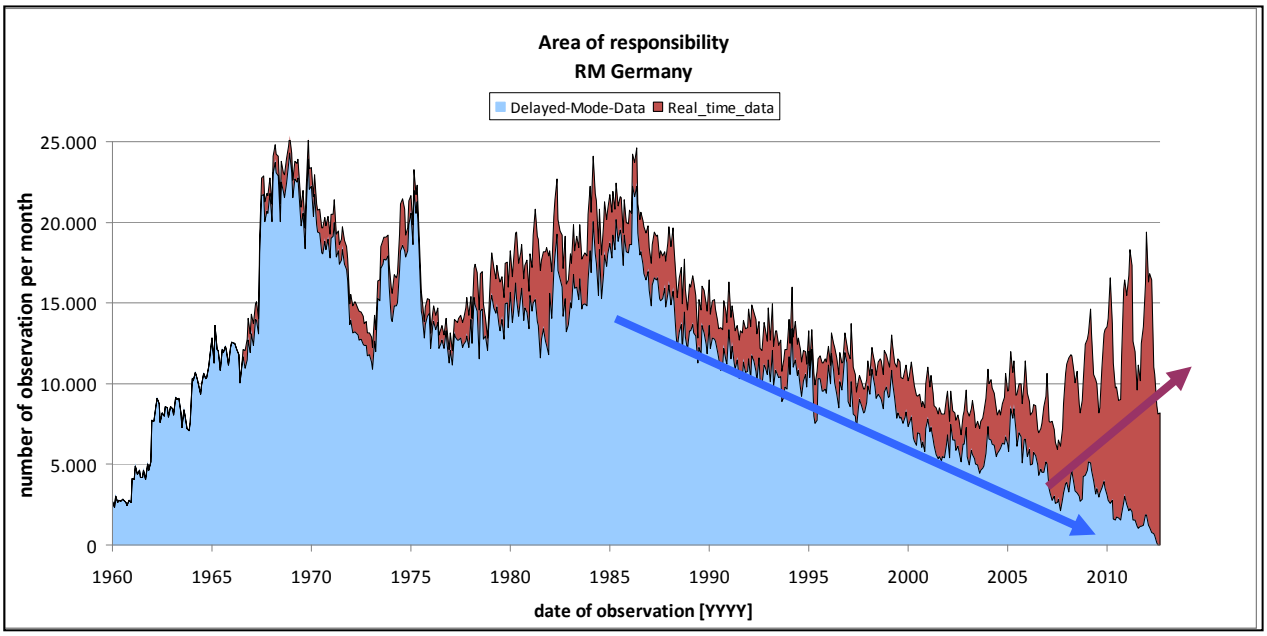


Figure 7

Remarkable is the steadily decreasing number of observations beginning in the end of the 1980 decade (blue arrow). Thanks to the rapid growing number of real-time-data the total number of observations per month since the year 2007 is rising again (lilac arrow). This mostly hourly data mainly come from automatic stations (AWS) on board of research vessels. There is a clear data peak in the southern summer and the data minimum in the southern winter.

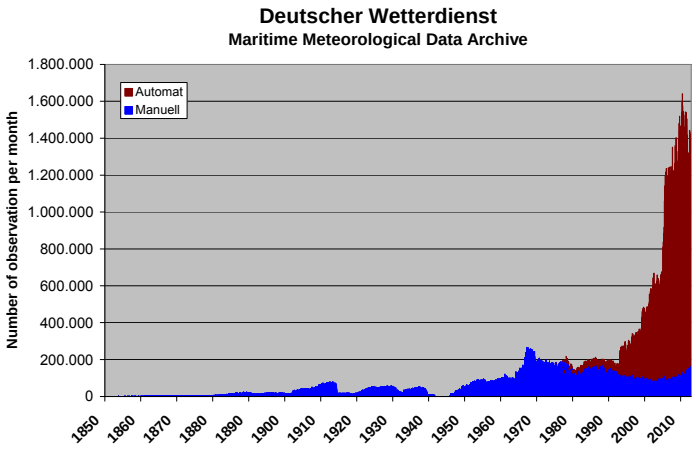


Figure 8

Besides the data within our own area of responsibility, DWD stores all available data in the German Global Marine Meteorological Data Archive.

This includes world-wide data received from the GCC and historical collections. Additionally, to provide access to near real time data, we archive observations received from GTS. To avoid duplicates within the archive the real time data is replaced by data received via the delayed mode data stream.

3.4 Data requests

There were only two data requests which focused on our area of responsibility.
The Council for Scientific and Industrial Research (CSIR) in South Africa asked for data from

- the historical period 1850 to 1890 and
- June 1992 to August 1993

Other requests concerned different locations all over the world, with a focus on North Atlantic, North Sea, Baltic Sea and Mediterranean Sea.

4. National proposal regarding the Germany's foreseen role in the MCDS

The Deutscher Wetterdienst (DWD), the meteorological national service of Germany, is willing to continue its activities within the new Marine Climate Data System (MCDS). Germany formally expressed its willingness to participate as well as a Data Assembly Centre (DAC), a Global Data Assembly Centre (GDAC) and a CMOC in the MCDS.

As a Delayed-mode Data Assembly Centre (MM-DM-DAC) all marine-meteorological data received in delayed mode from the German fleet will be applied with an automated HQC, with manual checking of striking values. Problems will be investigated and data will be forwarded to the appropriate GDAC

As a Global Data Assembly Centre the DWD will be one of the selected centres combining data of all streams from the DACs. Our role will be to establish a unique, complete dataset (including metadata), perform agreed quality checks and forward the data and metadata with flags to the CMOCs in agreed formats. Data from both, delayed-mode and real-time should be compared and linked. For it is mandatory that the GDACs are registered as WIS DCPCs, the DWD has already installed a DCPC within the GISC DWD.

Besides the activities mentioned above Germany has already expressed its willingness and commitment to establish a CMOC at Deutscher Wetterdienst to WMO in February 2012. The available facilities and infrastructure permit the generation and provision of the following marine-meteorological data, metadata and products within CMOC-DWD:

1. Generating of high quality climate data
    a. Historical data (Data rescue project HISTOR): rescuing the existing data of the archives of Deutsche Seewarte
    b. Delayed-mode data from German ships
2. Processing and distribution
3. Development and Advice to other Members

There are actual considerations to volunteer as mirrored CMOC.

REPORT OF RESPONSIBLE MEMBER - HONG KONG, CHINA

1. INTRODUCTION AND BACKGROUND

Hong Kong, China is one of eight responsible members of the Marine Climatological Summaries Scheme (MCSS) and is responsible for the area bounded by the Equator and latitude 30°N, and longitudes 100°E and 120°E. The Hong Kong Observatory (HKO) is in charge of the MCSS in Hong Kong, China, and the contact point is Mr Mok Hing-yim, Senior Scientific Officer. His contact details are as follow:

Name : Mr Mok Hing-yim
Address : Hong Kong Observatory, 134A Nathan Rd., Kowloon, Hong Kong
Tel: 852-2926 8451
Fax: 852-2311 9448
Email: hymok@hko.gov.hk

2. ACTIVITIES OF HONG KONG, CHINA AS MCSS CONTRIBUTING MEMBER (CM)

The Hong Kong Observatory is managing a fleet of 54 Voluntary Observing Ships as at 31 December 2011, with 22 of them installed with the TurboWin electronic logbook software.

Delay mode data sent to Global Collecting Centres (GCC) by the Hong Kong Observatory in 2010, 2011 and 2012 are summarized below:

Number of data sent in 2010:

Year of observation					Total
≤ 2006	2007	2008	2009	2010	
-	10	809	466	-	1285

Number of data sent in 2011:

Year of observation					Total
≤ 2007	2008	2009	2010	2011	
-	324	1618	529	-	2471

Number of data sent in 2012:

Year of observation					Total
≤ 2008	2009	2010	2011	2012	
619	452	328	-	-	1399

Data processing and data exchange frequency are summarized in the table below:

Frequency of data exchange with GCC	Quarterly
Data format	International Maritime Meteorological Tape-4 (IMMT-4)
Quality control	GCC minimum quality control software MQC version 4 Minimum Quality Control Standards version 6 (MQCS-6)
Frequency of submitting metadata to WMO	Quarterly
Metadata format	WMO Pub 47 version 03 (Document Revision 3.5)

3. ACTIVITIES OF HONG KONG, CHINA AS MCSS RESPONSIBLE MEMBER (RM)

3.1 Data Processing

Data processing, data exchange frequency and details on delayed mode data submitted quarterly to the GCCs in 2010, 2011 and 2012 are same as in section 2.

3.2 Climatological Summaries

Annual marine climatological summaries for the area of responsibility of Hong Kong, China have been compiled and published for 1961 to 1990. Decadal marine climatological summaries have been compiled and published for 1961-70, 1971-80, and 1981-90. Web version of the marine climatological summaries from 1961 to 2000 is being generated.

3.3 Archives

For the delayed mode data observed within Hong Kong's Area of Responsibility, the numbers of observation reports taken in the past five years that have been digitized in the GCC archive are:

2007	2008	2009	2010	2011	Total
24664	13625	14501	12223	14270	79283

Since 1949, the total number of delayed mode data stored in HKO's database is 2,176,448 (as at 31.12.2011).

3.4 Data requests

There were no data requests under the MCSS originating from contributing members and other users so far.

4. National proposal regarding HONG KONG, CHINA's foreseen role in the MCDS

Hong Kong, China would like to play the role of Data Acquisition Centre (DAC) to continue to collect marine climate data and prepare marine climatological summaries for the area bounded by the Equator and latitude 30°N, and longitudes 100°E and 120°E in the new Marine Climate Data System (MCDS).

REPORT OF RESPONSIBLE MEMBER - INDIA

1. INTRODUCTION AND BACKGROUND

India is one of the eight responsible members of the Marine Climatological Summaries Scheme (MCSS) and is responsible for the Indian Ocean Area north of 15°S bounded by the longitudes of 20°E and 100°E. India Meteorological Department (IMD) carries out the responsibility.

The name of the Centre in charge of the MCSS in India is Dr. L.S. Rathore, Director General of Meteorology and the contact point of the Responsible Member (RM) is S. Krishnaih, Additional Director General of Meteorology (Research), IMD, Ganeshkhind Road, Shivajinagar, Pune-411005, Tel. 0091-20-25535886, 0091-20-25535411, 0091-20-25535211 Fax 0091-20-25521529, 0091-20-25535435 & 0091-20-25533201 and email: krishnasya@gmail.com, s.krishnaiah@imd.gov.in, adgmrpune@hotmail.com.

2. ACTIVITIES OF INDIA AS MCSS CONTRIBUTING MEMBER (CM)

Marine weather observations from the meteorological log books of the VOS were scrutinized to eliminate instrumental, positional and coding errors and were digitized using the International Maritime Meteorological Tape-2 (IMMT-2) format. These data together with those received from other WMO Members were checked by an in-house quality control software application. The Minimum quality control software MQC version 4 obtained from GCC was also used for quality control. All flagged data were reviewed and corrected as far as possible, and the corrected data were then sent to GCC.

3. ACTIVITIES OF INDIA AS MCSS RESPONSIBLE MEMBER (RM)

3.1 Data Processing

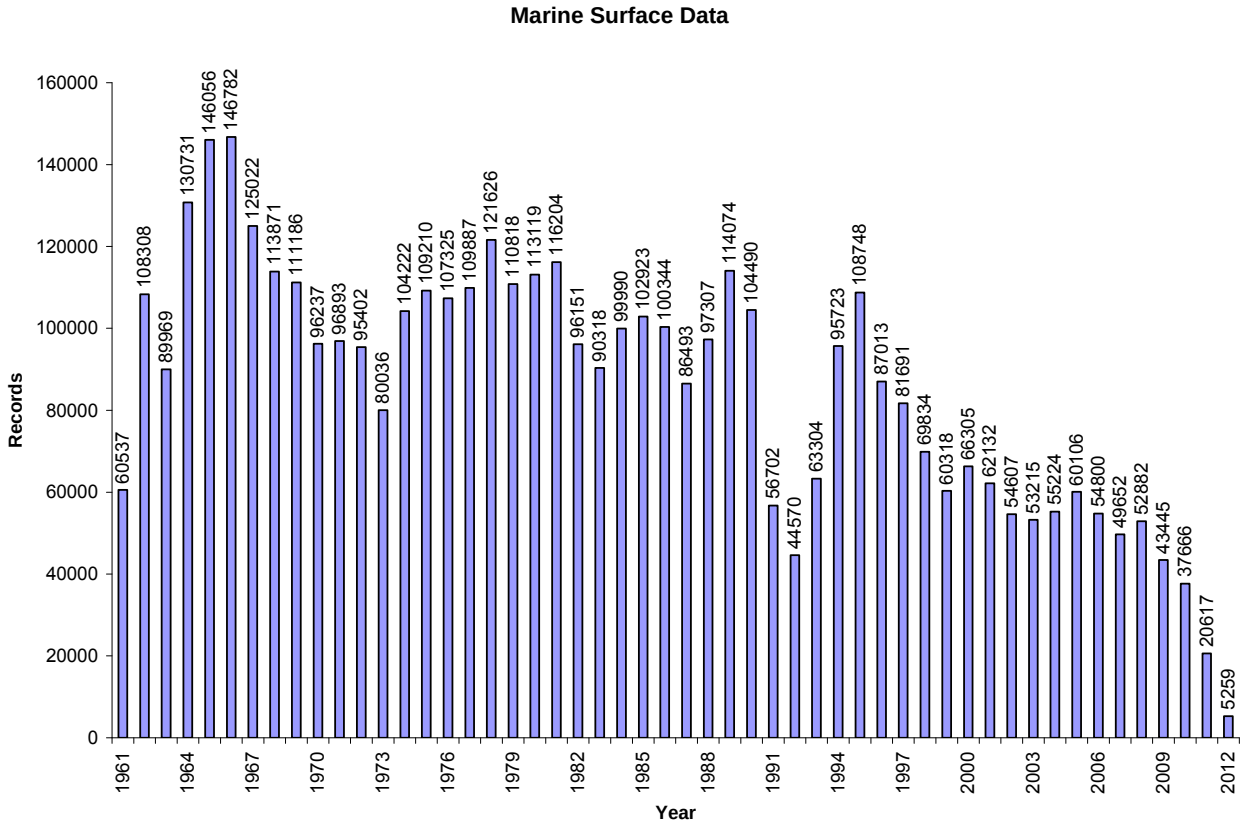
Marine weather observations from the meteorological log books of the VOS were processing undertaken by the RM, and data exchanged with the GCCs. The International Marine Meteorological Tape-2 (IMMT-2) and Minimum Quality Control Standard (MQCS) version 4 are being used. No additional quality control is applied to the data. In particular, all flagged data were reviewed and corrected as far as possible, and the corrected data were then sent quarterly to the GCCs in 2010, 2011, and 2012.

3.2 Climatological Summaries

Annual Marine Climatological Summaries for seventeen selected areas of the Indian area of responsibility were compiled and published for the period 1961 to 1970. Following the recommendation of the WMO Commission for Marine Meteorology at its eighth session held in 1981, chart form of the decadal summary for the decade 1971-80 was published. Surface Marine Climatological Atlas 1961-90 was published along with electronic form on CD-ROM. The decadal Marine Climatological summary charts for 1991-2000 was published along with CD. The Pentadal Marine Climatological Summaries Charts 2001-2005 has been produced in 2010 along with CD. About 2.3 lakhs marine observations from the area of responsibility of RM India were used for this purpose. The decadal Marine Climatological Summaries Charts 2001-2010 is in progress.

3.3 Archives

Marine weather observations made within the area of responsibility of RM India are received regularly from GCC (through ftp weblink of UK Met Office ftp://ftp.metoffice.gov.uk/) and archived in the National Data Center of India Meteorological Department, Pune, India. Total 44,69,344 records of marine weather observations made till date (1961-2012) within the area of responsibility of RM India were archived in National Data Center. Annual distribution of these observations for the period 1961-2012 is given in the following figure.



3.4 Data requests

The number of data request by various users (Indian party) for the years 2010, 2011 and 2012 (upto Oct'12) are 4 ,3 and 10 respectively. In 2009 Foreign (WMO) party requested oceanic experimental/expedition data & has supplied.

4. National proposal regarding India's foreseen role in the MCDS:

As of now there is no separate proposal for Marine Climate Data System (MCDS).

India (IMD) has a consolidated Climate Database Centre in which data acquisition of Marine data is also included. So India will be interested to offer Data Acquisition Centre facilities for VOS data collected in the area of responsibility.

India will be interested to have a role in the future MCDS.

REPORT OF RESPONSIBLE MEMBER - JAPAN

1. INTRODUCTION AND BACKGROUND

Japan is one of the eight Responsible Members for the Marine Climatological Summary Scheme (MCSS), whose responsible area is the western North Pacific and its marginal seas. The Japan Meteorological Agency (JMA) has taken charge of it since the beginning of MCSS. The contact point's e-mail address is mcss@climar.kishou.go.jp.

2. ACTIVITIES OF JAPAN AS MCSS RESPONSIBLE MEMBER (RM)

2.1 Collection, Archiving and Exchange of Marine Data

The numbers of reports JMA collected for last four years are shown in the table below.

	Number of reports	***Proportion of reports submitted using OBSJMA***
2009	24,748	59%
2010	24,133	66%
2011	18,074	67%
2012 (as of Sep)	15,410	71%

The proportion of reports submitted in the form of electrical logs using OBSJMA has been steadily increasing recent years and reached two thirds in 2010.

The numbers of reports JMA submitted to the Global Collecting Centres (GCCs) each quarter are summarized in the table below.

	January	***April***	***July***	***October***	***Total***
2009	3,516	3,102	2,825	3,015	12,458
2010	2,197	2,702	4,357	28,703	37,959
2011	2,134	3,260	2,733	--	8,127
2012	5,346	5,633	2,668	2,431	16,078

The reports are checked the quality along with MQCS-6 using MQC software. Submissions in the IMMT-4 format started in July 2011 for JMA's research vessels and in January 2012 for all the other vessels.

JMA has been operating the call sign masking scheme since December 2007, which replaces original call signs of weather reports with the generic one "SHIP" when the reports are exchanged via GTS. With regard to the provision of delayed-mode data to GCCs, JMA encourages ship owners to release unmasked data based on an agreement reached between JMA and ship owners. Under the agreement, JMA is permitted to provide unmasked reports to GCCs if owners concur with the international exchange of unmasked data after three months of observation. Some owners, who request for call sign masking, have agreed to provide data to GCCs with original call signs, although many other owners have not. JMA will continue its effort to increase the number of reports provided to GCCs with original call signs, on the basis of ship owners' cooperation and understanding.

No updates have been made to OBSJMA since ETMC-3. The software and its manual are available from the following web site:

http://marine.kishou.go.jp/en/obsjma-en.html.

2.2 The Marine Climatological Summaries

No climatological summaries have been published since ETMC-3.

2.3 Archives

As of October 2012, JMA has archived 25,752,577 reports as delayed-mode data since 1961. Reports coming from JMA's responsible area as well as other areas around the world are contained in the archive.

2.4 Data Requests

JMA provided ship observation data around the globe from 1991 to 2010 in October 2011 upon request from the China Ship Scientific Research Center.

3. NATIONAL PROPOSAL REGARDING THE JAPAN'S FORESEEN ROLE IN THE MCDS

Adding to the role as RM, Japan has some established roles in many international projects concerning marine climatology and oceanography. In the Argo project, JMA is the DAC of Japan and operates real time data, and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) is charged of delayed-mode quality check of Japanese floats' data. In the North-East Asian Regional GOOS (NEAR-GOOS), which is a regional pilot project of GOOS, JMA is charged of the Regional Real Time Data Base and the Japan Oceanographic Data Center (JODC) operates the Regional Delayed Mode Data Base. Regarding GTSPP, JMA undertakes a role of the Data Product Center of the North Pacific, and JODC is one of the Delayed-mode Data Assembly Centers. Also, the Japan Aerospace Exploration Agency (JAXA) is one of the regional DACs of Group for High Resolution Sea Surface Temperature (GHRSST) and JAMSTEC operates Triangle Trans Ocean Buoy Network (TRITON).

Japan is going to continue the current roles of the international projects. As a result, Japan will contribute to the new Marine Climate Data System in many ways.

REPORT OF RESPONSIBLE MEMBER - NETHERLANDS

1. INTRODUCTION AND BACKGROUND

The Netherlands is one of eight responsible members of the Marine Climatological Summaries Scheme (MCSS) and is responsible for the Mediterranean, Southern Indian Ocean and the Australian waters.

Centre in charge of the MCSS in The Netherlands:
Royal Netherlands Meteorological Institute (KNMI)

Contact point:
Mr. Jan Rozema
P.O. box 201
3730 AE DE BILT
The Netherlands
Telephone: +31 30 2206911
Fax: +31 30 2210407
E-mail: Jan.Rozema@knmi.nl

2. ACTIVITIES OF THE NETHERLANDS AS MCSS CONTRIBUTING MEMBER (CM)

As MCSS Contributing Member the Netherlands has a fleet of approximately 110 Voluntary Observing Ships that actively take part in both the VOS and VOSClim programmes. There are no further activities in the field of MCSS.

Date	Number of submitted observations
Feb-2010	16,029
Aug-2010	22,537
Jan-2011	33,494
Jul-2011	31,123
Oct-2011	8,173
Jan-2012	1,661
Apr-2012	21,093
Jul-2012	7,315
Oct-2012	12,855
Total	**426,510**

With respect to the MQC: all observations we receive from the Dutch VOS fleet are made with TurboWin. This implies that MQC has been done adequately.

3. ACTIVITIES OF THE NETHERLANDS AS MCSS RESPONSIBLE MEMBER (RM)

3.1 Data Processing

Until January 2011 the Netherlands sent a quarterly collection of Dutch VOS observations to both GCC's. Due to understaffing at KNMI, from that time on we regularly (quarterly) sent the received raw TurboWin IMMT-files to GCC Germany, where the observations are extracted and processed.

All observations on the Dutch VOS fleet are made with TurboWin. We try to keep up to the latest TurboWin, IMMT and MQCS versions as possible. The version of each system is caught in each individual record.

3.2 Climatological Summaries

No climatological summaries have been (or will be) produced for the years 2010-2012.

3.3 Archives

The following number of observations (per area of responsibility, for the period since 1854) is stored In the Dutch national database:

Responsible Area	**Number of observations**
Mediterranean	4,250,482
Southern Indian Ocean	2,261,027
Australian waters	3,228,480
Total	**9,739,989**

3.4 Data requests

No data requests concerning MCS have been received.

4. National proposal regarding The Netherlands' foreseen role in the MCDS

Since we are dealing with cutbacks in staff and finances, there are no active roles anticipated in the MCDS.

REPORT OF RESPONSIBLE MEMBER - RUSSIAN FEDERATION

The RUSSIAN FEDERATION is one of the eight Responsible Members for Marine Climatological Summaries Scheme (MCSS).

The All Russian Research Institute of Hydrometeorological Information - World Data Center (RIHMI-WDC), Roshydromet, has taken charge of it since the beginning of MCSS.

This report presents RIHMI-WDC's activities for MCSS in 2010-2012.

Responsible Member (RM) is Somova Svetlana (ssm@meteo.ru).

The software for the QC components and a new format were developed on the basis of the WMO recommendations (currently we are checking our ship meteorological data for climate limits according to MQCS – 5 and are using the format IMMT-3 (effective 1 January 2007)).

Data exchange frequency and data management followed the Recommendations of the WMO Commission for Marine Meteorology:

Frequency of data exchange with GCC	Quarterly
Data format	International Maritime Meteorological Tape-3, IMMT-3
Quality control	GCC minimum quality control software MQC version 5.

In the last 15 years (1997-2011), 1 414 845 ship meteorological observations were processed and sent to the Global Collecting Centres (GCCs) on a quarterly basis. Delayed-mode data were provided by Russian Ships. All observations were received from our Supplementary Ships.

The QC component used includes the software developed on the basis of the WMO recommendations on the QC criteria and additional QC software.

The additional QC comprises the following:

1. Check of the character part of a ship meteorological observation. The observation latitude and longitude are checked for the location on the land. The coordinates are considered erroneous if the observation point is located on the land. The check is performed with the help of the SEA DAT file which keeps the chart of the World ocean coast line with an accuracy of 1 degree.
2. Joint check of single observation data. Air temperature is considered questionable if it does not correspond to climate limits determined by the LIMITS file for each 10-degree square of the World ocean and for each month.
3. It is considered that wind wave height (HWHW) and wind wave period (PWPW) do correspond to each other.
4. Weather (ww)-visibility and (VV)-amount of clouds (Nh) are checked for correspondence to each other.
5. Joint check of cloud elements (h, N, Nh, CL, CM, CH). Possible combinations of parameters are analyzed on the basis of matrices. A gradation number is given to all cloud characteristics in accordance with their values. Element quality is determined on the basis of gradation values by matrices.

The numbers of observations submitted to the GCCs during 1997 to 2011 are shown in fig.1.

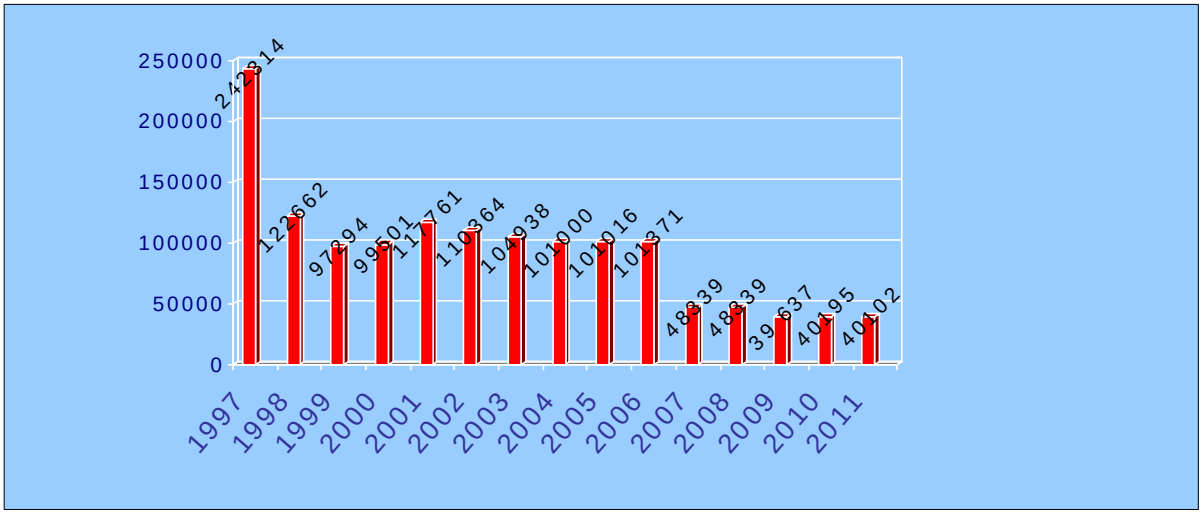
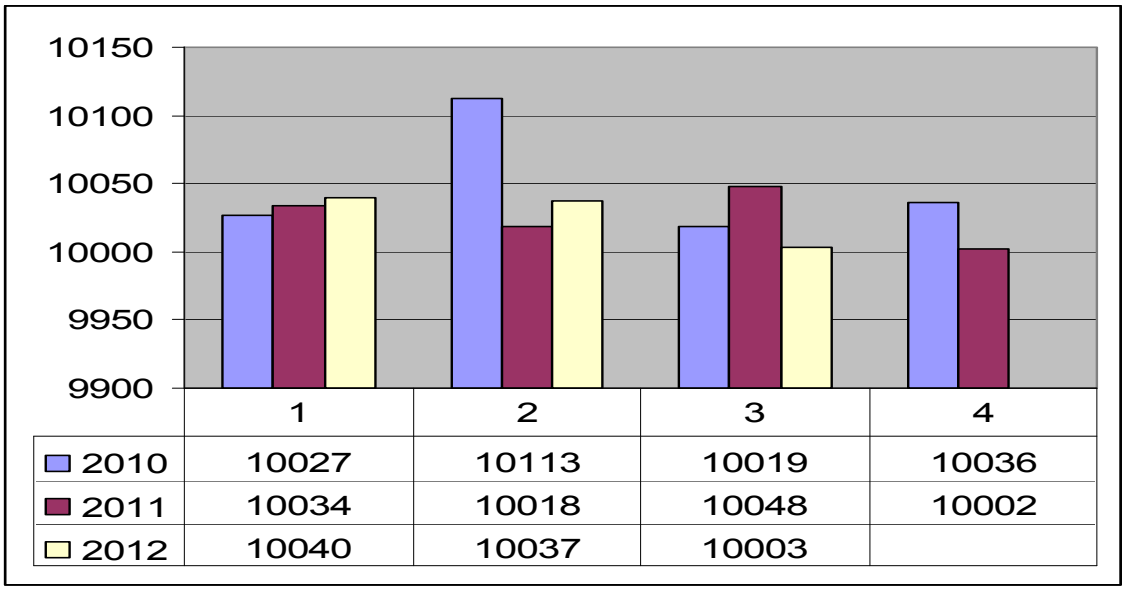


Figure 1. Distribution of ship observations contributed by RM Russia during 1997 - 2011

In particular, provide details on delayed mode data submitted quarterly to the GCCs in 2010, 2011, and 2012, are shown in fig.2.



	1	2	3	4
2010	10027	10113	10019	10036
2011	10034	10018	10048	10002
2012	10040	10037	10003	

Figure 2. Delayed mode data submitted quarterly to the GCCs in 2010, 2011, and 2012.

As a responsible member country the RIHMI-WDC receives the global dataset from the GCCs at the end of each quarter. The RIHMI-WDC collects IMMT data for the whole globe and stores the global marine datasets in the national database end historical archives.

National proposal regarding the RUSSIAN FEDERATION foreseen role in the MCDS.

It is expected that the Marine Climatological Summaries Scheme (MCSS) will be replaced by a new Marine Climate Data System (MCDS) and the MCDS will be responsible for effective integration of the existing WMO and IOC data and services to meet the needs of users in the field of applied climatology. To contribute to future activities of the MCDS the Russian Federation considers it to be reasonable to establish a WMO/IOC Centre for Marine Meteorological and Oceanographic Climate Data (CMOC) on the basis of the All-Russian Research Institute of Hydrometeorological Information – World Data Centre (RIHMI-WDC) of the Russian Federal Service for Hydrometeorology and Environmental Monitoring (RosHydromet) with the following proposed Terms of Reference:

- To develop integrated data sets containing data (both real time and delayed mode) on various parameters of the marine environment;
- To conduct marine meteorological and oceanographic data and metadata rescue, exchange, processing, control and archiving;
- To improve standardization and unification of methods of processing and formats as well as interoperability with the Oceanographic Data Portal technology;
- To establish close cooperation with other Centres on the issues of compatibility of data processing, control and exchange procedures being developed.

Somova S.M.

REPORT OF RESPONSIBLE MEMBER - UNITED KINGDOM

1. INTRODUCTION AND BACKGROUND

The UK Met Office is one of eight Responsible Members of the Marine Climatological Summaries Scheme (MCSS) and is responsible for the North Atlantic Ocean. It also acts as a Contributing Member for UK data.

The UK Met Office has a third role within MCSS as one of two Global Collecting Centres (GCC) for the global marine meteorological dataset. The activities of the GCC are not detailed below because these are published annually by JCOMM, the most recent 'GCC 2011 Annual Report' was published in early 2012 and also report at ETMC-4 in Doc. 2.4.

GCC United Kingdom
Met Office
GCC
S9 Saughton House
Broomhouse Drive
Edinburgh, EH11 3XQ
Scotland UK
Email: gcc@metoffice.gov.uk
Telephone:+44 (0)131 528 7313
Fax:+44 (0)131 528 7345

2. ACTIVITIES OF UK AS MCSS CONTRIBUTING MEMBER (CM)

The UK endeavour to submit their quality controlled delayed-mode VOS data to the GCCs on a quarterly basis. The total observations submitted to the GCCs during 2010 to third quarter 2012 are shown in figure 1:

Fig. 1: UK Contributions to the GCCs

Year	***Total Obs***
2010	70,865
2011	243,438
2012 (Q1-Q3)	125,653

Large volumes of data were submitted in 2011 and the first quarter of 2012 as a significant backlog of data were being processed and subsequently then available for international exchange.

All UK VOF ships now have access to Turbowin electronic logbook software so the number of paper logbooks received is small (usually old logs discovered on a ship or where technology problems have not permitted use of TurboWin).

After receipt, delayed-mode UK VOF data is batched and a pre-ingestion check program is run on the data. This program highlights issues such as duplicate date/time and out of range positions. Once any problems are resolved the data is loaded to the Met Office relational (Oracle) database, MIDAS. During storage of a delayed-mode observation, if the date/time/position/id matches a GTS observation already stored (VOS GTS data are ingested daily), this process overwrites the record with the delayed mode observation remaining (metadata records whether a GTS observation did originally exist).

Within 24 hours of storage an automatic higher quality control software checks the data and sets quality flags, these flags are based on position, range, internal consistency, rate of change and climatology checks. Manual quality control provides further analysis of the data and will address issues related to out of range values, conflicts with climatology and positional problems. Both automatic and manual

quality control is performed within 1 month of loading to the database and if any changes are made to data two versions will be stored in the database – 1 original version & 1 quality controlled version.

Before exchanging with the other GCC the data is also further checked with the MQCS-6 software.

3. ACTIVITIES OF UK AS MCSS RESPONSIBLE MEMBER (RM)

3.1 Data Processing

As a responsible member country the UK receive the complete global dataset from the GCCs at the end of each quarter.

Data are received in IMMT-4 having been checked by the GCCs with MQCS-6.

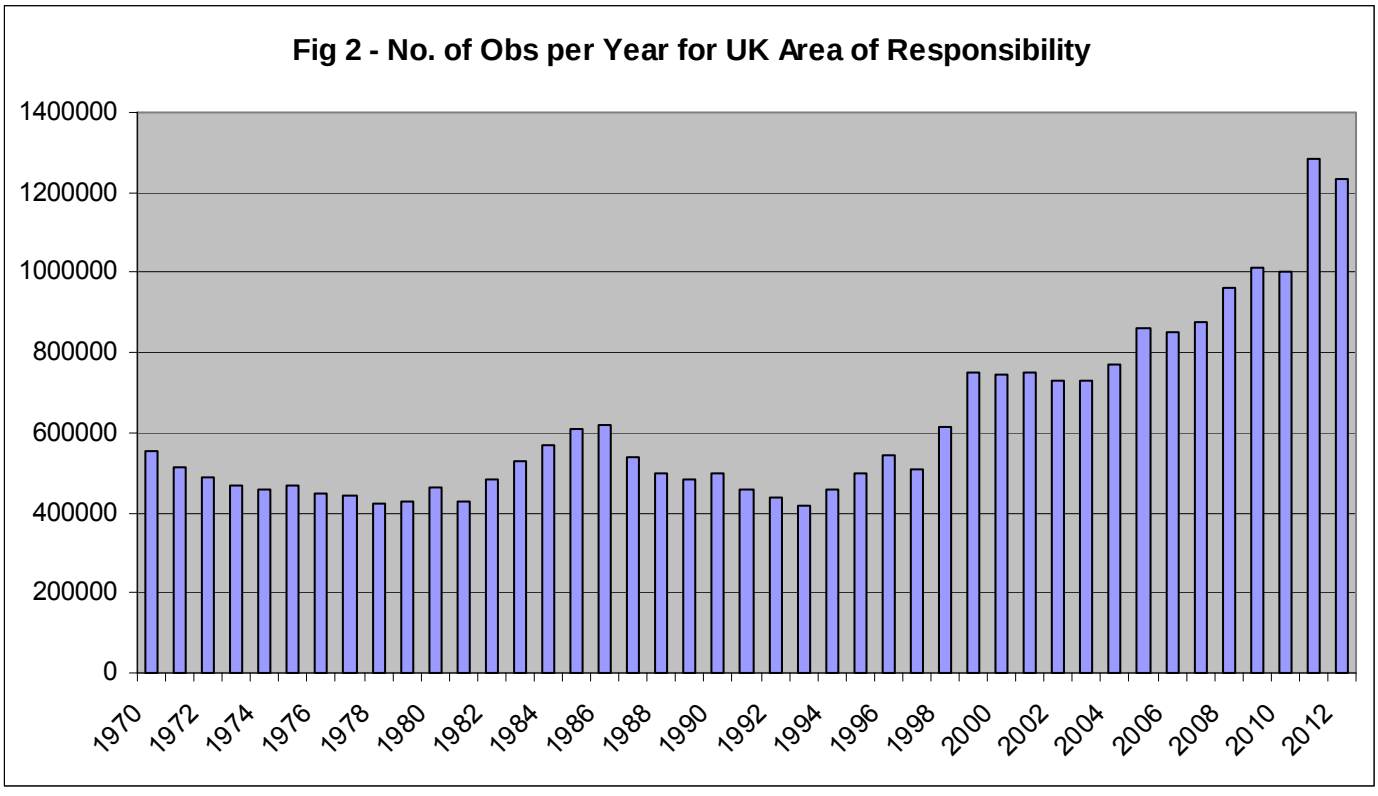
In addition to the MQCS, the UK applies a higher level of additional quality control similar to that it applies to its own data, as outlined in section 2. These checks include range, rate of change, internal consistency, climatology and position checks.

3.2 Climatological Summaries

During 2010, 2011 and 2012 there were no summary requests and as a consequence no charts were produced.

3.3 Archives

Figure 2 shows the volume of data stored in the database for the UK's area of responsibility from 1970-2012. It is assumed the significant increase in data volumes for 2011 and 2012 are related to the increasing number of automatic systems no reporting.



3.4 Data requests

The UK received no MCSS-related data requests during the period 2010-2012.

4. National proposal regarding the UK's foreseen role in the MCDS

The UK Met Office is heavily involved with the development of the new Marine Climate Data System (MCDS). We would like to migrate our role as CM to the role of Data Acquisition Centre (DAC), as well as moving from our GCC role to a Global Data Assembly Centre (GDAC) role for VOS data. Additionally we are keen to explore the possibility of becoming a mirroring Centre for Marine-Meteorological and Oceanographic Climate Data (CMOC) within the MCDS.

REPORT OF RESPONSIBLE MEMBER - UNITED STATES OF AMERICA

1. INTRODUCTION AND BACKGROUND

USA is one of eight responsible members for the Marine Climatological Summaries Scheme (MCSS) and is responsible for the Western Atlantic and Central/Eastern Pacific Oceans. NOAA's National Climatic Data Center (NCDC) is responsible for exchanges under the MCSS and questions regarding these data can be directed to:

Eric Freeman
NOAA's National Climatic Data Center
151 Patton Avenue, Asheville, NC 28801-5001, USA
Phone: +1 828.271.4463
Fax: +1 828.271.4022
Email: Eric.Freeman@noaa.gov.

2. ACTIVITIES OF USA AS MCSS CONTRIBUTING MEMBER (CM)

The USA provides delayed-mode observations from US Voluntary Observing Ships (VOS) to the Global Collection Centres (GCC) on a quarterly basis. These observations are primarily from paper logbook forms and are distributed in the International Maritime Meteorological Tape 3 (IMMT-3) format. The data are quality controlled using MQCS-5 standards.

Below is a summary on the number of observations provided by the US as CM to the MCSS since 2010:

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
2010	2765	848	1486	-	5099
2011	4208	234	-	6144	10586
2012 (through September)	511	410	615	-	1536

After 31 December 2012, the Climate Database Modernization Program (CDMP) at the NCDC will no longer be able to provide support for digitization of US VOS observations recorded on paper forms. The US VOS is currently upgrading the Shipboard Environmental Acquisition System (SEAS) e-logbook software to correct known problems and also be able to produce reports in IMMT-4 format using MQCS-6 standards for quality control. There may be a period during the transition from paper to the new SEAS (e.g. version 9) where US VOS delayed-mode observations may not be available. NCDC will continue to collect US observations in real-time from the WMO Global Telecommunications System (GTS) during this transition and will resume delayed mode exchanges when the SEASv9 observations become available. An upgrade to SEASv9 software will also allow the US to upgrade ships to the Voluntary Observing Ship Climate (VOSClim) Fleet as they will then have the means to report VOSClim-related fields contained in the IMMT format.

3. ACTIVITIES OF USA AS MCSS RESPONSIBLE MEMBER (RM)

3.1 Data Processing

As Responsible Member (RM) to the MCSS, NCDC receives and archives global delayed-mode files distributed by the GCCs on a quarterly basis. The files are also made available to the International Comprehensive Ocean Atmosphere Data Set (ICOADS) for inclusion in future data set releases.

3.2 Climatological Summaries

NCDC has not produced any climatological summaries since ETMC-3.

3.3 Archives

Marine weather observations made within and outside of the USA area of responsibility are routinely received from the GCCs and archived at NCDC.

4. National proposal regarding the USA's foreseen role in the MCDS

NCDC currently serves as the Data Assembly Centre (DAC) for the Voluntary Observing Ship Climate Fleet (VOSClim). NCDC will investigate additional participation in the MCDS, possibly as DAC for US delayed-mode data as well as global, real-time marine data collected from the GTS.

ANNEX IX

ANNOTATED VERSION OF RECOMMENDATION 2 (JCOMM-4)

1. CLARIFICATIONS REGARDING ANNEXES 2 AND 3 OF RECOMMENDATION 2 (JCOMM-4)

ORIGINAL TEXT	COMMENTS/SUGGESTED REVISIONS
6 Annex 2 to Recommendation 2 (JCOMM-4) 7 **TERMS OF REFERENCE FOR WMO-IOC CENTRES FOR MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATE DATA (CMOCs**	8
9 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 (CCl). 10 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	12

	CMOC domain. 11 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.		
13	**Capabilities:**	14	
15	(a) Each Centre must have, or have access to, the necessary infrastructure, facilities, experience and staff required to fulfil the approved functions;	16	It is currently unclear who will define the "functions"
17	(b) Each Centre must have, or have access to, interoperability with the WMO Information System (WIS) and/or IOC/IODE ODP;	18	This should be interpreted as "***Each Centre's data system must be interoperable with the WIS and/or IODE ODP***"
19	(c) Each Centre must be able to apply defined international standards applicable for Data and Quality Management;	20	It is suggested to reword this to: "***Each Centre must be able to apply defined WMO and IOC international standards applicable for Data and Quality Management***"
21	(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;	22	The "Mirroring CMOC" is currently undefined. See below under (h)
23	(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.	24	
25	**Corresponding functions:**	26	It is suggested to reword to "***Corresponding functions & tasks***" See *46* below
27	(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;	28	This should be interpreted as "***Each Centre, within the confines of its agreed scope, must contribute to WMO and IOC Applications, for example by rescuing, collecting, processing, archiving, sharing, distributing worldwide marine-meteorological and oceanographic data and metadata and to the extent that these functions are not carried out by other existing data centres, but are complementary to the functions of these other centres***"
29	(b) Each Centre must provide advice to	30	It is recommended to add

	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		"***preferably by referring to the JCOMM/IODE Ocean Data Standards (and best practices) (pilot) project and its publications and/or the MCDS web site***."
31	(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;	32	It is recommended to rephrase to: "***Each Centre must make datasets, and corresponding metadata, within the confines of its scope, available and discoverable through the WIS and/or IODE ODP***"
33	(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;	34	It is suggested to reword to" ***All CMOC must communicate and liaise closely (with meetings as required) within the network; particularly on the development and application of quality processes and procedures and on progress with their defined tasks***"
35	(e) Each Centre must operate appropriate data processing and quality control procedures, and generate the required products within its scope;	36	
37	(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;	38	It is recommended to **remove t**his paragraph as it duplicates (d)
39	(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	40	It is recommended to **remove** this paragraph as it is unclear what is meant, or it should be clarified.
41	(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;	42	It is suggested to reword this to "***Mirroring CMOCs will mirror data, metadata, products and processes at defined time-scales; the method of mirroring will be agreed upon among mirroring centres"***
43	(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);	44	It is suggested to reword this to "***Data (eg instrumental metadata) and products managed within a CMOC will be subject to version control,and metadata history will be preserved, using procedures agreed upon within the MCDS***;"
45	(j) Each Centre should report, on an annual basis, to the JCOMM Management Committee through the	46	

	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.		
47	**Data and Software Policy Requirements**	48	The term “data policy” is clear. The term “software policy” is not clear. It is suggested to reword to “**Data Policy and Software Licensing and Usage Rights Requirements “**
49	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-12) and IOC Resolution XXII-6. Where applicable software should also be made open and freely available.	50	The IOC policy, in clause 1 refers to “timely, free and unrestricted access”, not to “freely and openly”. It is suggested to reword to “***A CMOC must make all the data, metadata, and products falling within the scope of the CMOC network available to the international research community in a way consistent with WMO Resolution 40 (Cg-12) and IOC Resolution XXII-6. Where applicable software should also be shared, as possible***”.
51	**Annex 3 to** Recommendation 2 (JCOMM-4) **Formal DESIGNATION AND WITHDRAWAL of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs)**	52	The term “designation” is a bit odd. It is suggested to reword to “**Formal ESTABLISHMENT AND TERMINATION of WMO-IOC Centres for Marine-Meteorological and Oceanographic Climate Data (CMOCs)”**
53	53 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:	54	It is recommended to reword as follows “***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 establishment of a CMOC implies the following***:”
55	(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;	56	The term “governance” is somewhat confusing here. It is suggested to reword to “***The establishment of CMOCs is proposed by JCOMM and endorsed by the WMO Executive Council and UNESCO/IOC Assembly or Executive Council;”***

57	(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.	58	The text is unclear. It is recommended to " **The host of a candidate CMOC *is required to produce a comprehensive application document that demonstrates the ability to deliver the required outcomes and other criteria defined for the CMOC*.**"
59	The following approach is recommended by JCOMM:	60	
61	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	62	It is suggested to reword to "***The host of the candidate CMOC will describe its scope, capabilities, functions and data policy and software usage and licensing of the proposed CMOC***."
63	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.	64	It is suggested to reword to "***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 licensing and usage as described in the CMOC Terms of Reference detailed in Annex 2. The letter should be copied to the JCOMM Co-Presidents, 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***."
65	3. The IOC or WMO Secretariat will then request the appropriate JCOMM Co-President to take action, in particular to request the Data Management	66	It is suggested to reword to "***The IOC or WMO Secretariat will then request the appropriate***

	Coordination Group (DMCG) to evaluate and verify compliance with requirements of the proposed Centre.		***JCOMM Co-President to take action, in particular to request the Data Management Coordination Group (DMCG) to evaluate and verify compliance with capabilities of the proposed Centre."***
67	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 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.	68	
69	5. If endorsed by the DMCG, and depending on timing, the DMCG makes a recommendation to the JCOMM Management Committee (MAN).	70	What "advice" is expected from JCOMM? Is JCOMM not supposed to make a decision to either approve the application or reject it?
71	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.	72	Recommend to rephrase to "***If the application is not approved by the DMCG or MAN, the JCOMM Co-Presidents 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***."
73	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.	74	Recommend to rephrase to "***If an application is approved 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**.*".*
75	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.	76	The word "*candidate*" is a bit confusion. It is recommended to reword to "***If recommended by JCOMM, a Resolution is proposed to the WMO Executive Council and IOC Executive Council or Assembly for the establishment of the CMOC***.".
77	9. If the recommendation is approved by both the WMO Executive Councils and IOC Executive Council or Assembly, the candidate CMOC is	78	This is confusing if you put it next to 8: in 8 a draft resolution is submitted to WMO and IOC

listed in the appropriate WMO and IOC Manuals and Guides;	governing bodies. So 9 should refer to "**draft resolution**" and not to "recommendation".
79 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.	80 There is an inconsistency between 63 above and 79 as in 63 the process starts with a letter to the "IOC Executive Secretary or the WMO Secretary General respectively". In 79 it starts with "the" JCOMM Co-President. Also, there are 2 Co-Presidents so maybe say "relevant Co-President" (taking into account that "relevant" should be clarified). It is suggested to rephrase to "***It is expected that this process, from submission of the CMOC proposal to the JCOMM Co-Presidents, to formal approval by both WMO/IOC Executive Councils or IOC Assembly, may take from 6 months to 2 years***."
81 At times it may be necessary for a Centre to be withdrawn from the CMOC role. The approach proposed by JCOMM is the following:	82 The words "be withdrawn from the CMOC role" are odd. It is suggested to reword to "***At times it may be necessary for a Centre to terminate its CMOC role. The approach proposed by JCOMM is the following:"***
83 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.	84 See 81
85 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.	86 And what is then the result? It is suggested to reword to "***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.The proposed decision of termination of the CMOC shall then be submitted to the Secretary General of WMO and IOC Executive Secretary, the CMOC will cease its operations and submit a final report. Subsequently the Centre will be***

	removed from appropriate WMO and IOC Manuals and Guides.”

2. SUGGESTED REVISED VERSIONS OF ANNEXES 2 AND 3 TO RECOMMENDATION 2 (JCOMM-3)

Suggested revision of 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 (CCl).

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's data system must be interoperable with the WIS and/or IODE ODP;

(c) Each Centre must be able to apply defined WMO and IOC 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 and tasks:

(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, preferably by referring to the JCOMM/IODE Ocean Data Standards (and best practices) (pilot) project and its publications and/or the MCDS web site;

(c) Each Centre must make datasets, and corresponding metadata, within the confines of its scope, available and discoverable through the WIS and/or IODE ODP;

(d) All CMOC must communicate and liaise closely (with meetings as required) within the network; particularly on the development and application of quality processes and procedures and on progress with their defined tasks;

(e) Each Centre must operate appropriate data processing and quality control procedures, and generate the required products within its scope;

(f) .;

(g) .;

(h) Mirroring CMOCs will mirror data, metadata, products and processes at defined time-scales; the method of mirroring will be agreed upon among mirroring centres;

(i) Data (eg instrumental metadata) and products managed within a CMOC will be subject to version control, and metadata history will be preserved, using procedures agreed upon within the MCDS;

(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 Policy and Software Licensing and Usage Rights Requirements

A CMOC must make all the data, metadata, and products falling within the scope of the CMOC network available to the international research community in a way consistent with WMO Resolution 40 (Cg-12) and IOC Resolution XXII-6. Where applicable software should also be shared, as possible.

Suggested revision of Annex 3 to Recommendation 2 (JCOMM-4)

FORMAL ESTABLISHMENT AND TERMINATION 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 establishment of a CMOC implies the following:

(a) The establishment of CMOCs 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 comprehensive application document that demonstrates the ability to deliver the required outcomes and other criteria defined for the CMOC.

The following approach is recommended by JCOMM:

1. The host of the candidate CMOC will describe its scope, capabilities, functions and data policy and software usage and licensing 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 licensing and usage as described in the CMOC Terms of Reference detailed in Annex 2. The letter should be copied to the JCOMM Co-Presidents, 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 capabilities 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 the application is not approved by the DMCG or MAN, the JCOMM Co-Presidents 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 an application is approved 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 the establishment of the CMOC.

9. If the draft resolution 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-Presidents, to formal approval by both WMO/IOC Executive Councils or IOC Assembly, may take from 6 months to 2 years.

At times it may be necessary for a Centre to terminate its 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.The proposed decision of termination of the CMOC shall then be submitted to the Secretary General of WMO and IOC Executive Secretary, the CMOC will cease its operations and submit a final report. Subsequently the Centre will be removed from appropriate WMO and IOC Manuals and Guides.

ANNEX X

POTENTIAL CONTRIBUTING DATA TYPES TO THE MARINE CLIMATE DATA SYSTEM (MCDS)

Note: the list of potential contributors is not exhaustive, and other candidate centres can be added if applicable. The exact roles of DACs and GDACs still need to be refined.

Data type	*Panel*	*Contact point(s)*	*Effort*[1]	*Existing RT source*	*Existing DM source*	*DAC*	*GDAC*	*CMOC*
VOS	VOSP[2]	Gudrun.Rosenhagen@dwd.de nicola.scott@metoffice.gov.uk	Underway/2012	GTS/FM-13 SHIP GTS/FM-94 BUFR	PMOs[3]	RT[4]: GCCs[5] DM[6]: CMs[7]	GCCs[5]/IMMT	ICOADS[8] NODCs[9] RMs[47]
SAMOS / Underway marine MET and surface ocean data64	None, but SAMOS collaborates with JCOMM SOT	smith@coaps.fsu.edu	Moderate	SAMOS 1.0 (custom ASCII format)	Research Vessel operators	Florida State University		ICOADS[8] NODC[9]
Surface underway T&S	GOSUD[10]	loic.petit.de.la.villeon@ifremer.fr	Moderate	GTS/FM-62 TRACKOB GTS/FM-94 BUFR	GOSUD[10] PIs	GOSUD[10] Participants	GOSUD GDAC[11]/netCDF	ICOADS[8] WDCs[12] WOA[13] ? WOD[14] NODCs[9]
Upper Ocean T&S	GTSPP[15]	charles.sun@noaa.gov	Moderate	GTS/FM-63 BATHY	GTSPP[15] PIs	RT[4]: ISDM[16] DM[6]: GTSPP[15] DACs	US-NODC/ netCDF	WDCs[12], WOA[13] WOD[14] NODCs[9]
Argo	AST[17]	sylvie.pouliquen@ifremer.fr Susan.Wijffels@csiro.au	Moderate	GTS/FM-64 TESAC GTS/FM-94 BUFR Argo PIs	Argo/NetCDF	Argo national DACs[18] ARCs[19]	Argo GDACs[20]/netCDF Argo GADR[21]	WDCs[12], WOA[13] WOD[14] NODCs[9]
Drifters	DBCP[22]/GDP[23]	Sylvain.deMargerie@dfo-mpo.gc.ca rick.lumpkin@noaa.gov	Underway/2012	GTS/FM-18 BUOY GTS/FM-94 BUFR	Service Argos	RT[4]: SOC/DB[24] DM[6]: GDP[23] DAC[25] & SOC/DB[24]	RNODC/DB[26] (Canada)	ICOADS[8] NODCs[9], WOD[14] (th. chains only)
Meteorological Moored Buoys	DBCP[22]	jean.rolland@meteo.fr	To be discussed	GTS/FM-13 SHIP	NMHSs[27]	To be decided	To be decided	ICOADS[8] NODCs[9]

64 Beyond standard VOS; flow water system; can be more than T & S

Data type	*Panel*	*Contact point(s)*	*Effort*[1]	*Existing RT source*	*Existing DM source*	*DAC*	*GDAC*	*CMOC*
				GTS/FM-94 BUFR				?
Global Tropical Moored Buoys Array (GTMBA)	DBCP[22]/TIP[28]	paul.freitag@noaa.gov	Moderate	Surface data & T profiles GTS/FM-18 BUOY GTS/FM-94 BUFR	Sub-surface data TAO[29] PIs	???	TAO GDACs[30]	ICOADS[8] WDCs[12] WOA[13] WOD[14] NODCs[9]
Ocean Reference Sites	OceanSITEs[31]	richard.crout@noaa.gov sylvie.pouliquen@ifremer.fr	Moderate	GTS/FM-18 BUOY GTS/FM-94 BUFR	OceanSITEs[31] PIs	DACs	OceanSITEs[31] GDACs[32]/netCDF	ICOADS[8] WDCs[12] WOA[13] WOD[14] NODCs[9]
Tide gauges	GLOSS[33]	Torkild Aarup t.aarup@unesco.org psmsl@noc.ac.uk	To be discussed		GLOSS[33] PIs	National Centres	- DM[6]: PSMSL[34] & UHSLC[35] JASL[36] - RT[4]: VLIZ[37] & UHSLC[35] - HF[38]: BODC[39] & UHSLC[35] - GNSS[40]: TIGA[41]	ICOADS[8] ? NODCs[9] ?
Tsunameters	DBCP[22]/ITP[42]	richard.crout@noaa.gov	To be discussed	GTS/FM-94 BUFR FTP/FM-94 BUFR	USA (15sec data by FTP)	Regional Tsunami Watch Centres (input from Australia, Chile, Russia, Thailand, USA) India/FTP	NDBC provides global visual interface	ICOADS[8] ? NODCs[9]
Gliders	None	TBD	Important	Miscellaneous	Miscellaneous	To be discussed	To be discussed	NODCs[9] WOD[14]
High	GHRSST[43]	Silvia Bragaglia-Pike	Moderate	Space	Space	RDACs[44]	GHRSST	WDCs[12],

Data type	*Panel*	*Contact point(s)*	*Effort*[1]	*Existing RT source*	*Existing DM source*	*DAC*	*GDAC*	*CMOC*
Resolution SST data from satellites		s.bragagliapike@reading.ac.uk		agencies GTS/Multiple sources for *in situ* data	agencies		GDAC[45] GHRSST LTSRF[46]	NODCs[9]

1: Effort needed to have the considered data contribute to the MCDS
2: VOSP: Ship Observations Team (SOT) Voluntary Observing Ship's Scheme (VOS) Panel
3: PMOs: Port Meteorological Officers
4: RT: Real-Time
5: GCCs: Marine Climatological Summaries Scheme (MCSS) Global Collecting Centres (UK, Germany)
6: DM: Delayed Mode
7: CMs: Marine Climatological Summaries Scheme (MCSS) Contributing Members
8: ICOADS: International Comprehensive Ocean-Atmosphere Data set (NOAA & NCAR, USA)
9: NODCs: International Oceanographic Data and Information Exchange (IODE) National Oceanographic Data Centres
10: GOSUD: Global Ocean Surface Underway Data Project
11: GOSUD GDAC: Global Data Assembly Centre (Coriolis, France)
12: WDCs: World Data Centres for Oceanography (National Oceanographic Data Centres of USA, Russia, China)
13: WOA: World Ocean Atlas (National Oceanographic Data Centre, USA)
14: WOD: World Ocean Database (National Oceanographic Data Centre, USA)
15: GTSPP: Global Temperature and Salinity Profile Programme
16: ISDM: Integrated Science Data Management (Canada)
17: AST: Argo Steering Team
18: Argo DACs: Data Assembly Centres
19: ARCs: Argo Regional Centres
20: Argo GDACs: Global Data Assembly Centres: FNMOC (USA) and Coriolis (France)
21: GADR: Global Argo Data Repository (National Oceanographic Data Centre, USA)
22: DBCP: Data Buoy Cooperation Panel
23: GDP: Global Drifter Programme
24: SOC/DB: JCOMM Specialized Oceanography Centre for Drifting Buoys (Météo France)
25: GDP DAC: Global Drifter Programme (GDP) Drifter Data Assembly Centre (NOAA/AOML, USA)
26: RNODC/DB: JCOMM-IODE Responsible Oceanography Data Centre for Drifting Buoys (ISDM, Canada)
27: NMHSs: National Meteorological and Hydrological Services
28: TIP: Tropical Moored Buoy Implementation Panel
29: TAO: Tropical Atmosphere Ocean Array of moored buoys
30: TAO GDACs: NDBC (USA) for TAO, PMEL (USA) for ATLAS & sub-surface sites in PIRATA & RAMA, JAMSTEC (Japan) for TRITON and sub-surface sites in tropical Pacific and Indian oceans; NIOT (India) for 3 subsurface sites in RAMA, FIO (China) for the Bai Long and sub-surface mooring in RAMA. PMEL collects all real time data and most of the delayed mode data from the various moorings and delivers them from PMEL web site, http://www.pmel.noaa.gov/tao/disdel/disdel.html. NDBC, JAMSTEC, NIO and FIO each have their own data centers containing data from the subset of moorings which they operate. PMEL's QC procedures are available at http://www.pmel.noaa.gov/tao/proj_over/qc.html. The other data centers have adopted procedures patterned after PMEL's. A number of data formats are available including ASCII and NetCDF.
31: OceanSITEs: OCEAN Sustained Interdisciplinary Timeseries Environment observation System
32: OceanSITEs GDACs: Global Data Assembly Centree (Coriolis-France, and NOAA/NDBC-USA)
33: GLOSS: Global Sea Level Observing System

[34]: PSMSL: Permanent Service for Mean Sea Level (National Oceanography Centre, Liverpool, UK) – receiving mean delayed mode monthly QC'ed data
[35]: UHSLC: University of Hawaii Sea Level Centre (USA) - The UHSLC together with the BODC (UK) are receiving higher frequency (hourly or better; delayed mode to near real-tie) sea level data for GLOSS. The UHSLC together with VLIZ (Belgium) are collecting real-time sea level data via the GTS
[36]: JASL: UHSLC (USA) Joint Archive for Sea Level
[37]: VLIZ: Flanders Marine Institute (Belgium) – The VLIZ together with the UHSLC (USA) is collecting real-time sea level data via the GTS
[38]: HF: High Frequency data
[39]: BODC: British Ocean Data Centre (UK) – The BODC together with the UHSLC (USA) are receiving higher frequency (hourly or better; delayed mode to near real-tie) sea level data for GLOSS
[40]: GNSS: Geo-Referenced station using Global Navigation Satellite System (e.g. GPS)
[41]: TIGA: Continuous GNSS/GPS data to Tide Gauge Benchmark Monitoring data centre
[42]: ITP: International Tsunameter Partnership
[43]: GHRSST: Group for High Resolution SST
[44]: RDACs: GHRSST Regional Data Assembly Centres
[45]: GDAC: GHRSST Global Data Assembly Centre (NASA, USA)
[46]: LTSRF: GHRSST Long Term Stewardship and Reanalysis Facility (US NODC)
[47]: RMs: Marine Climatological Summaries Scheme (MCSS) Responsible Members

ACRONYM LIST

ACRE	Atmospheric Circulation Reconstructions over the Earth
AOML	NOAA Atlantic Oceanographic and Meteorological Laboratory (USA)
AOPC	Atmospheric Observation Panel for Climate
ASAP	As Soon As Possible
AWS	Automatic Weather Station
BUFR	FM 94 BUFR GTS format: Binary Universal Form for Representation of meteorological data
CBS	Commission for Basic Systems (WMO)
CCl	Commission for Climatology (CCl)
CDI	Common Data Index (SeaDataNet)
CDMP	Climate Database Modernization Programme (USA)
Cg	Congress (WMO)
CLIMAR	Workshop on Advances in Marine Climatology (JCOMM)
CM	Contributing Member (of MCSS)
CMM	WMO Commission for Marine Meteorology (now replaced by JCOMM)
CMOC	Centres for Marine Meteorological and Oceanographic Climate Data (of MCDS)
CSM	WMO Commission for Synoptic Meteorology (now replaced by the CBS)
CTD	Conductivity, Temperature, and Depth
DAC	Data Acquisition Centre
DBCP	Data Buoy Co-operation Panel (WMO-IOC)
DM	Delayed Mode
DMCG	Data Management Coordination Group (JCOMM)
DMPA	Data Management Programme Area (JCOMM)
DNA	Designed National Agency
DWD	Deutscher Wetterdienst (Germany)
EC	Executive Council
ECMWF	European Centre for Medium-Range Weather Forecasts
ECV	Essential Climate Variables
EOV	Essential Ocean Variable
ERA	ECMWF Re-Analysis
ESRL	NOAA Earth System Research Laboratory (USA)
E-SURFMAR	Surface Marine programme of the Network of European Meteorological Services, EUMETNET
ETCCDI	joint CLIVAR / CCl / JCOMM Expert Team on Climate Detection and Indices
ETDMP	Expert Team on Data Management Practices (JCOMM & IODE)
ETMC	Expert Team on Marine Climatology (JCOMM)
ETSI	Expert Team on Sea Ice (JCOMM)
ETWCH	Expert Team on Waves and Coastal Hazards Forecasting Systems (JCOMM)
ETWS	Expert Team on Wind Waves and Storm Surge (JCOMM, now ETWCH)
EUCOS	EUMETNET Composite Observing System
EUMETNET	Network of European Meteorological Services
EWDS	Extreme Waves Data Set
FAGS	Federation of Astronomical and Geophysical data analysis Services
FNMOC	Fleet Numerical Meteorology and Oceanography Center (USA)
FOO	Framework for Ocean Observing
FTP	File Transfer Protocol
GCC	Global Collecting Centre (of MCSS)
GCOS	Global Climate Observing System
GDAC	Global Data Assembly / Acquisition Centre
GDP	Global Drifter Programme
GE-BICH	Group of Experts on Biological and Chemical Data Management and Exchange Practices (IODE)
GFCS	Global Framework for Climate Services
GHRSST	Group for High-Resolution SST
GLOSS	Global Sea-level Observing System (JCOMM)

GMES	Global Monitoring for Environment and Security
GODAR	Global Oceanographic Data Archaeology and Rescue
GOOS	Global Ocean Observing System (IOC, WMO, UNEP, ICSU)
GO-SHIP	Global Ocean Ship-Based Hydrographic Investigations Program
GOSUD	Global Ocean Surface Underway Data project (IODE)
GRA	GOOS Regional Alliance
GTS	Global Telecommunication System (WWW)
GTSPP	Global Temperature and Salinity Profile Programme (IODE)
HISKLIM	HIStorical CLIMate (the Netherlands)
HISTOR	Digitization of historical navigation logbooks and meteorological ship journals (Germany)
HQCS	Higher Level Quality Control Standard
HQ-GDMSC	High Quality Global Data Management System for Climate
ICOADS	International Comprehensive Ocean-Atmosphere Data Set (USA)
ICSU	International Council for Science
ID	Identification Number
IFREMER	French Research Institute for Exploitation of the Sea
IMMA	International Maritime Meteorological Archive
IMMPC	International Maritime Meteorological Punch Card
IMMT	International Maritime Meteorological Tape
IMO	International Maritime Organization
IMOS	Integrated Marine Observing System (Australia)
IOC	Intergovernmental Oceanographic Commission (of UNESCO)
IODE	International Oceanographic Data and Information Exchange (IOC)
IPCC	Intergovernmental Panel on Climate Change
IPET	Inter-Programme Expert Team
IPET-DRMM	IPET on Data Representation Maintenance and Monitoring (CBS)
ISDM	Integrated Science Data Management (formerly MEDS, Canada)
ISO	International Organization for Standardization
ISTI	International Surface Temperature Initiative
ITP	International Tsunameter Partnership
IVAD	ICOADS Value Added Database
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM *in situ* Observations Programme Support Centre
JMA	Japan Meteorological Agency
KNMI	Koninklijk Nederlands Meteorologisch Instituut
MAN	JCOMM Management Committee
MARCDAT	Workshop on Advances in the Use of Historical Marine Climate Data
MBT	Mechanical BathyThermograph
MCDS	Marine Climate Data System (JCOMM)
MCP	Marine Community Profile
MCS	Marine Climatological Summary
MCSS	Marine Climatological Summaries Scheme
MEDS	Marine Environmental Data Service (Canada, now ISDM)
META-T	Water Temperature instrument/platform Metadata Pilot Project (JCOMM)
MM	Marine Meteorological
MQC	Minimum Quality Control
MQCS	Minimum Quality Control Standard
NCAR	National Center for Atmospheric Research (USA)
NCDC	NOAA National Climatic Data Center (USA)
NCEP	NOAA National Center for Environmental Prediction (USA)
NDBC	NOAA National Data Buoy Center (USA)
NetCDF	Network Common Data Format
NMDIS	SOA National Marine Data and Information Service (China)
NMHS	National Meteorological and Hydrological Service
NOAA	National Oceanic and Atmospheric Administration (USA)

NODC	National Oceanographic Data Centre (IODE)
NRT	near real-time
OBIS	Ocean Biogeographic Information System (IODE)
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	Observations Coordination Group (JCOMM)
ODAS	Ocean Data Acquisition System
ODASMS	ODAS Metadata Service (operated by China on behalf of JCOMM)
ODIN	Ocean Data and Information Network (IODE)
ODP	Ocean Data Portal (IODE)
ODS	Ocean Data Standards process (IODE & JCOMM)
ODSBP	Ocean Data Standards and Best Practices
OOPC	Ocean Observations Panel for Climate (GCOS-GOOS-WCRP)
OPA	Observations Programme Area (JCOMM)
OPACE	Open Panels of CCl Experts
Pub47	WMO Publication No. 47, International List of Selected, Supplementary and Auxiliary Ships
QARTOD	Quality Assurance of Real Time Oceanographic Data (USA)
QC	Quality Control
QMF	IODE Quality Management Framework
QMF	WMO Quality Management Framework
R/V	Research Vessel
RBM	results-based management
RECLAIM	RECovery of Logbooks and International Marine data
RIHMI	Russian Institute for Hydrological and Meteorological Information
RM	Responsible Member (of MCSS)
RNODC	Responsible Oceanographic Data Centre (IODE)
RNODC/DB	RNODC for Drifting Buoys
RT	Real-Time
RTMC	VOSClim Real-Time Monitoring Centre
RV	Research Vessel
SAMOS	Shipboard Automated Meteorological and Oceanographic System (USA)
SDN	SeaDataNet
SeaDataNET	Pan-European infrastructure for Ocean & Marine Data Management
SKOS	Simple Knowledge Organization System
SOA	State Oceanic Administration (China)
SOC	Specialized Oceanographic Centre (JCOMM)
SODC	Specialized Ocean Data Centre (IODE)
SOOP	Ship-Of-Opportunity Programme
SOOPIP	SOOP Implementation Panel (JCOMM)
SOT	Ship Observations Team (JCOMM)
SSS	Sea Surface Salinity
SST	Sea-Surface Temperature
TD	Technical Document
ToR	Terms of Reference
TR	Technical Report
TT	Task Team
TT-DMVOS	JCOMM Cross Cutting Task Team on Delayed Mode VOS Data (now obsolete)
TT-MCDS	ETMC Task Team on the MCDS
TT-MOCS	ETMC Task Team on Marine Meteorological and Oceanographic Climate Summaries (now obsolete)
TT-TDC	DMPA Task Team on Table Driven Codes
UID	Unique Record ID
UK	United Kingdom of Great Britain and Northern Ireland
UN	United Nations
UNESCO	UN Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change

URL	Uniform Resource Locator
USA	United States of America
VOS	Voluntary Observing Ship scheme (JCOMM)
VOSClim	VOS Climate
WCC-3	World Climate Conference 3
WDC	World Data Centre (ICSU, now with WDS)
WDS	World Data System (ICSU)
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization (UN)
WOD	World Ocean Database (USA)
WWW	World Weather Watch (WMO)
XBT	Expendable BathyThermograph

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