

**THIRD SESSION  
OF THE JCOMM EXPERT TEAM ON  
MARINE CLIMATOLOGY**

**(MELBOURNE, AUSTRALIA, 8-12 FEBRUARY 2010)**

**FINAL REPORT**



**THIRD SESSION OF THE  
JCOMM EXPERT TEAM ON  
MARINE CLIMATOLOGY**

**(MELBOURNE, AUSTRALIA, 8-12 FEBRUARY 2010)**

**FINAL REPORT**



**JCOMM MEETING REPORT NO. 70 (REVISION 1)**

## **NOTES**

### **WMO DISCLAIMER**

#### **Regulation 42**

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

#### **Regulation 43**

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent, and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

© World Meteorological Organization, 2008

The right of publication in print, electronic and any other form and in any language is reserved by WMO. Short extracts from WMO publications may be reproduced without authorization provided that the complete source is clearly indicated. Editorial correspondence and requests to publish, reproduce or translate this publication (articles) in part or in whole should be addressed to:

Chairperson, Publications Board  
World Meteorological Organization (WMO)  
7 bis, avenue de la Paix  
P.O. Box No. 2300  
CH-1211 Geneva 2, Switzerland

Tel.: +41 22 730 84 03  
Fax: +41 22 730 80 40  
E-mail: [Publications@wmo.int](mailto:Publications@wmo.int)

### **IOC (OF UNESCO) DISCLAIMER**

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariats of UNESCO and IOC concerning the legal status of any country or territory, or its authorities, or concerning the delimitation of the frontiers of any country or territory.

---

## CONTENTS

<b>Executive Summary</b>	.....	1
<b>Session Report</b>	.....	3
Annex I	Agenda .....	38
Annex II	List of Participants .....	40
Annex III	Data Management Expectations from the OceanObs'09 conference .....	43
Annex IV	Prospects for ICOADS wind wave summaries .....	47
Annex V	Observational requirements from GCOS (1999) .....	50
Annex VI	Proposal of new transport format for marine meteorological observations .....	51
Annex VII	Report by the Global Collecting Centres (GCCs) .....	53
Annex VIII	Reports by the Responsible Members (RMs) .....	60
Annex IX	Data flow proposal .....	75
Annex X	Tasks to be considered for the future High Level Quality Control Standard (HQCS) .....	79
Annex XI	Proposal to establish a network of mirrored WMO-IOC Centres for Marine-Meteorological and Ocean Climatological Data (CMOC) .....	80
Annex XII	Developing a bias-adjusted ICOADS to support climate research.....	84
Annex XIII	Terms of Reference of the Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS) .....	86
Annex XIV	Terms of Reference of the Task Team on Delayed Mode VOS Data (TT-DMVOS) .....	87
Annex XV	Working plan of the Task Team on Delayed Mode VOS Data.....	89
Annex XVI	Action items arising from the meeting.....	93
Annex XVII	References .....	98
Annex XVIII	Acronym list .....	101

---

## EXECUTIVE SUMMARY

The third meeting of the JCOMM Expert Team on Marine Climatology was held at the headquarters of the Australian Bureau of Meteorology (BOM), from 8 to 12 February 2010.

The main goals of the meeting were to review the status of the modernization of the Marine Climatological Summaries Scheme (MCSS), address guidance from the third session of JCOMM, Marrakech, Morocco, 4-11 November 2009, and advance the team work programme until the fourth session of JCOMM in 2012.

A scientific and technical workshop was organized during the first day and the morning of the second day of the session, and twenty-nine presentations made covering JCOMM aspects, contributions and requirements of the World Climate Research Programme (WCRP) and other climate related programmes, data and metadata issues including operational data flow and archaeology and archival aspects, marine meteorological and oceanographic climatological summaries, and data quality and exchange.

The meeting achieved consensus, and permitted to make substantial progress regarding a number of issues including in particular:

- A proposal to establish a pilot project to develop approaches for dissemination of bias adjustments and corrections alongside marine climate observations, and using presently available corrections to prove concept;
- A proposal to establish a pilot project on wave climate summaries;
- Thanks to the work of the cross cutting ETMC/SOT Task Team on Delayed Mode VOS Data (TT-DMVOS); substantial progress was made 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;
- A strategy was proposed for addressing data preservability particularly in relation to the use of table driven codes;
- A proposal for the encoding of ship's identification for addressing the ship security issue in such a way as the marine climatology requirements are better addressed;
- A proposal to initiate a pilot study to investigate the current content of the Ocean Data Acquisition Systems (ODAS) Metadata Service (ODASMS) and the Water Temperature Metadata (META-T) servers in terms of metadata available from operational observing platforms;
- Solutions proposed for the management of rigs and platforms, and associated metadata;
- A proposal for establishing a network of mirrored WMO-IOC Centres for Marine-meteorological and Ocean Climatological Data (CMOC) where the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) would be integrated;
- Proposed submission of a standard for the Quality Control of surface marine data to the JCOMM/IODE<sup>1</sup> standards process;
- Development of a template for documenting the requirements for long-term marine surface physical observations;
- Strengthening the links with the WMO Commission for Climatology (CCI) in particular regarding interoperability issues, marine indices and the monitoring of extremes events, data preservability, and data rescue, and contributions to the Global Framework for Climate Services (GFCS);
- Strengthening the cooperation with the satellite community, in particular for seeking the creation of match up satellite database;
- Compilation of catalogue of data available from Research Vessels;
- Strategy for improving the extreme wave database, and considerations for climatologies of

---

1 : IODE : International Oceanographic Data and Information Exchange (of IOC)

- storm surges, and sea-ice;
- Plans for the modernization of the Marine Climatological Summaries (MCS) part of the MCSS through the work of the ETMC Task Team on Marine Meteorological and Oceanographic Climatological Summaries (TT-MOCS);
  - Plans for organizing a third International Workshop on Advances in the Use of Historical Marine Climate Data (MARCDAT) tentatively in Italy around the end of 2010 or early 2011 and in close relationship with the satellite community;
  - Plans for organizing a fourth JCOMM Workshop on Advances in Marine Climatology (CLIMAR) in 2012 or 2013.
-

## GENERAL SUMMARY OF THE WORK OF THE SESSION

### 1. ORGANIZATION OF THE SESSION

#### 1.1 Opening

1.1.1 Mr Scott Woodruff (USA), Chairperson of the JCOMM Expert Team on Marine Climatology (ETMC) opened the Third Session of the Team at 0900 hours on Monday, 8 February 2010, at the Bureau of Meteorology, Melbourne, Australia.

1.1.2 A scientific and technical workshop was organized during the first day and the morning of the second day of the session. The twenty-nine presentations made at the workshop helped streamline discussion during the formal part of the Session addressed in this report. The Team requested the Secretariat to make the presentations available through the JCOMM web site (**action; Secretariat; 28 Feb 2010**).

1.1.3 The WMO Secretariat representative welcomed the participants to the Session on behalf of the Secretary-General of WMO, Mr Michel Jarraud, and the Executive Secretary IOC, Dr Wendy Watson Wright.

1.1.4 The Team recognized the rapidly developing WMO Integrated Global Observing System (WIGOS), promoted by the WMO Fifteenth Congress (Cg-XV) as a strategic objective of the WMO. WIGOS will establish an integrated, comprehensive and coordinated observing system to satisfy in a cost-effective and sustained manner the evolving observing requirements of WMO Members, and will enhance coordination of WMO observing systems with those of partner organizations, such as the Intergovernmental Oceanographic Commission (IOC) of UNESCO, for the benefit of society. The ETMC is expected to play a role in WIGOS especially through the JCOMM Pilot Project for WIGOS where the Global Collecting Centres (GCCs), and the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) have been identified as key ocean data sets where interoperability should be developed with the WMO Information System (WIS) and/or the Ocean Data Portal of IOC.

1.1.5 The Team recalled that activities undertaken by the ETMC, including the implementation of the Marine Climatological Summaries Scheme (MCSS) have a long history and have proved very successful and useful for Climate related applications. It was noted that in order to better address user needs, some progress has already been made regarding the modernization of the MCSS that will propose among other things improved marine data exchange and higher level quality control standard. This activity would be discussed during this Session as a major priority for the ETMC. Indeed, ocean data in general, and marine climatology data in particular are expected to play a crucial role in the developing Global Framework for Climate Services (GFCS).

#### 1.2 Adoption of the agenda

1.2.1 The Chairperson introduced the Provisional Agenda, and invited the meeting to review it and adopt it. The meeting adopted the Agenda ([Annex I](#)).

#### 1.3 Working arrangements

1.3.1 The Secretariat representative, on behalf of Dr Dexter (Australia), JCOMM Co-President, also welcomed the participants to Melbourne and 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. Mr Woodruff invited all participants to introduce themselves briefly. The list of participants is available as [Annex II](#).

## 2. JCOMM ASPECTS

### 2.1 Report by the ETMC Chairperson

2.1.1 The Chairperson, Mr Woodruff presented an overview of the activities of the ETMC since its second session (ETMC-II; Geneva, Switzerland, 26-27 March 2007). He recalled that as a major thrust of the intersessional work, ETMC and the JCOMM Data Management Coordination Group (DMCG) initiated modernization of the Marine Climatology Summaries Scheme (MCSS) (established in 1963) via two new task teams: on Delayed-mode Voluntary Observing Ship (VOS) data (TT-DMVOS), and on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS). Much work has been undertaken, including:

- New versions of the International Maritime Meteorological Tape (IMMT) format and Minimum Quality Control Standard (MQCS) were approved (IMMT-IV and MQCS-VI, to be implemented generally for all data collected as from 1 January 2011); see agenda item 5.2;
- The International Comprehensive Ocean-Atmosphere Data Set (ICOADS) has implemented the widely used International Maritime Meteorological Archive (IMMA) format and maintains a variety of extensive monthly summary products (plus some QC climatologies); see agenda item 6.1;
- Convergence with ICOADS as part of the modernization was proposed, including for greater interoperability in terms of formats, and in the development of a proposed Higher Quality Control Standard (HQCS); see agenda item 5.4;
- A Third JCOMM Workshop on Advances in Marine Climatology (CLIMAR-III, Gdynia, Poland, May 2008) was organized and recommendations made; see agenda item 8;
- With support from USA, imaging and digitization of VOS platform and instrumental metadata was completed back to 1955, together with imaging of 1973-93 volumes; see agenda item 6.3;
- JCOMM-III agreed that the Ocean Data Acquisition System (ODAS) Metadata Service (ODASMS, operated by China) would take over metadata formerly managed in the *On-line Information Service Bulletin on Non-drifting ODAS* operated by Integrated Science Data Management (ISDM, formerly MEDS) of Canada; see agenda item 4.6;
- Setting up of an extreme waves database in cooperation with the JCOMM Expert Team on Wind Waves and Storm Surges (ETWS); see agenda item 6.5;
- Progress with regard to historical ocean data rescue; see agenda item 6.3;

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

- Management of instrument/platform metadata from rigs and platforms; see agenda item 4.6.3;
- Consideration of Marine Climatology requirements for the future evolution of BUFR<sup>2</sup> templates for ocean observations; see agenda item 4.2;
- Consideration of the results from the comparison of Global Telecommunication System (GTS) data streams based on data collected in December 2007; see agenda item 4.1;
- Finalization of an overview report on marine Quality Control (QC) issues, focused on surface data reported by VOS and Research Vessels (R/Vs), to help initiate the process of standardizing QC; see agenda item 5.4;
- Strengthening the links, and develop the synergies with the WMO Commission for Climatology (CCI); see agenda item 3.3;

2.1.3 The new Chairperson of the JCOMM Data Management Coordination Group (DMCG), Ms Sissy Iona (Greece) reported on priorities decided by the recent Third Session of JCOMM (JCOMM-III, Marrakech, Morocco, 4-11 November 2009) for the current JCOMM intersessional period. These include:

---

2 : BUFR: Binary Universal Form for the Representation of Meteorological Data (WMO 2001c).

- (i) Develop standards/best practices in the marine community through the IODE<sup>3</sup>-JCOMM Standards Process;
- (ii) Continue to work under the JCOMM Pilot Project for WIGOS to make the Ocean Data Portal (ODP) and WIS interoperable as well as other ocean data systems interoperable with ODP and/or WIS;
- (iii) Upgrade present BUFR encoding for marine variables to include instrument/platform metadata;
- (iv) Complete META-T and ODAS implementation and capture of instrument/platform metadata;
- (v) Modernize the Marine Climatological Summaries Scheme (MCSS);
- (vi) Review and update the Data Management Plan;
- (vii) Update the *Catalogue of Standards and Best Practices* and contribute to the implementation of Quality Management Systems (QMS) in compliance with the WMO Quality Management Framework (QMF);
- (viii) Review and update the JCOMM Data Management Programme Area (DMPA) website;
- (ix) Organization of MARCDAT-III and CLIMAR-IV meetings (see agenda item 8).

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

- *Review the issue of reporting accuracy of GPS positions in coded reports and climate records (with the Ship Observations Team - SOT - and the DMPA Task Team on Table Driven Codes - TT-TDC):* For “coded” data, this has a bearing on the development of improved BUFR templates for Voluntary Observing Ship (VOS) and other data, as well as future improvements in the formats (IMMT and IMMA) used for VOS and other climate records. This also relates to a larger DMPA priority: *Endorse the upgrading of present BUFR encoding for marine variables to include instrument/platform metadata.* See agenda item 4.2;
- *Continue to actively plan and implement the modernization of the MCSS (TT-DMVOS and TT-MOCS):* These important modernization efforts are expected to continue to be a primary focus for ETMC. As part of the work, useful opportunities for interoperability, such as via the IMMA format and with ICOADS, should be fully explored in order to help achieve the goals of the modernization as quickly and efficiently as possible. As another important upcoming priority in the area of climatological product development and dissemination, the membership and work plans of TT-MOCS need to be updated and advanced as quickly as feasible. See agenda items 5.4 and 7.1;
- *Continue to explore: making products more readily discoverable and accessible; and the integration of oceanographic and sea-ice climatologies together with marine meteorological information (TT-DMVOS and TT-MOCS):* Improvements in product discoverability and accessibility will likely to rely on technological advances in the use of metadata (e.g. Snowden et al. 2010). Previously, JCOMM-II 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 the Terms of Reference (ToR) of the TT-MOCS (however, as noted above the work of that task team now needs to be renewed). See agenda items 2.4.3, 5.4, 7.1, and 7.2;
- *Devise a coordinated strategy for the preservation and archival of metadata associated with ocean rigs and platforms (with SOT, the JCOMM in situ Observing Programme Support Centre – JCOMMOPS – and other interested groups):* These offshore installations can provide high volumes of quality data; presently, however, they are not managed by JCOMM as an independent network. Other complications include how these metadata should be collected, e.g. the Surface Marine programme (E-SURFMAR) of the Network of European

---

3 : IODE : International Oceanographic Data and Information Exchange (of IOC)

Meteorological Services (EUMETNET) currently acts as a temporary repository for WMO-No. 47 (Pub. 47; WMO 1955) metadata; and that some mobile drilling rigs lend themselves more to the Pub. 47 format, whereas that format may be unsuitable for fixed platforms. JCOMM-III requested, since this issue was related to other metadata activities that have also been under consideration by ETMC (e.g. META-T, ODASMS), that ETMC resolve discussion with the above-mentioned groups. See agenda item 4.6.3;

- *Continue to contribute towards development of the extreme wave archive, and to evaluate the potential for calculation of wave monthly summaries for ICOADS (with ETWS and US National Oceanographic Data Center – NODC):* While the initial concept for the extreme wave archive has been successfully established, together with its hosting at US NODC, much more work is needed to help populate the archive and eventually make products available. Moreover, preliminary comparisons of moored buoy for this purpose detected some US archive differences that will need to be resolved so as to identify genuine extreme events (and which will also be indirectly beneficial to the National Oceanic and Atmospheric Administration – NOAA – in harmonizing its permanent archives of the historical buoy data). The potential for calculating wave summaries for ICOADS has been under consideration for several years, but resource limitations and questions about the impacts of code changes within the historical VOS and other wave records have thus far slowed progress. See agenda item 2.4.2, 7.1, and 7.2;
- *Continuation of both successful workshop series with a MARCDAT-III around 2010-11, followed as appropriate in approximately two years by a CLIMAR-IV:* These two workshop series have proved to be a very successful focus for ETMC, with widely available published outcomes for example currently produced from CLIMAR via the *International Journal of Climatology* special issues. A variety of potential venues, and scheduling possibilities, for MARCDAT-III have already been discussed, but the timing of that next workshop may depend e.g. partly on the scheduling of JCOMM-IV. See agenda item 8.

## 2.2 Report by the Secretariat

2.2.1 The Secretariat reported on the outcome of JCOMM-III, and actions related to the work of the ETMC. In addition to what was already reported by the Chairperson under the previous agenda item, the Team noted that JCOMM-III:

- Adopted Recommendation 7.1/1 (JCOMM-III) – Provision of ODAS and Water Temperature Metadata. Members/Member States are requested to provide the metadata content on a routine basis;
- Endorsed the ETMC proposal for modernizing the MCSS<sup>4</sup>;
- Noted with appreciation the outcomes and recommendations of CLIMAR-III (Gdynia, Poland, May 2008);
- Urged Members/Member States to contribute to the extreme wave database operated by the US NODC by identifying potential events and providing the data to this archive;
- Endorsed past ETMC recommendations that BUFR and other Table Driven Codes (TDCs) should be more carefully validated, so as to ensure that originally reported data are completely and accurately preserved.

2.2.2 The Team also acknowledged the following requests from JCOMM-III:

- Review the issue of reporting accuracy of Global Positioning System (GPS) positions in coded reports and climate records, in consultation with the SOT and the DMPA Task Team on Table Driven Codes (TT-TDC), with a view to perhaps enhancing the precision of such records in the future. See agenda item 4.2;
- Continue to actively plan and implement the modernization of the MCSS, i.e. (a) explore possibilities for interoperability, such as via the International Maritime Meteorological

---

4 : <http://www.jcomm.info/MCSS-mod>

Archive (IMMA) format, and with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS); (b) in consultation with SOT, to continue to develop and agree on detailed proposals for the future international marine data flow, including a Higher Quality Control Standard (HQCS), as well as questions of format and QC interoperability; (c) develop appropriate documents describing the modernization progress, and proposed amendments for the *Manual on and Guide to Marine Meteorological Services* (WMO–Nos. 558 and 471 respectively; WMO 1990 and 2001a), including in conjunction with the forthcoming adoption of IMMT-IV and MQCS-VI; and (d) continue to review the value and effectiveness of these modernization steps. See agenda items 5.4, 6.1, and 9.2;

- Continue to explore (a) making products more readily discoverable through product and services level metadata, and accessible through the use of Internet-based web service technologies; and (b) the integration of oceanographic and sea-ice climatologies together with marine meteorological information. See agenda items 2.4.3, 5.4, 7.1, and 7.2;
- In consultation with SOT, devise a coordinated strategy for the preservation and archival of metadata associated with ocean rigs and platforms. See agenda item 4.6.3;
- In consultation with ETWS, continue to contribute towards development of the extreme wave archive, and to evaluate the potential for calculation of wave monthly summaries for ICOADS. See agenda items 2.4.2, 6.1, 7.1, and 7.2.
- Continuation of both successful workshop series with a MARCDAT-III around 2010-11, followed as appropriate in approximately two years by a CLIMAR-IV. See agenda item 8;
- JCOMM-III requested the ETMC to develop storm surge climatologies in consultation with ETWS. See agenda item 2.4.2.

2.2.3 The Secretariat reported on the development of the WMO Integrated Global Observing System (WIGOS). From an ETMC perspective, it is expected that the importance of historical data to modelling will increase, e.g. data from ICOADS, the Global Collecting Centres (GCCs), the VOSclim Data Assembly Centre (DAC), the Responsible National Oceanographic Data Centre for Drifting Buoys (RNODC/DB; hosted by Canada), the World Ocean Atlas (WOA), the ODASMS, and the META-T servers. Historical data are valuable as tests of the ability of models to reproduce past conditions and so improve confidence that they can also make reliable predictions. The JCOMM Pilot Project for WIGOS is also therefore aiming at facilitating access to historical data and associated metadata through the ODP and WIS.

## **2.3 JCOMM Observations Programme Area (OPA)**

### **2.3.1 Ship Observations Team (SOT)**

2.3.1.1 The Team discussed requirements and activities of the SOT, particularly the outcome of the Fifth Session (SOT-V, Geneva, Switzerland, 18-22 May 2009). SOT-V recommended that the SOT continue to take an active role in the TT-DMVOS activities, and engage with TT-MOCS in the future as appropriate. In particular, SOT-V endorsed the changes proposed by ETMC for the versions IV and VI of IMMT and MQCS respectively, and requested the TT-DMVOS to investigate appropriate archiving format(s) at the GCCs taking into account the IMMT format and the modernized International Maritime Meteorological Archive (IMMA) format (offering greater flexibility and direct compatibility with ICOADS). SOT members were invited to discuss the proposed new TT-DMVOS data flow and provide feedback to TT-DMVOS via the GCCs.

2.3.1.2 The Team recalled that the SOT was invited to provide views on the proposed development of a Higher-level QC (HQC) standard, and modernized climatological summary products to replace the outdated Marine Climatological Summaries (MCS). TT-MOCS and TT-DMVOS were asked (i) to suggest how products will be served to users, e.g., through Responsible Members (RMs), ICOADS, and the WIGOS Pilot Project; including the role of Geographical Information Systems (GIS); and (ii) to discuss the desirability of new names to replace the data flow and MCS components of the outdated “MCSS” terminology.

2.3.1.3 The Team recalled the decision by the SOT to cease the VOS Climate Project (VOSClim), and integrate the VOSClim fleet into the wider VOS, and appropriate changes were subsequently incorporated into the forthcoming IMMT-IV format.

2.3.1.4 The Team recalled the recommendations from SOT-V, including in particular for the coding of swell and dew point temperature, which followed an inter-comparison of Electronic Logbooks (E-logbooks). The ETMC has then been involved in the refinement of those recommendations. The resulting recommendations were provided in writing to WMO Members in December 2009. E-logbook manufacturers have also been invited to implement the changes proposed in the E-logbook software in order for VOS observations produced by all types of E-logbooks to comply with the recommendations of the SOT and the ETMC.

2.3.1.5 The Team invited the SOT to make sure that the technical regulations as documented in appropriate WMO manuals and guides are properly being followed by the ship operators (**action; SOT; ongoing**).

2.3.1.6 The Team recognized that relative humidity sensors are increasingly being used by the VOS but that it was not always clear what algorithms were used to convert the measurements to dew point temperature, whether those algorithms were consistent with each other, and what were the sensor accuracies. It therefore stressed that the SOT operators should provide sufficient information concerning the relative humidity measurements through their national submissions to WMO-No. 47 (Pub. 47). The Team requested Elizabeth Kent (United Kingdom) and Scott Woodruff (USA) to liaise with the SOT Task Team on Instrument Standards, and investigate the requirements for humidity sensors, the current reporting practices for Pub. 47, identify possible problems, and make specific recommendations to the next SOT Session (**action; E. Kent, S. Woodruff; Apr 2011**).

## 2.3.2 Data Buoy Cooperation Panel (DBCP)

The Team noted the outcome of the Twenty-fifth Session of the Data Buoy Cooperation Panel (DBCP) was held in Paris, France, 28 September-1 October 2009. The following DBCP issues are of particular interest to the ETMC:

- The Panel is working on rationalization of collection of metadata from moored buoys to contribute, via JCOMMOPS, to the ODASMS operated by China. A format for the collection of metadata from moored buoys has been drafted;
- Discussions are underway for updating the BUFR template for buoy data;
- The Panel in cooperation with the ETWS initiated a Pilot Project on wave measurement evaluation and testing (PP-WET), which established the protocols for inter-comparison activities. Several national or agencies including Australia, Canada, United Kingdom and E-SURFMAR, and USA are participating in the inter-comparison projects. Efforts are being made to collect appropriate metadata from wave measuring buoys.
- The Panel is contributing to the JCOMM Pilot Project for WIGOS, and a review of relevant WMO and IOC Publications has been initiated.
- A new DBCP Technical Document that includes information on DBCP recommended quality control procedures has been drafted.

## 2.4 **JCOMM Services Programme Area (SPA)**

### 2.4.1 Results from the Fourth Session of the Services Coordination Group

2.4.1.1 The team noted the outcome of the Fourth Session of the Services Coordination Group (SCG-IV, Geneva, Switzerland, 11-13 March 2009).

2.4.1.2 The Group identified four major activity areas aligned with the Expected Results' process within both WMO and IOC, which needed to be initiated or kept going under what is now called the JCOMM Services and Forecasting Systems Programme Area (SFSPA), as following:

- (i) Technology transfer (e.g. wave forecasting systems, and provision by developed countries of related global and regional wave products and datasets);
- (ii) Expanding marine-related hazards forecasting and warning system (in a multi-hazard framework) for improved coastal risk management; and role of JCOMM in tsunami monitoring activities;
- (iii) Operational met-ocean forecasting system (wave forecast verification), and interactions with the Commission for Atmospheric Sciences (CAS) and its Working Group on Numerical Experimentation (WGNE) for the atmospheric-ocean coupling in support of enhancing the accuracy in weather and climate predictions;
- (iv) Service Delivery, and expansion of the Global Maritime Distress and Safety System (GMDSS) into the Arctic waters. The JCOMM Expert Team on Maritime Safety Services (ETMSS) and the JCOMM Expert Team on Sea Ice (ETSI) should work together for the full implementation of the weather-related Maritime Safety Information (MSI) by 2010/11.

2.4.1.3 In addition to its involvement with the Joint CCI-CLIVAR-JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI), the Team welcomed strengthening the cooperation with the ETWS and ETSI in developing wave and sea ice climatologies and indices.

2.4.1.4 The Team recalled the outcome of the World Climate Conference-3 (Geneva, August/September 2009) aimed at initiating a *Global Framework for Climate Services* (GFCS) to boost climate adaptation, which is intended to bridge the gap between climate information providers and users (see <http://www.wmo.int/wcc3>). The GFCS seeks to integrate climate observations, research, assessments and predictions in order to generate information and services required for factoring climate variability and change into socio-economic decision-making. Recognizing the considerable importance of the GFCS to WMO and UNESCO/IOC, and to their Members/Member States, as well as the potential role for JCOMM in climate services, the Team agreed that it should contribute to the GFCS and include related aspects in its work programme, as appropriate.

#### 2.4.2 Expert Team on Wind Waves and Storm Surges (ETWS)

2.4.2.1 The Team recalled the strong cooperation established with the Expert Team on Wind Waves and Storm Surges (ETWS), particularly in the development of the JCOMM extreme wave database and the co-organization of the Third JCOMM Workshop on Advances in Marine Climatology (CLIMAR-III, Gdynia, May 2008) to address wind wave and storm surge climatology issues. The ETWS also contributed to the ETCCDI on wave and surge indices, as part of a broader JCOMM contribution on surface and sub-surface marine climate indices, developed in a special session of CLIMAR-III.

2.4.2.2 The Team recalled the outcomes of the WMO Country-level Disaster Risk Reduction (DRR) survey<sup>5</sup>, related to the top ten hazards of concern, including storm surge, and the expressed need by 90% of the WMO Members for guidance on standard methodologies for monitoring, archiving, and analysing hazards. In this context, the Team agreed that there is a need for continuing to develop regional and global storm surge climatologies as a measure of risk assessment for marine hazards and to assist Members/Member States in developing their own databases and hazard analysis. A stronger collaboration between ETWS and ETMC to address these issues is required.

2.4.2.3 The Team requested Val Swail to represent the ETMC at the next DBCP Session and stress requirements to collect instrument/platform metadata for marine climatology purposes (**action; V. Swail; Sep. 2010**).

2.4.2.4 The Team noted the role of the ETWS in the development of the joint DBCP/ETWS Pilot Project for wave measurement evaluation and testing (PP-WET), and recalled that it was important

---

5 : [http://www.wmo.int/pages/prog/drr/natRegCap\\_en.html](http://www.wmo.int/pages/prog/drr/natRegCap_en.html)

to estimate biases of wave measurements for the purpose of producing wave climate summaries. The Team invited PP-WET members to investigate how they can address marine climatology requirements (**action; PP-WET; mid-2010**).

#### 2.4.3 Expert Team on Sea Ice (ETSI)

2.4.3.1 The Team agreed that interactions with the ETSI were needed in particular for the development of sea-ice climatologies. This aspect will be discussed under agenda item 7.2.1.

### 2.5 JCOMM Data Management Programme Area (DMPA)

#### 2.5.1 Results from the Third Session of the Data Management Coordination Group

2.5.1.1 The Team reviewed the Outcome from the Third Session of the Data Management Coordination Group (DMCG-III, Oostende, Belgium, 26-28 March 2008). In particular, that Group noted the significant progress towards developing ocean data standards, Table Driven Codes (TDCs), and rapid progress with the JCOMM Pilot Project for WIGOS.

2.5.1.2 At DMCG-III, ETMC reported on the reorganization of work with the creation of the two task teams TT-MOCS and TT-DMVOS. ETMC was asked to develop a database of extreme wave events in collaboration with ETWS, and extend the contents of the ICOADS (see agenda item 6.5.1).

2.5.1.3 ETMC was also invited to continue to address QC issues for surface meteorology and oceanographic measurements, and to help guide the development of the metadata pilot project for water temperature measurements (META-T). That metadata project will expand its view to include other instrumentation and variables.

2.5.1.4 DMCG-III recognized the collaborations between ETMC and ETWS, and between ETMC and ETSI, including through ETCCDI to develop marine climate indices (see agenda items 2.4.3, 3.3, and 7.2.1).

2.5.1.5 Similarly to ETMC, the JCOMM-IODE Expert Team on Data Management Practices (ETDMP) created a task team to continue the development of the End-to-End (E2E) technology, which will focus activities on supporting the WIGOS work. DMCG-III proposed refocusing the main work of ETDMP on standards development through managing the standards process.

2.5.1.6 The JCOMM Observations Programme Area (OPA) contributed to a document, which explains how marine data can be distributed in both real-time and delayed-mode. This will contribute to the catalogue of best practices that was assembled by JCOMM.

2.5.1.7 DMCG-III finalized the *Data Management Plan* as JCOMM/TR-No. 40 (JCOMM 2008b)<sup>6</sup>, and its associated implementation plan (available from the JCOMM web site<sup>7</sup>). The implementation plan requires regular updating, and the Team requested Scott Woodruff to review it and suggest changes if necessary in light of this Session's discussions (**action; S. Woodruff; 1 April 2010**).

2.5.1.8 The Team recalled that the DMCG-III requested an overview report on marine QC issues, focused on surface data reported by VOS and Research Vessels (R/Vs), to help initiate the process of standardizing QC (DMPA 2008). Possible broadened involvement has since been explored, but more work is needed to finalize the report for proposed submission to the IODE-JCOMM Standards process<sup>8</sup>. The Team recommended that a standard for the QC of surface marine data should eventually be submitted to the JCOMM/IODE standards process. The Team requested Scott Woodruff to discuss the suitability of the current report, and the feasibility of

6 : <ftp://ftp.wmo.int/Documents/PublicWeb/amp/mmop/documents/JCOMM-TR/J-TR-40-DM-Plan/J-TR-40-JCOMM-DM-Plan.pdf>

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

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

submitting it through the standards process, with Sissy Iona (**action; S. Woodruff; ASAP**).

## 2.5.2 JCOMM-IODE Expert Team on Data Management Practices (ETDMP)

2.5.2.1 The Team noted that JCOMM-III agreed on the need to expand the Terms of Reference of the ETDMP in order to cover a wider range of activities, and endorsed the proposal for sharing the activities of the ETDMP with the UNESCO/IOC-IODE Committee, including its membership.

2.5.2.2 JCOMM-III acknowledged the key role of the ETDMP in prototyping connections of oceanographic and marine meteorological data sets to, and the interoperability of, End-to-End Data Management (E2EDM) and the WIS, and recommended to pursue the very close collaboration of the JCOMM Pilot Project for WIGOS with the UNESCO/IOC-IODE Ocean Data Portal (ODP), the WMO Commission for Basic Systems (CBS) and the WMO Commission for Instruments and Methods of Observation (CIMO). It urged both the DMPA and the OPA to provide full support to the development of the Pilot Project, and requested the DMPA to ensure continuing cooperation between the UNESCO/IOC-IODE ODP and WIGOS in order to address the issue of uniformity of a user interface for access to data and information.

2.5.2.3 JCOMM-III also acknowledged the development of the IODE-JCOMM Ocean Data Standards Pilot Project (ODS) that is to be managed by the ETDMP to encourage and recommend the wide adoption of best practices and standards for broad community use. JCOMM-III adopted Recommendation 7.3/1 (JCOMM-III) – Development of Data Management Standards. In this regard, JCOMM-III stressed the importance of ensuring that the relevant communities be consulted on the usability and acceptability of candidate standards prior to their adoption, to ensure their effectiveness for target communities.

2.5.2.4 The Team noted with interest that the Pan-European infrastructure for Ocean & Marine Data Management (SeaDataNet) has been invited to submit standards through the JCOMM/IODE Standards process, e.g. Common Data Index (CDI), cruise summary report, QC for sea level data, Ocean Data View (ODV), and ASCII formats. Sissy Iona (Greece) reported that this topic would be discussed at the upcoming ETDMP-II meeting.

## 3. REVIEW OF CONTRIBUTIONS AND REQUIREMENTS OF THE WORLD CLIMATE PROGRAMME AND OTHER CLIMATE RELATED PROGRAMMES

### 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

3.1.1 The Team discussed requirements for marine climatological data and services in support of the WMO-IOC-UNEP-ICSU Global Ocean and Climate Observing Systems (GOOS and GCOS), and noted the recent development of the *Progress Report on the Implementation of the Global Observing System for Climate in Support of the UNFCCC 2004-2008* (GCOS 2009), and the preparation of the 2010 update (GCOS 2010) of the *Implementation Plan* (GCOS IP). The previous IP (GCOS 2004) together with its satellite supplement (GCOS 2006) served as the bases for that updated GCOS IP, thus recognizing progress and changes in the past five years in science, technology, user needs, and international coordination.

3.1.2 The Team noted discrepancies between the WMO/CEOS<sup>9</sup> database<sup>10</sup> of user requirements and what it considered were the most traceable and consistent data requirements for marine climatology relevant to GOOS and GCOS, i.e. those described in the Table A of Annex II of GCOS (1999), as reproduced here in [Annex V](#). The Team requested Scott Woodruff and Elizabeth Kent to develop a template for documenting the requirements for long-term marine surface

---

9 : CEOS: Committee on Earth Observation Satellites: <http://www.ceos.org/>

10 : <http://www.wmo.int/pages/prog/sat/Databases.html#UserRequirements>

physical observations, and liaise with ETSI, ETWS, the GCOS AOPC<sup>11</sup>/OOPC<sup>12</sup> Working Groups on Surface Pressure (WG-SP<sup>13</sup>) and on Sea-Surface Temperature and Sea-Ice (WG-SST/SI), and the World Climate Research Programme Working Group on Surface Fluxes, in the view to consolidate and update those requirements, and make appropriate recommendation to AOPC and OOPC for updating the WMO/CEOS database on observational requirements (**action; S. Woodruff/E. Kent; 15 April 2010**). The template should be circulated to the Team by e-mail for approval.

3.1.3 Additionally it should be possible to update the numbers of observations required as stated by GCOS (1999) based on more recent research on the calculation of uncertainty estimates for gridded datasets.

3.1.4 The Team requested the TT-MOCS to consider the potential for routine assessment of data adequacy in support of the periodic reviews of GOOS/GCOS (**action; TT-MOCS; ongoing**).

### **3.2 Review relevant outcomes from the OceanObs'09 conference (Venice, Italy, 21-25 September 2009)**

3.2.1 The Team reviewed relevant outcomes and recommendations from the OceanObs'09 conference (Venice, Italy, 21-25 September 2009). In particular, a number of Community White Papers (CWP), and a Plenary Paper on ocean data management relevant to the work of the Team were discussed. A summary of Data Management Expectations from the OceanObs'09 conference is provided in [Annex III](#).

3.2.2 The Team noted that the post-OceanObs'09 Working Group has been established to consider the plans and opportunities presented at the Conference and to propose a framework that will best serve the diverse sustained observing needs in the decade ahead. The provisional membership for the Group has been proposed and JCOMM is represented by OPA (Candyce Clark, David Meldrum). The Team requested the Secretariat to liaise with the chair of OPA and investigate how the ETMC can contribute to the work of this Working Group, and to report to the Chairperson of the ETMC (**action; Secretariat; ASAP**).

### **3.3 Existing and potential linkages with the WMO Commission for Climatology (CCI)**

3.3.1 The Team discussed existing and potential linkages with the WMO Commission for Climatology (CCI).

3.3.2 In particular, the current JCOMM representatives on the Joint CCI-CLIVAR-JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI), i.e. Scott Woodruff, Elizabeth Kent, David Parker, and Val Swail, had presented the results developed from the marine climate indices discussion session at the CLIMAR-III workshop, to the Third Session of the ETCCDI (De Bilt, The Netherlands, 13-16 May 2008). The presentations were generally well received, particularly by the CCI component of ETCCDI. The modelling group within ETCCDI had some difficulty relating to the marine climate indices described since models are presently not capable of producing this information, so the task of comparing model results with observations could not be carried out. In subsequent discussions about JCOMM's continuing role in ETCCDI, it was suggested that the representation be modified somewhat to include expertise from both surface and sub-surface observations, climate change detection activities, climate indices and ocean climate modellers.

3.3.3 The Commission for Climatology was represented by Dr William Wright, an Expert Team Leader in the Data and Data Management Open Programme Area Group (OPAG) during the last Intersessional Period (IP), and recommended as a co-chair in CCI's Data Management Open Panels of CCI Experts (OPACE) during the next IP. Dr Wright outlined current draft plans for the Commission for Climatology, which will be discussed at the upcoming CCI XV meeting in Antalya,

---

11 : AOPC: Atmospheric Observation Panel for Climate: <http://www.wmo.ch/pages/prog/gcos/index.php?name=AOPC>

12 : OOPC: Ocean Observations Panel for Climate: <http://www.wmo.ch/pages/prog/gcos/index.php?name=OOPC>

13 : [http://www.esrl.noaa.gov/psd/gcos\\_wgsp/](http://www.esrl.noaa.gov/psd/gcos_wgsp/)

Turkey on 19-24 February. He related them to some ETMC activities where he believed there could be scope for collaborative work, and invited ETMC members to nominate issues they'd like raised at the meeting.

3.3.4 Dr Wright explained that CCI would seek to align its activities with the emerging Global Framework for Climate Services (GFCS) which had the aim of “strengthening the production, availability and application of science-based climate prediction and services,” including a focus on user interaction. Other strategic thrusts identified by Dr Wright included CCI’s desire to ensure “fit for purpose” climate data in support of all climate applications and services, including the increased use of space-based and other remotely-sensed data. He also identified the development of WMO- and ISO-compliant data and metadata standards suitable for the Climate Program; capacity building; and data rescue as key data management priorities in the next Intersessional Period. Another focus for CCI was the development and deployment of improved Climate Data Management Systems (CDMSs) as a means of ensuring improved access to reliable, well managed climate data, particularly from developing and least developed countries, and the planned role of CDMSs in implementing capacity in new WMO systems and standards, including WIS and BUFR encoding.

3.3.5 Dr Wright outlined several areas of potential collaboration between the ETMC and CCI, noting the desire to adopt a coordinated approach to marine and environmental data and data management. The Team agreed with this approach. Areas identified included: 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. He also invited ETMC to consider whether some of their needs could be met via PC-based CDMSs. In reply, ETMC members requested that CCI be asked to discuss how more effective arrangements for collaboration on the development of climate indices could be put in place. They also noted that the establishment of BUFR as the WMO standard for encoding data from ships was, and would remain, problematic until the actual requirements for information to be encoded were fully spelt out by WMO.

3.3.6 The Team also discussed potential connections with other CCI Expert Teams in light of informal discussions that took place in May 2008 (in conjunction with CLIMAR-III) among Scott Woodruff (Chair, ETMC), Val Swail (Chair, ETWS), Bob Keeley (Chair, DMCG), Elanor Gowland (former member ETMC, and GCC representative), Craig Donlon (former Chair, SCG), and Etienne Charpentier (WMO Sec.). These discussions addressed future directions for marine climatology in the context of the WMO strategic plan, which were anticipated to fall mainly under Expected Results (ER) 4 (Integration of WMO observing systems), and 5 (Development and implementation of the new WMO Information System). The informal discussion group had agreed with some directions and priorities for marine climatology in general:

- Modernization of the Marine Climatological Summaries Scheme (MCSS). This will be jointly undertaken by TT-MOCS, offering the potential for organizational links to the ETCCDI; and by the cross cutting TT-DMVOS. The latter Task Team will also eventually link to the JCOMM Pilot Project for WIGOS.
- Develop a Pilot Project for creation of a value-added version (e.g., bias corrected) of the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). This will include consideration of establishing interoperable *in situ* and satellite climatologies and products (e.g. the Group for High Resolution SST – GHRSSST). This links naturally with the WMO Information System, and the development of interoperability arrangements with WIS through WIGOS.
- Integration of sea-ice and wind waves and storm surges climatologies through (i) liaison with the ETCCDI, ETSI, and ETWS, and (ii) consideration of new data management (e.g. global wave climatology atlas – ERA-40 wave atlas<sup>14</sup>).
- Development of a higher level of QC as tasked to the TT-DMVOS and TT-MOCS.

---

14 : <http://www.knmi.nl/waveatlas>

- As agreed at the TT-DMVOS/TT-MOCS planning meeting 10 May 2008, the limited near-term focus of TT-MOCS would be on climatologies, which fits well with preceding bullets related to climatologies.
- Seeking to reconcile, to the extent practical, the different data management requirements of early historical, contemporary delayed-mode, and real-time marine data.

3.3.7 The informal discussion group had agreed that stronger links should be established between JCOMM and CCI and synergies further developed.

3.3.8 The Team agreed with the general spirit of the discussions from the informal discussion group but noted that its recommendations did not lead to any practical restructuring of the ETMC at JCOMM-III nor CCI as foreseen for its fifteenth Session (CCI-XV, Antalya, Turkey, 19-24 February 2010). In parallel, the team noted that the CCI is planning at its CCI-XV to substantially restructure itself into a more flexible structure of four Open Panels of CCI Experts (OPACEs) building from a large pool of volunteers. This is to consider in particular the need to be flexible and adaptable to new priorities to support the eventual recommendations of the Global Framework for Climate Services (GFCS) high-level task force. The four foreseen OPACEs are (1) Climate Data Management; (2) Global and Regional Climate Monitoring and Assessment; (3) Climate Products and Services; and (4) Climate Information for Adaptation and Risk Management. It is planned to establish under OPACE-1 an Expert Team on Climate Database Management Systems (ET-CDBMS) replacing the current ET1.1 and re-establish the ETCCDI under OPACE-2. Other climate data and monitoring aspects such as Data Rescue, Observing Requirements and Standards for Climate and Climate Monitoring activities including long term homogenous data sets, operational monitoring of weather and climate extremes; and Climate Watch Systems are expected to be planned by projects for which Task-Teams should be constituted during the next intersession period by OPACE-1 and OPACE-2 on ad-hoc basis.

3.3.9 The Team agreed that it should explore with the CCI opportunities to develop climate indices on a broader basis than just ETCCDI. The Team requested Val Swail to provide William Wright with the list of marine indices proposed by JCOMM in the view to present them to the CCI Management Group (***action; V. Swail; ASAP***).

## **4. DATA AND METADATA: OPERATIONAL FLOW**

### **4.1 Results of the ETMC GTS comparison (using December 2007 data)**

4.1.1 The Team reviewed the results of comparison of GTS data from different GTS data streams conducted for the month of December 2007. There were differences in the contents of the streams in terms of the reports present and absent in each data stream. Some similar reports (same position, time and callsign) were found to differ in some elements; the reasons for this are not always clear, but probably include reports being corrected and sent again by the ship, with particular elements being added or excluded.

4.1.2 Difficulties with the BUFR data stream archived by the UK Met Office meant that considerable time was expended before it was concluded that a comparison including this stream was not practical in the time available. A comparison of the GTS and delayed mode data stream has therefore not yet been carried out and would be extremely valuable. Further work may allow the Met Office data stream to be included in this comparison, if that was thought to be worthwhile.

4.1.3 Moreover, additional GTS data streams could potentially be included in a follow-up comparison, including the more heavily processed NOAA National Centers for Environmental Prediction (NCEP) BUFR (plus attached original FM13 and other message string) data now used as the primary GTS input for ICOADS<sup>15</sup>, which have been subject to a “dup-merge” processing in

---

15 : <http://icoads.noaa.gov/rt.html>

which exact duplicates were removed and partial duplicates blended to create more complete BUFR reports.

4.1.4 The Team made the following recommendations:

- (a) When using GTS data in the climate record data streams from multiple centres should be merged. In doing this the number of observations in the record can be increased by 3–5%.
- (b) The BUFR template as used by the Met Office introduces differences to reports, which make it hard to compare with the original FM13 data.
- (c) The merged GTS data stream should be compared to the delayed mode data stream to determine whether any of the unresolved report differences can be understood using quality controlled data. Any "close match" report elements which differ and for which the reason cannot be determined should be marked as suspect in the climate record.

4.1.5 The Team requested Elizabeth Kent to provide the results of the December 2007 GTS data inter-comparison to the data centres that had provided the evaluated data sets, ask them to provide feedback regarding the identified problems, and then analyse the information collected in the view to make further recommendations (**action; E. Kent; Apr 2010**). Depending on the results from these investigations, the Team agreed that another inter-comparison of GTS data might eventually be needed, e.g. based on GTS data from NCEP, the NOAA National Climatic Data Center (NCDC), the Deutscher Wetterdienst (DWD), the Japan Meteorological Agency (JMA), the European Centre for Medium Range Weather Forecasts (ECMWF), and the United Kingdom Met Office—to cover a more recent period, and see whether the results would be consistent with the December 2007 survey.

## 4.2 Review of the BUFR (and other) templates for VOS and other surface marine data

4.2.1 The Team discussed BUFR encoding requirements and template development status for ship data and other marine data, including the work by the DMPA Task Team on Table Driven Codes (TT-TDC)<sup>16</sup> and the former SOT Task Team on Coding. This discussion was connected with the related issues of (a) standards for data transmission from ship to shore, and (b) Automatic Identification System (AIS) binary weather messages, and the desirability of convergence as practical with those separate requirements.

4.2.2 Much discussion took place since the last ETMC meeting with regard to the development of a new BUFR template for VOS data that would take a wide spectrum of requirements into account, including those expressed by the ETMC and the need to transmit metadata in real-time as proposed by the META-T Pilot Project. The Team reviewed the proposal from TT-TDC, and recommended the following elements and features for inclusion in the new template:

- Essential VOS<sub>clim</sub> elements (e.g. for bias adjustment);
- A flag to indicate whether cloud data were originally recorded in Oktas or percentage before encoding in BUFR reports;
- It must be possible to derive heights of sensors above deck and above water (e.g. gives an indication of how clear the sensor is of the deck and potentially other obstructions as this information cannot always be derived from WMO-No. 47 records).
- Provision for reporting both the wind at anemometer height and at 10m (including method of height adjustment if any);
- Wind measurement system and possibly associated quality information;
- Time of last GPS fix if different from report time.

4.2.3 The Team agreed that the TT-TDC was a good mechanism for addressing the coding issues in terms of marine climatology requirements, and for interacting with the CBS in this regard.

---

<sup>16</sup> : <http://www.jcomm.info/tdc>

4.2.4 The Team stressed that the recording and distribution of the original data was essential to meet the requirements for marine climatology. For example, the Team agreed that the NCEP practice of attaching the original FM13 (and other original message formats including FM18) data to BUFR reports was extremely valuable and that the practice should be more widely encouraged. It invited the SOT to address the issue of making the original data available in FM13 or other format as appropriate (e.g. IMMT plus some IMMA elements) through attachment to BUFR reports in the view to make specific recommendations to Members in this regard.

4.2.5 The Team also recognized that the issue of preservability of the real-time data could be addressed at three different levels and clear guidance should be proposed for each of those steps:

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 is 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.

4.2.6 The Team formed a small group comprised of Frits Koek (lead, Netherlands), Gudrun Rosenhagen (Germany), Shawn Smith (USA), Elizabeth Kent (UK), Nicola Scott (UK), and Scott Woodruff (USA) to address each of those levels, and make proposals to the SOT 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; Apr 2011**).

*AIS Binary Messages:*

4.2.7 The Team reviewed the status of recent developments with regard to the Automatic Identification System (AIS) and its use to exchange ship observations. The SOT has been working with IMO on the development of an AIS message format for observing ships taking into account the SOT recommendation to adapt the format to reflect BUFR code requirements where possible.

4.2.8 Taking the SOT recommendations into account, a document with guidance on the use of AIS application-specific messages will be submitted to the International Maritime Organization (IMO) Maritime Safety Committee (MSC) meeting in May 2010 for formal approval as a new Safety of Navigation (SN) Circular. The AIS message format for the WMO weather observation report is contained in Table 10.2 "WMO Weather observation report from ship", and the relevant BUFR descriptors are currently shown against each parameter. The Team noted the following:

- The time resolution is 10 minute and, it is now proposed that Latitudes and Longitudes should be measured to BUFR coarse accuracy of 1/100 degree;
- A square function is used for horizontal visibility and cloud height, and offsets are used for some parameters e.g. for temperatures in degrees Kelvin;
- Parameters have also been added for those VOSclim elements that can realistically be reported, e.g. heading (HDG), course over ground (COG), speed over ground (SOG), and relative wind direction and speed (RWD and RWS);
- This revised format allows a level of harmonisation with the format E-SURFMAR is currently developing for future autonomous shipborne Automatic Weather Station (AWS) systems.

### 4.3 Review of electronic logbooks

4.3.1 Members operating the VOS have been encouraged to use electronic logbooks (E-logbooks) such as ObsJMA (developed by Japan), SEAS (USA), and TurboWin (Netherlands). It is essential that amendments on codes and formats be carefully coordinated and accommodated in a timely fashion in the E-logbooks. The Team was presented with the processes currently used to

modify some E-logbooks, and to document, archive, and harmonize the computational algorithms (e.g. for computed quantities such as dew point temperature).

4.3.2 The Team reviewed the results from the E-logbook inter-comparison that has been conducted recently by the SOT, and the recommendations resulting from this exercise as presented to the fifth session of the SOT. In particular, the Team endorsed the following recommendations:

- (i.) that all E-Logbook software report dew point temperature to one decimal place.
- (ii.) that the algorithm for calculating dew point temperature be standardised between E-logbooks according to WMO technical regulations and approved by ETMC.
- (iii.) that ETMC approve the swell coding options and should follow the proposed guidelines;
- (iv.) that all E-logbook software provides more information on screen to aid in the selection of correct code figures for visibility (VV) and height of base of lowest cloud (h) when the ranges and heights are at the boundaries of the levels. Refer to the *Manual on Codes* (WMO 1995) FM13-XII Ext. SHIP. For VV refer to WMO code table 4377 and note that if the distance of visibility is between two of the distances given, the code figure for the smaller distance shall be reported. For h refer to WMO code table 1600 and note that a height exactly equal to one of the values at the ends of the ranges shall be coded in the higher range.
- (v.) that SEAS and TurboWin prompt for the entry of ship speed if it is not entered.

4.3.3 SOT-V also requested E-logbook developers to consider adding the functionality to transmit periodic administrative messages containing all known category 1 and 2 metadata proposed by the META-T Pilot Project.

4.3.4 For climate applications, SOT-V had encouraged SOT members developing and maintaining E-logbooks to preserve the source code of historical versions of E-logbook systems, and recommended that 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.

4.3.5 The Team noted that a web page<sup>17</sup> has been set up on the WMO web site for the purpose of documenting algorithms used for the computation of dew point temperature using e-logbooks, and a template proposed for describing the algorithms. E-logbook manufacturers have been invited to complete the template with the present and past versions of their E-Logbook algorithms, along with their periods of validity, and submit these templates to the WMO Secretariat for posting on the WMO web site. The Chair of the SOT Task Team on Instrument Standards will be reviewing, in consultation with the ETMC, the dew point temperature algorithms currently in use with a view to eventually getting agreement on a common algorithm for use in all E-Logbooks.

4.3.6 The Team noted that WMO Members have been 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.

4.3.7 The Team noted with concern the existence of some QC procedures that could potentially prevent real observations from being recorded and distributed (e.g. using correlation between wind and wave data, the QC might reject true wave observations in certain conditions where the wind is high while the sea is calm). The Team agreed that whenever there are possible ambiguities, the E-logbook software should always leave the possibility for ship observers to confirm the reality of the observed variables when the automatic QC was about to reject them.

4.3.8 The Team invited JMA to consult with the ETMC chair and seek guidance regarding the calculation methods that must be used for the recording of VOS observations using ObsJMA e-logbook software (**action; JMA; ASAP**). Similarly, the Team requested Australia and E-SURFMAR to investigate after what period the original call sign could be released for the delayed mode data

---

17 : <http://www.wmo.int/pages/prog/amp/mmop/JCOMM/OPA/SOT/dewpoint-algo.html>

(**action; BOM, E-SURFMAR; ASAP**).

#### 4.4 Ship call sign masking (including encode proposal)

4.4.1 The Team recalled developments since ETMC-I regarding the issue of masking of ship's identification within FM13 SHIP reports that followed concerns expressed by ship owners and masters with regard to ship's identification and position being made available via public websites. In particular, the WMO Executive Council adopted Resolution 27 (EC-LIX) authorizing Members, under certain conditions, to mask the identification of the ship from VOS reports being exchanged in real-time. The SOT defined four different schemes that permitted to address implementation of Resolution 27 (EC-LIX), i.e. REAL<sup>18</sup>, SHIP<sup>19</sup>, MASK<sup>20</sup>, and ENCODE<sup>21</sup>. The team noted that no action has been taken so far regarding possible technical solutions for the ENCODE callsign masking scheme.

4.4.2 The Team discussed the current status of this issue, and reviewed a preliminary proposal to encode ship call signs. The Team concluded that an encoding scheme for ship call signs that includes latitude and longitude was definitely achievable using for example a symmetric encryption scheme like Advanced Encryption Standard (AES) 256, which is a solid encryption scheme that can be easily implemented via open source methods (i.e. Open Source toolkit for the Secure Sockets Layer – OpenSSI – via perl). Indeed, the parties that need to encrypt and decrypt the messages would be known in advance, and key distribution would be manageable, so an encoding scheme that would rely on the use of private and public key, such as GNU Privacy Guard (GnuPG, also known as GPG), would add unnecessary complication.

4.4.3 Based on the feedback from the ETMC meeting, the Team requested Scott Woodruff to refine an ENCODE proposal to be submitted to the SOT Task Team on ship call sign masking (**action; S. Woodruff; Jun 2010**). In particular the proposal should include information about the encryption scheme to be used, proposed BUFR descriptor(s) (including bit-length of the descriptors), and recommendations regarding the governance and management of the encoding/decoding keys.

*Impact of ship masking for the ICOADS, and related issues:*

4.4.4 Currently, ICOADS utilizes as its primary marine GTS source BUFR data, including attached original message(s) (e.g. FM13 or FM18), provided monthly by the NOAA National Centers for Environmental Prediction (NCEP). These “dumped” BUFR data are subjected to a “dup-merge” processing at NCEP in which exact duplicates are removed and partial duplicates blended to create more complete BUFR reports, thus a single BUFR message may have attached one or more original messages. Effective with the NCEP files for December 2007 and onward, because of the introduction during that month of new ship masking procedures by Japan and the US (and since NCEP does not have the mandate to implement selective unmasking based on confidential time-varying lists), all ship reports have their BUFR IDs reset to the string “MASKST.” (The attached original FM13 message(s) also have their ID fields masked out, in this case with a string of X's in place of the original ID field length.) In the future, alternative US or international GTS sources, such as from the NOAA National Climatic Data Center (NCDC), may alleviate the wholesale masking problem in the NCEP data, once more thoroughly validated (e.g. unmasked IDs are left intact in the NCDC source). Also, after a 90-day delay ICOADS receives from the NOAA VOS Program, unmasked reports (FM13) that were originally masked over GTS, which will benefit delayed-mode ICOADS updates. The Team requested Japan 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 (**action; Japan; end 2010**).

---

18 : REAL: Official ITU callsign of the ship (i.e. unmasked).

19 : SHIP : Non-unique identifier. The callsign is unilaterally replaced by the letters “SHIP”. USA and Japan are using this scheme, and are distributing the data through a secured parallel system for authorized legitimate users.

20 : MASK : Unique, repeating identifier. The masking identifier is assigned by the NMS that recruited the ship. This scheme is being implemented by Australia, and European countries participating in E-SURFMAR

21 : ENCODE : Unique, non-repeating identifier. The identifier is derived from encrypting elements in the message, e.g. callsign + latitude + longitude.

4.4.5 Coincident with the latest ICOADS Release 2.5 (1662-2007) (Woodruff et al. 2010b) is also a new procedure to extend ICOADS to near-real-time: providing IMMA records based on the best available GTS receipts (currently based exclusively on the NCEP data). This forward extension to ICOADS is updated monthly, and lags real-time by two to six weeks. These data are subjected to basic quality checks and to the maximum extent possible the IMMA core fields are populated. This product is replacing an existing near-real-time ASCII-formatted product containing only a limited selection of data fields.

#### *Role of the GCCs:*

4.4.6 As discussed in the [pre-final] OceanObs'09 Community White Paper, *Surface In situ Datasets for Marine Climatological Applications* (Woodruff et al. 2010a), one important change from the current data flow is the additional responsibility for GTS data (including proposed future buoy data) collection. Besides offering the potential to construct an optimal combined GTS/DM VOS data mixture, the GCCs could provide a secure environment for data processing, which may help in dealing with the callsign masking issue. The combination of several GTS data sources should allow the construction of the most complete and highest quality GTS data stream.

## **4.5 Status of the WMO Ship Catalogue (WMO-No. 47)**

4.5.1 The Team recalled that following the Team's First Session (ETMC-I, 7-10 July 2004, Gdynia, Poland), SOT assumed responsibility for future revisions to WMO-No. 47 (Pub. 47), with ETMC assuming an advisory role, as appropriate. The Team was presented with the status of the WMO database and future plans, including prospects for implementation of changes more recently proposed by SOT to Pub. 47, and for more timely metadata availability and updates.

4.5.2 The Team noted that a range of Pub. 47 XML Generator tools, modelled on those used by the Australian Bureau of Meteorology, had been developed to assist VOS Programme Managers and PMOs to collect the requisite Pub. 47 metadata, and to provide it to WMO in XML metadata exchange format. These tools are in the public domain for the benefit of members, particularly those without a national VOS database, or those lacking the capability to produce an XML file for Pub. 47 metadata from their national VOS database.

4.5.3 In addition, the E-SURFMAR VOS on-line database is able to manage online the Pub. 47 metadata, as well as the "masked" callsigns. It permits to prepare national input for Pub. 47. SOT-V invited non-European VOS operators to add metadata for their fleets into the database, and Australia and New Zealand are currently using it.

4.5.4 The Team noted, and endorsed, the recommendations from SOT-V regarding the management of Pub. 47.

4.5.5 The Team also noted the following decisions by JCOMM-III:

- JCOMM-III endorsed the proposals from the Ship Observations Team (SOT) relating to modifications to Pub. 47, including metadata requirements, and urged that these be considered by the WMO Executive Council, at its sixty-second session (Geneva, June 2010). The revised Pub. 47 Metadata Version 03 document (version 3.3) is available from the VOS website<sup>22</sup>.
- Considering that the management of Pub. 47, its updating and timeliness, has been a matter of concern in the last few years, JCOMM-III requested the SOT to discuss with CBS how ship metadata could be managed in the future, and agreed in principle that: (1) the regulatory part of Pub. 47 (i.e. the description of the procedures for submitting input, including format, and for making Pub. 47 metadata available to end users) be included in the future *Manual on WIS or WIGOS*; and (2) the metadata management (i.e. the database

---

22 : [http://www.bom.gov.au/jcomm/vos/documents/pub47\\_documentation\\_version3.pdf](http://www.bom.gov.au/jcomm/vos/documents/pub47_documentation_version3.pdf)

itself, and the metadata content) be operated by an operational centre as part of the WMO Information System (WIS).

4.5.6 The Team requested the secretariat to circulate to Team members information about where the informal copies of the Pub. 47 (i.e. E-SURFMAR, JCOMMOPS) can be obtained (**action; Secretariat; ASAP**).

4.5.7 The Team noted that JCOMM-III had approved changes to the *Guide to Marine Meteorological Services* (WMO 2001a) to describe the conditions under which the digital images, sketches and drawings must be provided with the metadata for Pub. 47. Those conditions were made optional by JCOMM-III hence permitting as wide as possible participation of vessels in the VOSCLIM fleet.

## 4.6 Status of buoy and other Ocean Data Acquisition System (ODAS)<sup>23</sup> metadata

### 4.6.1 Report from META-T Pilot Project and JCOMMOPS

4.6.1.1 The Team reviewed latest developments regarding the Water Temperature instrument/platform Metadata Pilot Project (META-T). This activity is essentially promoting the collection of metadata through the real-time data flow, and developing two mirrored metadata servers based in USA (NDBC) and China (NMDIS). The Team noted with appreciation that BUFR templates are being updated to increase the number of metadata delivered in real-time. In particular, a BUFR template for XBT data has been completed and agreed upon by the CBS Inter Programme Expert Team on Data Representation and Codes (IPET-DRC).

### 4.6.2 Report from ODAS metadata centre

4.6.2.1 The Team reviewed the status of the Ocean Data Acquisition Systems (ODAS) metadata system, which has been hosted for several years by the National Marine Data and Information Service (NMDIS), China. In particular, JCOMM-III agreed with the transfer of the *On-line Information Service Bulletin* on non-drifting ODAS – currently operated by Integrated Science Data Management (ISDM), Canada – to the ODASMS. Efforts are needed across JCOMM to gather current and historical ODAS metadata to be included into this or other databases (e.g., Pub. 47 or JCOMMOPS).

4.6.2.2 the Team recalled that JCOMM-III recognized that metadata are important in a number of domains including climate applications and research (e.g. bias correction), and operational applications, permitting amongst other things to interpret the data correctly, ensure traceability to standards, enhance coherence of data records, and facilitate quality monitoring activities. JCOMM-III therefore stressed that its Members/Member States should routinely provide the metadata content on a routine basis and adopted Recommendation 7.1/1 (JCOMM-III) – Provision of ODAS and Water Temperature Metadata.

4.6.2.3 The Team noted that the DBCP is currently working towards documenting the existing moored buoy systems operated by buoy operators, recognizing that there was at present no collection of the relevant information (metadata) on these moored buoy systems. An initial list starting from the relevant parameters included in the JCOMM ODAS Metadata structure (Version 1.1)<sup>24</sup> has been compiled. A number of additional parameters have subsequently been suggested (for example as needed by the DBCP Pilot Project on wave evaluation and testing – PP-WET). The initial list should be completed by the next DBCP Session, and discussions are underway with

---

23 : An Ocean Data Acquisition System (ODAS) is defined as “a structure, platform, installation, buoy or other device, not being a ship, together with its appurtenant equipment, deployed at sea essentially for the purpose of collecting, storing or transmitting samples or data relating to the marine environment or the atmosphere or the uses thereof” (UNESCO/IMCO, 1972, p.10.). The WMO Secretariat suggests that this could be interpreted to include, but not be limited to, drifting and moored buoys, profiling floats, lighthouses and light vessels, observing towers and platforms, oil rigs, land-based automatic stations which have been allocated international ocean data buoy identifier numbers (or national identification numbers, as is the case with Coastal-Marine Automated Network [C-MAN] reports from NDBC), ice drift buoys, light vessels, and buoys mounted on ship.

24: Available from <http://icoads.noaa.gov/etmc/documents.html>.

JCOMMOPS and other related parties to investigate how best such a metadata database might be developed, populated and maintained, and in order to investigate the potential resource implications for JCOMMOPS. Metadata collected by JCOMMOPS are eventually made available to the ODASMS.

4.6.2.4 The Team recognized that the ODASMS was probably not used to its potential, and recommended that a Pilot Study be made by the USA to investigate the current content of the ODASMS and META-T servers in terms of metadata from operational observing platforms reporting during a given month, in order to explore the feasibility to populate ICOADS with identified ODAS metadata. The Pilot Study should permit to identify possible problems (e.g. missing information, access, formatting) and to make specific recommendations for improving the ODASMS and META-T servers. The results from the study should be reported to the next DBCP Session (**action; USA; Sep 2010**).

#### 4.6.3 Rig and platform metadata issues

4.6.3.1 The Team discussed the issue of the management of instrument/platform metadata from rigs and platforms. Particularly, JCOMM-III noted that the ETMC and the Ship Observations Team (SOT) had different views about where information about manual observing systems on “rigs and platforms” should be recorded (in ODAS or in WMO-No. 47), and strongly recommended that a coordinated strategy for the preservation and archival of metadata associated with ocean rigs and platforms be devised.

4.6.3.2 It was recalled that ETMC-I had agreed that, on a temporary basis, mobile offshore platforms should be subject to Pub. 47 metadata requirements, whilst fixed platforms should be subject to ODAS metadata requirements. Later, ETMC-II considered that *‘for rigs and platforms, manual observing-systems should be treated as a “ship” and their metadata included in the Pub. 47; automated systems onboard rigs and platforms should be treated as a “buoy” and their metadata included in the ODASMS.’*

4.6.3.3 The Team recalled the SOT position that that Pub. 47 should be restricted to essentially mobile ships, and that rigs and platforms (except perhaps mobile drilling rigs which are ship-shaped and lent themselves more to the Pub. 47 format type) should be reported under the ODASMS. According to the SOT, the Pub. 47 format was not entirely suitable for fixed platforms. However, it must be noted that metadata from some of the ODAS are being made available to WMO for inclusion in Pub. 47 by a few WMO Members (e.g. instrumented oil rigs operated by UK), but the WMO Secretariat would need to confirm whether those metadata were actually preserved in Pub. 47 presently.

4.6.3.4 The Team agreed that the rigs and platforms data may be difficult or impossible to identify in GTS data (and thus in climate databases such as ICOADS) and are not necessarily monitored by JCOMM groups such as the DBCP or the SOT. So a mechanism for collecting such data is needed. Because the observing and reporting practices for the manual observations made from rigs and platforms are very similar to those of VOS observations, the Team suggested that the SOT should eventually become responsible for rigs and platforms. At the same time, because of the cross cutting nature of the problem, which is of interest to both the DMPA and the OPA, the Team invited the Management Committee to discuss the consideration of including rigs and platforms as part of the Terms of Reference of the SOT (**action; MAN; Nov 2010**).

4.6.3.5 The Team noted that the *Guide to the Global Observing System* (WMO 2007) states in Part III, paragraph 3.2.1.3.2.3 under (d) Identification that *“Fixed and anchored platform stations are identified as ships and included in the International List of selected, Supplementary and Auxiliary Ships (WMO No. 47) and contain appropriate explanatory notes.”*

4.6.3.6 The Team agreed that a universally accepted solution to JCOMM should be proposed and agreed upon between the ETMC and the SOT. The Team considered that the manual observations from rigs and platforms were of similar nature of the VOS observations, and that it would be quite

appropriate for their metadata to be included in Pub. 47. The Team requested the ETMC Chairperson to contact the SOT Chairperson and discuss the issue in the view to find an acceptable agreement to both groups (*action; S. Woodruff; Jun 2010*).

## 5. DATA QUALITY AND EXCHANGE

### 5.1 Overview from the Task Team on Delayed-Mode Voluntary Observing Ship data (TT-DMVOS)

5.1.1 Ms Nicola Scott reported on the activities of the JCOMM cross cutting Task Team on Delayed Mode VOS Data (TT-DMVOS). She recalled that the DMCG-II and ETMC-II acknowledged the need to modernise the current Marine Climatological Summaries Scheme (MCSS). The second Session of DMCG (DMCG-II, Geneva, Switzerland, 10-12 October 2006) formally established the TT-DMVOS, and the Third Session of the DMCG (DMCG-III, Ostend, Belgium, 26-28 March 2008) formally established the JCOMM/DMPA Task Team on Marine Meteorological & Oceanographic Climatological Summaries (TT-MOCS) to investigate and initiate the work required. Terms of Reference of TT-MOCS and TT-DMVOS are provided in [Annex XIII](#) and [Annex XIV](#) respectively.

5.1.2 TT-DMVOS has held two meetings (Gdynia, Poland, 10 May 2008; and Venice, Italy, 22 September 2009) working towards modernization of the data flow component of the MCSS (the Climatological Summaries function under the MCSS will be discussed separately, under Agenda Item 7).

5.1.3 The TT-DMVOS coordinated the issue and analysis of replies from two questionnaires to the Contributing Members (CMs) and the Responsible Members (RMs) regarding the collection and distribution of marine climatological data. The actual number of meteorological services willing to contribute their data to the MCSS appeared to be significantly less (i.e. 26) than the 41 CMs previously thought to be part of the scheme but the GCCs now know which CMs to contact to help with their submissions. It was noted that RMs were generally keen to continue their involvement in the MCSS. Results of the questionnaires were considered while designing the future data flow, and a number of detailed new proposals developed.

5.1.4 The Team noted with appreciation that significant proposals have been thoroughly discussed and a future framework for data flow and QC was been agreed on (i) future data flow, (ii) Higher Quality Control Standards (HQCS), and (iii) revisions of IMMT and MQCS with new IMMT-IV and MQCS-VI approved by JCOMM-III. In light of technology advances and reducing duplication of effort, a new data flow is proposed (see agenda item 5.4.1).

5.1.5 In particular, the TT-DMVOS identified the potential benefits of the GCCs becoming more proactive in data collection. During 2009 the GCCs have approached several CMs in an attempt to provide help/advice in submitting their VOS data to the international archive. As a result of these collaborations three CMs (Ireland, Israel and Sweden) have contributed their data, which otherwise would not have been possible (and Greece will soon be contributing also). The Team thanked DWD (Germany) for the digitisations and conversions that they have carried out to help make this possible.

5.1.6 The future HQCS as proposed by the TT-DMVOS will be conducted by the GCCs prior to archival of data and will primarily be based on an automated system comprising of various quality control measures. The Team agreed that the proposed system should eventually include the following:

1. Advanced MQC checks/flagging
2. Climatology comparisons
3. Real-time Monitoring Comparisons
4. NWP Model Output comparisons
5. Satellite Comparisons

5.1.7 The Team discussed what and/or where would be a suitable storage system for the MCSS data. It is important that this be a single storage point, which is easily accessible to users and interoperable with the WIS.

5.1.8 The Team endorsed the remaining elements of the 2007-2010 workplan as proposed by the TT-DMVOS, which is provided in [Annex XV](#).

5.1.9 Recalling the recommendation of SOT-V that VOSCLim practices should be extended to the wider VOS, the Team recommended that the VOSCLim Real Time Monitoring Centre (RTMC) should be requested to provide monitoring data for all VOS to the DAC for extended integration into ICOADS. It was further requested that the RTMC consider whether this could be extended to buoy data and investigate the potential for populating the model comparison fields using archived data. The Team requested Scott Woodruff to contact the RTMC and address the issue (**action; S. Woodruff; ASAP**).

## **5.2 Status of the International Maritime Meteorological Tape (IMMT) format and the Minimum Quality Control Standard (MQCS)**

5.2.1 The Team recalled that the Global Collecting Centres (GCCs) under the Marine Climatological Summaries Scheme were established by Recommendation 11 (CMM-XI) (Lisbon, April 1993). Germany and the United Kingdom have been operating the GCCs and have responsibility for the upkeep of the International Maritime Meteorological Tape (IMMT) format and Minimum Quality Control Standard (MQCS).

5.2.2 The Team noted with appreciation that the IMMT format and the MQCS were revised by JCOMM-III (Rec. 12/1) in accordance with changes proposed as an outcome from ETMC-II and careful review by the first and second meetings of the TT-DMVOS. The new formats include many minor changes but also new elements including a VOSCLim ship indicator, International Maritime Organization (IMO) Number, relative humidity and an Automated Weather System (AWS) indicator. The Team reviewed the format and standard, and concurred that their implementation status should be put into effect generally for all data collected as of 1 January 2011.

5.2.3 The Team agreed that the next changes to IMMT/MQCS after the forthcoming versions IV and VI respectively, should be as extensive as needed to better meet user requirements. The next format should for example include higher resolution elements such as high-resolution position, time (e.g. minutes, in addition to hours), new flags resulting from the new HQCS (see item 5.4.2) and a unique identifier. At the same time the Team recognized that a significant issue arising from making such extensive changes to formats and standards is the need for all CMs/RMs/GCCs/users to update their software to allow for changes – this is the main reason that these overdue changes have not previously been included.

5.2.4 The team discussed a proposal for a new transport format for marine meteorological observations ([Annex VI](#)). This proposed format is arranged into two parts; the organisational data and the meteorological data. The representation of fields and organization of this transport format has some similarities with the IMMA, except for example in the representation of position. In comparison to IMMT, the number of columns for elements date, time, position, pressure, wind speed and direction are increased. The Team requested the TT-DMVOS to consider all user requirements and work towards the production of a flexible future format, including convergence and interoperability with IMMA (**action; TT-DMVOS; Sep 2010**). To prepare for this work, the Team requested the GCCs to gather user requirements (**action; GCCs; 15 Apr 2010**).

5.2.5 In this context, the Team also agreed that the following issues should be discussed by the TT-DMVOS in liaison with other JCOMM groups, Panels, and associated programmes as appropriate, e.g. DBCP, the Global Ocean Surface Underway Data Pilot Project (GOSUD), and Argo:

- How should the format be structured, and what should the relationship of this format be to

the IMMA format and its content?

- Considering potential future needs, are there any more elements, metadata, or QC flags that should be included (e.g. salinity, buoys, sub-surface observations)?
- How should a unique identifier be defined and added to the new format?

### 5.3 Review of the operations of the Global Collecting Centres

#### 5.3.1 Report of the Global Collecting Centres (GCCs)

5.3.1.1 The Team reviewed the current operation/activities of the Global Collecting Centres (GCCs) operated by the United Kingdom and Germany. The 2009 GCC annual report marks the 16<sup>th</sup> year of GCC operation. The Team noted the following:

- It was an average year as far as the number of observations received, with just a little over 1 million observations (**1,069,118**) received and with contributions coming from eighteen members.
- Problems with on-land positions have been decreasing. 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.
- Although data were received from as far back as 1992 in 2009 and 1988 in 2008, over 60% of data are from 2008 & 2009 and 96% from the last four years. Most submissions in 2009 (and the three years previous) were received in the preferred IMMT-3.
- Problems with duplicate and resubmitted observations during different quarters were identified during 2008.
- In the last three years that there had been an increase in most elements being reported as blank and results from 2009 show again a rise of around 5-10% for most elements. The increase of automated stations on the ships might be the reason for this development, the new AWS indicator in the revised IMMT format version 4 should help clarify this in future.
- The GCCs have continued to receive considerable volumes of data from VOSClim registered ships, contributing to 6% of the total submissions during the last three years. It is encouraging to see that most of these observations do now contain the extra VOSClim additional elements. There are still a considerable number of observations with additional elements received from non-VOSClim ships.
- In 2009 only seven out of the ten registered CMs contributed data from their VOSClim ships.
- VOSClim data still appears to be of a higher standard compared with VOS. All observations had corresponding flags reported to the common met elements and the flags attached to VOSClim elements are increasing too (72.7% in 2009).
- A continuing problem is the use of masked callsigns by ships in real-time. This has an impact on international data archives, the real-time and delayed-mode observations are not easily identified as being from the same source making quality control difficult. Also, without a call sign it is impossible to link with the ship metadata for analysis of data.

5.3.1.2 The full report by the GCCs is provided in [Annex VII](#).

5.3.1.3 The Team requested the Contributing Members (CMs) (i) to refrain from re-submitting data. However, if it is necessary they should then make the GCCs aware of this to allow replacement within the database; and (ii) to encourage ships already reporting the additional elements (and other vessels) to join the VOSClim project (**action; RMs; ongoing**).

5.3.1.4 The Team noted that both GCCs have been identified by their respective NMHSs as WMO Information System (WIS) Data Collection and Production Centres (DCPC).

#### 5.3.2 Report of the Responsible Members (RMs)

5.3.2.1 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.

5.3.2.2 The Team reviewed the current operation/activities of the Responsible Members (RMs) – Germany; Hong Kong, China; India; Japan; the Netherlands; the Russian Federation; the United Kingdom, and the United States of America – and 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](#).

5.3.2.3 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 ongoing modernization, to be passed to TT-DMVOS. The Team suggested that the MCSS could evolve in such a way as to encourage the Responsible Members to switch from regional responsibilities to global responsibilities for specialized data sets

## 5.4 Status of modernization proposals

### 5.4.1 Data flow

5.4.1.1 The Team discussed a proposal from the TT-DMVOS to modernize the data-flow in light of technology advances and seeking to minimize duplication of effort. This proposal has now been widely reviewed and discussed by many within the marine community with the structure being generally agreed and accepted as the future goal to work towards. The proposal is detailed in [Annex IX](#).

5.4.1.2 An important change from the current data flow is that a Real-Time GCC (GCC-RT) will be responsible for real-time (GTS) data collection/storage (and the possible later ingest of GTS buoy data). It was also proposed that the current GCCs (DWD, Germany & Met Office, UK) continue their current roles but with the new title of Delayed-Mode GCC (GCC-DM).

5.4.1.3 However, the proposed data flow is still largely preliminary, and decisions must be made as to whom should fulfil the proposed GCC-RT and GCC-DM roles, and to agree further details of GCC and Special User responsibilities. The Team agreed that the TT-DMVOS should address the following issues:

- Governance and mechanisms for selecting the GCC-RT
- Time scale for the RT implementation into the MCSS data flow
- Clarifying the role of ICOADS or CMOCs (see agenda item 6.1.2)
- Consideration of multiple GTS data streams and their consolidation into a single data set to include also background field information.
- Strengthening of the global data flow network and transition of regional responsibility to global and specialized responsibility for the Responsible Members
- GCC-RT and GCC-DM should store their data and products in a Data Collection/Production Centre (DCPC) for the WIS for which they will regularly produce discovery metadata and allow access to datasets e.g. via the Ocean Data Portal (ODP) [in line with the WIGOS Framework].

5.4.1.4 The Team requested the TT-DMVOS to draft a proposal for the new data flow to be documented in the *Manual on* (WMO No. 558) and *Guide to* (WMO No. 471) *Marine Meteorological Services* (**action; TT-DMVOS; Feb 2011**). Once the proposal is properly documented, the Team requested the Secretariat to write to Members in order to seek candidates for specific functions of the new schemes, and seek feedback from them on their respective roles (**action; Secretariat; Mar 2011**). The goal is to eventually submit a consolidated proposal, including changes to the manual and guide to Marine Meteorological Services to JCOMM-IV.

5.4.1.5 The Team recommended that a TT-DMVOS meeting be organized on the side of the MARCDAT-III workshop (**action; co-Chairs TT-DMVOS; Nov 2010**).

#### 5.4.2 Higher-level Quality Control (HQC)

5.4.2.1 The Team discussed the proposal from the TT-DMVOS for the future High Quality Control Standard (HQCS). The HQCS is proposed for operation by the GCCs prior to data archival, and anticipated to be primarily based on an automated system comprising a variety of advanced QC measures. As part of planning the proposed system, the Team requested the TT-DMVOS to explore possibilities for convergence with existing QC processing software and standards, and for interoperability with ICOADS—in terms both of existing QC procedures and possible utilization of the IMMA format (**action; TT-DMVOS; end 2010**). The Team agreed that the proposed system should eventually include the tasks detailed in [Annex X](#).

5.4.2.2 The Team also requested the TT-DMVOS and TT-MOCS to take the following aspects of the proposal into account as the proposal advances:

- The CMs would continue to use (an improved) MQCS, because HQCS is envisioned to set flags specifically for archival/end-user products. The archival format may need to be different from the transmission format, since many more flags will be required (see also agenda item 5.2 where a new transport format was discussed).
- Also there will be specific tools for the real-time GCC comparisons and comparisons with satellite/NWP data, therefore it is envisioned that the HQCS would only be operated by the GCCs.
- The GCCs will permanently archive all original data (primary archive).
- The delayed-mode GCCs will, where possible, correct problems with date, time and position by checking with CMs (in a proposed secondary archive).
- In addition, exact duplicates will be removed (from this archive). If non-exact duplicates cannot be resolved they will not be rejected from the archive but they will be flagged to highlight the duplicate issue. In planning this aspect, the definition of exact duplicates needs to be carefully considered (e.g. otherwise exact duplicates from different GTS data streams might still possess useful source information that would be lost if rejected).
- The HQCS could be applied to past collected (and possibly historical) data as appropriate.

5.4.2.3 The Team requested Elizabeth Kent (UK) and Scott Woodruff (USA) to investigate the possibility of using for the HQC aspects of the Extended Edited Cloud Report Archive (EECRA) methodology. The TT-DMVOS was requested to consider the Data Management Programme Area survey document (DMPA 2008) on ship QC procedure as a starting point for the development of the HQCS proposal (**action; TT-DMVOS; May 2010**).

5.4.2.4 The team requested the TT-DMVOS to document the HQC proposal and circulate it to the Team and E-logbook developers (**action; TT-DMVOS; Mar 2010**). Sissy Iona offered to provide documentation about QC procedures recommended by the IOC, the International Council for the Exploration of the Sea (ICES), and the European Union applied in delayed mode within ocean community to the TT-DMVOS (**action; S. Iona; ASAP**).

## 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 The International Maritime Meteorological Archive (IMMA) format

6.1.1.1 The Team reviewed the development and status of the International Maritime Meteorological Archive (IMMA) format, which is in wide use for storing historical and contemporary marine data for the International Comprehensive Ocean-Atmosphere Data Set (ICOADS; <http://icoads.noaa.gov/>)<sup>25</sup>.

6.1.1.2 The Team reviewed the general improvements in interoperability with ICOADS that have recently been recommended through the TT-DMVOS. In particular, as a fundamental component of interoperability, the Team considered maintenance and evolution of the IMMA format in relationship to that of IMMT, plus possible convergence of the two formats. The Team agreed with the following:

- To introduce quarterly output by the GCCs of IMMA as a format output option, in addition to IMMT (it was noted, however, that GCCs should still have the capability to receive/process IMMT data for much longer to allow Contributing Members time to update their software/systems).
- To make IMMT-IV the final version of IMMT, from which a new format should then be agreed to suit modern data/user requirements (e.g. higher-resolution latitude/longitude, such as already implemented in IMMA format).
- To update IMMA to incorporate changes made effective 1 January 2007 for IMMT-III<sup>26</sup> together with changes recently adopted by JCOMM-III for IMMT-IV (to be implemented generally for all data collected as from 1 January 2011).
- That any proposals for IMMA format changes related to the proposed convergence with the IMMT format should be thoroughly coordinated and implemented with due consideration of cost and transition issues. (Possibly some slightly different format options might need to continue to exist within the IMMA format, as is currently the case with the IMMA representation of longitude, to satisfy different user or archival requirements.)
- To explore some limited convergence of the IMMA format with appropriate features of BUFR and other Table Driven Codes (e.g., establish cross-references between IMMA field names and BUFR table numbers, and demonstrated record export capability from BUFR so that modern records can be merged with historical records in ICOADS, thus helping to ensure the continued homogeneity of long-term climate evaluations).
- To develop generalized fields for IMMA historical attachment to store a selection of data commonly reported from early ships. This will be beneficial in making original data forms (e.g., Beaufort wind force numbers, tenths of sky clear or cloudy, and magnetic wind directions) readily available to researchers or to help facilitate readjustments into standardized units (e.g., a uniform retranslation of Beaufort wind forces to  $\text{m s}^{-1}$  according to a scale other than WMO 1100).
- To consider additional areas for future work, based on recommendations from the most recent MARCDAT workshop, as well as earlier workshops, as detailed in Table 1 below.

---

25 : The IMMA format has been recommended as a standard to JCOMM and is ideal for marine surface data spanning many centuries. It is an ASCII-based format with a fixed "core" set of the most commonly reported meteorological variables sufficient for most users, also including the time, location, and individual platform identification (e.g. ship callsign or WMO buoy number, if available). In addition to the IMMA core, an arbitrary number of data "attachments" can be made. It is in these attachments where ship metadata, original data records, QC flags, special ICOADS source tracking information, platform type, and a variety of other ancillary metadata are preserved.

26 : See preliminary IMMT-III to IMMA format translation specifications: <http://icoads.noaa.gov/immt3.html>

Table 1. Recommendations relating specifically to the IMMA format from MARCDAT-II (Kent et al. 2007b), which are tracked at on the web<sup>27</sup>.

<u>Recommendation</u>	<u>Individual observations</u>
21	Integrate datasets to the ICOADS using IMMA attachments: The integration of appropriate datasets into the ICOADS should be accomplished using IMMA attachments to provide ancillary information. Priorities for integration should include: information for the interpretation of cloud information including the solar elevation and the relative lunar illuminance from the Extended Edited Cloud Reports Archive (EECRA; Hahn and Warren 1999), and meteorological reports from research vessels.
33	Expand use of the IMMA attachments: The role of the IMMA attachments for incorporating quality control, bias, metadata and other non-standard information into the ICOADS should be expanded. Tools and documentation should be developed to guide users in the conversion of datasets into IMMA format. GHRSSST may be considered as a model for this.
35	User feedback: Need both user survey, and methods to capture the feedbacks and bias assessments (e.g., IMMA attachments) that can be provided by users and applications such as re-analyses.
<u>Recommendation</u>	<u>Gridded datasets</u>
71	ICOADS QC: The existing ICOADS QC should be kept intact. Collect alternative QC information and make available with IMMA attachments.

6.1.1.3 The Team requested Scott Woodruff (USA, lead), Steve Worley (USA), and Eric Freeman (USA) to follow up these developments and make recommendations to the ETMC through the TT-DMVOS as appropriate (**action; ICOADS USA Project Team; Apr 2010**) in the view to document a consolidated proposal at the next SOT Session (**action; TT-DMVOS; Apr 2011**). The proposal should include the following considerations:

- Inclusion of other types of data than the VOS
- Whether 2D wave spectra might be included in IMMA as an attachment or linked to detailed information archived elsewhere
- The possible provision of test data sets to help validate calculations and format translations (e.g. input: IMMT/BUFR, output: IMMA)
- The impact of the proposed HQC and its new flags, including the possibility of separate QC attachments
- What requirements might exist for higher precision for time (currently stored as hour to hundredths) and latitude/longitude (currently stored as degrees to hundredths)

6.1.1.4 The Team agreed that it should eventually be possible to include new attachments optionally as national practice without having to go through the formal approval process. Steve Worley and Scott Woodruff were asked to investigate feasibility (**action; S. Woodruff and S. Worley; Apr 2010**). Considering that ICOADS data are stored using flat files, some record ID would have to be used to link optional attachments to the original record.

#### 6.1.2 Proposal for formal recognition of ICOADS within JCOMM

6.1.2.1 The Team discussed a proposal for formal recognition of ICOADS, and potentially other centres holding global marine climatological data sets, within WMO and IOC through JCOMM. The proposed formalization would be beneficial in a number of respects, including expanding and strengthening the international participation in ICOADS, and thereby accelerating development; and in facilitating more open exchange of historical marine data and metadata, with the assurance that those data and metadata (in some cases rescued at considerable expense to Members/Member States) would become part of a formal and permanent international archive. Moreover, depending on how the proposal is crafted, it could also be beneficial for garnering more sustained US (e.g. NOAA) support and commitment.

6.1.2.2 The Team agreed with a plan for establishing a network of mirrored WMO-IOC Centres for Marine-meteorological and Ocean Climatological Data (CMOC). The plan is provided in [Annex XI](#),

<sup>27</sup> : <http://www.marineclimatology.net>

and includes a brief outline for the Terms of Reference (ToR) for a centre operating within the proposed network.

6.1.2.3 As part of the plan, the Team decided to set up an *ad hoc* Task Team comprised of Gudrun Rosenhagen (Germany, lead), Eric Freeman (USA), Elizabeth Kent (UK), Nicola Scott (UK), Scott Woodruff (USA), and Steve Worley (USA), to expeditiously advance the proposal by the end of August 2010, including for refining the ToR and developing an accompanying formal Recommendation for proposed adoption by JCOMM-IV (**action; ad hoc Task Team; Aug. 2010**). The Terms of Reference of the *ad hoc* Task Team are provided in Annex B of [Annex XI](#).

#### 6.1.3 Proposal for “advanced” (bias adjusted) ICOADS

6.1.3.1 The Team also discussed how ICOADS might potentially evolve to a more advanced version, including bias correction adjustments; and potential linkages with satellite data-streams. Related discussions began in early 2008.

6.1.3.2 The Team recognized that community experts have done significant work on specific variables and time periods to enhance homogeneity across observing systems, estimate the uncertainty of observations, and improve QC (e.g. track checking). These activities typically result in analyzed (gridded) datasets. The proposed idea is to make the underlying observations used in these improved datasets readily available to all ICOADS users. Although plans are in an early stage it is envisaged that a group of active researchers with experience using ICOADS would assume responsibility for making data adjustments, metadata, and other derived information available alongside the original observations, which will remain unaltered. Proposed contributions would be vetted by a steering panel, and a unified interface would inform the users about the latest updates, and provide flexible data access. The proposed system would be dynamic and evolve as recommended adjustments are evaluated, reviewed, and refined. These observations could support a new broad set of statistical or analyzed summary products, but there are many details to be fleshed out and suitable funding across the international groups needs to be identified.

6.1.3.3 The Team noted that the development of this initiative arose as one of the recommendations from CLIMAR-III (Gdynia, Poland, May 2008). The initial proposal, which will have to be matured and funded, is detailed in [Annex XII](#). The Team agreed in principle with the proposal but realized that it will have to be matured and resources found for its development. The Team requested the Chairperson to coordinate efforts with Team members, and other experts as appropriate in order to make a consolidated proposal to JCOMM-IV (**action; S. Woodruff; end 2011**). The Team also agreed that planned merger of the Extended Edited Synoptic Cloud Reports Archive (EECRA) cloud information into ICOADS could possibly form a useful test-bed for developing some of the related data management techniques.

6.1.3.4 The Team recommended establishing a Pilot Project to develop approaches for dissemination of bias adjustments and corrections alongside climate marine observations and using presently available corrections to prove concept. They agreed that the proposal for such a Pilot Project should be submitted to the MARCDAT-III workshop in late 2010 or early 2011, and a white paper documenting the initial proposal and rationale be attached to the invitation letters for the workshop (**action; S. Smith; mid May 2010**). The Team requested the Secretariat to prepare the invitation letter as appropriate in liaison with the MARCDAT-III organizing committee (**action; Secretariat; Jun 2010**). The organizing committee was also invited to draft terms of reference for the steering team of the Pilot Project, and to organize a special session to discuss this Pilot Project proposal at MARCDAT-III (**action; MARCDAT-III Organizing Committee; Jun 2010**).

#### 6.1.4 Potential linkages with satellite data

6.1.4.1 The Team noted a proposal provided in written form by Craig Donlon (European Space Agency - ESA) for linking satellite data into ICOADS.

6.1.4.2 The Team recognized that several large-scale projects now in place are re-processing satellite data to provide homogenised fundamental climate data records (FCDR), providing a well-established complementary datasets to in situ measurements for a limited period.

6.1.4.3 The Team discussed options to include satellite data in ICOADS (or enable more transparent access), starting with SST measurements linked to projects such as the Group for High Resolution Sea Surface Temperature (GHR SST), and possibly extending to other satellite fields (e.g. wind vectors, sea-ice parameters, sea state parameters).

6.1.4.4 The Team recognized the potential benefits of initiating a match up satellite database and invited NCAR to investigate the issue (*action; S. Worley; Jun 2010*) Such a database would permit to improve bias correction as well as to address the needs of satellite products. At the same time, the satellite community can benefit from the in situ community's experience with regard to the management of historical data sets (e.g. version control). The Team recommended to include a session at MARCDAT-III dedicated to the integration of satellite data within ICOADS; it also recommended to select two co-chairs from the in situ and satellite communities for the MARCDAT-III session dedicated to satellites and to prepare a concept paper on the issue in preparation for the workshop (*action; MARCDAT-III organizing committee; Jun 2010*).

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

6.2.1 The Team discussed oceanographic data and metadata integration issues particularly regarding the latest developments with regard to the XBT fall rate equation, and Sea Surface Salinity (SSS).

6.2.2 The Team recalled that data from oceanographic profiling instruments are an important supplement to the near-surface data. However, data from each instrument type have different characteristics, which can create time- and space-dependent biases. For the latest ICOADS Release 2.5 (Woodruff et al. 2010), near-surface profile temperatures were selected from the depth closest to 4m and  $\leq 10$ m. In previous Releases the scheme started at the shallowest depth in a profile and used the first temperature value at any depth  $\leq 3$ m. 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 World Ocean Database 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 International marine data and metadata recovery**

### **6.3.1 RECOVERY of Logbooks And International Marine data (RECLAIM) and related projects (ACRE, GODAR, HISKLIM, HISTOR, etc.)**

6.3.1.1 The Team was informed about national and international activities to recover logbooks and other international marine data and metadata. The Team discussed the need to further promote and enhance such activities. These include the following in particular:

- RECOVERY of Logbooks And International Marine data<sup>28</sup> (RECLAIM);
- Atmospheric Circulation Reconstructions over the Earth<sup>29</sup> (ACRE);
- HISTorical CLIMate<sup>30</sup> (HISKLIM), the Netherlands: This project is mainly focusing 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.

---

28 : <http://icoads.noaa.gov/reclaim/>

29 : <http://www.met-acre.org/>

30 : <http://www.knmi.nl/onderzk/hisklim/index-en.html>

- HISTOR, Germany: Data are available and digitization is underway.
- Canada: Hudson Bay and remote location historical data are being recovered.
- The Global Oceanographic Data Archaeology and Rescue (GODAR): The Team asked Steve Worley to coordinate with Sydney Levitus on the relationships between surface and subsurface data that are rescued by GODAR and made available to ICOADS via the World Ocean Database (WOD) (**action; S. Worley; ASAP**):
  - This coordination confirmed that all profile data digitized and exchanged under GODAR are added to the WOD. As long as ICOADS continues to process all WOD data types (OSD, Surface Only, XBT, etc.), including the 1st and 2nd headers, any GODAR marine surface meteorological data associated with the profiles will become part of ICOADS.

6.3.1.2 The Team noted with appreciation that the Climate Data Modernization Program (CDMP) of NOAA can help Members to recover historical data (e.g. through imaging and digitization).

6.3.1.3 The Team also recalled that the recovery of historical marine meteorological data from research vessels should be considered as part of international marine data rescue. It is anticipated that many national and university operators of research vessels maintain repositories of data for their individual vessels. These records may include a combination of high-frequency (e.g., 1 minute sample) observations from automated weather systems and paper records from manned observing. As an example, the Scripps Institution of Oceanography has catalogued over 200 cruises with automated marine data from the *Roger Revelle* and *Melville* covering the past two decades.

6.3.1.4 The Team invited the participants at the meeting to investigate possibility of compiling catalogue of available Research Vessel data, and to provide feedback to Shawn Smith (**action; ETMC-3 participants; ongoing**). Based on the collected information, the Team requested Shawn Smith to develop a list of potential candidate data sets to be included in ICOADS (**action; S. Smith; Dec 2010**).

6.3.1.5 The Team recognized Sydney Levitus for his long-term dedication to find, rescue, and make available historical ocean profile data and all associated metadata.

## 6.3.2 Lloyds commercial ship particulars

6.3.2.1 The Team discussed a proposal, which is being coordinated with the International Maritime Organization (IMO), to access Lloyds commercial ship “particulars” (platform metadata). This is to complete metadata records from Pub. 47 as well as adding important ship descriptions (e.g. ship dimension, tonnage information) to improve our understanding of data biases in ICOADS, and provide better estimates of random errors. IMO has historical and contemporary records of Lloyd’s metadata, which access on an ongoing basis would be useful for example with understanding the early (e.g., pre World War II) climate record.

6.3.2.2 While ICOADS data and metadata are normally made available on a free and unrestricted basis, in case public availability of some metadata fields proved problematic, the Team proposed that derived products could be developed eventually utilizing the information for ICOADS product improvements, but in a secure setting. The proposal is to establish an initial (non-public) ingest database to store the selected particulars until resources permit full merger into ICOADS. The Team noted with appreciation the offer from National Oceanography Centre (NOC, UK) to produce some statistics on ship sizes over time based on the Lloyds data that were purchased by NOC (**action; E. Kent; Dec 2010**). The Team requested Scott Woodruff (USA) to explore feasibility of using the Lloyds Educational Trust mechanism for accessing the historical collection of IMO numbers (**action; S. Woodruff; Dec 2010**).

## 6.4 History of the marine ship code

6.4.1 The Team recalled that ETMC-II had reviewed the status of previous work related to documenting the history of the marine ship codes (results are available on the web<sup>31</sup>). Following on from this work, ETMC-II 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. NOAA's Climate Database Modernization Program (CDMP) has also partnered to some extent on this work, including archiving copies of the resultant imaged publications.

6.4.2 The Team requested the Secretariat to investigate whether a policy could be set up to preserve previous versions of the manual on codes (**action; Secretariat; end 2010**). Meanwhile, Team members were invited to provide paper and/or scanned/e-versions of national versions of the manual on codes to the CMDP (contact: Eric 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 (**action; ETMC members; Dec 2010**). CDMP was invited to prepare a list of documents proposed for digitization, and suggest on priorities (**action; E. Freeman; Dec 2010**). The prioritized list should then be circulated to the Team.

6.4.3 The Team noted with appreciation that JMA has scanned earlier editions of the IMMT format, as well as reports of past Sessions of the former WMO Commission for Marine Meteorology (CMM), and made those available via a JMA web site<sup>31</sup>. The Team requested the Secretariat to make all these documents available permanently via the WMO web site (**action; Secretariat; Jun 2010**).

## 6.5 Wave and storm surge data

### 6.5.1 Status of the global extreme wave event archive

6.5.1.1 Following a request from DMCG-II, a proposal for establishing a JCOMM global extreme wave event archive<sup>32</sup> was developed between the ETWS and ETMC. The database is to be for used in model validation and validation of remotely sensed waves, where such models and algorithms suffer from lack of sufficient data. It would be populated with measured wave data where the significant wave height exceeds 14 metres, with appropriate accompanying metadata.

6.5.1.2 A number of wave data meeting the database requirements have been identified. However, the Team noted the potential for significant problems in comparability of the same observations from different databases. Within NOAA for example the official version of the US moored buoy data is archived at the US National Oceanographic Data Center (NODC), but differences have been detected between that archive and similar archives at the National Climatic Data Center (NCDC) and National Data Buoy Center (NDBC), due to differences in processing, quality control and archiving. These issues extend beyond the scope of the extreme wave event archive. The Team requested the Secretariat to write to the Permanent Representative of USA with WMO in order to invite NOAA to address discrepancies with regard to the different wave databases (**action; Secretariat; Jun 2010**). It requested Scott Woodruff to provide background information to the Secretariat for inclusion in the letter (**action; S. Woodruff; May 2010**).

6.5.1.3 ETWS has recently expressed a strong interest in expanding the scope of the extreme wave event archive to include satellite estimates in the first stages of implementation; eventually data from wave radars such as WaMoS or MIROS might also be included. It has been suggested that an archive of storm surge events for similar purposes should also be considered.

6.5.1.4 The Team noted that the ETWS raised concerns about the need to associate adequate disclaimers with the planned database, since the extracted in situ data will necessarily be very sparse and incomplete. It was also considered likely that some complications would also need to be sorted out on open redistribution and other national or organizational data policies.

---

31 : [http://goos.kishou.go.jp/ws/ETMC/code\\_task/](http://goos.kishou.go.jp/ws/ETMC/code_task/)

32 : The rationale for the data base is to have a relatively small and manageable set of extreme storm sea states for comparison with wave forecast and hindcast products, model development and evaluation and satellite sensor calibration and validation.

6.5.1.5 The Team noted with appreciation that the management and hosting of the database has been offered by the US NODC, in collaboration with the Integrated Science Data Management (ISDM) of Canada. NODC has developed and tested an ocean wave data and information portal (OWDIP) for hosting the global extreme wave event archive. The OWDIP is scheduled to be fully operational by fall 2010. ISDM will start to prepare and transfer extreme wave data to NODC, beginning spring 2010. ISDM will assist NODC in data processing as needed. After the pilot phase, other nations will be approached for their contribution and the project will expand to include remotely sensed wave measurements such as from coastal radars and satellites.

6.5.1.6 While the initial concept for the extreme wave event archive has been successfully established, together with its hosting at US NODC, the Team agreed that much more work is needed to help populate the archive and eventually make products available. The team also noted that JCOMM-III urged Members/Member States to participate in this activity by identifying potential events and providing the data for this archive, and recommended that the potential for calculation of wave monthly summaries (linked to ICOADS) be evaluated.

6.5.1.7 The Team recommended that Members scan their archives containing wave data in the view to identify the wave extreme events that meet the agreed upon criteria. The Team requested the Secretariat to write to the WMO Members in the view to invite them to help populating the database<sup>33</sup> (**action; Secretariat; Jun 2010**). The DBCP was also invited to address how it could contribute to the database (**action; DBCP; Sep 2010**). The Team requested Val Swail to investigate with the Oil and Gas Producers (OGP) whether some extreme wave events could be recovered from their databases (**action; V. Swail; Jun 2010**).

#### 6.5.2 Potential for calculation of wave monthly summaries

6.5.2.1 The team recalled that a considerable amount of wave data from ships and buoys is already available in ICOADS. The potential for calculating wave summaries for ICOADS has been under consideration for several years. Recommendations from the CLIMAR and MARCDAT meetings have supported the development of wave climate statistics and summaries using these data<sup>34</sup>, but resource limitations and questions about the impacts of code changes within the historical VOS and other wave records have thus far slowed progress. A number of technical issues, listed in [Annex IV](#), will have to be addressed if wave climate summaries are to be produced.

6.5.2.2 The Team recommended to establish a Pilot Project to initiate wave climate summaries covering the period 1970 to 2010. The Team agreed that the proposal for such a Pilot Project should be submitted to the MARCDAT-III workshop in late 2010 or early 2011, and a white paper documenting the initial proposal and rationale, addressing both technical (e.g. guidelines on algorithms to be developed to compute the summaries) and resource issues, attached to the invitation letters for the workshop (**action; S. Woodruff; mid May 2010**). The Team requested the Secretariat to prepare the invitation letter as appropriate in liaison with the MARCDAT-III organizing committee (**action; Secretariat; Jun 2010**). The organizing committee was also invited to draft terms of reference for the steering team of the Pilot Project, and to organize a special session to discuss this Pilot Project proposal at MARCDAT-III (**action; MARCDAT-III Organizing Committee; Jun 2010**).

## 7. MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATOLOGICAL SUMMARIES

### 7.1 Status of the Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS)

---

33 : Submissions should be made to the NODC; the contact point being Charles Sun

34 : See <http://www.marineclimatology.net>

7.1.1 The Team recalled that JCOMM/DMPA Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS) was proposed at ETMC-2 (Geneva 26-27 March 2007) in response to a recommendation from the JCOMM Data Management Coordination Group for modernization of the Marine Climatological Summaries Scheme. To assist TT-MOCS in scoping and prioritising its activities, an *ad hoc* Task Team, chaired by Mr. Martin Rutherford, was established to draft the Terms of Reference. The final Terms of Reference, endorsed by the Third Session of the DMCG (Ostend, Belgium, 26-28 March 2008) are included in [Annex XIII](#).

7.1.2 However, the Team noted with concern that although formally created as a Task Team and with an agreed TOR, TT-MOCS failed to attract a Chairperson, and hence no specific activities were undertaken to progress the tasks detailed in the TOR.

7.1.3 A joint meeting of the TT-DMVOS and TT-MOCS was held following CLIMAR-III in Gdynia, Poland. Taking into account the outcomes of CLIMAR-III, the joint meeting proposed that TT-MOCS proceed by addressing a single task; to investigate options for the development of a modern marine wind climatology under the interim leadership of Mr. Rutherford. The highly successful Group for High Resolution Sea Surface Temperature (GHR SST) collaboration was suggested as a possible organisational model.

7.1.4 Following a period of literature review, an e-mail invitation was sent to authors of marine wind related papers and projects seeking their advice on how to proceed and requesting registration of interest in adopting or developing a "best practice" ocean wind vector dataset and products. Whilst most addressees responded to the request, none were willing to participate in new activities prior to the OceanObs'09 meeting in Venice in September 2009. The majority of respondents proposed that future marine climatologies be addressed in the OceanObs'09 Community White Papers, which, perhaps not coincidentally, were already under consideration/preparation.

7.1.5 The need remains to modernise the MCS and to make both in-situ marine observations and derived products available to the research community through 'discoverable' standards compliant web services. The Team agreed that TT-MOCS should aim to have input to any future ocean colour, sea-ice extent, marine winds or wave and storm surge groups that might form as an outcome of OceanObs'09.

7.1.6 The Team agreed that the TT-MOCS needed to be re-invigorated and nominated Elizabeth Kent to lead the Task Team on an interim basis for one year. The Team renewed the membership of the Task Team and selected the following members to participate in TT-MOCS:

- Elizabeth Kent (interim Chairperson)
- Gudrun Rosenhaguen (Germany) - GCC
- Nicola Scott (UK) - GCC
- Val Swail (Canada; Chair ETWS) - wave climate summaries
- Vasily Smolyanitski (Russian Federation; Chair ETSI) - sea-ice summaries
- Scott Woodruff - ICOADS

7.1.7 The Team also requested Elizabeth Kent to review the Terms of Reference of the Task Team in light of this Session's discussions, and seek additional members to address the following issues (**action; E. Kent; end 2010**):

- Bias correction
- Satellite climatologies
- GCOS working group on SST and Sea-Ice

7.1.8 The Team requested the TT-MOCS 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 on* (WMO No. 558) and *Guide to* (WMO No. 471) *Marine Meteorological Services* by the end of 2011

in view to have those changes eventually submitted to JCOMM-IV (*action; TT-MOCS; end 2011*).

7.1.9 The Team requested Elizabeth Kent to convene a 1-day meeting of the TT-MOCS in conjunction with the MARCDAT-III workshop (*action; E. Kent; MARCDAT-III*).

## **7.2 New perspectives on contributions and climatological requirements within JCOMM**

### **7.2.1 Expert Team on Sea Ice (ETSI)**

7.2.1.1 The Team considered the developments by the SFSPA Expert Team on Sea Ice (ETSI) for sea-ice climatology based on ice charts included in the Global Digital Sea Ice Data Bank (GDSIDB). Such sea-ice climatology makes use of the GDSIDB data to provide information to the Arctic Marine Shipping Assessment (AMSA) in 2007-2008 and the assessment of extreme 2007 and 2008 conditions in terms of sea-ice climatology. The Global Digital Sea Ice Data Bank holds 7- or 10-day period mapped ice data for the Arctic starting from March 1950 and for the Antarctic from January 1973, up to near the present for both regions. From the 1970s, GDSIDB ice charts can serve as ground-truth for SSM/I products (based on a comprehensive usage of all available sources of ice information and expert knowledge) or can form a unique source of ice conditions and climate for the pre-1978 period.

7.2.1.2 In order to expand sea-ice climatologies and enhance the GDSIDB, ETSI recommended a strengthened collaboration with ETMC. The Team welcomed these developments, and noted that these issues will be further discussed at the Fourth Session of the Expert Team on Sea Ice (ETSI-IV) and the Twelfth Session of the Global Digital Sea Ice Data Bank (GDSIDB-XII), which will held back-to-back in St Petersburg, Russian Federation, 1-5 March 2010.

### **7.2.2 Expert Team on Wind Waves and Storm Surges (ETWS)**

7.2.2.1 The Team recalled the discussion under agenda item 2.4.2, and discussed new perspectives on contributions and climatological requirements from the SFSPA Expert Team on Wind Waves and Storm Surges (ETWS). JCOMM-III requested the ETWS and ETMC to jointly develop global storm surge climatologies. The Team agreed that this was an important activity and that the ETMC should be actively involved in the development of storm surge databases and resultant climatologies. The data base aspect of the activity has direct parallels to the present joint ETWS/ETMC project on the extreme waves event archive. Details on the proposed storm surge climatology will be developed from the forthcoming Third Session of ETWS and will be communicated to ETMC, after which a project proposal will be jointly developed.

### **7.2.3 JCOMM/IODE Expert Team on Data Management Practices (ETDMP)**

7.2.3.1 The Team recalled the discussion under agenda item 2.5.2, and discussed new perspectives on contributions and climatological requirements from the JCOMM/IODE Expert Team on Data Management Practices (ETDMP). In particular, the Team recalled that new Marine Climatology Summary (MCS) standards as would eventually be proposed by the TT-MOCS could eventually be submitted to the JCOMM/IODE Standards process in the view to expose them to the wider oceanographic community.

## **8. MARINE DATA AND CLIMATOLOGY WORKSHOPS, AND RECOMMENDATIONS**

8.1 Continuity and coordination for marine climatology issues (including ICOADS) have 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 Gdynia, Poland, 2008.

8.2 The Team reviewed the outcome and recommendations from the third CLIMAR workshop

(CLIMAR-III<sup>35</sup>), which was held in Gdynia, Poland, from 6 to 9 May 2008.

8.3 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, and Exeter, UK, 2005.

8.4 Following JCOMM-III recommendation, it was proposed continuing both successful workshop series with a MARCDAT-III around 2010-2011, followed as appropriate in approximately two years by a CLIMAR-IV.

8.5 In light of the need to strengthen the cooperation with the satellite community for the purpose of marine climatology, the Team proposed to organize the MARCDAT-III meeting in Frascati, Italy, at the European Space Agency (ESA) as a preferred approach, and likely dedicate e.g. a day of the workshop to satellite and *in situ* integration matters. Other options discussed were Ostend, Belgium at the IOC Project Office for the IODE, and St. John's, Canada. The meeting requested Scott Woodruff and Val Swail to convene an Organizing Committee for MARCDAT-III, to include in particular representatives from ESA, AOPC and OOPC, and to approach ESA regarding the possibility of organizing the workshop in Italy around the end of 2010 or beginning of 2011 (**action; S. Woodruff and V. Swail; Apr 2010**). The Organizing Committee will be tasked to set up a programme and work out the announcement, concept paper, and invitation letters with assistance from the Secretariat (**action; MARCDAT-III Organizing committee; May 2010**).

8.6 The Team supported the idea of organizing a CLIMAR-IV meeting around 2012-2013 after JCOMM-IV. However, considering that the past two CLIMAR workshops had been held in Europe, the Team recommended that CLIMAR-IV be held in another region.

8.7 The Team also discussed the "Wiki"<sup>36</sup>, which was introduced to allow the marine climatology community to track recommendations from the marine climatology workshops. While recognizing that the Wiki has been underutilized, the team agreed that it should continue to be used for this purpose as well as for maintaining up to date information about available marine climatology data sets.

## 9. MANUALS, GUIDES AND OTHER TECHNICAL PUBLICATIONS

### 9.1 Guide to the Applications of Marine Climatology

9.1.1 The Team noted that presentations at CLIMAR-III (Gdynia, Poland, 2008) were incorporated into a technical report (JCOMM 2009), and a selection of papers will be published in a forthcoming special issue of the *International Journal of Climatology (IJClim)*; Royal Meteorological Society, United Kingdom) hopefully before MARCDAT-III.

9.1.2 The Team discussed the status of this *IJClim* Special Issue. The *IJClim* Special Issue will form the latest update to the current (Gulev 2005) dynamic part of the *Guide to the Applications of Marine Climatology*. The Team agreed that another update to the dynamic part could hopefully be achieved through a similar outcome from the proposed CLIMAR-IV.

9.1.3 The Team requested CMDP to provide a digitized version of the original version of the *Guide to the Applications of Marine Climatology* (WMO 1994) to the WMO Secretariat (**action; E. Freeman; Jun 2010**). The Team invited WMO to investigate making this digitized version available on-line (**action; Secretariat; Jun 2010**).

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

---

35 : <http://icoads.noaa.gov/climar3/>

36 : <http://www.marineclimatology.net>

9.2.1 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 MCSS modernization. It requested TT-DMVOS and TT-MOCS to review the publications and to circulate to the Team members by e-mail concrete proposals for their updating in view to submit a consolidated proposal to JCOMM-IV (**action; TT-MOCS & TT-DMVOS; Jun 2011**).

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

9.3.1 Following discussions at ETMC-I and ETMC-II, the Team was informed on actions previously undertaken and the current status of the *Guide to Climatological Practices* (WMO 1983). The team agreed that no further input from ETMC was required at this point.

## **10. ORGANIZATIONAL MATTERS**

### **10.1 Terms of Reference (ToR) of the Expert Team on Marine Climatology**

10.1.1 The Team reviewed its Terms of Reference (ToR).

10.1.2 The Team agreed that the MCSS terminology might have to eventually be changed but it was premature to make proposals in this regard at this point.

10.1.3 The team stressed that OPA experts should be associated to the work of the ETMC (e.g. DBCP, SOT).

## **11. REVIEW OF ACTION ITEMS**

11.1 The Team reviewed and agreed on the actions arising from this Session. These are summarized in [Annex XVI](#).

## **12. CLOSURE OF THE SESSION**

12.1 Mr Scott Woodruff thanked all for participating and for their comments and support to the ETMC, as well as the Secretariat. He stressed that there is still a substantial amount of work to be completed before the Fourth Session of JCOMM in 2012, especially by the two Task Teams on Delayed Mode VOS Data (TT-DMVOS) and Marine-meteorological and Oceanographic Climate Summaries (TT-MOCS). The Team thanked Australia for the great facilities and support provided for and during the Session.

12.2 The Third Session of the JCOMM Expert Team on Marine Climatology (ETMC-III) closed by 12:40 hours on Friday 12 February 2010.

---

## **ANNEX I**

### **AGENDA**

#### **1. ORGANIZATION OF THE SESSION**

- 1.1 Opening
- 1.2 Adoption of the agenda
- 1.3 Working arrangements

#### **2. JCOMM ASPECTS**

- 2.1 Report by the ETMC Chairperson
- 2.2 Report by the Secretariats
- 2.3 JCOMM Observations Programme Area (OPA)
  - 2.3.1 Ship Observations Team (SOT)
  - 2.3.2 Data Buoy Cooperation Panel (DBCP)
- 2.4 JCOMM Services Programme Area (SPA)
  - 2.4.1 Results from the Fourth Session of the Services Coordination Group
  - 2.4.2 Expert Team on Wind Waves and Storm Surges (ETWS)
  - 2.4.3 Expert Team on Sea Ice (ETSI)
- 2.5 JCOMM Data Management Programme Area (DMPA)
  - 2.5.1 Results from the Third Session of the Data Management Coordination Group
  - 2.5.2 Expert Team on Data Management Practices (ETDMP)

#### **3. REVIEW OF CONTRIBUTIONS AND REQUIREMENTS OF THE WORLD CLIMATE PROGRAMME AND OTHER CLIMATE RELATED PROGRAMMES**

- 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 Review relevant outcomes from the OceanObs'09 conference (Venice, Italy, 21-25 September 2009)
- 3.3 Existing and potential linkages with the WMO Commission for Climatology (CCI)

#### **4. DATA AND METADATA: OPERATIONAL FLOW**

- 4.1 Results of the ETMC GTS comparison (using December 2007 data)
- 4.2 Review of the BUFR (and other) templates for VOS and other surface marine data
- 4.3 Review of electronic logbooks
- 4.4 Ship call sign masking (including encode proposal)
- 4.5 Status of the WMO Ship Catalogue (WMO-No. 47)
- 4.6 Status of buoy and other Ocean Data Acquisition System (ODAS) metadata
  - 4.6.1 Report from META-T project and JCOMMOPS
  - 4.6.2 Report from ODAS metadata centre
  - 4.6.3 Rig and platform metadata issues

#### **5. DATA QUALITY AND EXCHANGE**

- 5.1 Overview from the Task Team on Delayed-Mode Voluntary Observing Ship data (TT-DMVOS)
- 5.2 Status of the International Maritime Meteorological Tape (IMMT) format and the Minimum Quality Control Standard (MQCS)
- 5.3 Review of the operations of the Global Collecting Centres
  - 5.3.1 Report of the Global Collecting Centres (GCCs)
  - 5.3.2 Report of the Responsible Members (RMs)
- 5.4 Status of modernization proposals

- 5.4.1 Data flow
- 5.4.2 Higher-level Quality Control (HQC)

## **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 The International Maritime Meteorological Archive (IMMA) format
  - 6.1.2 Proposal for formal recognition of ICOADS within JCOMM
  - 6.1.3 Proposal for “advanced” (bias adjusted) ICOADS
  - 6.1.4 Potential linkages with satellite data
- 6.2 Oceanographic data and metadata integration issues (XBT fall rate equation, SSS, etc.)
- 6.3 International marine data and metadata recovery
  - 6.3.1 REcovery of Logbooks And International Marine data (RECLAIM) and related projects (ACRE, GODAR, HISKLIM, HISTOR, etc.)
  - 6.3.2 Lloyds commercial ship particulars
- 6.4 History of the marine ship code
- 6.5 Wave and storm surge data
  - 6.5.1 Status of the global extreme wave event archive
  - 6.5.2 Potential for calculation of wave monthly summaries

## **7. MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATOLOGICAL SUMMARIES**

- 7.1 Status of the Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS)
- 7.2 New perspectives on contributions and climatological requirements within JCOMM
  - 7.2.1 Expert Team on Sea Ice (ETSI)
  - 7.2.2 Expert Team on Wind Waves and Storm Surges (ETWS)
  - 7.2.3 JCOMM/IODE Expert Team on Data Management Practices (ETDMP)

## **8. MARINE DATA AND CLIMATOLOGY WORKSHOPS, AND RECOMMENDATIONS**

## **9. MANUALS, GUIDES AND OTHER TECHNICAL PUBLICATIONS**

- 9.1 *Guide to the Applications of Marine Climatology*
- 9.2 Review of the *Manual on and Guide to Marine Meteorological Services* (WMO-No. 558 and 471)
- 9.3 Review of the *Guide to Climatological Practices* (WMO-No. 100).

## **10. ORGANIZATIONAL MATTERS**

- 10.1 Terms of Reference (ToR) of the Expert Team on Marine Climatology

## **11. REVIEW OF ACTION ITEMS**

## **12. CLOSURE OF THE SESSION**

---

## ANNEX II

### LIST OF PARTICIPANTS

#### TEAM MEMBERS

Mr Scott WOODRUFF  
Chairperson, JCOMM ETMC  
IT Specialist  
(R/PSD3), 325 Broadway  
Boulder CO 80305  
United States  
Tel: +1 303 497-6747  
Fax: +1 303 497-7013  
E-mail: scott.d.woodruff@noaa.gov

Ms. Mizuho HOSHIMOTO  
Forecaster  
Japan Meteorological Agency  
1-3-4 Otemachi Chiyoda-ku Tokyo 100-8122  
Japan  
Tel: +81-3-3212-8341  
Fax: +81-3-3211-3047  
E-mail: mizuho\_hoshimoto@met.kishou.go.jp

Dr Elizabeth C. KENT  
National Oceanography Centre,  
Southampton  
European Way  
Southampton  
Hampshire  
SO14 3ZH  
United Kingdom  
Tel: +44 23 80596646  
Fax: +44 23 80596400  
E-mail: eck@noc.soton.ac.uk

Mr Frits KOEK  
Royal Netherlands Meteorological Institute  
Postbus 201  
NL-3730AE de Bilt  
the Netherlands  
Tel: +31 302 20 68 60  
E-mail: frits.koek@knmi.nl

Ms Gudrun ROSENHAGEN  
Deutscher Wetterdienst  
Bernhard-Nocht-Str. 76  
20359 HAMBURG  
Germany  
Tel: +49-40 6690 1850  
Fax: +49-40 6690 1952  
E-mail: gudrun.rosenhagen@dwd.de

Ms Nicola SCOTT  
Climate Marine Data Manager  
Met Office S9 Saughton House Broomhouse  
Drive  
Edinburgh  
EH11 3XQ  
United Kingdom  
Tel: +44 (0)131 528 7312  
Fax: +44 (0)131 528 7345  
E-mail: Nicola.Scott@Metoffice.gov.uk

Mr Val SWAIL  
Chairperson, JCOMM ETWS  
Chief, Climate Data and Analysis Section  
Environment Canada  
4905 Dufferin Street  
Toronto M3H 5T4  
Ontario  
Canada  
Tel: +1 (416) 739 4347  
Fax: +1 (416) 739 5700  
E-mail: Val.Swail@ec.gc.ca

Dr Wing-Tak WONG  
Hong Kong Observatory  
134A Nathan Road  
Kowloon  
Hong Kong  
China  
Tel: +852 2926 8430  
Fax: +852 2311 9448  
E-mail: wtwong@hko.gov.hk

**OTHER REPRESENTATIVES FROM  
JCOMM**

Dr Peter DEXTER  
Co-President, JCOMM  
Ocean Services Section  
Bureau of Meteorology  
GPO Box 1289  
Melbourne VIC 3001  
Australia  
Tel: +61 (0) 3 9669 4870  
Fax: +61 (0) 3 9669 4725  
E-mail: p.dexter@bom.gov.au

Ms Sissy IONA  
Coordinator, JCOMM Data Management  
Programme Area  
Head HNODC  
Hellenic Centre for Marine Research,  
Anavyssos  
Institute of Oceanography  
46.7 Km, Athens-Sounio Ave.  
PO BOX 712 Anavyssos  
190 13 Attica  
Greece  
Tel: +30-22910-76367  
Fax: +30-22910-76347  
E-mail: sissy@hnodc.hcmr.gr

Mr Greg REED  
IODE Co-chairperson  
Co-chairperson, ODP-WIGOS Steering  
Group  
Member of the JCOMM/DMCG  
Executive Officer, Australian Ocean Data  
Centre Joint Facility  
Australian Ocean Data Centre Joint Facility  
Level 2, Building 89, Garden Island  
POTTS POINT NSW 2011  
Australia  
Tel.: +61 2 9359 3141  
Fax: +61 2 9359 3120  
E-mail: greg@metoc.gov.au

Mr Eric FREEMAN  
Member of the JCOMM cross cutting TT-  
DMVOS  
Member of the JCOMM/DMPA/TT-MOCS  
Meteorologist/Senior Analyst  
Sourcecorp - Govt. Contractor  
Climate Database Modernization Programme  
(CDMP)  
Remote Sensing Applications Division  
(RSAD)  
NOAA's National Climatic Data Center  
151 Patton Avenue  
ASHEVILLE North Carolina 28801-5001  
United States  
Tel: +1 828 271 4463  
Fax: +1 828 271 4022  
E-mail: Eric.Freeman@noaa.gov

Mr Martin RUTHERFORD  
Chairperson, JCOMM/DMPA/TT-MOCS  
Director, Maritime MGI  
HM Branch  
Level 2, Building 89/90 Garden Island  
POTTS POINT NSW 2011  
Australia  
Tel: +61 2 9359 3139  
Fax: +61 2 9359 3120  
E-mail: tdom@metoc.gov.au

**CCL REPRESENTATIVE**

Dr William J. WRIGHT  
Data Management Section  
Bureau of Meteorology  
GPO Box 1289  
Docklands  
Victoria 3008  
Australia  
Telephone: +61-3 9669 4349  
Telefax: +61-3 9669 4678  
E-mail: w.wright@bom.gov.au

## **OBSERVERS**

Ms Nelly FLORIDA RIAMA  
Agroclimate and Marine Climate Information  
Meteorological Climatological and  
Geophysical Agency  
Jl. Angkasa I No.2 Kemayoran  
Jakarta  
Indonesia  
Tel: 62-21-4246321 ext 4208  
Fax: 62-21-4246703  
E-mail: [nelly@bmg.go.id](mailto:nelly@bmg.go.id)

Mr. Steven Worley  
Scientific Data Manager  
National Center for Atmospheric Research  
PO Box 3000  
Boulder CO 80307  
United States  
Tel: +1 303 497 1248  
E-mail: [worley@ucar.edu](mailto:worley@ucar.edu)

Dr Rick BAILEY  
Manager, Ocean Services Development  
Australian Bureau of Meteorology  
GPO Box 1289  
Melbourne, Victoria 3001  
Australia  
Tel: +61 (3) 96694103  
E-mail: [r.bailey@bom.gov.au](mailto:r.bailey@bom.gov.au)

Dr Phil PARKER  
Project Manager, South Pacific  
Sea Level & Climate Monitoring Project  
Australian Bureau of Meteorology

GPO Box 1289  
Melbourne, Victoria 3001  
Australia  
Tel: +61 (3) 9669 4727  
Fax: +61 (3) 9669 4725  
E-mail: [p.parker@bom.gov.au](mailto:p.parker@bom.gov.au)

Mr Shawn SMITH  
Member TT DMVOS  
Research Associate  
Center for Ocean-Atmosphere Prediction  
Studies  
Florida State University  
Tallahassee, FL 32306-2840  
USA  
Tel: +1 (850) 644 6918  
Fax: +1 (850) 644 4841  
E-mail: [smith@coaps.fsu.edu](mailto:smith@coaps.fsu.edu)

## **SECRETARIAT**

Mr Etienne CHARPENTIER  
Scientific Officer, Observing Systems Division  
Observing and Information Systems  
Department  
World Meteorological Organization  
7 bis, Avenue de la Paix  
Case Postale No. 2300  
CH-1211 Genève 2  
Switzerland  
Tel: + 41 22 730 82 23  
Tel: + 41 22 730 80 21  
E-mail: [echarpentier@wmo.int](mailto:echarpentier@wmo.int)

---

### ANNEX III

#### DATA MANAGEMENT EXPECTATIONS FROM OCEANOBS'09

Scott Woodruff<sup>1</sup>, Greg Reed<sup>2</sup>, Bob Keeley<sup>3</sup>

- (3) Integrated Science Data Management, Department of Fisheries and Oceans, 200 Kent St., Ottawa, Canada, K1A 0E6, Email: Robert.Keeley@dfo-mpo.gc.ca
- (1) NOAA/ESRL (PSD3), 325 Broadway; Boulder, CO 80305 US, Email: Scott.D.Woodruff@noaa.gov
- (2) Australian Ocean Data Centre Joint Facility, Wylde Street, Potts Point, NSW Australia, Email: greg@metoc.gov.au

1. OceanObs'09 took place in Venice 21-25 September 2009<sup>1</sup>. This was the second conference, a decade after the first (OceanObs'99), to review the state of the ocean observing system and to look ahead for what is needed and what is possible. It brought together more than 600 participants from 36 countries. The ocean community was asked to submit community white papers on all aspects of the observing system. A few of these focused on data management, and many others touched on data management issues. Data management was also the subject of four plenary papers reviewing the current state of ocean data management and identifying weaknesses that needed attention. They also acted as the summary and consolidation of the ideas found in the community white papers and from the experience of the plenary paper authors. The last of the plenary papers, presented a vision for the future suggesting technologies and strategies that looked to be useful to pursue. All these plenary (and white) papers will appear in the conference proceedings later in 2010 and can then be read for greater detail. This paper will summarize the results to indicate the expectations of the ocean community towards a global ocean data system, and to present the possible solutions that could be implemented. The data management community needs to take these into consideration and to choose implementation strategies that achieve community expectations.

#### Introduction

2. In 1999 the first OceanObs'99 meeting was held to review the state of the ocean observing system and to plan actions and directions into the next decade. Out of this meeting was born the Argo program as well as other developments. The conference was focused on meteorological and physical oceanographic variables.

3. In late September 2009 OceanObs'09 was held with more than 600 participants. Its objective was to celebrate what had been accomplished in the last 10 years, to review what is known and needs further work and to look ahead for actions in the coming decade. At this conference biogeochemistry had a presence as well as a strong presence of data management.

4. In preparation for the conference, a call went out for ocean communities to prepare white papers that represented broadly held views of the state of the ocean observing system, and to consider what was needed for routine and sustained global information on the marine environment sufficient to meet society's needs. Considerations were for describing, understanding and forecasting marine variability (including physical, biogeochemical, ecosystems and living marine resources), weather, seasonal to decadal climate variability, climate change, sustainable management of living marine resources, and assessment of longer term trends.

5. Plenary speakers were recruited to take these many community views and to consolidate them into a broader domain view and to look forward to how such activities could realize societal benefits. Of the approximately 40 Plenary Papers, four (specifically with lead authors of Pouliquen, Keeley, Blower, and Hankin) dealt with data management.

6. This document provides a brief summary of the expectations of what the international data systems should be working on and toward, based on those four Plenary Papers (and in which

---

1 : <http://www.oceanobs09.net/>

additional details can be found; see drafts on the OceanObs'09 web site<sup>2</sup>). The following summary consists of simple bullets extracted from each of the four papers to describe the points made. No attempt has been made to extract common points from the four papers, even though there evidently are many.

**Pouliquen et al.: *The development of data system and growth in data sharing***

- (a) There is a general lack of a service / product component in the oceanographic domain to convert observed data into products of direct use to society. Data systems need to support a range of user needs from highly demanding scientific requests to highly processed information for the general public.
- (b) Data acquired with public funds are increasingly viewed as public property and so should be available. There is a need to actively encourage the rapid dissemination of data by pointing out to ocean data providers the benefits that outweigh perceived problems. While progress has been made, it is mostly confined to physical oceanography. The scope of timely and open data sharing needs to be broadened to other disciplines. Data sharing policies need to encourage strongly both open and timely data provision to users. Coincident with this, there needs to be a method to provide formal recognition of data providers to reward them for their contribution.
- (c) Nations and users are increasingly looking for syntheses of data, not simply data or products from individual projects. Data portals provide an avenue to expose the many data sources but require the active cooperation of data providers to describe their data.
- (d) The Internet is increasingly used for data exchanges. However, low bandwidth alternatives are still needed.
- (e) To improve data exchange and data flows, product development and services there is a strong need to develop widely agreed and used international methods and procedures based on international or de facto standards.
- (f) Pressure is mounting to not only provide data quality information but also to include estimates of the uncertainties in the measurements.
- (g) There is a need for increased support for data management infrastructure. Part of this support needs to be spent on coordinating data flows among providers.
- (h) Increased emphasis needs to be put on easing the integration of satellite with in-situ observations so that products based on combined results can be easily built.
- (i) There are both advantages and disadvantages to distributed or centralized data systems. The impacts of the disadvantages of whatever choice need to be minimized.
- (j) Information about how the data were collected, the instruments used, the processing carried out, etc., is increasingly recognized as important to acquire and provide with data.
- (k) Solutions need to be found to control the many versions of data that are created, some duplicates, some with different levels of processing.

**Keeley et al.: *Data assembly infrastructure: from acquisition to archives***

- (a) Because of the variety of ocean data being collected and the expertise needed to properly manage them, no single centre, even in a single nation, is likely to be able to handle everything. This means there is an increasing need to build effective collaborations between data centres and implement easier ways to combine data from different centres.
- (b) Technical developments of instrumentation put increasing emphasis on preserving information about these collection methods to ensure proper comparisons when measurements from different instruments are analyzed together.
- (c) Access to data in very quick time frames (hours to days) demands a higher level of cooperation among the partners managing the data. Since there is an increasing demand for real-time products and services, data centres need to invest more time in these collaborations. Close communication with all data users is important.
- (d) Documentation of versions of data is important to help archives and users understand the information they are presented. International data systems and their community should

---

2 : [http://www.oceanobs09.net/blog/?page\\_id=622](http://www.oceanobs09.net/blog/?page_id=622)

- invest time in trying to resolve how best to control versions and implement the scheme widely. Unique identifiers may play a role here. Preserving processing history is also important and may have a role as well.
- (e) Data centres will need to work with library services or other agencies to provide citation incentives to data originators to submit data. This may be through the use of Digital Object Identifiers, or other appropriate means.
  - (f) Data centres need to ensure that there are data access policies in place and that these are respected. These policies may be part of projects or more general at agency or national levels. Policies that allow for open and timely data sharing remove one obstacle to improved data access.
  - (g) Data centres need to be well connected to data collection activities in their country. They must be able to offer a valued service to become contributing members of the data collection activity. Data centres need to work with projects to ensure the long term preservation of data and metadata. Part of the work is to ensure that funding for data management is built into projects from the beginning.
  - (h) To ensure the integrity of the climate record data centres need to preserve data as it was received. These records must be archived and indexed in case they must be consulted many years after.
  - (i) There is a need for adoption of many kinds of standard practices. These include vocabularies, data exchange formats, quality control processing, version control, and mandatory metadata to accompany measurements. The international data management community needs to actively pursue the development, agreement and implementation of such standard practices.
  - (j) Because the variety of data is both large and increasing, it is prudent for data centres to look for more robust data models that can accommodate the variety without significant changes needed in archive structures and practices. This will not only improve data handling at centres, but if common structures are adopted widely, will improve the integration and interoperability of the different types of data.
  - (k) National data centres are not the only players in managing ocean data. It is necessary to work closely with others including academia, and non-governmental organizations such as the International Council for Science (ICSU).
  - (l) To date, the development of common practices has happened on a by chance basis. A forum is needed to allow data system developers to discuss problems and solutions so that recommended standard practices can be more rapidly implemented.

**Blower et al.: *Data dissemination: from archives to customer***

- (a) Reduce social barriers to data sharing. This will need development of suitable policies, and rewards such as making data sets a citable property for researchers. The more open the data sharing policies and practices, the greater are the community-wide rewards.
- (b) Help data providers to standardize on a minimal set of data formats. This essential because it is becoming less prevalent for individual datasets to be used alone.
- (c) Establish a forum for discussing ocean and Geographic Information System (GIS) integration issues. There is a significant body of work done by the Open Geospatial Consortium (OGC) much of which is of relevance to the ocean community. We need to ensure strong communications and adopt practices that can serve our needs.
- (d) Set up cross community pilot projects. This will have many positive results including standardization of terms, formats, quality assessment practices, dissemination strategies and tools, and better interoperability of data sets. It will also increase the range of users supported and encourage data sharing where such practices are just beginning.
- (e) Invest in linking data systems to end-user tools. Data dissemination needs to support push and pull technologies, standardized formats, vocabularies, etc. Exploiting existing and proven tools, and extending them as possible will optimize investments already made.
- (f) Improvements in dissemination will hinge on developments and implementation of standard practices. This covers many fronts including vocabularies, taxonomies, catalogues, web services, quality control and access protocols. Semantic web technology is a likely contribution and more efficient data portals will be the result.

- (g) Data rescue is an important consideration. There are many data sets largely still inaccessible because they do not exist in electronic form. Investments are needed to bring these data sets into existing electronic archives,
- (h) Web services will become increasingly important and used. Exploiting existing and established services, such as the Open-source Project for a Network Data Access Protocol (OPeNDAP), Web Map Service Interface Standard (WMS), etc., optimizes investments already made.

**Hankin et al.: *Data management vision***

- (a) Expectations are that data systems will exist at diverse organizations, but all will function as a virtual system. The system will cope with significantly increased data volumes and kinds, will support broad data sharing with rich metadata including provenance information, data will be easily and quickly locatable, that archives will support long term preservation of data and that data services will support a wide range of users.
  - (b) The data management community needs to have pragmatic and realistic attitudes when planning data management strategies. Because of the rapid development of information technology, unless software development is simple, long development times can render results obsolete before they are deployed. Such risks can be offset by investment in common software tools.
  - (c) Recommended standards need to be appropriately matched to their intended use. A wide variety are needed including for metadata of all kinds, use of Open Archival Information System Reference Model (OAIS-RM) strategies, data content, file formats, collection level metadata descriptions, and inclusion of error estimates on measurements.
  - (d) The data management community needs to develop strong and continuing communication with scientists, program managers and users. Data collection agencies need to be connected to archives to ensure the preservation of the data. Encouraging cross discipline links will promote standards and interoperability.
  - (e) Improvements and use of highly functional tools for users will greatly benefit interoperability objectives. The expectation of the functioning of these tools will be shaped by widely used technology such as Google, Facebook, and Flickr. Opportunities to use such tools need to be exploited.
  - (f) Data management strategies based on sampling geometry (vectors, fields, etc.) will improve the robustness of data models, improve access and encourage the development of standardized tools. Examples such as netCDF-CF (Network Common Data Form- Climate and Forecast) point the way forward.
  - (g) Standardized metadata is important and must maintain unbreakable links to observations. The use of semantic web tools will assist interoperability of different systems.
  - (h) Data sharing can be increased by the adoption of appropriate policies and developing methods for citation of data for researchers.
  - (i) There is a wealth of data that exist in non-electronic or non-accessible electronic forms. Mobilize these records.
  - (j) Satellite and in-situ data must be seamlessly available.
-

## ANNEX IV

### PROSPECTS FOR ICOADS WIND WAVE SUMMARIES

Sergey Gulev, Vika Grigorieva, Val Swail

This short note is to summarize the current availability of wind wave parameters from the ICOADS collection and to deliver recommendations for potential development of the routine summaries (MSTG) for wind wave characteristics in the same manner as is done for other meteorological quantities.

Currently ICOADS in the LMRF-6.0 and IMMA formats provide the following information about wind waves:

- wind sea height, meters
- wind sea period, seconds,
- wind sea directions, degrees
- swell height, meters
- swell period, seconds
- swell direction, degrees
- secondary important swell height
- secondary important swell direction

It is important to note that initially all these parameters were reported in codes (e.g. half-meter increments for heights, from 1 sec to 2 sec increments for periods) and then were converted to metric values. Furthermore, there are several important problems in the VOS wave reports which should be first sorted out before any kind of space-time averaging is performed.

**I. Temporal inhomogeneity of the type of reported variables.** Before roughly 1953-1958 VOS reported wind sea height, period and direction (as stated in the format description). However, in fact (as it is stated in the technical documentation) these were reports of the highest of sea or swell component observed. Thus, all these reports have to be more likely attributed to significant wave height – SWH - (if we assume the highest of sea or swell to be a measure for SWH). Later (after 1953-1958) VOS started to report sea and swell separately. Nevertheless, before 1953 reports of swell exist and it is still unclear how much they are swell and what they are in fact. What can be done certainly is the development of SWH (as  $max[sea,swell]$ ) products for the period prior to 1950 and the development of products for sea, swell and computed SWH for the period after 1958. It is unclear what to do with the period 1953-1958. New practices were introduced slowly and at the moment there is no way of knowing which practice was applied for the reports within this period. Some semi-manual analysis is presently being done which involves analysis of call signs, SLP and wind speed to sort out the problem. What can be surely done is the development of SWH summaries for the whole 1856+ period, assuming SWH to be defined as  $max[sea,swell]$ . See details in Gulev and Grigorieva (2004, GRL).

**II. Considering the period 1958+,** generally all parameters listed above are available, but in fact massively appear starting from 1963. However, their trimming requires much work to handle several biases in VOS wave characteristics. The most critical things are the following.

**1. Swell codes for the period prior to 1968 and after 1968.** The coding systems were changed in 1968 and this change was not simultaneously accepted by all ship owners. The period of the full acceptance continued until 1974-76 (our estimate). Thus, each swell report for the period from 1968 to 1976 should be checked with respect to the neighbouring data and wind/SLP situation to get a hint which period is reported (according to the old or to the new system). Be it sea, things would be easier, but for swell synoptic analysis may not necessarily tell much. This is presently being investigated in Moscow, trying to use ERA-WAM hindcast for these years to sort out the reports. Currently we have sorted out practically all problems for 1970-1976, but the 2-yr period of

68-69 is still a disaster. Making our products we simply exclude these 2 years from the analysis when analyzing swells.

**2. Separation of sea and swell.** Frequently young swells are reported as seas and vice-versa (mature seas reported as swells). Furthermore, there are simple mistakes when officers are placing information in the wrong fields of the report. This was especially the practice when assistants were changed to mates for doing observations. Two approaches can be used. First, it is possible to use theoretical (or say semi-theoretical, e.g. JONSWAP) functions of wind duration versus wave height and to look at 2D-PDFs. Secondly, one can look at wave age, whose derivation requires wind speed and the component of wind in the wave direction. The second approach involves wave periods which are uncertain for different reasons (see below). See details in Gulev et al. (2003, JGR, 2003, WMO Guide) and in Gulev and Hasse (1998, JPO, 1999, IJC).

**3. Correction of wave periods.** VOS-reported wave periods are known to be biased. Importantly, they can be both underestimated and overestimated. Overestimation results from the cases when the measurements are done properly (i.e. using a watch and counting a parcel of 10 consecutive waves). In this case sailors frequently skip 1-2 small waves in the parcel. The resulting computation of period as  $t_{10}/(n-1)$  or  $t_{10}/(n-2)$  leads to the overestimation compared to the estimate  $t_{10}/n$ . Underestimation results from the inappropriate practice of observations, i.e. when the observations are taken arbitrarily or not taken by observing. In this case VOS wave reports are more likely the hindcast of the waves from wind.

**4. Impact of evaluation of true wave period.** This is critical and compared to the wind, it is certain that such evaluation is not practiced. Biases may amount to 30-50%. We corrected most biases by using ship velocity and course data, however the drop in the number of samples is close to critical after the correction is applied.

**5. Small waves - Problem of coding system.** According to WMO (1995) the height of waves from 0.25 m to less than 0.75 m should be coded as "01". COADS LMR6 and IMMA return a nominal value of 0.5 m for all code figures "01". However, observers in general tend to overestimate small wave heights. Moreover, in practice observers frequently apply code 01 to the wave heights less than 0.25 m, which should be coded "00" according to WMO (1995). There is the correction of Gulev et al. (2003) which can be applied to seas; it is unclear what to do with small swell so far. The bias in climatology may be up to 0.2-0.3 meters for the tropical regions, which is quite a large value.

**6. Very high waves** coded as "50" and returned in meters to be equal to 25 meters. There are many of them, too many. For the whole history there are 241 cases of VOS wind waves between 16 and 24.5 meters and about several thousands of waves of 25 meters exactly. If we incorporate all in the averaging, the bias for mid latitudes may amount to 1-2 meters; moreover all extreme wave stats will be strongly biased, distributions will be looking not like a one-peak distributions. A guideline is to simply skip all reports with code "50" or to carefully look at them using wind and SLP information. We are processing these extremes (or potentially extreme artifacts).

**III. Considering development of the products,** one should think about the delivery of SWH which has to be computed from sea and swell, as well as dominant period, which also should be derived from the sea and swell period. Recommendations were derived by Hogben (1984), Barratt (1991) and Gulev et al. (2003). Some uncertainties exist; perhaps new approaches should be developed for different regions. Buoy data and ERA-40-WAM and similar hindcasts can be used further.

**IV. The sampling problem is general, but quite critical for waves.** Our experience shows that for a proper estimation of wave characteristics only reports will all wave parameters, wind, SLP, ship course and velocity should be used. These requirements limit the number of reports available for the analysis to less than those available for flux computations (see Gulev et al. 2007a,b, J. Climate).

**Recommendation:** If the ICOADS community decides to develop wave summaries, a comprehensive compendium guide should be first developed. We can try to lead drafting of this guide in co-operation with ICOADS and some people still doing VOS waves. The help of captains and officers would be desirable. In a year, such a guide with corresponding codes can be developed. Otherwise, this work can be left out, and will be done anyway. The latest release of the VOS wave climatology was expected to be issued (50 years: 1958-2007) at the end of 2008. This will bring probably a new set of guidelines, which can be further used by the community.

**Footnote:** We could retrieve from our archive what comes out from the exercise of taking all reports for e.g. sea height or period, or swell for a calendar month, applying general quality control, then trimming of 4 or 3.5 sigma, and plotting the map – this will be self explanatory even for well sampled months. Anecdotal values will appear in the tropics and in the Southern Ocean, the midlatitudinal patterns will be hardly detectable, there will be no consistency between heights and periods, etc.

---

ANNEX V

OBSERVATIONAL REQUIREMENTS FROM GCOS (1999)

IOC/INF-1127  
Annex II

ANNEX II

Tabulated Observational Data Requirements for GOOS/GCOS

Table A

A summary of the sampling requirements for the global ocean, based largely on OOSDP (1995), but with revisions as appropriate. These are a statement of the required *measurement network* characteristics, not the characteristics of the derived field. The field estimates must factor in geophysical noise and unsampled signal. Some projections (largely unverified) have been included for GODAE.

SAMPLING REQUIREMENTS FOR THE GLOBAL OCEAN							
Code	Application	Variable	Hor. Res.	Vert. Res.	Time Res.	No. of samples	Accuracy
A	NWP, climate, mesoscale ocean	Remote SST	10 km	-	6 hours	1	0.1-0.3°C
B	Bias correction, trends	<i>In situ</i> SST	500 km	-	1 week	25	0.2-0.5°C
C	Climate variability	Sea surface salinity	200 km	-	10 day	1	0.1
D	Climate prediction and variability	Surface wind	2°	-	1-2 day	1-4	0.5-1.0 m/s in the components
E	Mesoscale, coastal	Surface wind	50 km	-	1 day	1	1-2 m/s
F	Climate	Heat flux	2° x 5°	-	month	50	Net: 10 W/m <sup>2</sup>
G	Climate	Precip.	2° x 5°	-	daily	Several	5 cm/month
H	Climate change trends	Sea level	30-50 gauges + GPS with altimetry, or several 100 gauges +GPS	-	monthly means		1 cm, giving 0.1 mm/yr accuracy trends over 1-2 decades
I	Climate variability	Sea level anomalies	100-200 km	-	10-30 days	~ 10	2 cm
J	Mesoscale variability	Sea level anomalies	25-50 km	-	2 days	1	2-4 cm
K	Climate, short-range prediction	sea ice extent, concentration	~ 30 km	-	1 day	1	10-30 km 2-5%
L	Climate, short-range prediction	sea ice velocity	~ 200 km	-	Daily	1	~ cm/s
M	Climate	sea ice volume, thickness	500 km	-	monthly	1	~ 30 cm
N	Climate	surface pCO <sub>2</sub>	25-100 km	-	daily	1	0.2-0.3 µatm
O	ENSO prediction	T(z)	1.5° x 15°	15 m over 500 m	5 days	4	0.2°C
P	Climate variability	T(z)	1.5° x 5°	~ 5 vertical modes	1 month	1	0.2°C
Q	Mesoscale ocean	T(z)	50 km	~ 5 modes	10 days	1	0.2°C
R	Climate	S(z)	large-scale	~ 30 m	monthly	1	0.01
S	Climate, short-range prediction	<u>U</u> (surface)	600 km	-	month	1	2 cm/s
T	Climate model validation	<u>U</u> (z)	a few places	30 m	monthly means	30	2 cm/s

## ANNEX VI

### PROPOSAL OF NEW TRANSFER FORMAT FOR MARINE METEOROLOGICAL OBSERVATIONS

**Note:** This proposal is divided into two parts, the first including the organisational data and the second with the meteorological elements.

Points for discussion:

- Should quality flags directly follow each met element or be grouped together at the end?
- Should some elements be given additional quality flags. A "?" has been added where this seems necessary.

It should be simple to align the new format with IMMA, except for position (as this is far more detailed). The red numbers of characters (time, position, wind speed and direction) mark the proposed changes.

IMMTransfer-format		IMMArchive-format	
<b>First part:</b>	<b>Organisational Elements</b>		
Year UTC	AAAA	IMMA-core	Len: 4
Month UTC	MM	IMMA-core	Len: 2
Day UTC	YY	IMMA-core	Len: 2
Time UTC	GGgg	IMMA-core	Len: 4
Quadrant	Qc		Len: 1
Latitude	LaLaLaLaLa		Len: 5
Longitude	LoLoLoLoLoLo		Len: 6
Flags	Q20		1
Country Code	CC	IMMA-core	Len: 2
Call sign		IMMA-core	Len: 7
Source of obs		Table C2	Len: 1
Obs Platform		Table C2	Len: 1
AWS Indicator	AWS		Len: 1
IMO Number	IMO		Len: 7
Ship Course	Ds	IMMA-core	Len: 1
Ship Speed	vs	IMMA-core	Len: 1
Flags	Q17-18		2
<b>Versions:</b>			
IMMT Version		IMMA-core	Len: 1
IMMA Version		IMMA-core	Len: 1
FM Code Version		Table C2	Len: 1
MQCS Version		Table C2	Len: 1
National Quality Indicator		Table C2	Len: 1
<b>Second part:</b>	<b>Meteorological Elements</b>		
Wind direction	ddd	IMMA-core	Len: 3
Wind speed indicator	iw	IMMA-core	Len: 1
Wind speed	fff	IMMA-core	Len: 3
Flags	Q4-5		2
Visibility Indicator		IMMA-core	Len: 1
Visibility	VV	IMMA-core	Len: 2
Flags	Q2		1
Weather data Indicator	ix	Table C2	Len: 1
Present Weather	ww	IMMA-core	Len: 2
Past Weather 1	W1	IMMA-core	Len: 1
Past Weather 2	W2	Table C2	Len: 1
Flags	Q9		1 ?
Sea Level Pressure	PPPPP	IMMA-core	Len: 5
Pressure Tendency	a	IMMA-core	Len: 1
Amount of pressure tendency	ppp	IMMA-core	Len: 3
Flags	Q8, Q15-16		3

Temperature Indicator	iT	IMMA-core	Len:	1
Sign of temperature	sn	IMMA-core	Len:	1
Air Temperature	TTT	IMMA-core	Len:	3
Flags	Q6			1
Indicator of Tb measurement		IMMA-core	Len:	1
Sign of web-bulb temperature	sw	IMMA-core	Len:	1
Wet-bulb temperature	TbTbTb	IMMA-core	Len:	3
Flags	Q19			1
Indicator of Td measurement		IMMA-core	Len:	1
Sign of dew point	st	IMMA-core	Len:	1
Dew Point	TdTdTd	IMMA-core	Len:	3
Flags	Q7			1
Relative Humidity indicator	Rhi		Len:	1
Relative Humidity	RH		Len:	4
Flags				1
Indicator for Tw		IMMA-core	Len:	1
Sign of sea surface temperature	sn	IMMA-core	Len:	1
Sea surface temperature	TwTwTw	IMMA-core	Len:	3
Flags	Q10			1
Total cloud amount	N	IMMA-core	Len:	1
Lower cloud amount	Nh	IMMA-core	Len:	1
Cloud height measurement indicator		IMMA-core	Len:	1
Height of clouds	h	IMMA-core	Len:	1
Genus of lower clouds	CL	IMMA-core	Len:	1
Genus of middle clouds	CM	IMMA-core	Len:	1
Genus of high clouds	CH	IMMA-core	Len:	1
Flags	Q1, Q3			2 ?
Indicator for wave measurement		Table C2	Len:	1
Period of wind waves	PwPw	IMMA-core	Len:	2
Height of wind waves	HwHw	IMMA-core	Len:	2
Direction of swell waves	dw1dw1	IMMA-core	Len:	2
Period of swell waves	Pw1Pw1	IMMA-core	Len:	2
Height of swell waves	Hw1Hw1	IMMA-core	Len:	2
Direction of 2. swell waves	dw2dw2	Table C2	Len:	2
Period of 2. swell waves	Pw2Pw2	Table C2	Len:	2
Height of 2. swell waves	Hw2Hw2	Table C2	Len:	2
Flags	Q11-13			3 ?
Indicator of precipitation	iR	Table C2	Len:	1
Amount of precipitation	RRR	Table C2	Len:	3
Duration of precipitation	tR	Table C2	Len:	1
Flags	Q14			1 ?
Ice accretion on ship	Is	Table C2	Len:	1
Thickness of ice accretion	EsEs	Table C2	Len:	2
Rate of ice accretion	Rs	Table C2	Len:	1
Concentration of sea ice	ci	Table C2	Len:	1
Stage of development	Si	Table C2	Len:	1
Ice of land origin	bi	Table C2	Len:	1
True bearing of ice edge	Di	Table C2	Len:	1
Ice situation and trend	zi	Table C2	Len:	1
Flags				0 ?
VOSCLim-Elements		Table C2	Len:	19
Flags				7
<b>Characters without flags: 159</b>		<b>Characters with flags:</b>		<b>184</b>

## ANNEX VII

### REPORT BY THE GLOBAL COLLECTING CENTRES

#### 1. Introduction

The Global Collecting Centres (GCCs) for the Marine Climatological Summaries Scheme (MCSS) have been established by Recommendation 11 (CMM-XI) (Lisbon, April 1993). Germany and the United Kingdom have been operating the GCCs. The current activities of the GCCs will be reported through the GCC annual report.

#### 2. GCC report

##### 2.1 VOS Data

2.1.1 The 2009 GCC annual report marks the 16<sup>th</sup> year of GCC operation. It was an average year as far as the number of observations received, with just a little over 1 million observations **(1,069,118)** received and with contributions coming from eighteen members (Fig. 1). In 2009, due to a TT-DMVOS action, the GCCs were permitted to become more pro-active in their approach to collecting observations. This resulted in contributions from Ireland, Israel & Sweden (and soon also Greece) which are expected to continue further in 2010.

2.2.2 The 2009 areal distribution map (Fig. 2) 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 decreasing with only 230 observations in 2009 (making up a very small percentage of total data). 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.

2.2.3 Although data were received from as far back as 1992 in 2009 and 1988 in 2008, over 60% of data are from 2008 & 2009 and 96% from the last four years (Fig. 3). The majority of data received by the GCCs arrive in IMMT format by email and anonymous FTP transfer. Most submissions in 2009 (and the three years previous) were received in the preferred IMMT-3 (2008/2009: 6.5% / 9.3% IMMT-1, 3.1% / 1.8% IMMT-2, 90.4% / 88.9% IMMT-3).

2.2.4 Problems with duplicate and resubmitted observations during different quarters were identified during 2008. In 2008 there were >18k obs and 2009 >10k resubmitted obs in different quarters, whereas there were only 605 dregs in 2008 and 3,164 dregs in 2009 highlighted by the Quarterly Exchange processing (duplicates/resubmissions within the same quarter). If data are resubmitted during different quarters/years these duplicates cannot be rejected by routine GCC processing. They can only be identified by the RMs during further quality processing. Not only does this generate extra work for the GCCs and RMs, this also means there are considerably less unique records each year than previously thought which, in turn, significantly affects the yearly statistics within the Annual Report. CMs are asked to refrain from re-submitting data, however, if it is necessary then please make GCCs aware of this to allow replacement within the database.

2.2.5 In an effort to provide an up-to-date CM membership list the GCCs sent a Marine Climatological Data Questionnaire to marine meteorological services throughout the world during December 2007. The purpose of the questionnaire was to seek information on whether each country ran a Voluntary Observing Ship Fleet and if they are currently contributing their observations to the MCSS and, if not, whether they require help in doing so. The aim was to encourage all countries to contribute their data and to increase the amount of checked observations within the archives. The results of this questionnaire were presented at CLIMAR-III and highlighted that the actual meteorological services willing to contribute their data to the MCSS amounts to 26. This is significantly less than the 41 CMs previously thought to be part of the scheme (Fig. 4). The following Table 1 shows that during 2007 17 CMs, 2008 16 CMs and 2009 18

countries submitted data. The remaining countries hope to be in a position to contribute to the scheme soon.

**Table 1**

Country Name	2007	2008	2009
Argentina	344	2	
Australia	330,369	60,285	63,539
Brazil			
Canada			
Croatia			
France	107,764	12,820	13,677
Germany	304,430	588,678	692,192
Greece			
Hong Kong, China	2,968	2,528	2,185
India	4,796	2,640	698
Ireland			8,398
Israel	7,585		1,200
Japan	25,555	21,075	12,458
Kenya			
Malaysia	5,325	2,498	2,264
Netherlands	53,102	40,304	75,603
New Zealand	11,218	7,061	7,682
Nigeria			
Norway	12,611	35,690	85,402
Poland	1,033	1,104	1,112
Russian Federation	48,339	48,122	39,637
Singapore			
South Africa	1,508	658	3,198
Sweden			3,222
United Kingdom	50,430	24,239	31,819
USA	134,503	31,182	24,832
<b>Total</b>	<b>1,101,880</b>	<b>878,886</b>	<b>1,069,118</b>

2.2.6 There is evidence to show that the percentage of elements reported blank has varied frequently over the past three years (Fig. 5). The most commonly reported blank elements are still precipitation, swell direction and height of lowest cloud. It was observed in the last three years that there had been an increase in most elements being reported as blank and results from 2009 show again a rise of around 5-10% for most elements. The increase of automated stations on the ships might be the reason for this development, the new AWS indicator in the revised IMMT format version 4 should help clarify this in future.

2.2.7 The MQC software compares flags already set on the data by CMs to those the MQCS-V would set. This analysis identifies in 2008 and 2009 0.04% occasions where flags conflicting with MQCS-V required resetting to a level of 6 or 7 (N.B. detailed meanings of level 6 & 7 have now been added to the new IMMT-4 format).

## 2.3 VOSClim Data

2.3.1 The GCCs have continued to receive considerable volumes of data from VOSClim registered ships (Table 2), contributing to 6% of the total submissions during the last three years. It is encouraging to see that most of these observations do now contain the extra VOSClim additional elements, 81% in 2009, 74% in 2008 and 67% in 2007. There are still a considerable number of observations with additional elements received from non-VOSClim ships amounting to

23,517 in 2008 and 12,364 in 2009. CMs are asked to encourage ships already reporting these elements (and other vessels) to join the VOSClime project. In both 2007 & 2008, nine out of the eleven registered CMs contributed data from their VOSClime ships, whereas only seven out of eleven contributed during 2009.

**Table 2**

**Observations from VOSClime-Ships / Observations with VOSClime-Elements 2007 - 2009**

<b>Country Name</b>	<b>2007</b>		<b>2008</b>		<b>2009</b>	
Australia	27.431	18.519	8.419	3.422	6.437	2.360
Canada	0	0	0	0	0	0
France	9.512	0	12.275	12.275	12.706	12.706
Germany	10.364	9.959	14.026	11.945	25.973	22.121
India	1.773	465	1.524	0	30	0
Japan	3.026	3.026	1.029	1.029	0	0
Netherlands	5.254	4.928	9.272	6.853	16.503	12.767
New Zealand	455	342	464	463	891	891
United Kingdom	8.902	7.486	1.528	0	6.838	5.637
USA	198	0	46	0	0	0
<b>Total</b>	<b>66.915</b>	<b>44.725</b>	<b>48.583</b>	<b>35.987</b>	<b>69.378</b>	<b>56.482</b>

2.3.2 The majority of VOSClime data submitted in 2009 were not older than 12 months (Fig. 7). As with VOS contributions, observations are processed through a series of programs to ensure they pass the MQCS. VOSClime data still appears to be of a higher standard compared with VOS. All observations had corresponding flags reported to the common met elements and the flags attached to VOSClime elements are increasing too, 2008 only 54.9% were flagged, but 2009 it was 72.7%.

2.3.3 The area distribution map (Fig. 6) shows that VOSClime ships are distributed similarly to VOS. The observations reported on-land by VOSClime ships in the last years were a similar proportion to VOS too, and in the last three years it is seen that VOSClime ships had an increase in elements being reported as blank also (Fig. 8).

## 2.4 Highlights & Issues

- TT-DMVOS & TT-MOCS set up
- New CM total of 26 oppose to previously documented total of 41.
- GCCs met in Hamburg twice & wider task team meeting twice.
- Some changes proposed by task team work have already filtered through to routine work practices.
- IMMT-4 & MQCS-6 adopted and due for general use by 1<sup>st</sup> January 2011.
- GCCs will be providing data to the JCOMM WIGOS Pilot Project (member of steering team)
- Both GCCs have been identified as DCPCs by their NMS for the WIS.
- A continuing problem is the use of masked callsigns by ships in real-time. This has an impact on international data archives, the real-time and delayed-mode observations are not easily identified as being from the same source making quality control difficult. Also, without a call sign it is impossible to link with the ship metadata for analysis of data.

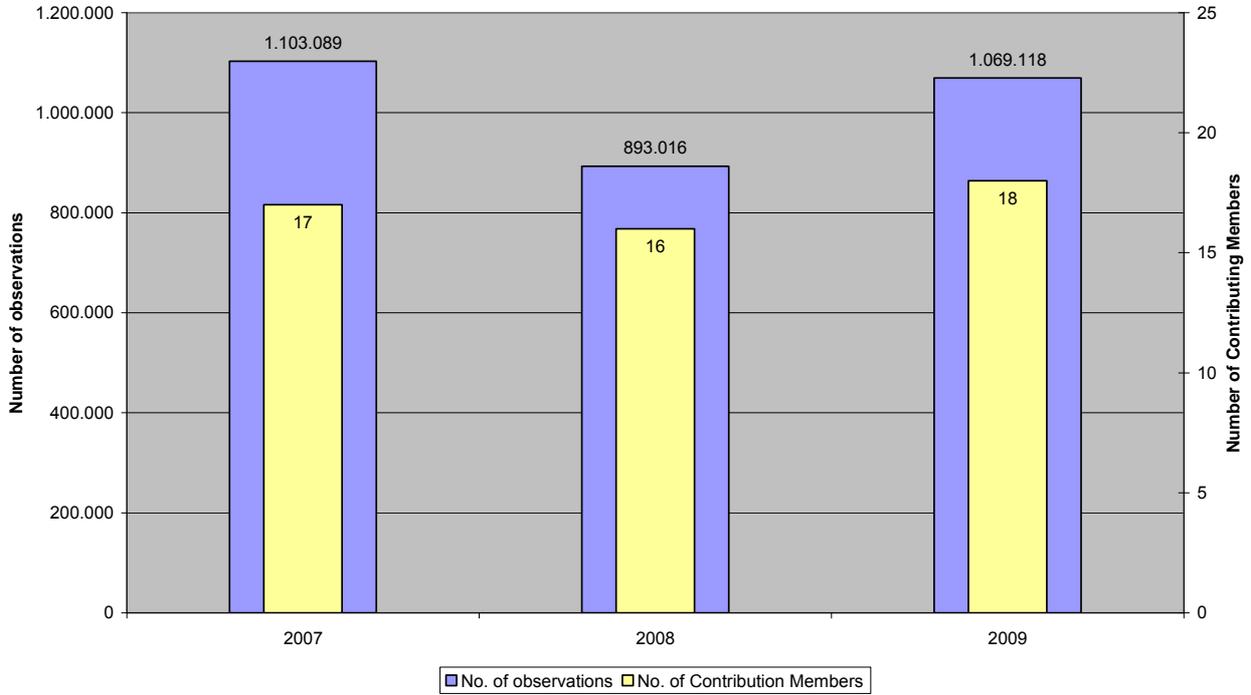
## 2.5 Looking to the future

- Future data transfer format to be completely re-vamped – perhaps not IMMT
- QE data to be provided in IMMA format also (from 1Q2010).
- Reviewing roles of RMs and new role of GCC for RT
- New data-flow with more detailed QC and central storage and access (still being discussed/developed).

- Ultimately new end products to be created to meet modern user requirements.
- See TT-DMVOS ETMC-III papers 5.1, 5.2 & 5.4.

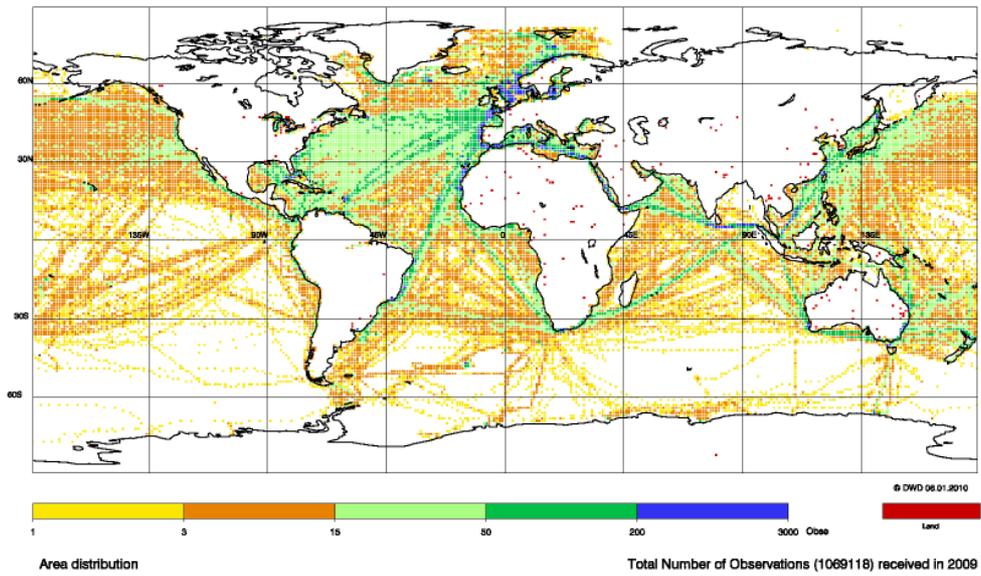
**Figure 1**

**Contributed observations 2007 - 2009**



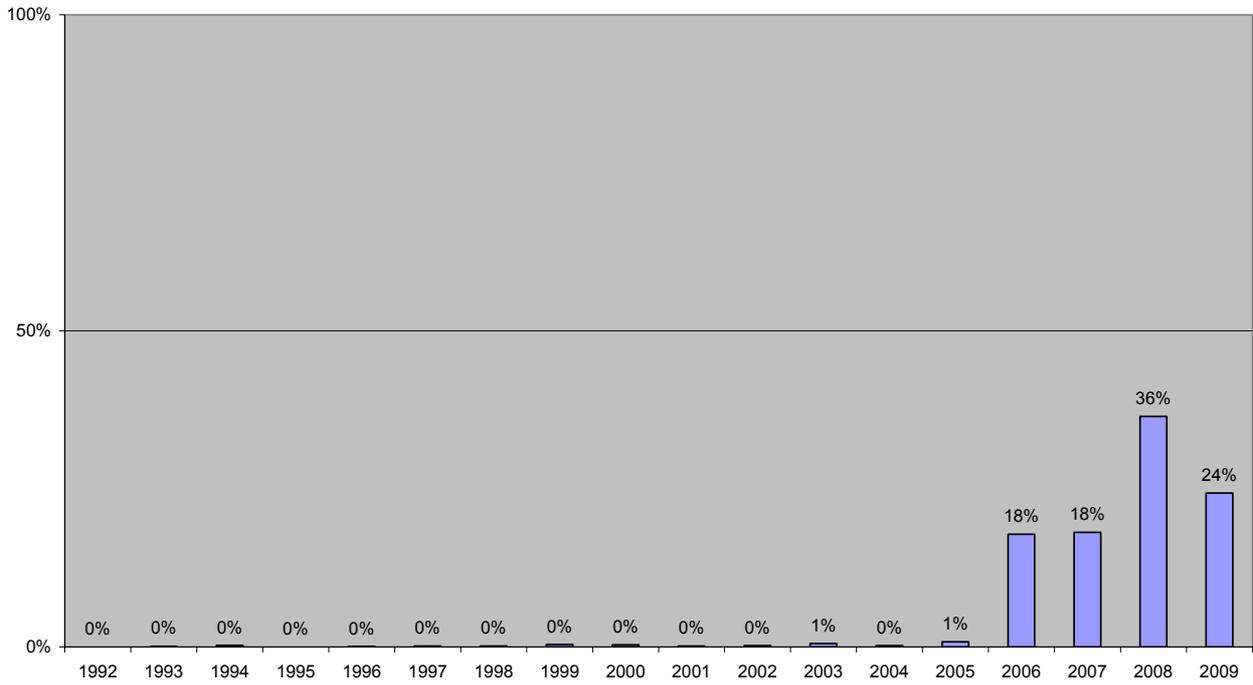
**Figure 2**

**Distribution of Reported Positions**

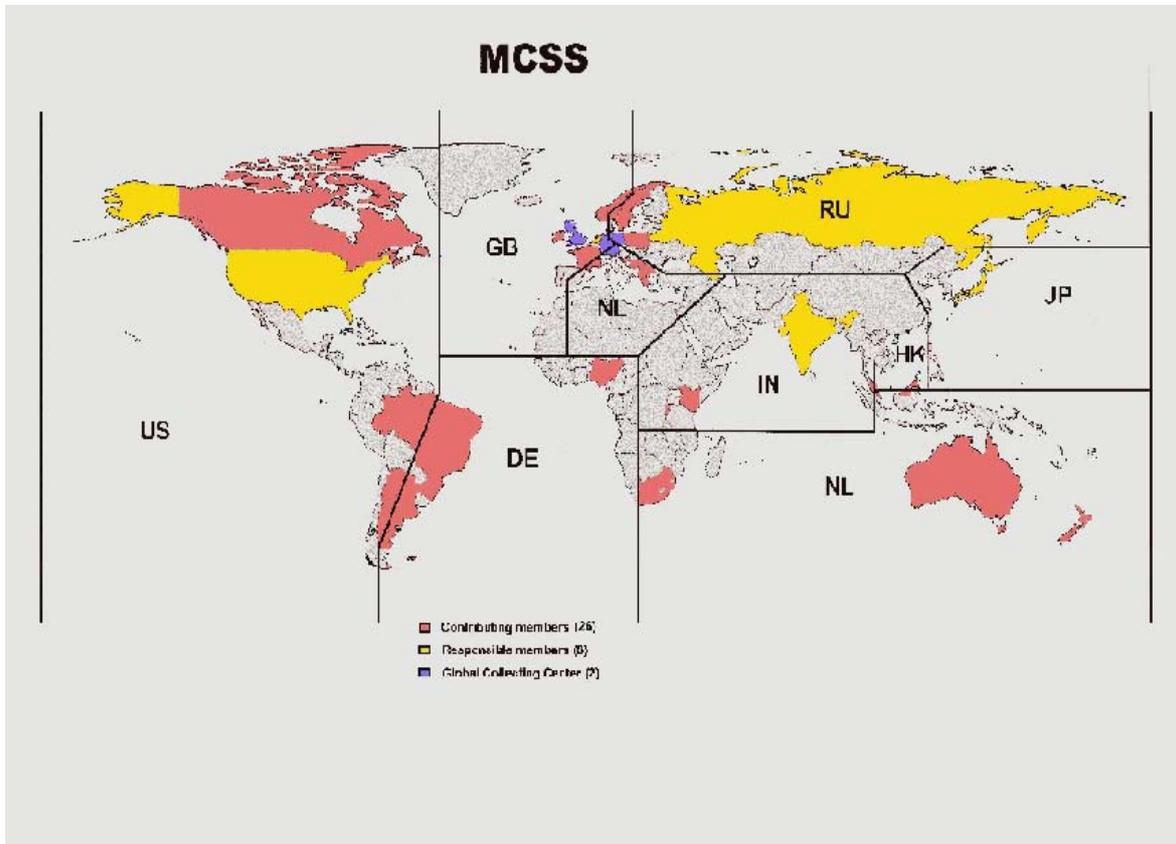


**Figure 3**

**Distribution of Data received 2009**

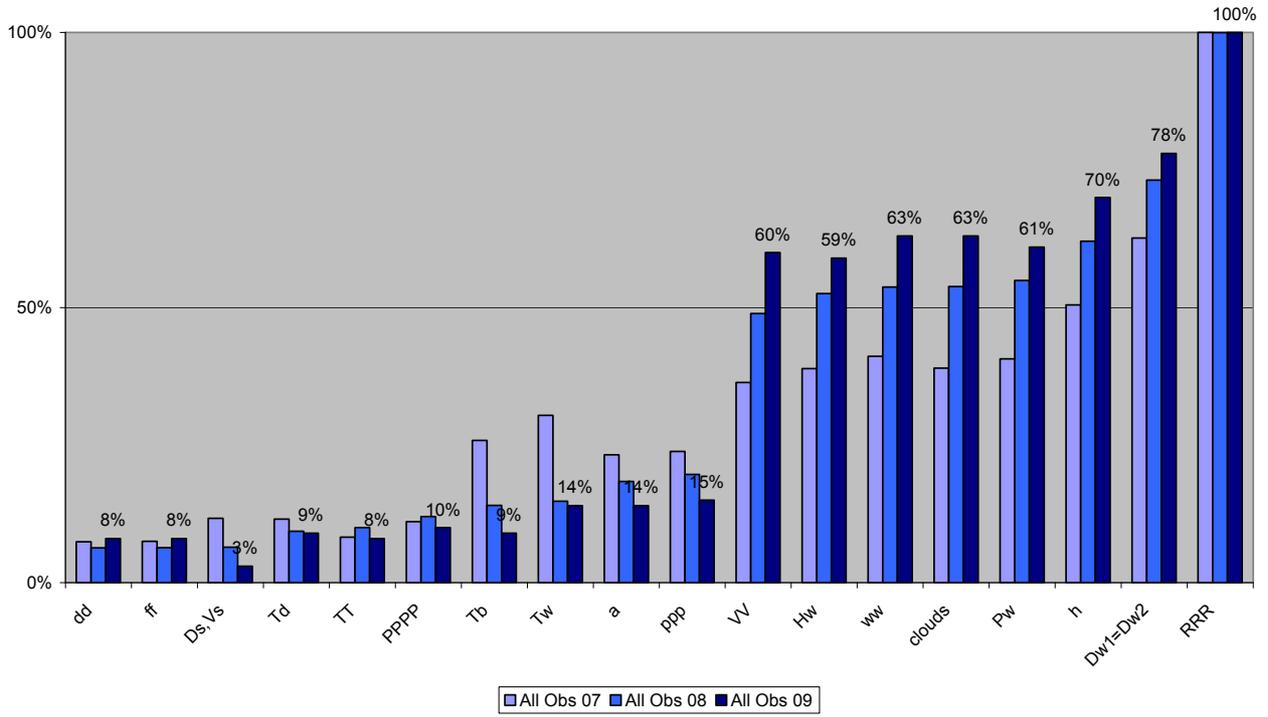


**Figure 4**



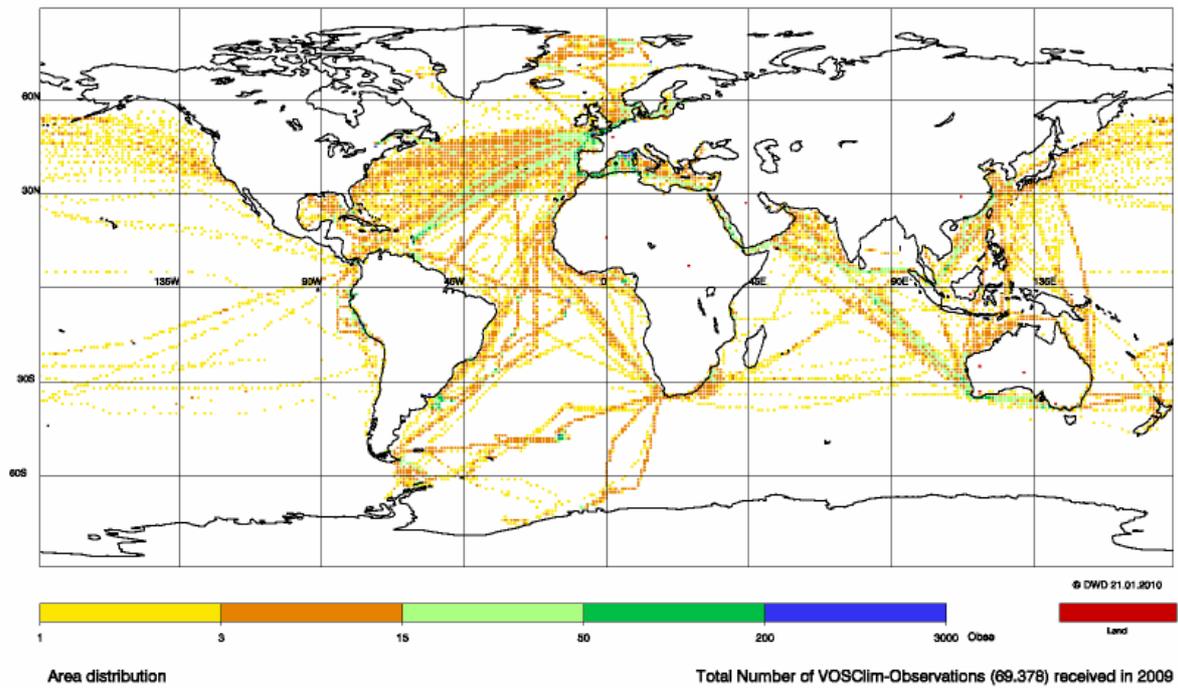
**Figure 5**

Elements reported blank 2009



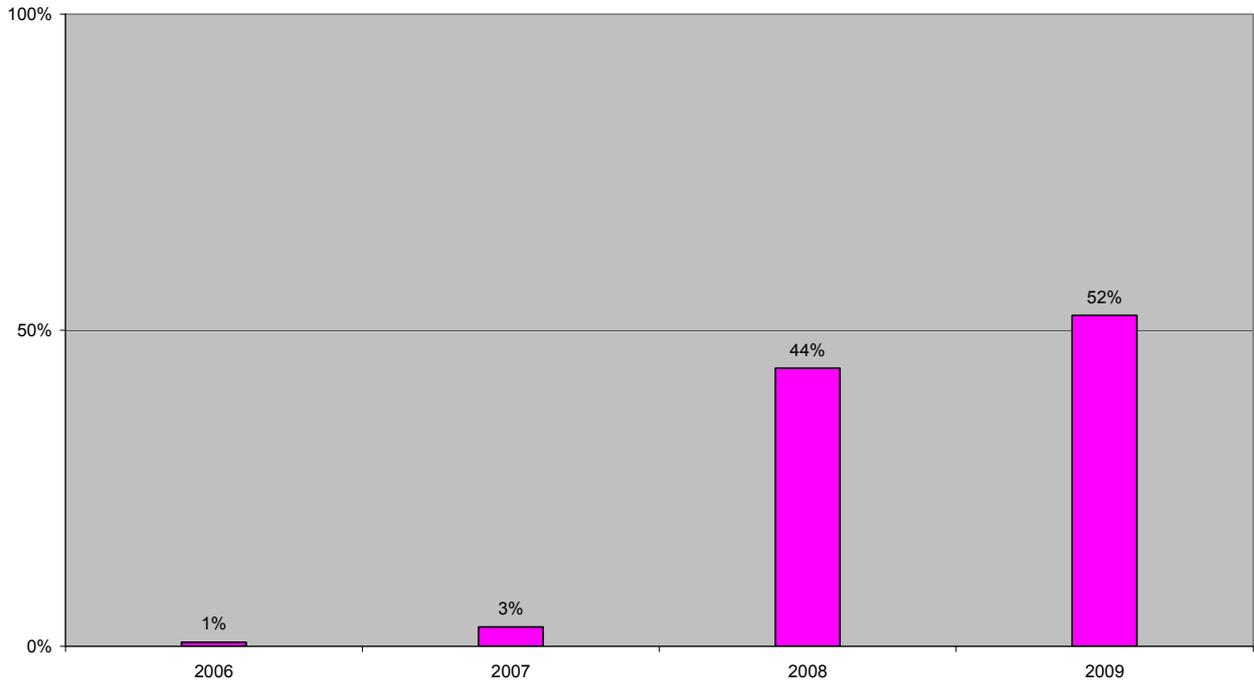
**Figure 6**

Distribution of Reported Positions from VOSclim-Ships



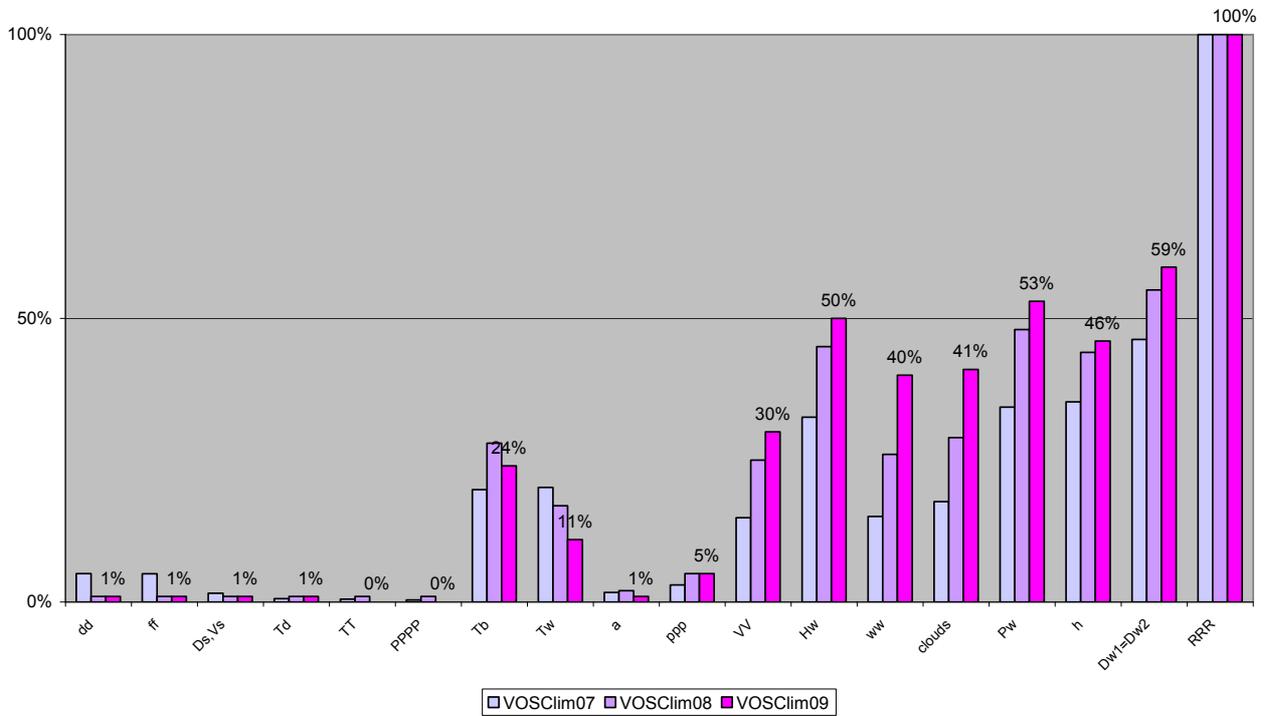
**Figure 7**

**Distribution of Data received 2009 from VOSCLim-Ships**



**Figure 8**

**Elements reported blank 2009**



## ANNEX VIII

### 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. Data management

1.1 The German Meteorological Service, Deutscher Wetterdienst, hosts one of the two Global Collecting Centres (GCCs) within the Marine Climatological Summaries Scheme, the MCSS, and at the same time acts as Contributing Member world-wide and as Responsible Member for the South Atlantic Area.

1.2 Following numbers of observations were contributed from ships of the German VOS fleet and fixed stations to the GCC in the last three years while acting as CM:

	2007		2008		2009	
	No. of Ships	No. of Obs.	No. of Ships	No. of Obs.	No. of Ships	No. of Obs.
Selected Ships	662	191.880	736	156.716	500	122.092
Supplementary Ships	1	593	1	127	2	9
Auxiliary Ships	19	10.111	22	7.617	12	5.198
Automated Stations	23	51.450	29	303.033	26	463.648
Fixed Sea Stations	16	107.895	16	100.012	18	110.748
<b>Total</b>		<b>361.929</b>		<b>567.505</b>		<b>701.695</b>
VOSclim Ships	27	10.364	29	14.026	32	24.624

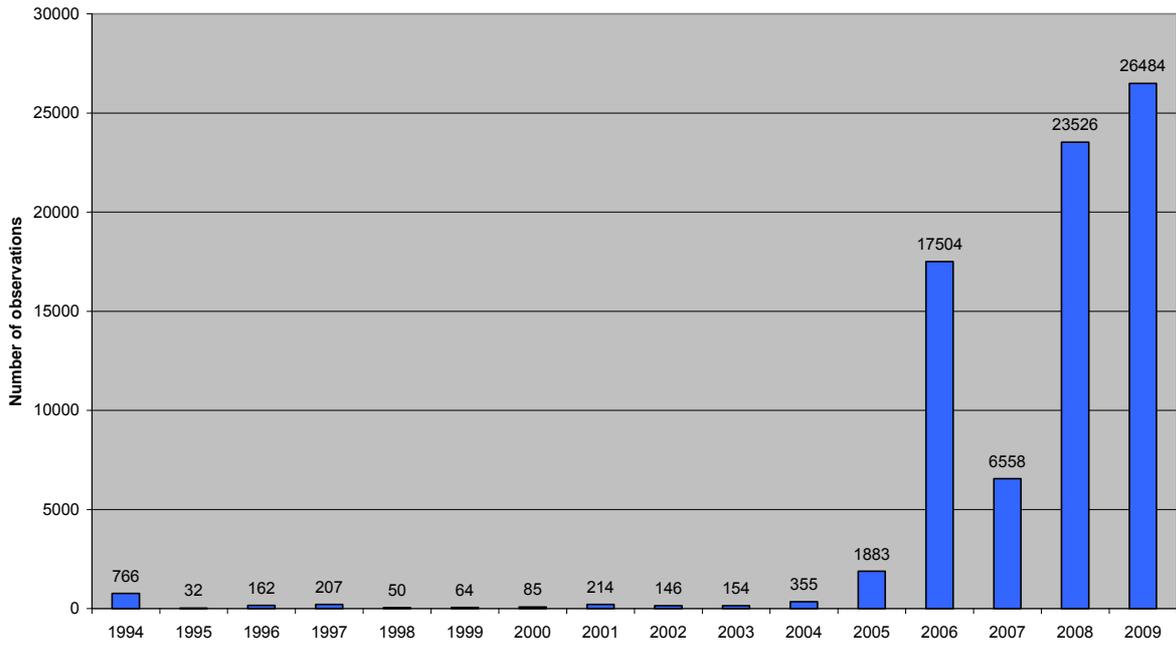
1.3 Mostly the VOSclim-ships produce observations with the special VOSclim-elements, but this is not always the case, as it is shown in the following table:

	No. of obs from VOSclim-ships	No. of obs with VOSclim-elements
2007	10.364	9.959 (96%)
2008	14.026	11.945 (85%)
2009	24.624	23.121 (94%)

1.4 The total number of data sets received from the Area of Responsibility of RM Germany in the year 2009 amounts to 78.190. There are also older reports contained in this number, which were generated in the years before, but delivered to the GCCs in 2009 (Fig.1 and 2). Figure 3 provides an overview of the areal distribution.

1.5 The received observations were checked with our national QC (HQCS) higher quality control standards and corrected manually, if possible. By bilateral contacts with the CMs, mistakes of the previous years held off and the data quality improved considerably.

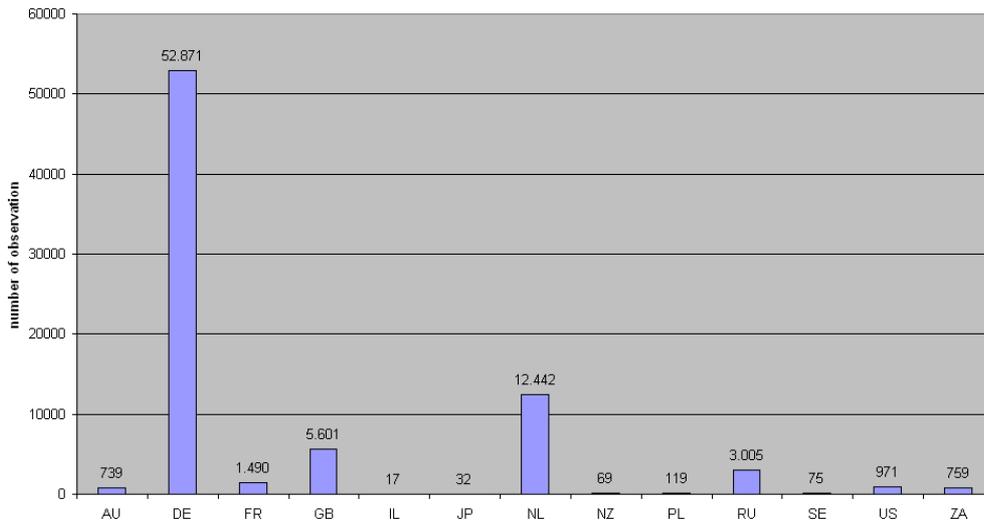
Distribution of data received during 2009 for the South Atlantic



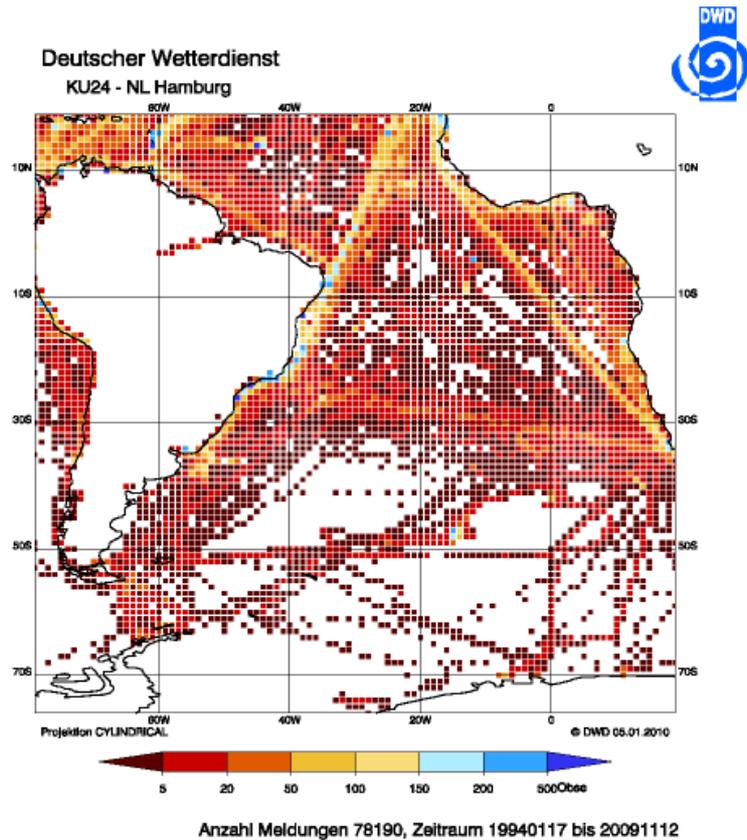
**Fig. 1:**

Distribution of numbers of observations received during 2009 for the area South Atlantic

Responsible Area South Atlantic  
Data contribution by country



**Fig. 2:** Distribution of observations received during 2009 for the area South Atlantic by country



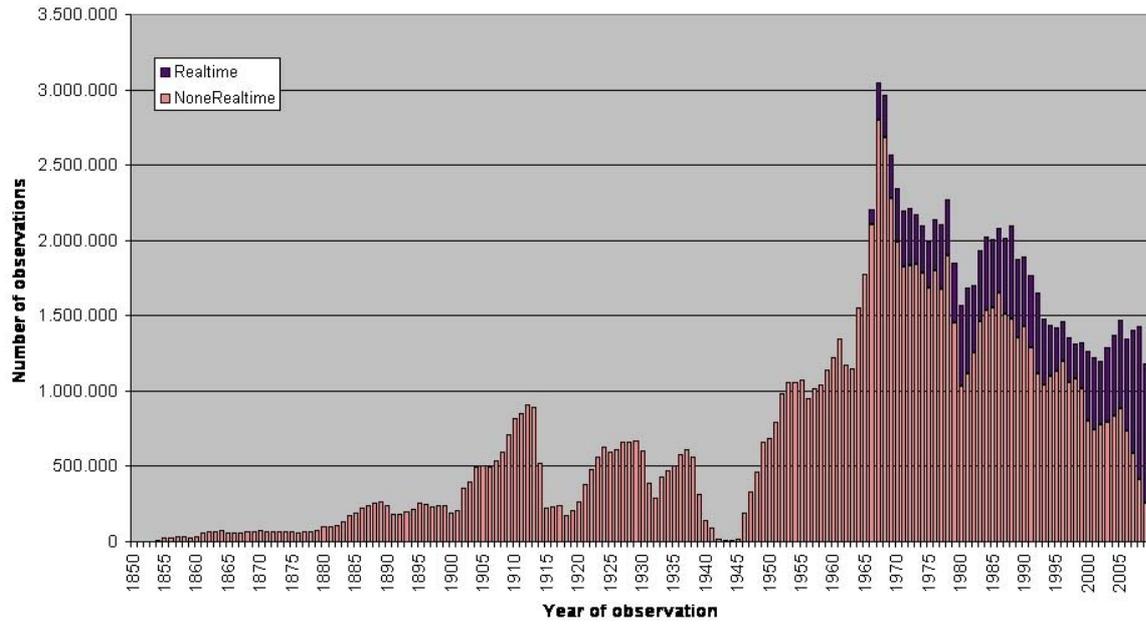
**Fig. 3:** Areal distribution of observations received by RM Germany from the area South Atlantic during 2009  
(Total 78.190 observations from the period of 1994 to 2009)

## 2. **Marine Data Archive:**

2.1 There are not only those observations from the area of responsibility stored in the German Global Marine Meteorological Data Archive. As many other Responsible Members all data world-wide received from the GCC, the GTS and historical collections are stored in this archive. All the data is checked by MQCS and HQCS. Striking values were checked manually. These quality controlled and flagged data build the basis for the 2009 new calculated and revised global marine climatology which is used to compare and check the delayed mode data among others.

2.2 The whole archive contains over 105 million of non-real-time data and about 19 million real-time data. Data storage in the German archive goes back to 1850 with a significant gap for the 1<sup>st</sup> and 2<sup>nd</sup> world war, as it is shown in figure 4. The incoming non-real-time data are compared with the whole archive and duplicate records received from the GTS are replaced with data received from the GCC.

**Marine Meteorological Data Archiv  
Ships (Dec.2009)**



**Fig.4:** Yearly distribution and numbers of observations till December 2009

## REPORT OF RESPONSIBLE MEMBER - HONG KONG, CHINA

### Area of Responsibility

1. Under the Marine Climatological Summaries Scheme of WMO, the Hong Kong Observatory (HKO) is responsible for collecting marine meteorological data for the area bounded by the Equator and latitude 30°N, and longitudes 100°E and 120°E.

### Marine Climatological Summaries

2. Annual marine climatological summaries for HKO's area of responsibility 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.

### Data Exchange with Global Collecting Centres

3. Delay mode data sent to Global Collecting Centres (GCC) by HKO in the past three years:

Number of data sent in 2007:

Year of observation					Total
≤ 2003	2004	2005	2006	2007	
1247	48	544	1062	65	2966

Number of data sent in 2008:

Year of observation					Total
≤ 2004	2005	2006	2007	2008	
128	214	941	1244	-	2527

Number of data sent in 2009:

Year of observation					Total
≤ 2005	2006	2007	2008	2009	
-	-	936	1249	-	2185

4. 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:

2005	2006	2007	2008	2009	Total
16341	23331	24664	13625	11666	89627

5. Data exchange frequency and data management details:

Frequency of data exchange with GCC	Quarterly
Data format	International Maritime Meteorological Tape-3 (IMMT-III) (effective 1 January 2007)
Quality control	GCC minimum quality control software MQC version V (effective 1 January 2007)
Frequency of submitting metadata to WMO	Quarterly
Metadata format	WMO Pub 47 version 03 (effective 1 July 2007)

## **Challenges**

6. Most shipping companies are reluctant to have third party software installed on the ship computer. Only 2 out of 48 ships in the Hong Kong VOS fleet have installed electronic logbook "TurboWin".

---

## REPORT OF RESPONSIBLE MEMBER - INDIA

### Introduction

India is one among the 8 responsible members of the Marine Climatological Summaries Scheme (MCSS) with the responsibility of the Indian Ocean Area north of 15°S bounded by the longitudes of 20°E and 100°E. India Meteorological Department carries out the responsibility.

### Voluntary Observing Ships & Data Processing

As on Dec 2009, the status of the Voluntary Observing Ships fleet of India is as given below:

<b>Category</b>	<b>No. of ships as on 31 Dec 2009</b>
Selected	11
<i>Supplementary</i>	134
<i>Auxiliary</i>	20
<i>Other (specify)</i>	Nil
Total National VOS fleet	165
<i>VOS vessels recruited in 2009</i>	Nil
<i>Number of VOS vessels de-recruited in 2009</i>	Nil
<i>Number of VOSCLim vessels at 31 December 2009</i>	22
<i>Number of VOSCLim vessels recruited in 2009</i>	Nil
<i>Number of VOSCLim de-recruitments in 2009</i>	Nil
<i>Number of VOSCLim recruitments planned for 2009</i>	Nil
<i>Target number of ships to participate in VOSCLim</i>	Nil

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.

### Marine 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. Recently decadal Marine Climatological summary charts for 1991-2000 was published along with CD. Pentadal Marine Climatological summary charts for 2001-2005 is in progress. About 2.3 lakhs marine observations from the area of responsibility of RM India are available for this purpose.

### Marine Data Archival

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 41,62,398 records of marine weather observations made till date (1961-2009) within the area of responsibility of RM

India were archived in National Data Center. Annual distribution of these observations for the period 1961-2009 is given in the following figure 1.

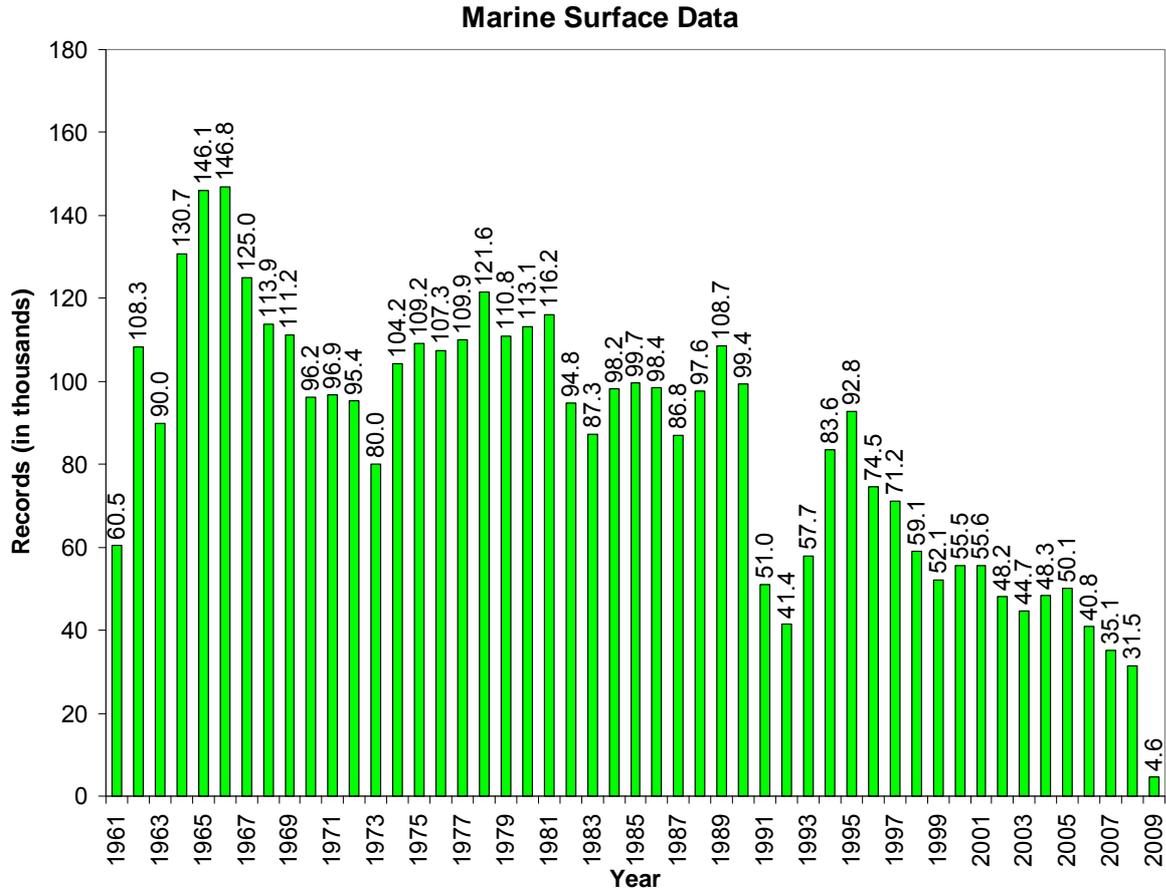


Fig 1: Marine Surface Data available in the archives of National Data Center, India Meteorological Department, Pune for the Indian area of responsibility.

## REPORT OF RESPONSIBLE MEMBER - JAPAN

### Area of Responsibility

Japan is one of the eight Responsible Members for 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.

### Collection, archiving and exchange of marine data

The numbers of the reports which JMA collected for last three years are:

2007 27,551(38%) 2008 29,926(52%) 2009 24,748(59%).

The figures in parenthesis are proportions of electrical logs using OBSJMA.

The numbers of the reports JMA submitted to the Global Collecting Centres (GCCs) are:

2007 Jan 5358	Apr 5742	Jul 6797	Oct 7658	total 25,555
2008 Jan 5961	Apr --	Jul 9099	Oct 6015	total 21,075
2009 Jan 3516	Apr 3102	Jul 2825	Oct 3015.	total 12,458

In December 2007, JMA started operating the call sign masking system, which replace original call signs with "SHIP" before providing to GTS. Because of this procedure, more data are provided with the original call signs and JMA became to be able to store the real time data with the original call signs. Also, JMA fixed up an agreement with ship owners for the delayed mode observing data. Some owners, who request the call sign masking, have agreed to provide data to GCCs with their original call signs after three months of the observing. Under the agreement, we were able to submit some data with the original call signs which were reported to JMA with dummy call signs in past years. Meanwhile, since fewer vessels are registered in JMA recently, the number of the reports is decreasing. Also, we still have data without providing GCCs as the owners' request. We keep them with their original call signs for the future.

OBSJMA was updated in March 2009 to correspond to Windows Vista OS. We provided the updated OBSJMA CD-ROM to VOSs. Also, owners can download the software from the web site; <http://marine.kishou.go.jp/en/obsjma-en.html>.

### The marine climatological summaries

We have not published any climatological summaries since ETMC-II.

---

## REPORT OF RESPONSIBLE MEMBER - NETHERLANDS

Since the ETMC-II session in 2007, KNMI has continued to submit IMMT reports to the GCC's.

<b>Date</b>	<b>Number of submitted observations</b>
July 2007	23,826
January 2008	18,895
August 2008	21,409
January 2009	15,989
April 2009	28,138
October 2009	31,622
<b>TOTAL</b>	<b>139,879</b>

In the MCSS, the Netherlands are responsible for the Mediterranean, Southern Indian Ocean and the Australian waters. However, we collect IMMT data for the whole globe and therefore receive the files with global observations from the GCC's in return, every quarter. There are no further activities in the field of MCSS.

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.

---

## 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 2009.

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 13 years (1997-2009), 1 334 536 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 2009 are shown in fig.1.

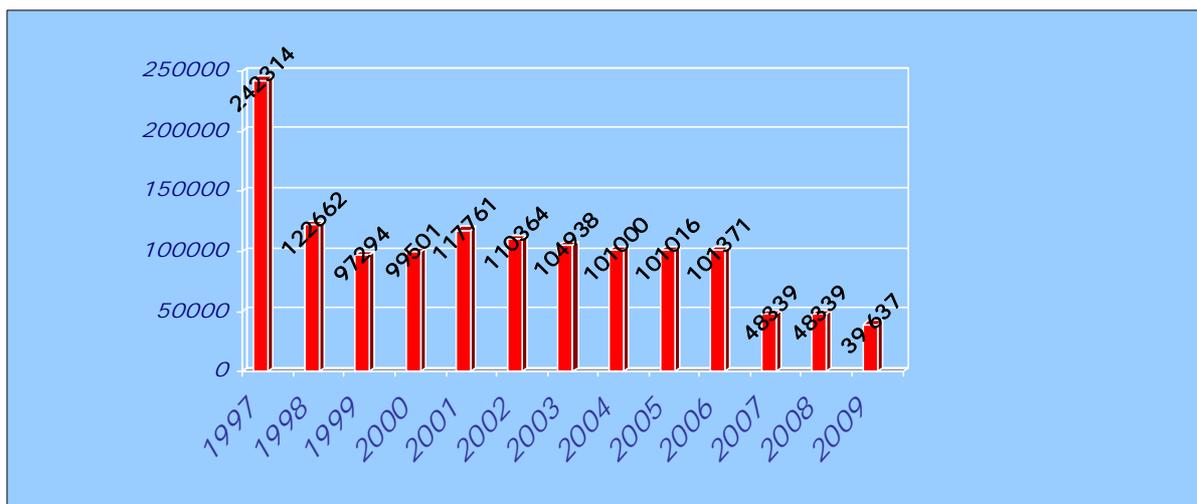


Figure 1. Distribution of ship observations contributed by RM Russia during 1997 - 2009

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 its historical archives.

*Svetlana Somova*

---

## REPORT OF RESPONSIBLE MEMBER - UNITED KINGDOM

### 1. BACKGROUND

The UK Met Office maintains three roles within the Marine Climatological Summaries Scheme (MCSS). It acts as a contributing member for UK data, it is one of eight responsible members (taking responsibility for data within the North Atlantic Ocean) and is also one of two Global Collecting Centres (GCC) for the global marine meteorological dataset. The activities of the GCCs are not detailed below because these are published annually by JCOMM. The most recent 'GCC 2009 Annual Report' will be published early 2010.

### 2. CONTRIBUTING MEMBER ROLE

The UK Voluntary Observing Fleet as at end 2009 is displayed in fig. 1. Noting that the number of selected ships/rigs is declining and that all UK ships now have access to electronic logbook software, TurboWin.

<b><i>Fig. 1: UK VOF end 2009</i></b>	
<b><i>Category</i></b>	<b><i>Number as at end 2009</i></b>
Selected Ships	337 (inc 14 AWS)
Active Rigs	23
VOSclim Ships	57

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 2007 to 2009 are shown in fig.2.

<b><i>Fig. 2: Contributions to the GCCs</i></b>	
<b><i>Year</i></b>	<b><i>Total Obs</i></b>
2007	50,430
2008	24,239
2009	31,819

During 2008 & 2009 the UK Met Office had trouble contributing their data due to resource issues. However, by August 2009 a new automated QC system was introduced which should ensure regular and complete contributions in future.

### 3. RESPONSIBLE MEMBER ROLE

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

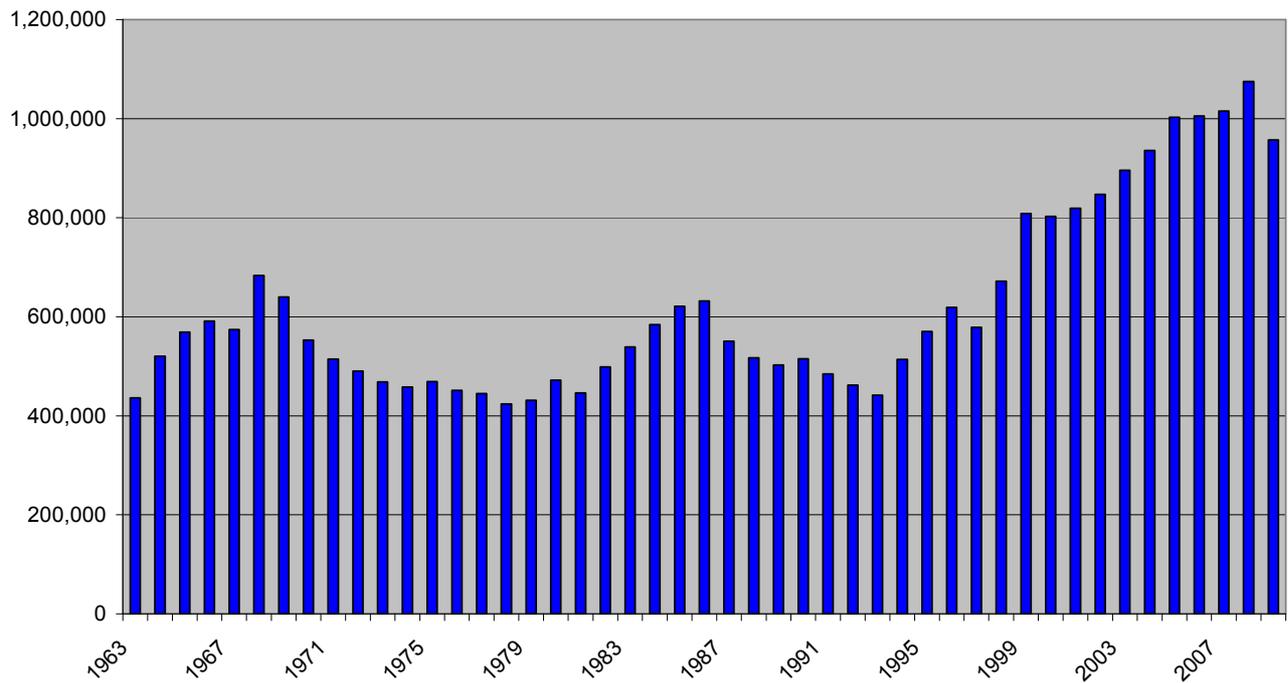
**3.1 Data Processing:** The UK stores the global marine datasets in the Met Office relational (Oracle) database. VOS GTS data are loaded to the database daily with the delayed-mode data being added within one week of receipt. During storage of a delayed-mode observation, if the date/time/position/id match a GTS observation already stored, this process overwrites this record with the delayed-mode observation remaining (metadata records whether a GTS observation did originally exist).

Within 24 hours of storage automatic quality control software checks the data and sets quality flags (currently GCC flags are not passed to the database). 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.

**3.2 Climatological Summaries:** During 2007 to 2009 there were no summary requests and as a consequence no charts were produced.

**3.3 Data Requests:** During 2007 to 2009 the UK received some data requests under the MCSS originating from both contributing members to research students. Fig. 3 shows the volumes of delayed-mode data stored in the database for the UK's area of responsibility.

**Fig. 3: No. of Obs per Year for UK Area of Responsibility**



## REPORT OF RESPONSIBLE MEMBER - UNITED STATES OF AMERICA

*February 2009*

### Introduction

The United States is one of eight responsible members of the Marine Climatological Summaries Scheme (MCSS) and is responsible for the Western Atlantic Ocean, Caribbean Sea and much of the Pacific Ocean.

### Data Exchange with the GCCs

No delayed mode observations were provided from 2004 through the 2<sup>nd</sup> quarter of 2007 due to a lack of resources, but the US is proud to announce that contributions to the Global Collection Centers (GCC) resumed in the 3<sup>rd</sup> quarter of 2007 and have consistently been submitted since that time. The data is collected and prepared at the National Climatic Data Center (NCDC) and is distributed to the GCCs in IMMT format.

The NCDC is also responsible for delayed mode Voluntary Observing Ship Climate (VOSClm) data assimilation and access at the VOSClm Data Assembly Center (DAC) located at NCDC. Quarterly GCC data files are processed, VOSClm observations are parsed and reports containing the number of VOSClm observations by contributing members are produced. The reports are distributed to the GCCs for inclusion in their annual reports. The delayed mode VOSClm observations are available through the VOSClm website (<http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclimdata.html>).

### US observations processed through MQCS-V and submitted to the GCCs since 2007:

#### 2007:

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
		118631	15872	134503

#### 2008:

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
	18791	8345	4045	31181

#### 2009:

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
6656	10496	3277	4352	24781

---

## **ANNEX IX**

### **DATA-FLOW PROPOSAL**

#### **1 Future Data-Flow**

1.1 In light of technology advances and seeking to minimize duplication of effort, a new data flow was proposed (see Fig. 1) at JCOMM-III (November 2009). Over the past 18 months this proposal has now been widely reviewed and discussed by many within the marine community with the structure being generally agreed and accepted as the future goal to work towards.

1.2 The proposed data flow is still largely preliminary, and decisions must be made as to whom should fulfil the roles for GCC-DM & GCC-RT and to agree further details of GCC and Special User responsibilities.

1.3 The grey coloured boxes (1, 2, and 4 in Fig. 1) indicate the components that already essentially exist in the current systems – data collection by ship operators and CMs and the QC carried out by the GCCs respectively. In contrast, the other boxes of varying colors are the proposed new or modified aspects to the data flow. Further details and proposals are:

#### **2 Real-time GCC (GCC-RT) (box 3a)**

2.1 An important change from the current data flow is that a Real-time GCC (GCC-RT) will be responsible for real-time (GTS) data collection/storage (and the possible later ingest of GTS buoy data).

2.2 It should be discussed who should take on this new role for GCC-RT and decide how the selection process will be carried out. One proposal could be that the existing Real-time Monitoring Centre (RTMC) for VOS data (Met Office, UK) expands their responsibilities to encompass the GCC-RT role. It is envisaged that the current RTMC monitoring tools could be adapted to fulfil the additional GCC-RT responsibilities which will ultimately produce an original and QCd version of data in the archive format (yet to be agreed) which will then be archived in a single point central database (box 5). Other suitable candidates for GCC-RT should be discussed.

2.3 As another output the GCC-RT should provide data completeness reports to assist with GTS monitoring.

#### **3 Delayed-mode GCC (GCC-DM) (box 3b)**

3.1 In addition to the detail provided in the description of Figure 1, it is proposed that the current GCCs (DWD, Germany & Met Office, UK) continue their current roles but with the new title of 'GCC-DM'. As the current system has proved to work well, the tasks and responsibilities will remain the same with each centre mirroring tasks. The current system guarantees a reliable data-flow and the distribution over two centres has proved especially useful in cases of computer failure and software changes in one of the two centres.

3.2 The GCC-DM will work closely with the GCC-RT (see section 1.1) to link the delayed-mode observations with corresponding real-time records, compare quality and set flags where appropriate. The GCC-DM will apply the agreed HQCS to data prior to archival in the single point central database (same as for 1.1, see 1.4).

3.3 This arrangement may be help in dealing with the callsign masking issue. GCC-DM & GCC-RTs could provide a secure environment for data processing with collection of both data streams (real-time and delayed-mode) the GCCs may potentially identify no longer sensitive "masked" data and convert to the real callsign.

#### **4 NWP and Satellite (boxes 4a & 4b)**

Boxes 4a (NWP) and 4b (SAT) represent future additional QC resources (Numerical Weather Prediction and Satellite data, respectively) proposed for use by the GCCs when quality checking data and setting flags. Further details of HQCS can be found in Doc 5.4.2.

## **5 MCSS WIS DCPC (box 5)**

GCC-RT and GCC-DM should store their data and products in a Data Collection/Production Centre (DCPC) for the WIS for which they will regularly produce discovery metadata and allow access to datasets e.g. via the Ocean Data Portal (ODP) [in line with the WIGOS Framework].

## **6 Users (boxes 6a, 6b & 6c)**

Users of the data have been categorised into 3 types (see fig. 1):

- General Users (box 6a) are considered to be research, public etc.
- Special Users (box 6b) comprise ICOADS and VOSClm DAC.  
The role of ICOADS within MCSS should be more clearly defined. It could, for example, be upgraded to JCOMM Data and Product Center.  
The VOSClm DAC (hosted at the NOAA National Climatic Data Center) will continue to carry out existing duties of extracting VOSClm data from global dataset (providing feedback to GCC-DM where appropriate) and routinely publishing VOSClm data statistics.
- It is proposed the 8 current RMs (box 6c) undertake a new role with responsibilities related to routine end-product generation meeting state-of-the-art general user requirements. Details of product types will be defined by TT-MOCS in due course.

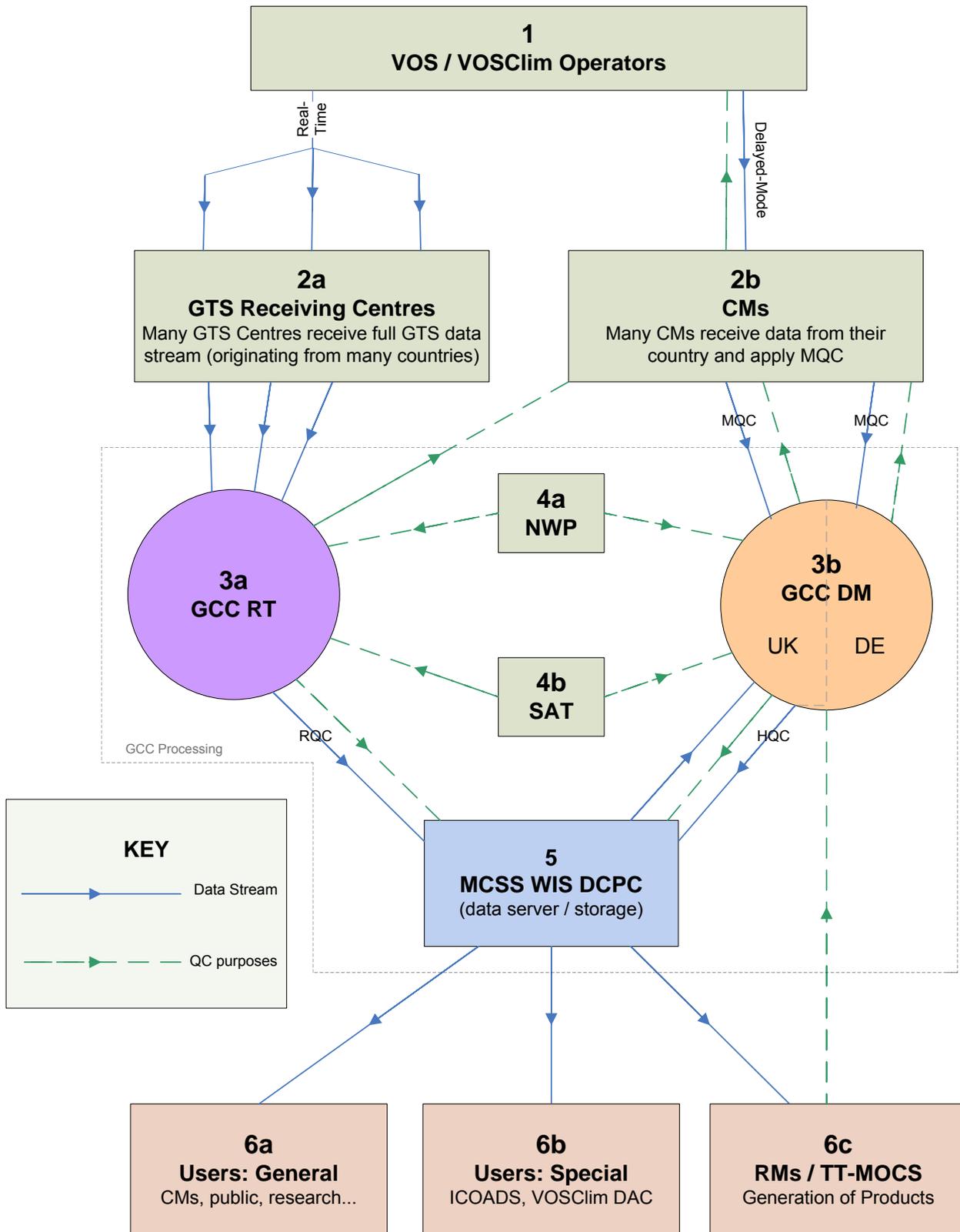


Figure 1: Proposed flow of MCSS data and products, and organizational (including GCCs, TT-MOCS) and project (including ICOADS, VOSCLIM, and WIGOS Pilot for JCOMM) roles. The grey boxes (1, 2, and 4) indicate that those components already essentially exist in the current systems. In contrast, the other boxes of varying colors are proposed new or modified aspects to the data flow.

**Detailed description of Figure 1 (notes by box number)**

1. **VOS/VOSclim Operators:** actual ships making the observations, with observers ordinarily sending data in both real-time (GTS) and delayed mode (paper or electronic logbooks).
- 2a. **GTS Receiving Centres:** Major GTS centres (e.g., across RMs) receiving all VOS and buoy data (FM 13, FM 18, or BUFR) from the GTS/WIS. Their role is to forward all relevant marine data that comes to them regularly (e.g. daily, or initially monthly) on a regular schedule to GCC-RT. The forwarding format are anticipated to be primarily FM 13, FM 18, or BUFR (additional marine codes).
- 2b. **CMs:** The Contributing Members (currently numbering 26) are responsible for:
  - a) collecting DM VOS data from their recruited vessels
  - b) applying Minimum QC (MQC) to these data
  - c) forwarding MQC data to GCC-DM
  - d) investigating problems identified and reported by GCC-DM or GCC-RT
  - e) informing VOS or VOSclim (and/or Port Meteorological Officers) about identified problems
- 3a. **GCC Real-Time (GCC-RT):** The GCC-RT is responsible for:
  - a) assembling all of the real-time data from the GTS Receiving Centres (2a)
  - b) resolving duplications within and among the GTS datastreams
  - c) identifying data that are unique among datastreams, to assist GTS monitoring activities
  - d) applying Real-time QC (RQC; proposed for development)
  - e) comparing observations with co-located model NWP results to identify possible problems (or linking as appropriate to existing monitoring efforts such as UK Met Office)
  - f) comparing with available satellite products to identify possible VOS data problems
  - g) notifying respective CM of possible problems
  - h) forwarding the data (both original and quality controlled) to the Server (5) on an appropriate timescale (in IMMA/IMMT or other suitable format)
- 3b. **GCC Delayed Mode (GCC-DM):** The GCC-DM is responsible for [Note: partly representative of current GCC processing at the GCCs in Germany and UK, including (a)-(b) and (e)]:
  - a) assembling the delayed mode data received from CM
  - b) ensuring MQC is applied to the delayed mode data
  - c) comparing real-time and delayed mode data via Server (5)
  - d) identifying and flagging/linking of duplicates of real-time and delayed mode data
  - e) notifying the respective CM of any systematic data problems identified, and resolving issues where possible
  - f) applying the proposed Higher QC (HQC), e.g. track checking, comparisons with NWP and satellite products to real-time and delayed mode data
  - g) forwarding the dataset to the Server (5), as soon as possible (in IMMA/IMMT or other suitable format)
- 4a. **NWP:** One or more NWP centres producing analysis and forecasts with GTS data that can provide model fields to compare to real-time and delayed-mode data. These fields are provided regularly (preferably daily or longer time frames as appropriate).
- 4b. **Satellite:** One or more satellite centres with fields of variables that are also found in GTS data. These fields are delivered regularly (preferably daily or longer time frames as appropriate).
5. **MCSS WIS DCPC (data server / storage):** Being a Data Collection or Production Centre (DCPC) involves being part of WMO Information System (WIS) and providing both data and discovery metadata. The server contains (or links to) separate or integrated database(s) (real-time and delayed-mode, original and quality controlled). The WIS will hold all discovery metadata for data within the server/storage point. Software recommended by WIGOS will be used.

The MCSS WIS DCPC is responsible for:

  - a. providing appropriate access to the discovery metadata and data (ICOADS and other users) via the WIS;
  - b. providing a data-bank to hold the data
- 6a. **Users - General:** General users (CMs, research, public) may access the Server (5).
- 6b. **Users - Special (ICOADS & VOSclim DAC):** Special users have access to the Server (5) and may feedback to GCCs and interconnect separately with the WIGOS Pilot Project as appropriate.
- 6c. **RMs / TT-MOCS:** Use data from server to produce state-of-the-art products (climatologies, etc.).

## ANNEX X

### TASKS TO BE CONSIDERED FOR THE FUTURE HIGH LEVEL QUALITY CONTROL STANDARD (HQCS)

The following tasks are to be considered when developing the future High Level Quality Control Standard (HQCS):

1. **Changes/additions to existing MQCS checks:** Including on-land position checks (*which ocean-land mask to be used must be discussed*). Additional element inter-comparisons and many more time-sequence checks to extend the existing minimum quality checks. Details of these **new/updated checks will be proposed by the GCCs to the TT-DMVOS & TT-MOCS by July 2010**. [N.B. Details of flag setting will need to be addressed alongside the decision of the future data archive format.]
  2. **Climatologies:** Data comparisons to be made of sea temperature, air temperature and present weather with defined climatologies. It is proposed that the 30-year ECMWF climatology is used for this purpose. If this proposal is accepted it is anticipated that the **climatology comparison checks could be developed by the end of 2010**.
  3. **Real-time Monitoring Comparisons:** There are currently real-time monitoring duties carried out on VOS data at the UK Met Office. The new MCSS future data-flow (Doc 5.4.1) plans include a near-real-time QC component which should be used in comparisons of delayed-mode data. It is envisaged that the time-scale for this aspect to be considerably longer than for 1 & 2 as appointment of real-time GCC is yet to be agreed.
  4. **NWP Model Output:** Data comparisons with model data (such as the ECMWF model) to verify quality. This is considered as an aspirational target for the future of QC, with development and implementation thought to be some years from now. Nonetheless it is useful to bear in mind for the overall future plans.
  5. **Satellite:** Data comparisons with satellite data to verify quality. This is also considered as an aspirational target for the future of QC, with development and implementation thought to be some years from now.
-

## ANNEX XI

### PROPOSAL TO ESTABLISH A NETWORK OF MIRRORED WMO-IOC CENTRES FOR MARINE-METEOROLOGICAL AND OCEAN CLIMATOLOGICAL DATA (CMOC)

Following are the steps suggested to possibly establish a network of mirrored WMO-IOC Centres for Marine-meteorological and Ocean Climatological Data (CMOC) (tentative name):

1. ETMC-III makes a proposal to establish the network, such that the following elements need to be defined:
  - (a) Terms of Reference (ToR) with list of capabilities and functions, and draft recommendation for JCOMM-IV (Annex A provides a preliminary draft of example ToR that could be included).
  - (b) Information about the proposed selection process, and governance, e.g. proposed by Members/Member States, nominated by JCOMM via ETMC, and finally endorsed by the WMO/IOC Executive Councils (ECs) or WMO Congress (Cg) as appropriate.
  - (c) Information about the proposed process for regularly assessing the capabilities of the CMOCs, and of the network as a whole.
  - (d) Basic guidance (including ToR, governance, assessment, etc.) to be published in WMO No. 471 (WMO 2001); and optionally only in WMO No. 558 (WMO 1998), if it is deemed desirable to make the guidance mandatory to Members/Member States hosting such a centre.
2. The draft ETMC proposal should be published as an Annex in the ETMC-III final report. An *ad hoc* Task Team is proposed (Annex B) for establishment by ETMC-III to refine the proposal, and have it approved by email correspondence by the Team, in view to submit a formal proposal to JCOMM-IV. As part of the proposal, it might be desirable that ICOADS acts as a CMOC on a trial basis, and that the USA makes the corresponding offer in due course. Once the proposal is approved by the Team, WMO/IOC then writes to Members/Member States asking them to nominate centres (perhaps listing ICOADS as an example of a network of centres that already meets the criteria, and which already made an offer) to act as such on a trial basis at a given date, indicating that the plan is to adopt the proposal at JCOMM-IV, and following at WMO/IOC ECs, or WMO Cg as appropriate.
3. Nominations are reviewed by ETMC (by email/teleconference), which will make proposals to JCOMM-IV.
4. WMO/IOC writes to those centre(s) that have been selected (as well as those rejected, with an explanation) for the trial.
5. The ToR, changes to WMO Nos. 558 and/or 471, and a list of candidate(s) are submitted to JCOMM-IV for adoption through formal Recommendation. Members/Member States are encouraged to regularly submit ocean data sets collected nationally to the CMOC(s), including appropriate information and metadata.
6. The WMO EC or Cg formally includes ToR in WMO Nos. 471 and/or 558 respectively, as appropriate.

#### References

- WMO, 1990: *Manual on Marine Meteorological Services*. WMO–No. 558, World Meteorological Organization, Geneva. Volume I (Global Aspects) and Volume II (Regional Aspects), including Supplements (June 1995, April 1998, and November 2002).
- WMO, 2001: *Guide to Marine Meteorological Services*. WMO–No. 471), World Meteorological Organization, Geneva.

## **ANNEX A: TERMS OF REFERENCE FOR A WMO-IOC CENTRE FOR MARINE-METEOROLOGICAL/OCEAN CLIMATOLOGICAL DATA (CMOC)**

The proposed WMO-IOC Centres for Marine-meteorological/Ocean Climatological Data (CMOC) should have the following capabilities to carry out their corresponding functions, as a mirrored component within a network of CMOCs:

### **Capabilities:**

- (a) A CMOC must have, or have access to, the necessary infrastructure and facilities required to perform the functions required for the long-term processing, quality control (QC), and archival of marine-meteorological and related oceanographic data and metadata, gathered under the common requirements of WMO and UNESCO/IOC marine-related programmes and co-sponsored programmes;
- (a) A CMOC must have qualified managerial and technical staff with the necessary experience to fulfil its functions;
- (b) A CMOC must have, or have access to, interoperability with the WMO Information System (WIS);
- (c) A CMOC must be able to host, implement, and validate marine QC and related processing, and climatological product generation, as standardized within the CMOC network;
- (d) A CMOC 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 must assess a CMOC, at least every five years, to verify its capabilities and performance.

### **Corresponding functions:**

- (a) A CMOC must assist Members/Member States internationally in the rescue, exchange, processing, and archival of meteorological and related oceanographic data and metadata according to procedures documented in WMO 471 and 558 as appropriate;
- (b) A CMOC must advise Members/Member States internationally on enquiries regarding the rescue, exchange, processing, and archival of meteorological and related oceanographic data and metadata, and products;
- (c) A CMOC must actively participate, or assist, in the organization of international workshops related to the network’s data and product holdings;
- (d) Following the procedures described in WMO 471 and 558, a CMOC must closely cooperate with the network of other CMOCs in the rescue, exchange, processing, and archival of marine-meteorological and related 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;
- (e) A CMOC must regularly inform Members/Member States and report, on an annual basis, to the JCOMM Management Committee 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 informed on the status and activities of the CMOC network as a whole, and propose changes, as required.

## Data Policy Requirements

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:

- (a) WMO Resolution 4039 (Cg-XII) - 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-640 - IOC Oceanographic Data Exchange Policy;

---

---

39 : Full text of the Resolution can be found at [http://www.wmo.int/pages/about/Resolution40\\_en.html](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."

40 : 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.

**ANNEX B: TERMS OF REFERENCE AND MEMBERSHIP  
FOR AN *AD HOC* TASK TEAM  
TO DEFINE THE WMO-IOC CENTRES FOR MARINE-METEOROLOGICAL/OCEAN  
CLIMATOLOGICAL DATA (CMOC) PROPOSAL**

The overall purpose of this Task Team is to finalize, before 31 August 2010, a proposal for the establishment of a network of mirrored WMO-IOC Centres for Marine-meteorological/Ocean Climatological Data (CMOC). Following are the proposed Terms of Reference (ToR) for this *ad hoc* Task Team, and its proposed Membership (for discussion and finalization by ETMC-III):

**Proposed Terms of Reference:**

- (a) To provide background information describing the rationale for the proposal, potential impact on Members, and benefits to them;
- (b) Clarify the role of the CMOC(s) as part of the new data flow to be proposed by the TT-DMVOS;
- (c) To draft a finalized ToR for a WMO-IOC Centre for an individual Centre for Marine-meteorological/Ocean Climatological Data (CMOC) (Annex A);
- (d) To draft a complete JCOMM-IV recommendation, including the (a) ToR as one element, along the lines of the recommendation for Regional Marine Instrument Centres (RMIC) as adopted recently by JCOMM-III;
- (e) To discuss the possible requirements for additional mechanisms for governance of the proposed whole network of CMOCs;
- (f) To submit the resulting proposal and other findings to ETMC for consideration and approval.

**Proposed membership:**

- (a) Gudrun Rosenhagen (Germany, lead);
  - (b) Representatives of US ICOADS core project members, including NOAA's Earth System Research Laboratory (ESRL, USA, S. Woodruff) and National Climatic Data Center (NCDC, USA, E. Freeman) and the National Center for Atmospheric Research (NCAR, USA, S. Worley);
  - (c) Elizabeth Kent (UK);
  - (d) Nicola Scott (UK).
-

## ANNEX XII

### DEVELOPING A BIAS-ADJUSTED ICOADS TO SUPPORT CLIMATE RESEARCH (Adapted from Draft Concept Plan, 2008)

*Shawn R. Smith<sup>a</sup>, Mark A. Bourassa<sup>a</sup>, Scott Woodruff<sup>b</sup>, Steve Worley<sup>c</sup>, Elizabeth Kent<sup>d</sup>, Simon Josey<sup>d</sup>, Nick Rayner<sup>e</sup>, and Richard Reynolds<sup>f</sup>*

<sup>a</sup>Center for Ocean-Atmospheric Prediction Studies, Florida State University, USA

<sup>b</sup>NOAA Earth Science Research Laboratory, USA

<sup>c</sup>National Center for Atmospheric Research, USA

<sup>d</sup>National Oceanography Center, Southampton, UK

<sup>e</sup>Met Office Hadley Center, Exeter, UK

<sup>f</sup>NOAA National Climatic Data Center, USA

#### 1. Overview

1.1 The overall goal of the activity is to develop a set of individual marine reports from ICOADS that are adjusted (or corrected) in a manner that best represents our current state-of-the-art. 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)

1.2 As an important part of the program, adjustment factors should all have associated uncertainty estimates. As possible, the adjustments should be applied to the entire ICOADS period-of-record (currently 1662-2007). It would be acceptable for the correction algorithms to vary in time (e.g. ship heating would be different for metal vs. wooden ships). The corrected ICOADS observations would then be used to develop new monthly climatologies (updating e.g. da Silva et al. 1994), new and improved ICOADS monthly summary products, and marine climate indices. The corrected observational set would be made available via the ICOADS group for the international user community.

1.3 The outcome of the proposed activity would be a master (or “advanced”) marine climate observational data set that includes bias adjustments and uncertainty measures—the marine equivalent of efforts by NOAA/NCDC (and others) to create land data sets that adjust for station moves and instrumentation changes (e.g. United States Historical Climatology Network – USHCN).

1.4 This master set would pull together the combined knowledge and efforts of the marine data community to create a global resource that will be available for future generations of scientists. The advanced ICOADS will also provide a data management framework to allow addition and improvement of corrections as continuing research activities expand our knowledge for various parameters (a plan that allows for future expansion). The authors anticipate that the proposed program will provide guidance and collaborative activities that will facilitate a wide range of ICOADS-based climate research activities.

## 2. Structure

2.1 The proposed structure for the program will support international contributions from multiple agencies and institutions. The preliminary program concept includes the following activities:

1. *Central data management:* This activity focuses on technical aspects of data formats and database development, storing the correction factors, distribution, archival, etc. The current ICOADS US partners (NCAR, NOAA/ESRL, and NOAA/NCDC) would lead this effort.
2. *Defining correction factors:* Groups with expertise in various parameters within ICOADS (e.g., SST, AT, waves, clouds, etc.) would be targeted to create and recommend correction factors. Possible topic area experts are listed in Table 1 below.
3. *Metadata augmentation:* Metadata (e.g., instrument types, observations heights, platform type, etc.) are critical to the development of adjustments and corrections to ICOADS.
4. *Quality control:* Develop and implement new methods (e.g., track checking, multivariate checks) that expand or augment the current ICOADS quality evaluation.
5. *Product development:* Including, but not limited to, developing new climatologies, indices, and summary statistics.
6. *Steering Panel:* A panel of experts will be selected with the primary purpose to approve correction factors prior to their inclusion into ICOADS. This panel will also provide overall guidance to the bias-corrected ICOADS program. User-friendly documentation is a key goal of this panel.

Table 1: Parameters within ICOADS of interest to the climate community and possible topic area experts.

<b>Parameter/Characteristic</b>	<b>Possible Topic Area Expert(s)</b>
Wind direction and speed	Mark Bourassa, Bridget Thomas
Air Temperature	Liz Kent, Dave Berry
Sea Temperature	Dick Reynolds, Tom Smith, Nick Rayner
Atmospheric Pressure	Gil Compo, Rob Allan
Moisture (humidity)	Mark Bourassa, Liz Kent
Clouds (cover, type, height?)	Steve Warren, Karel Hahn
Waves and Swell	Sergey Gulev, Val Swail, Mark Bourassa
Ice cover	Nick Rayner

## Reference

da Silva, A. M., C.C. Young, and S. Levitus, 1994: *Atlas of Surface Marine Data (Vol. 1: Algorithms and Procedures; Vol. 2: Anomalies of Directly Observed Quantities; Vol. 3: Anomalies of Heat and Momentum Fluxes; Vol. 4: Anomalies of Fresh Water Fluxes; Vol. 5: Miscellaneous Derived Quantities)*. NOAA/NESDIS Atlases 6-10, US Government Printing Office, Washington.

---

### ANNEX XIII

**TERMS OF REFERENCE OF THE JCOMM/DMPA/ETMC  
TASK TEAM ON MARINE-METEOROLOGICAL AND OCEANOGRAPHIC CLIMATOLOGICAL  
SUMMARIES  
(TT-MOCS)  
(as endorsed by DMCG-III)**

The Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS) will:

1. Identify existing and potential users of, and review requirements for, marine climatological summary products and their dissemination, including in particular for climate change detection, monitoring and indices as indicators of climate trends on appropriate time scales;
2. Consider the potential for integrated products (e.g. meteorological, oceanographic, sea-ice), and explore linkages between marine and coastal land based products; develop accordingly a list of potential products, consider production and delivery mechanisms, and their appropriate structure;
3. Develop metrics for the marine climatology products and their delivery including: (i) documentation and standardization of QC of climatological summaries (including Marine Climatological Summaries - MCS) (ii) data and products usage, and (iii) data adequacy for product quality;
4. Update, jointly with TT-DMVOS, the Marine Climatological Summaries Scheme (MCSS), and review the organisational structures and responsibilities, including the definition of the role and functions of the RMs concerning generation of marine climatological products;
5. Propose changes to JCOMM to the *Manual on* and the *Guide to Marine Meteorological Services* to reflect the proposed changes in the MCSS;
6. Contribute to the development of internationally agreed Higher-level Quality Control Standards (HQCS);
7. Liaise with other JCOMM Teams and Panels (ETSI, ETWS, SOT, TT-DMVOS), the CCI (including its ET2.2 on Climate Monitoring including the Use of Satellite and Marine Data and Products and ET1.3 on the Rescue, Preservation and Digitization of Climate Record), and the joint CCI/CLIVAR/JCOMM ETCCDI, where appropriate for the tasks above;
8. Report to the ETMC at its regular sessions.

Membership of TT-MOCS is open to all ETMC Members and is to include those members holding the positions listed below. The Task Team will select its chairperson among its members:

- (a) ETMC members: Co-chairpersons of the TT-DMVOS who also represent the GCCs, interested RMs, members also on ETCCDI.
  - (b) External to ETMC: CCI, ETWS, ETSI, and others as agreed by the Task Team.
-

## ANNEX XIV

### TERMS OF REFERENCE (TOR) OF THE JCOMM DMPA TASK TEAM ON DELAYED-MODE VOLUNTARY OBSERVING SHIP DATA (TT-DMVOS)

(as proposed by ETMC-II and SOT-IV, and endorsed by DMCG-III)

**Background:** The Marine Climatological Summaries Scheme (MCSS), established in 1963 (Resolution 35, Cg-IV), 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 countries (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 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 in Germany and 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 ICOADS.

**Scope:** In practice, the delayed-mode marine climatological data, handled under the MCSS, and published in the MCS, have generally been limited to Voluntary Observing Ship (VOS) data (i.e., excluding buoy or other non-ship data), in accordance with the original intent of the MCSS. The Task Team will focus primarily on modernizing the management and quality control of the delayed-mode VOS data, while at the same time exploring possible connections with the management of real-time VOS and other ship-based data (e.g., Shipboard Automated Meteorological and Oceanographic System (SAMOS) and GOSUD). To develop a clearer separation between data processing, and the preparation of climatological summaries, the team's scope will be limited to data management. Because the RMs and the GCCs have primary involvement in the data processing, they will be invited to contribute to the work. The review and modernization of the MCS is clearly also an important task, which will be considered separately by the ETMC, and to which the RMs will be invited to contribute. In addition, as part of the collective modernization of the data management and the MCS, it is anticipated, in due course, that the "MCSS" terminology will be replaced by a new and more up-to-date terminology reflecting a separation between the two functions.

**The self-funded Task Team will primarily work via email and shall:**

1. Examine current delayed-mode VOS data management practices, including those of the GCCs, and streamline them as possible to reduce redundancies (if any), standardize operations, and exploit appropriate modern technologies;
2. Examine possibilities for commonality of the data management of the delayed-mode data, with real-time VOS data;
3. Keep under review the International Maritime Meteorological Tape (IMMT) format, and suggest changes if necessary;
4. Keep under review the Minimum Quality Control Standards (MQCS), and suggest changes if necessary;
5. Submit proposals to the JCOMM via the ETMC for revising technical publications, in particular the WMO *Manual* (No. 558) and *Guide* (No. 471) *on Marine Meteorological Services*, to incorporate possible changes in the IMMT and the MQCS, and to reinvent the MCSS terminology;
6. Review the International Maritime Meteorological Archive (IMMA) format, and suggest ways to reconcile the IMMT and IMMA formats;
7. Establish and maintain a website to share relevant information;
8. Collaborate and liaise with VOSclim and other groups (e.g., SAMOS and GOSUD), as needed, both to ensure access to expertise and appropriate coordination.

**Membership from ETMC; including both GCCs as Co-chairs, and all RMs presently represented on the ETMC):**

Elanor Gowland (Co-chairperson, Germany)  
Reinhard Zöllner (Co-chairperson, Germany)  
Elizabeth C. Kent (United Kingdom)  
Frits B. Koek (the Netherlands)  
Alexander Vorontsov (Russia)  
Wing-tak Wong (China)  
Takashi Yoshida (Japan)  
Scott D. Woodruff (USA)

**Membership from the SOT:**

Graeme Ball (Chairperson of the OPA/SOT, Australia)  
Julie Fletcher (Chairperson of the OPA/SOT/VOS Panel, New Zealand)  
Shawn Smith (USA)  
Henry Kleta (Germany)  
Bruce Sumner (HMEI, associate Member)  
A representative from US/NOAA/NCDC

**Reporting mechanisms:**

The Team will produce a project plan to guide operations for the next three years. The plan should explain the linkages to other components of the JCOMM, including the SOT and other pertinent programs.

The Team will establish an annual reporting mechanism to the ETMC and the SOT.  
The Team will report to the ETMC and the SOT

---

ANNEX XV

**TASK TEAM ON DELAYED MODE VOS DATA (TT-DMVOS)  
WORKING PLAN FOR 2007 – 2010**

<b>Task No.</b>	<b>Task</b>	<b>Detail</b>	<b>who</b>	<b>when</b>	<b>Status</b>
1	Mutual links on GCCs homepages	Each of the current GCC websites should create an active link to the other.	<b>GCCs</b>	By end October 2007	Completed
2	Create a unique homepage and email address for the GCCs and investigate ways of making GCC information available, plus in due course explore the possibility of making data freely available	<b><i>A single website is to be developed for GCCs, to provide access to information regarding data, data-flow, current developments and the Annual report. It should also be investigated how to make data available to users via the site, and monitor the use.</i></b>	<b><i>GCCs, supported by TT-members</i></b>	Start investigation asap complete by end December 2008	Discussed in at GCC March 09 Hamburg meeting. Could be difficult – will address again in 2010.
3	GCCs to take a more active role in the collection of data	<b><i>GCCs to contact CMs to encourage dataflow to the GCCs. Where possible, the GCCs should provide advice/support in getting non-submitting countries to set up a system to allow their data to be contributed.</i></b>	<b>GCCs</b>	As soon as work plan agreed by TT-DMVOS	Questionnaire results highlighted the CM membership to be 26. GCCs to approach CMs in 2009 to help with contributing data. 3 CMs contributed in 2009 that wouldn't have done so without GCC help.
4	Review and suggest changes to the function of the RMs and GCCs	Investigate whether the RM role is still required in its current state (to be responsible for data for a specific geographic area). Consider whether it will be beneficial to make data available to all CMs quarterly i.e. from an FTP server.	<u>GCCs</u> , members of the TT-DMVOS	Start investigations / discussions asap. Decide RM and GCC role by April 2008 for presentation at CLIMAR III in May	GCCs distributed a questionnaire to the 8 RMs. Results now are available with information of activities within MCSS. Provisional future data-flow is currently being discussed and established.
5	Develop and standardize higher level quality control standards (HQCS)	To agree on an appropriate HQCS and decide how flags should be set (with input from TT-DMOCS). Software to be developed in-line with these decisions and thoroughly tested by both GCCs.	<u>GCCs</u> , <u>TT-DMVOS</u> , <u>TT-MOCS</u> , and external experts as appropriate	Start: January 2008, decide on HQC standards by December 2008, software developed by end April 2009	Discussion started July 2007. Further work continued at GCC meeting Mar 09 in Hamburg. HQCS framework proposed to TT and JCOMM-III.

6	GCCs to apply standardized HQCS and archive the HQ controlled data (data stream CMs to GCCs unchanged); GCCs reporting to ETMC via TT-DMVOS	GCCs to routinely apply HQCS software (setting flags only) to collected data prior to archiving.	<u>GCCs</u>	start: after completion of Task 5, routinely apply HQCS by end September 2009	
7	Discuss a simplified VOSclim data flow, i.e. routinely transmit quarterly contributions of CMs to the DAC, and document the impact this would have	<i>Discuss benefits of sending the complete global dataset to DAC in USA and what impact would this have. Also consider whether they could collect this data from an FTP server.</i> Consideration should also be given to the frequency and method of data distribution and definition of VOSclim. Recommendation should be supplied to ETMC/SOT via annual reporting mechanism (task 15)	<b>TT-DMVOS, GCCs</b>	Start: October 2007, decide by end January 2008	Since July 2008 the GCCs sent the whole quarterly dataset to the DAC for selecting the VOSclim-ships. DAC now responsible for selecting VOSclim data and stats.
8	Review and suggest appropriate data storage structure for archival of delayed mode data. Also consider the storage and use of additional remarks and phenomena reports.	Decide on the most suitable database structure for storage of delayed mode data, taking into account the reconciliation of IMMT and IMMA formats. Consider a structure that data can be easily retrieved and which other data types may eventually be stored. Also think about storage of meteorological and quality metadata.	GCCs, supported by appropriate experts	Start: May 2008, depending greatly on codes but aim to complete by end December 2008 (prior to archival of standardized HQ controlled data by the GCCs )	Proposed data flow created in 2008. To be discussed further in 2010.
9	Review and suggest appropriate data structure for archival of real-time data	<b>Decide on the most suitable method of storage for real-time data. Consider how the chosen real-time data storage links to the delayed-mode data storage.</b>	<b>TT-DMVOS, GCCs and ETMC chair</b>	Start: May 2008, depending greatly on codes but aim to complete by end December 2008	(See the proposed VOS-dataflow) Provisional future data-flow is currently being discussed and established. To be discussed further in 2010.
10	Investigate how suggested changes to MQCS-V could be implemented	<i>Changes suggested to MQCS-V at ETMC were initially agreed but formal acceptance may not be until ETMC 2011. Therefore, ways to implement these changes sooner should be investigated.</i> As a result GCC software will require upgrading to reflect this.	TT-DMVOS, GCCs	start: September 2007	In August 08 the ETMC agreed with the corrected limit of SLL to 40m in MQCS-V. Since October 08 the GCCs have used the updated software. This has still to be formally accepted. IMMT-4/MQCS-6

					<u>proposed at JCOMM-III.</u>
11	Investigate ways to reconcile the IMMT and IMMA formats, and suggest improvements.	Compare and contrast the differences and similarities between IMMA and IMMT formats. Decide on the particular strengths of each that may be ultimately combined in a new format, with appropriate consideration to the characteristics of Table Driven Codes (e.g., BUFR). Also investigate software for conversion of IMMA to other data formats, and vice versa. Consider particularly the idea of including unique identifiers on each observation and also conversion issues concerning netCDF.	<u>Chair ETMC, Co-Chairs and members of the TT-DMVOS</u>	Start: October 2007, report thoughts by April 2008	NCDC has provided Chair ETMC with a program to convert from IMMT-III to IMMA. GCC Germany have comparisons. GCCs to provide Quarterly data in IMMA also starting 1Q2010.
12	Develop appropriate promotional material to make the system widely known in the marine community	Investigate and action various methods of promoting the work of the GCCs (i.e. international marine publications and a newsletter to PMOs).	<u>GCCs, members of the TT</u>	Iterative. What's available now, and change information in line with the change of processes.	The GCCs and the WMO listed contact persons and email-addresses from many CMs.
13	Investigate and implement suitable end products for use by international users	Liaison with TT-MOCS regarding the planned modernization of the marine climatological summaries, including investigating the types of end products users would like (i.e. charts/summaries) and possibilities for generating these routinely.	<u>TT-MOCS, TT-DMVOS, and GCCs</u>	After completion of tasks 5,6 & 8 – summer 2010	
14	Start discussions in the direction of an enhanced Marine Climatological Information System (MARINECLIS)	Investigate the feasibility of disseminating data and marine climatological products via a dedicated internet platform in support of user requirements.	Chair ETMC, Co-Chairs TT-DMVOS, Chair TT-MOCS, experts	Start discussions asap, taking into account as appropriate findings in tasks 2 & 4.	Yet to start
15	Develop an annual reporting mechanism between TT-DMVOS, ETMC and SOT	Ensure ETMC and SOT are kept informed annually of developments any problems with achieving the work plan.	<u>Co-Chairs TT-DMVOS in cooperation with Chairs ETMC and SOT</u>	To start in 2008 and then continue annually	Developments reported to CLIMAR-III, SOT-V & JCOMM-III
16	Update GCCs function description within WMO manuals/guides	GCCs to update descriptions of MCSS dataflow, and other changes to MCSS in liaison with TT-MOCS, within the WMO 'Guide to Marine Meteorological Services' (WMO-No. 471) and 'Manual on Marine Meteorological Services' (WMO-No. 558).	<u>GCCs, TT-MOCS</u>	After new dataflow system is fully agreed and tasks 2, 4, 5, 6, 8, 9 & 13 are complete	
17	Set up TT-DMVOS meeting to chart progress	Align this meeting to coincide with CLIMAR-III	<u>TT-DMVOS</u>	Book meeting by end November	Meeting occurred alongside CLIMAR-III in

				2007, set agenda by end March 2008	May 08. Another meeting alongside OceanObs'09 in Sept 09.
18	Draft new ToR for the ETMC	Consider TT-DMVOS's important place within ETMC and include in the ToR	Secretariat, Chair ETMC, Chairs <u>TT-DMVOS &amp; MOCS</u>	by CLIMAR-III (May 2008), starting asap	To be done once changes completed
19	Draft proposal to ETMC regarding ICOADS role in modernised dataflow	Draft a proposal that would be circulated through ETMC for agreement around CLIMAR-III, regarding a proposed formalisation of the role of ICOADS in the context of modernising the delayed-mode data flow, and related issues, with the aim to develop a recommendation for JCOMM-III	<u>TT-DMVOS</u>	Prior to meeting (task 9), by beginning March 2008	(See the proposed VOS-dataflow) Provisional future data-flow is currently being discussed and established
20	Review GHRSSST-PP database	Review the structure and content of the GHRSSST-PP database prior to operational implementation. Feedback results to ETMC.	<u>TT-DMVOS</u>	Start asap, complete by December 2007	Yet to start

---

**ANNEX XVI**

**ACTION ITEMS ARISING FROM THE MEETING**

<b>No.</b>	<b>Ref.</b>	<b>Action</b>	<b>By</b>	<b>Deadline</b>
1	1.1.2	to make the presentations of the ETMC-III scientific and technical workshop available through the JCOMM web site	Secretariat	28 Feb 2010
2	2.3.1.5	to make sure that the technical regulations as documented in appropriate WMO manuals and guides are properly being followed by the ship operators	SOT	ongoing
3	2.3.1.6	to liaise with the SOT Task Team on Instrument Standards, and investigate the requirements for humidity sensors, the current reporting practices for Pub. 47, identify possible problems, and make specific recommendations to the next SOT Session	E. Kent, S. Woodruff	Apr. 2011
4	2.4.2.3	to represent the ETMC at the next DBCP Session and stress on requirements to collect instrument/platform metadata for marine climatology purposes	V. Swail	Sep. 2010
5	2.4.2.4	to investigate how PP-WET can address marine climatology requirements	PP-WET	mid-2010
6	2.5.1.7	to review the DMPA Implementation Plan and suggest changes if necessary in light of this Session's discussions	S. Woodruff	1 April 2010
7	2.5.1.8	to discuss feasibility of submitting the overview report on marine QC issues, focused on surface data reported by VOS and Research Vessels (R/Vs) through the standards process with Sissy Iona	S. Woodruff	ASAP
8	3.1.2	to develop a template for documenting the requirements for long-term marine surface physical observations	S. Woodruff/E. Kent	15 April 2010
9	3.1.4	to consider the potential for routine assessment of data adequacy in support of the periodic reviews of GOOS/GCOS	TT-MOCS	ongoing
10	3.2.2	to liaise with the chair of OPA and investigate how the ETMC can contribute to the work of the post-OceanObs'09 Working Group, and to report to the Chairperson of the ETMC	Secretariat	ASAP
11	3.3.9	to provide William Wright with the list of marine indices proposed by JCOMM in the view to present them to the CCI Management Group	V. Swail	ASAP
12	4.1.5	to provide the results of the December 2007 GTS data inter-comparison to the data centres that had provided the evaluated data sets, ask them to provide feedback regarding the identified problems, and then analyse the information collected in the view to make further recommendations	E. Kent	Apr 2010
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	F. Koek, <i>ad hoc</i> group	April 2011

		Marine Meteorological Service (i.e. for the part describing the VOS Scheme) and the Manual on Codes		
14	4.3.8	to consult with the ETMC chair and seek guidance regarding the calculation methods that must be used for the recording of VOS observations using ObsJMA e-logbook software	JMA	ASAP
15	4.3.8	to investigate after what period the original call sign could be released for the delayed mode data	BOM, E-SURFMAR	ASAP
16	4.4.3	to refine an ENCODE proposal to be submitted to the SOT Task Team on ship call sign masking	S. Woodruff	Jun 2010
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	end 2010
18	4.5.6	to circulate to Team members information about where the informal copies of the Pub. 47 (i.e. E-SURFMAR, JCOMMOPS) can be obtained	Secretariat	ASAP
19	4.6.2.4	to report the results from the ODASMS-ICOADS pilot study to the next DBCP Session	USA	Sept. 2010
20	4.6.3.4	to discuss the consideration of including Rigs & Platforms as part of the Terms of Reference of the SOT	MAN	Nov. 2010
21	4.6.3.6	to contact the SOT Chairperson and discuss the issue of Rigs and platforms metadata in the view to find an acceptable agreement to both groups	S. Woodruff	Jun 2010
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	ASAP
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	Sep 2010
24	5.2.4	to gather user requirements	GCCs	15 Apr. 2010
25	5.3.1.3	CMs (i) to refrain from re-submitting data. However, if it is necessary they should then make the GCCs aware of this to allow replacement within the database; and (ii) to encourage ships already reporting the additional elements (and other vessels) to join the VOSclim project	RMs	ongoing
26	5.4.1.4	to draft a proposal for the new data flow to be documented in the Manual (WMO No. 558) and Guide (WMO No. 471) to Marine Meteorological Services	TT-DMVOS	Feb 2011
27	5.4.1.4	to write to Members in order to seek candidates for specific functions of the new schemes, and seek feedback from them on their respective roles	Secretariat	Mar 2011
28	5.4.1.5	to organize a TT-DMVOS meeting on the side of the MARCDAT-III workshop	Chair TT-DMVOS	Nov 2010

29	5.4.2.1	to explore possibilities for convergence with existing QC processing software and standards, and for interoperability with ICOADS—in terms both of existing QC procedures and possible utilization of the IMMA format	TT-DMVOS	end 2010
30	5.4.2.3	to consider the Data Management Programme Area survey document on ship QC procedure as a starting point for the development of the HQCS proposal	TT-DMVOS	May 2010
31	5.4.2.4	to document the HQC proposal and circulate it to the Team and e-logbook developers	TT-DMVOS	Mar 2010
32	5.4.2.4	to provide documentation about QC procedures recommended by the IOC, ICES, and the European Union applied in delayed mode within ocean community to the TT-DMVOS	S. Iona	ASAP
33	6.1.1.3	to follow up IMMA developments and make recommendations to the ETMC through the TT-DMVOS as appropriate	S. Woodruff & ICOADS USA Project Team	Apr 2010
34	6.1.1.3	to document a consolidated IMMA proposal at the next SOT Session	TT-DMVOS	Apr 2011
35	6.1.1.4	to investigate feasibility of including new attachments optionally as national practice without having to go through the formal approval process	S. Woodruff & S. Worley	Apr 2010
36	6.1.3.3	to coordinate efforts with Team members, and other experts as appropriate in order to make a consolidated proposal to JCOMM-IV for an advanced bias adjusted ICOADS	S. Woodruff	end 2011
37	6.1.3.4	to submit with the invitation letters for the MARCDAT-III a documented proposal and a white paper for a Pilot Project to develop approaches for dissemination of bias adjustments and corrections alongside climate marine observations and using presently available corrections	S. Smith	mid May 2010
38	6.1.3.4	to prepare the invitation letter in liaison with the MARCDAT-III organizing committee, and make reference to the proposal for a bias adjustments pilot project and materials	Secretariat	Jun 2010
39	6.1.3.4	to draft terms of reference for the steering team of the bias adjustments Pilot Project, and to organize a special session to discuss this Pilot Project proposal at MARCDAT-III	MARCDAT-III organizing committee	Jun 2010
40	6.1.4.4	to investigate the issue of initiating a match up satellite database	S. Worley	Jun 2010
41	6.1.4.4	to include a session at MARCDAT-III dedicated to the integration of satellite data within ICOADS; to select two co-chairs from the in situ and satellite communities for the MARCDAT-III session dedicated to satellites and to prepare a concept paper	MARCDAT-III organizing committee	Jun 2010
42	6.3.1.1	to discuss with Sid Levitus and check whether the World Ocean Database (WOD) can be made available to the ICOADS	S. Worley	Mid Mar 2010
43	6.3.1.4	to investigate possibility of compiling catalogue of available Research Vessel	ETMC-3 participants	ongoing

		data, and to provide feedback to Shawn Smith		
44	6.3.1.4	to develop a list of potential candidate data sets to be included in ICOADS	S. Smith	Dec 2010
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	Dec 2010
46	6.3.2.2	to explore feasibility of using the Lloyds Educational Trust mechanism for accessing the historical collection of IMO numbers	S. Woodruff	Dec 2010
47	6.4.2	to investigate whether a policy could be set up to preserve previous versions of the manual on codes	Secretariat	end 2010
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	Dec 2010
49	6.4.2	to prepare a list of documents proposed for digitization, and to suggest on priorities. The prioritized list should then be circulated to the Team.	E. Freeman	Dec 2010
50	6.4.3	to make the documents scanned by JMA (i.e. earlier editions of the IMMT format, reports of past CMM Sessions) permanently available via the WMO web site	Secretariat	Jun 2010
51	6.5.1.2	to write to the Permanent Representative of USA with WMO in order to invite NOAA to address discrepancies with regard to the different wave databases	Secretariat	Jun 2010
52	6.5.1.2	to provide background information to the Secretariat for inclusion in the letter	S. Woodruff	May 2010
53	6.5.1.7	T to write to the WMO Members in the view to invite them to help populating the extreme waves database	Secretariat	Jun 2010
54	6.5.1.7	to address how it could contribute to the extreme waves database	DBCP	Sep 2010
55	6.5.1.7	to investigate with the Oil and Gas Producers (OGP) whether some extreme wave events could be recovered from their databases	V. Swail	Jun 2010
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	mid May 2010
57	6.5.2.2	to prepare the invitation letter taking into account the proposal to establish a wave climate summaries pilot project in liaison with the MARCDAT-III organizing committee	Secretariat	Jun 2010
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-III	MARCDAT-III organizing committee	Jun 2010
59	7.1.7	to review the Terms of Reference of TT-MOCS in light of this Session's discussions, and seek additional members to address bias correction,	E. Kent	end 2010

		satellite climatologies, and GCOS working group on SST and Sea-Ice		
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-IV	TT-MOCS	end 2011
61	7.1.9	to convene a 1-day meeting of the TT-MOCS in conjunction with the MARCDAT-III workshop	E. Kent	MARCDAT-III
62	8.5	to convene an Organizing Committee for MARCDAT-III, to include in particular representatives from ESA, AOPC and OOPC, and to approach ESA regarding the possibility of organizing the workshop in Italy around the end of 2010 or beginning of 2011	S. Woodruff & V. Swail	Apr 2010
63	8.5	to set up a programme for MARCDAT-III and work out the announcement, concept paper, and invitation letters with assistance from the Secretariat	MARCDAT-III organizing committee	May 2010
64	9.1.3	to provide a digitized version of the original version of the WMO <i>Guide to the Applications of Marine Climatology</i> to the WMO Secretariat	E. Freeman	Jun 2010
65	9.1.3	to investigate making the digitized version of the WMO <i>Guide to the Applications of Marine Climatology</i> available on-line	Secretariat	Jun 2010
66	9.2.1	to review the WMO No. 558, and No. 471 publications and to circulate to the Team members by e-mail concrete proposals for their updating in view to submit a consolidated proposal to JCOMM-IV	TT-MOCS & TT-DMVOS	Jun 2011
67	6.1.2.3	<i>ad hoc</i> Task Team to expeditiously advance the proposal by the end of August 2010, including for refining the ToR and developing an accompanying formal Recommendation for proposed adoption by JCOMM-IV	G. Rosenhaguen & <i>ad hoc</i> TT	Aug 2010

## ANNEX XVII

### REFERENCES

†: Available from: <http://www.wmo.int/pages/prog/amp/mmop/publications.html>

- Berry, D., 2009a: Comparison of BUFR template from Appendix G of SOT-IV/DOC. I-6.2.2 to FM 13-XII Ext. SHIP [[http://www.noc.soton.ac.uk/ooc/SURFACE/BUFR/bufr\\_template.php](http://www.noc.soton.ac.uk/ooc/SURFACE/BUFR/bufr_template.php)].
- Berry, D.I., E.C. Kent, and S.D. Woodruff, 2009b: Blending ICOADS Release 2.5 and WMO Publication 47, 1966-2007. [Available from <http://icoads.noaa.gov/e-doc/imma/>].
- Boyer, T.P., J.I. Antonov, H. Garcia, D.R. Johnson, R.A. Locarnini, A.V. Mishonov, M.T. Pitcher, O.K. Baranova, and I. Smolyar, 2006: *World Ocean Database 2005, Chapter 1: Introduction*. NOAA Atlas NESDIS 60. S. Levitus, Ed., U.S. Government Printing Office, Washington, D.C., 182 pp., DVD.
- Brohan, P., R. Allan, J.E. Freeman, A.M. Waple, D. Wheeler, C. Wilkinson, and S. Woodruff, 2009: Marine observations of old weather. *Bull. Amer. Meteor. Soc.*, **90**, 219-230.
- Charpentier, E., D.E. Harrison, J.R. Keeley, E. Kent, M. Mietus, N. Rayner, M. Rutherford, V. Swail, and S. Woodruff, 2008: Third JCOMM Workshop on Advances in Marine Climatology (CLIMAR-III). *MeteoWorld*, December 2008.
- da Silva, A. M., C.C. Young, and S. Levitus, 1994: *Atlas of Surface Marine Data (Vol. 1: Algorithms and Procedures; Vol. 2: Anomalies of Directly Observed Quantities; Vol. 3: Anomalies of Heat and Momentum Fluxes; Vol. 4: Anomalies of Fresh Water Fluxes; Vol. 5: Miscellaneous Derived Quantities)*. NOAA/NESDIS Atlases 6-10, US Government Printing Office, Washington.
- Diaz, H., C. Folland, T. Manabe, D. Parker, R. Reynolds, and S. Woodruff, 2002: Workshop on advances in the use of historical marine climate data. *WMO Bulletin*, **51**(4), 377-380.
- DMPA, 2008: Common Issues of Quality Control of Surface Marine Data (Draft, 7 March 2008; Chairs: ETMC, DMCG, SAMOS, GOSUD, et al.). Doc 5.3 rev1 for *DMCG-III, Ostend, Belgium, 26-28 March 2008* [[http://www.jcomm.info/index.php?option=com\\_oe&task=viewDocumentRecord&docID=1838](http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=1838)].
- GCOS, 1998: *Report on the Adequacy of the Global Climate Observing Systems – United Nations Framework Convention on Climate Change, November 2-13 1998, Buenos Aires, Argentina*. GCOS Report No. 48, 34 pp.
- GCOS, 1999: *Global Ocean Observations for GOOS/GCOS: An Action Plan for Existing Bodies and Mechanisms*. GCOS Report No. 51, GOOS Report No. 66, IOC/INF-1127, 89 pp.
- GCOS, 2003: *Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC*. April 2003, GCOS Report No. 82, 74 pp.
- GCOS, 2004: *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC*. October 2004, GCOS Report No. 92, 136 pp.
- GCOS, 2005: *Progress with the Initial Ocean Climate Observing System: A Report to the UNFCCC*. April 2005, GCOS Report No. 98, 13 pp.
- GCOS, 2006: *Systematic Observation Requirements for Satellite-based Products for Climate*. Supplemental details to the satellite-based component of the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC*. September 2006, GCOS – 107 (WMO/TD No. 1338), 90 pp. [<http://www.wmo.int/pages/prog/gcos/Publications/gcos-107.pdf>].
- GCOS, 2009: *Progress Report on the Implementation of the Global Observing System for Climate in Support of the UNFCCC 2004-2008*. August 2009, GCOS Report No. 129, 104 pp. [<http://www.wmo.int/pages/prog/gcos/Publications/gcos-129.pdf>].
- GCOS, 2010: *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (2010 Update)*. [http://www.wmo.int/pages/prog/gcos/documents/GCOSIP-10\\_DRAFTv1.0\\_131109.pdf](http://www.wmo.int/pages/prog/gcos/documents/GCOSIP-10_DRAFTv1.0_131109.pdf).
- Gulev, S., Ed., 2005: Advances in marine climatology. *Int. J. Climatol.*, **25**, 821-1022 [Dynamic part of WMO–No. 781, 1995; WMO/TD–No. 1081 Rev. June 2005 (JCOMM TR No. 13, Rev. 1)].†
- Hahn, C.J., S.G. Warren, and J. London, 1995: The effect of moonlight on observation of cloud cover at night, and application to cloud climatology. *J. Climate* **8**: 1429-1446.
- Hahn, C.J., and S.G. Warren, 1999. *Extended Edited Synoptic Cloud Reports from Ships and Land Stations Over the Globe, 1952-1996*. NDP-026C, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory: Oak Ridge, TN [<http://cdiac.ornl.gov/ftp/ndp026c/ndp026c.txt>].
- JCOMM, 2000: *Subgroup on Marine Climatology, Eighth Session, Asheville, NC, USA, 10 to 14 April 2000, Final Report*. JCOMM Meeting Report No. 2.†
- JCOMM, 2004: *Expert Team on Marine Climatology, First Session, Gdynia, Poland, 7-10 July 2004, Final Report*. JCOMM Meeting Report No. 32.†
- JCOMM, 2005: *Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology, Second Session, Halifax, Canada, 19-27 September 2005*. Abridged Final Report with Resolutions and Recommendations, WMO–No. 995.†

- JCOMM, 2007a: *JCOMM Data Management Programme Area Coordination Group (DMCG), Second Session, Geneva, Switzerland, 10-12 October 2006, Summary Report*. JCOMM Meeting Report No. 43.†
- JCOMM, 2007b: *Second Session of the JCOMM Expert Team on Marine Climatology (ETMC), Geneva, Switzerland, 26-27 March 2007*. JCOMM Meeting Report No. 50.†
- JCOMM, 2008a: *Third Session of the JCOMM Data Management Programme Area Coordination Group (DMCG-III) Ostend, Belgium, 26-28 March 2008*. JCOMM Meeting Report No. 56.†
- JCOMM, 2008b: *JCOMM Data Management Plan*. JCOMM Technical Report No. 40, WMO/TD-No. 1426.†
- JCOMM, 2009: *Proceedings of the Third JCOMM Workshop on Advances in Marine Climatology, Gdynia, Poland, 6-9 May 2008*. JCOMM Technical Report No. 45, WMO/TD-No. 1445.†
- Kennedy, J., R.O. Smith, and N.A. Rayner, 2009: Using AATSR data to assess the quality of in situ sea-surface temperature observations for climate studies. *Remote Sensing of the Environment* (submitted).
- Kent, E., S. Woodruff, N. Rayner, T. Arbetter, C. Folland, F. Koek, D. Parker, R. Reynolds, R. Saunders, V. Smolyanitsky, S. Worley, and T. Yoshida, 2007a: Advances in the use of historical marine climate data (Second International Workshop on Advances in the Use of Historical Marine Climate Data). *Bull. Amer. Meteor. Soc.*, **88**, 559-564.
- Kent, E., S. Woodruff, N. Rayner, T. Arbetter, C. Folland, F. Koek, D. Parker, R. Reynolds, R. Saunders, V. Smolyanitsky, S. Worley, and T. Yoshida, 2007b: Second International Workshop on Advances in the Use of Historical Marine Climate Data. *Bull. Amer. Meteor. Soc.*, **88**, 559-564.
- Kent, E.C., S.D. Woodruff and D.I. Berry, 2007c: WMO Publication No. 47 metadata and an assessment of observation heights in ICOADS. *J. Atmos. Oceanic Technol.*, **24**, 214-234.
- Kent, E. C. and D. I. Berry, 2008: *Assessment of the Marine Observing System (ASMOS): Final Report*. NOCS Research and Consultancy Report No. 32, 55 pp.
- O'Carroll, A.G., J.R. Eyre, and R.W. Saunders, 2008: Three-Way Error Analysis between AATSR, AMSR-E, and In Situ Sea Surface Temperature Observations. *J. Atmos. Oceanic Technol.*, **25**, 1197-1207.
- OOPC, 1999: *Report of the Joint GCOS/GOOS/WRCP Ocean Observations Panel for Climate (OOPC), Fourth Session – Woods Hole, MA, USA, May 17, 1999*. GCOS Report No. 56, 85 pp.
- OOSDP, 1995: *The Scientific Design for the Common Module of the Global Ocean Observing System and the Global Climate Observing System: An Ocean Observing System for Climate*. Report of the Ocean Observing System Development Panel (OOSDP), US WOCE Office, Texas A&M University, College Station Texas, 285 pp.
- Rayner, N.A., P. Brohan, D.E. Parker, C.K. Folland, J.J. Kennedy, M. Vanicek, T. Ansell and S.F.B. Tett 2006: Improved analyses of changes and uncertainties in sea surface temperature measured in situ since the mid-nineteenth century: the HadSST2 data set. *J. Climate*, **19**(3), 446-469.
- Snowden, D. & Co-Authors, 2010: Metadata Management in Global Distributed Ocean Observation Networks. In *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. & Stammer, D., Eds., ESA Publication WPP-306 (in press).
- Swail, V. & Co-Authors, 2010: Wave measurements, needs and developments for the next decade. In *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. & Stammer, D., Eds., ESA Publication WPP-306 (in press).
- UNESCO/IMCO [Intergovernmental Maritime Consultative Organization; now the International Maritime Organization], 1972: *Safety Provisions of Ocean Data Acquisition Systems, Aids and Devices (ODAS)*, London.
- WMO, 1983: *Guide to Climatological Practices*. WMO-No. 100, second edition. Available from [http://www.wmo.int/pages/prog/wcp/ccl/guide/guide\\_climat\\_practices.html](http://www.wmo.int/pages/prog/wcp/ccl/guide/guide_climat_practices.html)
- WMO, 1955: *International List of Selected, Supplementary and Auxiliary Ships*. WMO-No. 47 (serial publication, recently annual; Eds. prior to 1966 were entitled *International List of Selected and Supplementary Ships*).
- WMO, 1990: *Manual on Marine Meteorological Services*. WMO-No. 558. Volume I (Global Aspects) and Volume II (Regional Aspects), including Supplements (June 1995, April 1998, and November 2002).
- WMO, 1994: *Guide to the Applications of Marine Climatology*. WMO-No. 781.
- WMO, 1995: *Manual on Codes*. International Codes, Vol. I.1, Part A – Alphanumeric Codes. WMO-No.306 [1995 Ed., Suppl. No. 6 (VIII.2007), Rec. 5 (CBS-Ext.(06)); with undated Corrigendum to Suppl. 6; available from: <http://www.wmo.int/pages/prog/www/WMOCodes/ManualCodes.html>].
- WMO, 2001a: *Guide to Marine Meteorological Services*. WMO-No. 471, World Meteorological Organization, Geneva.
- WMO, 2001b: *Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology, First Session, Akureyri, 19-29 June 2001*. Abridged Final Report with Resolutions and Recommendations, WMO-No. 931, 157 pp.†

- WMO, 2001c: *Manual on Codes*. International Codes, Vol. I.2, Part B – Binary Codes. WMO–No.306 [2001 Ed., Suppl. No. 3 (XI.2007), Rec. 4 (CBS-Ext.(06))]; available from: <http://www.wmo.int/pages/prog/www/WMOCodes/ManualCodes.html>].
- WMO, 2003a: *Advances in the Applications of Marine Climatology–The Dynamic Part of the WMO Guide to the Applications of Marine Meteorology*. WMO/TD–No. 1081 (JCOMM Technical Report No. 13), 246 pp.†
- WMO, 2007: *Guide to the Global Observing System*. WMO–No. 488, Third Ed. [[http://www.wmo.ch/pages/prog/gcos/documents/gruanmanuals/GOS/488\\_Guide\\_2007.pdf](http://www.wmo.ch/pages/prog/gcos/documents/gruanmanuals/GOS/488_Guide_2007.pdf)].
- Wilkinson, C., S.D. Woodruff, P. Brohan, S. Claesson, E. Freeman, F. Koek, S.J. Lubker, C. Marzin, D. Wheeler, 2010: RECOVERY of Logbooks And International Marine Data: The RECLAIM Project. *Int. J. Climatol.* (accepted).
- Woodruff, S., 2007: Archival of data other than in IMMT format: The International Maritime Meteorological Archive (IMMA) Format. *Second Session of the JCOMM Expert Team on Marine Climatology (ETMC), Geneva, Switzerland, 26-27 March 2007*, JCOMM Meeting Report No. 50, 68-101.†
- Woodruff, S.D., H.F. Diaz, E.C. Kent, R.W. Reynolds, and S.J. Worley, 2008: The evolving SST record from ICOADS. In *Climate Variability and Extremes during the Past 100 Years* (S. Brönnimann, J. Luterbacher, T. Ewen, H.F. Diaz, R.S. Stolarski, and U. Neu, Eds.), *Advances in Global Change Research*, Vol. 33, Springer, 65-83.
- Woodruff, S.D. & Co-Authors, 2010a: Surface In situ Datasets for Marine Climatological Applications. In *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. & Stammer, D., Eds., ESA Publication WPP-306 (in press).
- Woodruff, S.D., S.J. Worley, S.J. Lubker, Z. Ji, J.E. Freeman, D.I. Berry, P. Brohan, E.C. Kent, R.W. Reynolds, S.R. Smith, and C. Wilkinson, 2010b: ICOADS Release 2.5: Extensions and Enhancements to the Surface Marine Meteorological Archive. *Int. J. Climatol.* (in press).
- Worley, S.J., S.D. Woodruff, R.W. Reynolds, S.J. Lubker, and N. Lott, 2005: ICOADS Release 2.1 data and products. *Int. J. Climatol.* (CLIMAR-II Special Issue), 25, 823-842 (DOI: 10.1002/joc.1166).
- Worley S.J. & Co-Authors, 2010: The Role of ICOADS in the Sustained Ocean Observing System. In *Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2)*, Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. & Stammer, D., Eds., ESA Publication WPP-306 (in press).
-

## ANNEX XVIII

### ACRONYM LIST

ACRE	Atmospheric Circulation Reconstructions over the Earth
AES	Advanced Encryption Standard
AIS	Automatic Identification System
AMSA	Arctic Marine Shipping Assessment
AOPC	Atmospheric Observation Panel for Climate
Argo	International profiling float programme
ASAP	As soon as possible
ASAP	Automated Shipboard Aerological Programme
AWS	Automatic Weather Station
BOM	Bureau of Meteorology (Australia)
BUFR	Binary Universal Form for the Representation of meteorological data
CAS	WMO Commission for Atmospheric Sciences
CB	Capacity-Building
CBS	WMO Commission for Basic Systems
CCI	WMO Commission for Climatology
CDI	SeaDataNET Common Data Index
CDMS	Climate Data Management System
CEOS	Committee on Earth Observations Satellites
Cg	WMO Congress
CIMO	WMO Commission for Instruments and Methods of Observation
CLIMAR	JCOMM Workshops on Advances in Marine Climatology
CM	Contributing Member
CMDP	NOAA Climate Data Modernization Program (USA)
CMM	Former WMO Commission for Marine Meteorology (now JCOMM)
CMOC	WMO-IOC Centres for Marine-meteorological and Ocean Climatological Data
CONOPS	WIGOS Concept of Operations
CWP	Community White Papers
DAC	Data Assembly Centre
DBCP	Data Buoy Cooperation Panel
DCPC	Data Collection and Production Centre (of WIS)
DMAC	IOOS Data Management and Communications (USA)
DMCG	JCOMM Data Management Coordination Group
DMPA	JCOMM Data Management Programme Area
DRR	Disaster Risk Reduction
DWD	Deutscher Wetterdienst (Germany)
E2E	End-to-End Data Management
E2EDM	End-to-End Data Management Pilot Project
EC	Executive Council
ECMWF	European Centre for Medium Range Weather Forecasts
EECRA	Extended Edited Cloud Report Archive
ENCODE	Ship masking scheme whereby a unique, non-repeating identifier is used; the identifier is derived from encrypting elements in the message, e.g. callsign + latitude + longitude
ESA	European Space Agency
E-SURFMAR	EUMETNET Surface Marine programme
ETCCDI	Joint CCI-CLIVAR-JCOMM Expert Team on Climate Change Detection and Indices
ET-CDBMS	Expert Team on Climate Database Management Systems
ETDMP	JCOMM-IODE Expert Team on Data Management Practices
ETMC	JCOMM Expert Team on Marine Climatology
ETMSS	JCOMM Expert Team on Maritime Safety Services
ETSI	JCOMM Expert Team on Sea-Ice

ETWS	JCOMM Expert Team on Wind Waves and Storm Surges
EUMETNET	Network of European Meteorological Services
FAQ	Frequently Asked Questions
FTP	File Transfer Protocol
GAW	Global Atmosphere Watch
GCC	Global Collecting Centre
GCC-DM	Delayed-mode GCC
GCC-RT	Real-time GCC
GCOS	WMO-IOC-UNEP-ICSU Global Climate Observing System
GCOS-IP	GCOS Implementation Plan in Support of the UNFCCC
GDAC	Global Data Assembly Centre
GDSIDB	Global Digital Sea Ice Data Bank
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GFCS	Global Framework for Climate Services
GHRSSST	Group for High Resolution SST
GISC	Global Information System Centres (of WIS)
GMDSS	Global Maritime Distress and Safety System
GODAE	Global Ocean Data Assimilation Experiment
GODAR	Global Oceanographic Data Archaeology and Rescue
GOOS	WMO-IOC-UNEP-ICSU Global Ocean Observing System
GOS	WMO Global Observing System
GOSUD	Global Ocean Surface Underway Data Pilot Project
GPS	Global Positioning System
GTS	Global Telecommunication System
GTSP	Global Temperature and Salinity Profile Programme
HISKLIM	HISTorical CLIMate (the Netherlands)
HQC	Higher-level QC
HQCS	Higher Quality Control Standard
ICES	International Council for the Exploration of the Sea
ICOADS	International Comprehensive Ocean-Atmosphere Data Set
ICSU	International Council for Science
IMMA	International Maritime Meteorological Archive
IMMT	International Maritime Meteorological Tape
IMO	International Maritime Organization
IMOS	Integrated Marine Observing System (Australia)
IOC	Intergovernmental Oceanographic Commission of UNESCO
IOCCP	IOC International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange (of IOC)
IP	Implementation Plan
IP	Intersessional Period
IPET-DRC	CBS Inter Programme Expert Team on Data Representation and Codes
ISDM	Integrated Science Data Management (Canada)
ISO	International Organization for Standardization
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	JCOMM <i>in situ</i> Observing Programme Support Centre
JMA	Japan Meteorological Agency
LDCs	Least Developed Countries
LDP	ODP Light Data Provider
M&G	Manual and Guides
MAN	JCOMM Management Committee
MARCDAT	International workshop on Advances in the Use of Historical Marine Climate Data
MASK	Ship masking scheme whereby a unique, repeating identifier is used; the masking identifier is assigned by the NMS that recruited the ship
MCP	Marine Community Profile

MCS	Marine Climatological Summary
MCSS	Marine Climatological Summaries Scheme
META-T	Water Temperature Metadata Pilot Project
MQCS	Minimum Quality Control Standard
MSC	Maritime Safety Committee (of IMO)
MSI	Maritime Safety Information
NCDC	NOAA National Climatic Data Center (USA)
NCEP	NOAA National Centers for Environmental Prediction (USA)
NDBC	NOAA National Data Buoy Center (USA)
NetCDF	Network Common Data Form
NMDIS	National Marine Data and Information Service (China)
NMHS	National Meteorological and Hydrographic Service
NOAA	National Oceanic and Atmospheric Administration (USA)
NOC	National Oceanography Centre (UK)
NODC	IODE National Oceanographic Data Centre
NWP	Numerical Weather Prediction
OBIS	Ocean Bio-geographical Information System
OceanSITES	OCEAN Sustained Interdisciplinary Timeseries Environment observation System
OCG	JCOMM Observations Coordination Group
ODAS	Ocean Data Acquisition System
ODASMS	ODAS Metadata Service
ODIN	IOC Ocean Data and Information Network
ODP	UNESCO/IOC-IODE Ocean Data Portal
ODS	IODE-JCOMM Ocean Data Standards Pilot Project
ODV	Ocean Data View
OGC	Open Geospatial Consortium
OOPC	Ocean Observations Panel for Climate
OPA	JCOMM Observations Programme Area
OPACE	Open Panels of CCI Experts
OPAG	Open Programme Area Group
OT	OceanTeacher
OWDIP	Ocean Wave Data and Information Portal
PA	Programme Area (of JCOMM)
PDF	Portable Document Format
PP-WET	DBCP/ETWS Pilot Project for Wave measurement Evaluation and Testing
PSMSL	Permanent Service for Mean Sea Level
Pub. 47	WMO-No. 47 (WMO, 1955)
QA	Quality Assurance
QC	Quality Control
QMF	WMO Quality Management Framework
QMS	Quality Management System
R/V	Research Vessel
RA	WMO Regional Association
REAL	Ship masking scheme whereby the Official ITU callsign of the ship is used (i.e. unmasked)
RECLAIM	REcovery of Logbooks And International Marine data
RIHMI-WDC	Russian Research Institute of Hydrometeorological Information
RM	Responsible Member
RMIC	WMO-IOC Regional Marine Instrument Centre
RNODC	IODE Responsible National Oceanographic Data Centre
RNODC/DB	RNODC for Drifting Buoys
RRR	Rolling Review of Requirements
RTMC	VOSclim Real Time Monitoring Centre
SCG	JCOMM Services Coordination Group
SDN	SeaDataNet
SeaDataNet	Pan-European infrastructure for Ocean and Marine Data Management

SFSPA	JCOMM Services and Forecasting Systems Programme Area
SHIP	Ship masking scheme whereby a non-unique identifier is used; the call sign is unilaterally replaced by the letters "SHIP"
SOC	JCOMM Specialized Oceanography Centre
SOC/DB	SOC for Drifting Buoys
SOT	JCOMM Ship Observations Team
SPA	JCOMM Services Programme Area
SSS	Sea Surface Salinity
SST	Sea Surface Temperature
TDC	Table Driven Code
TOR	Terms of Reference
TT-DMVOS	SOT/ETMC Task Team on Delayed Mode VOS Data
TT-MOCS	ETMC Task Team on Marine Meteorological and Oceanographic Climatological Summaries
TT-TDC	DMPA Task Team on Table Driven Codes
UNFCCC	United Nations Framework Convention on Climate Change
VCP	Voluntary Cooperation Programme
VOS	Voluntary Observing Ship
VOSClim	VOS Climate Project
WCC	World Climate Conference
WCRP	World Climate Research Programme
WDC	ICSU World Data Centre
WDIP	WIGOS "Test of Concept" Development and Implementation Plan
WG	Working Group
WGNE	CAS Working Group on Numerical Experimentation
WG-SP	GCOS AOPC/OOPC Working Group on Surface Pressure
WG-SST/SIAOPC/OOPC	Working Group on Sea-Surface Temperature and Sea-Ice
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMO	World Meteorological Organization
WOA	World Ocean Atlas
WOD	World Ocean Database
XBT	Expendable Bathythermograph
XML	Extensible Markup Language

