**WORLD METEOROLOGICAL ORGANIZATION**

**INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)**

**JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)**
**SHIP OBSERVATIONS TEAM (SOT)**

**EIGHTH SESSION**

CAPE TOWN, SOUTH AFRICA, 20-24 APRIL 2015

SOT-8 / Doc. 10.2.1
(08.04.2015)

ITEM: 10.2.1

Original: ENGLISH

# GLOBAL COLLECTING CENTRES (GCC) REPORT ON THE VOS AND VOSCLIM

*(Submitted by United Kingdom and Germany)*


## Summary and purpose of the document

This document presents the 2014 Global Collecting Centre Annual Report including developments and future plans affecting GCC operations. It provides status on volume and frequency of delayed-mode data being received and processed by the GCCs which are then subsequently forwarded to the eight Responsible Members and VOSClim Data Assembly Centre.


## ACTION PROPOSED

The Team will review the information contained in this report, and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

The Team will be invited to consider the role of the GCCs in processing the delayed-mode IMMT (International Marine Meteorological Tape-format) data and the associated quality control standards, especially in the framework of the modernization of the MCSS and the development of the new Marine Climate Data System (MCDS) per Recommendation 2 (JCOMM-4).

**Appendices**: **A** Full report of the GCCs to the eighth Session of the SOT
**B** GCC Annual Report 2014 (English)
**C** Layout of the International Maritime Meteorological Tape, Version 5 (IMMT-5)
**D** Minimum Quality Control Standard, Version 7 (MQCS-7)

## - A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

10.2.1.1 The Team recalled that under the revised Marine Climatological Summaries Scheme (MCSS), adopted by the eleventh session of the Commission for Marine Meteorology (CMM) (Lisbon, Portugal, April 1993), through Recommendation 11 (CMM-XI), the two Global Collecting Centres (GCCs) were established, in Germany and the United Kingdom, to: (i) collect all marine climatological data observed worldwide; (ii) ensure that minimum quality control procedures are applied; (iii) generate complete and duplicate global data sets; and (iv) provide these data sets to the Responsible Members under the MCSS.

10.2.1.2 The Team reviewed a consolidated 2014 report from the two GCCs. The report included a status on the volume and frequency of delayed-mode data being forwarded to the VOSClim Data Assembly Centre.

10.2.1.3 The Team also considered the role of the GCCs in processing the delayed-mode IMMT (International Maritime Meteorological Tape-format) data and the associated quality control standards.

10.2.1.4 The Team considered the new Marine Climate Data System (MCDS) and how the roles of MCSS members will migrate to the new data flow structure when it is introduced.

10.2.1.5. The Team made the following recommendations:

(i) Contributing Members (CMs) should submit their observations only once. If there is a requirement to resubmit data (e.g. quality improvements) then the GCCs should be made aware of this;

(ii) All CMs should submit data files in one IMMT format only – preferably now IMMT-5 quality checked to MQCS-7 making use of its increased coding capabilities;

(iii) CMs not able to submit their data because of issues e.g. with digitizing or converting into the IMMT format, should contact GCCs for advice;

(iv) All VOSClim class ships should use the indicator for registered VOSClim ships in element 41 (observation Platform) of the newly adopted formats IMMT-4 and -5;

(v) All VOSClim class ship observations should include the additional VOSClim elements;

(vi) If possible CMs should ensure all masked call signs (i.e. ‘SHIP’) are converted back to the original ID prior to submission; and

(vii) SOT should stay up to date with TT-MCDS developments.

10.2.17. The Team decided on the following action items:

(i) All CMs that did not submit data during 2014 should do so in 2015 or alternatively contact GCC for advice (***action; CMs; end of 2015***); and

(ii) The GCC should proactively contact CM that have not submitted data for a number of years to offer assistance and encourage submission of data (***action; GCCs; end 2015***).

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Appendices: 4

## APPENDIX A

## FULL REPORT OF THE GCCS TO THE EIGHTH SESSION OF THE SOT

### 1. VOS Data

The Marine Climatological Summaries Scheme (MCSS) was established by the WMO Commission for Marine Meteorology in 1963. In an effort to improve data flow and quality of global marine data two Global Collecting Centres (GCCs) were created in 1994.

The 2014 GCC report marks the 21th year of operation and is attached within Appendix B. The main highlights from the report are:

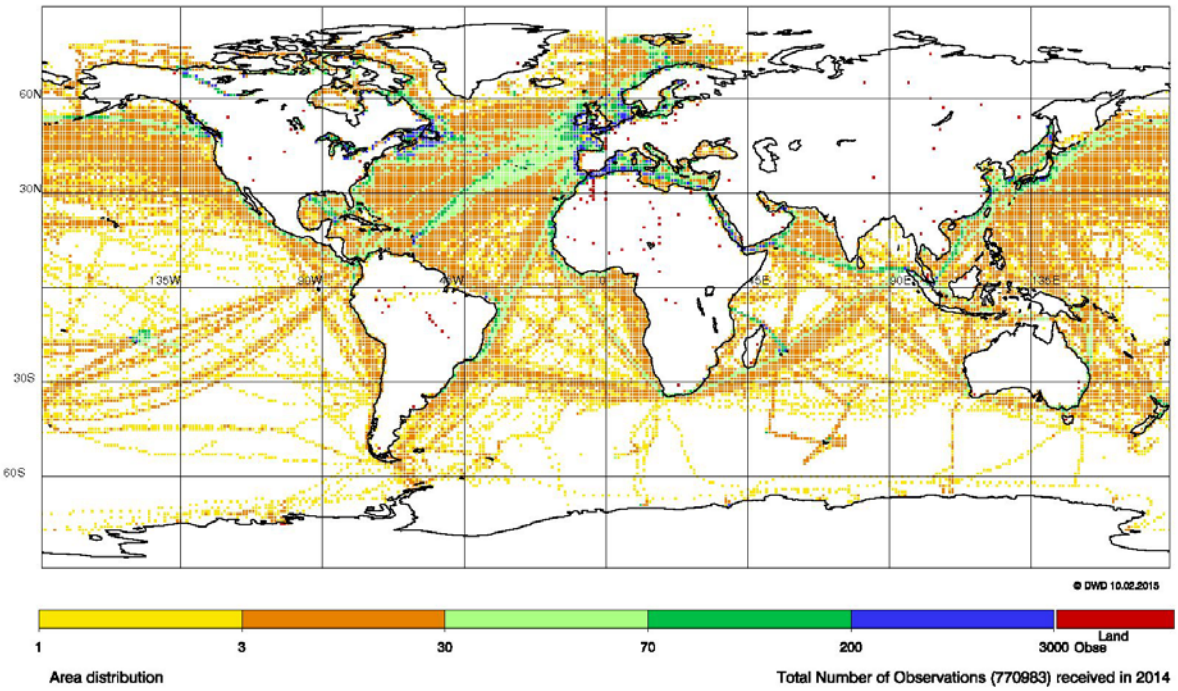
- 770,983 observations were received during 2014 from 18 countries, 2 fewer than the record high of 20 in 2013. Similarly, the number of observations contributed declined of the second consecutive year.
- 1008 VOS ships made observations in 2014.
- 92% of the data were observed in the last two years, 2013 and 2014.
- 72% of the received observations were coded in IMMT-4 format and 4% in the most recent IMMT-5 format. 22% of the received observations were coded in the older IMMT-3 format, and 1% still in IMMT-1 and IMMT-2 format.

*Table 1: Observations received by GCCs in 2014*

| Country Name | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter | Total |
|---|---|---|---|---|---|
| Argentina | | | | | 0 |
| Australia | 28 | 448 | 1.224 | | 1.700 |
| Brazil | | | | | 0 |
| Canada | | | | 310.490 | 310.490 |
| Croatia | | 9.910 | | | 9.910 |
| France | 47.462 | | 42.410 | 25.962 | 115.834 |
| Germany | 37.449 | | 6.770 | 28.070 | 72.289 |
| Greece | | | | | 0 |
| Hong Kong, China | 937 | | 586 | 2.848 | 4.371 |
| India | | | | | 0 |
| Ireland | 180 | | | 19.754 | 19.934 |
| Israel | | | | | 0 |
| Italy | | | | | 0 |
| Japan | 1.053 | 4.818 | 3.561 | 1.387 | 10.819 |
| Kenya | | | | | 0 |
| Malaysia | 133 | | 30 | 108 | 271 |
| Netherlands | 4.128 | 5.996 | 7.198 | 5.926 | 23.248 |
| New Zealand | 3.316 | | | 1.660 | 4.976 |
| Nigeria | | | | | 0 |
| Norway | 14.175 | 14.033 | 15.075 | 15.790 | 59.073 |
| Poland | | | | 1.117 | 1.117 |
| Russian Federation | 5.004 | 5.003 | 5.003 | 2.795 | 17.805 |
| Singapore | | | | | 0 |
| South Africa | 447 | 74 | | | 521 |
| Sweden | | 20.800 | | | 20.800 |
| United Kingdom | 41.719 | 18.300 | 8.707 | 17.178 | 85.904 |
| USA | 3.125 | 3.968 | 2.225 | 2.603 | 11.921 |
| | | | | | |
| **18 of 27 Contributing Countries** | **159.156** | **83.350** | **92.789** | **435.688** | **770.983** |

- When evaluated against the MQCS the majority of the reported elements were again found to be of good quality. Such elements were assigned a QC Flag of '1' meaning 'element appears correct'. For example frequently reported elements such as air pressure, wind direction, wind speed and sea surface temperature were flagged with a '1' in over 98% of cases, and air temperature in 92% of cases.
- There were 174 observations (0.02%) showing on-land positions. These are plotted as red dots in Figure 1.

*Figure 1: Distribution of Observations received in 2014*




## 2. VOSClim Data

The VOSClim Project was a long standing pilot within JCOMM's Voluntary Observing Ship's Scheme. It aimed at providing a high-quality subset of marine meteorological data with detailed information on how data have been obtained. These data are available in delayed mode and are of great value to both operational marine forecasting and global climate studies. The IMMT-4 and 5 formats include a VOSClim data indicator which should be selected if a ship has this capability.

Since July 2008, at the end of each quarter all VOS data including VOSClim data is disseminated. Responsible Member USA operates the VOSClim DAC where a subset of data of VOSClim ships is extracted from the quarterly file and stored at the DAC.

The National Climatic Data Centre (NCDC) VOSClim Data Assembly Centre (DAC) has transitioned from using the NCDC maintained VOSClim ship list to the list produced by E-SURFMAR (EUCOS-Surface Marine Operational Service). The E-SURFMAR database is now the primary source for VOSClim ship metadata. The first GCC VOSClim report using the E-SURFMAR database was produced for the 4th quarter of 2014.

*Table 2: VOSClim Data Received in 2014 by Quarter*

**Total Number of Observations from VOSClim-Ships / Number of Observations with VOSClim-Elements from VOSClim-Ships / Number of Observations with VOSClim-Elements from not listed ships 2014**

| Country Name | 1st Quarter | | | 2nd Quarter | | | 3rd Quarter | | | 4th Quarter | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 301.060 | 0 | 0 | 301.060 | 0 | 0 |
| France | 45.515 | 45.515 | 1.245 | 0 | 0 | 0 | 39.855 | 39.855 | 1.385 | 24.425 | 24.425 | 1.537 | 109.795 | 109.795 | 4.167 |
| Germany | 8.707 | 7.807 | 443 | 0 | 0 | 0 | 2.511 | 2.149 | 436 | 7.998 | 7.198 | 83 | 19.216 | 17.154 | 962 |
| Hong Kong, China | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 47 |
| India | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Japan | 0 | 0 | 0 | 3.026 | 3.026 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.026 | 3.026 | 0 |
| Netherlands | 3.364 | 3.352 | 471 | 3.705 | 3.670 | 775 | 5.297 | 5.270 | 1.431 | 2.667 | 2.474 | 187 | 15.033 | 14.766 | 2.864 |
| New Zealand | 991 | 941 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 991 | 941 | 2 |
| United Kingdom | 32.351 | 25.036 | 1.082 | 15.925 | 11.188 | 166 | 6.802 | 4.682 | 353 | 12.988 | 9.590 | 586 | 68.066 | 50.496 | 2.187 |
| USA | 2.947 | 2.945 | 44 | 688 | 682 | 377 | 308 | 308 | 1.117 | 150 | 148 | 361 | 4.093 | 4.083 | 1.899 |
| **8 of 11 countries** | 93.875 | 85.596 | 3.287 | 23.344 | 18.566 | 1.318 | 54.773 | 52.264 | 4.723 | 349.288 | 43.835 | 2.801 | **521.280** | **200.261** | **12.129** |

During 2014:

- 521,280 observations were received and processed from VOSClim registered ships by the GCCs during 2014.
- This makes up 68% of data received by the GCCs from the VOS fleet in 2014.
- 8 of the 11 CMs with registered VOSClim ships submitted observations (Table 2) in 2014. *Note* – This does not include CMs providing VOSClim reports from non-registered VOSClim ships.
- In 2014, the GCCs received data from over 358 listed VOSClim ships.
- 200,261 of the VOSClim observations (38%) contained the VOSClim defined additional elements.
- The CMs France and Japan provided 100% of VOSClim elements in the VOSClim reports.

## 3. Call Sign Masking

- In 2013 and 2014 the GCCs received only unmasked call signs from the CMs.

## 4. Developments and Future Changes

- Formats and Standards: IMMT-5 and MQCS-7 were adopted at JCOMM-4 in May 2012 and were in effect from June 2012. These include only minor updates of wording and QC limits (see Appendices C & D for the full IMMT-5 & MQCS-7). The 'MQC-software for CMs' was updated to MQCS-7 and the 7th version is available at http://www.wmo.int/pages/prog/amp/mmop/mqc_soft.html.

- MCDS: The concept of the Marine Climate Data System (MCDS) is being implemented. It encompasses a generic data flow structure with defined roles and tasks to be applied to all data types across JCOMM for the management of their climate data. A MCDS vision for 2020 and implementation plan were proposed and endorsed by JCOMM-4. The new JCOMM Task Team on the Marine Climate Data System (TT-MCDS) was formed and absorbs the work and tasks of the TT-DMVOS & TT-MOCS. Members of the Expert Team on Marine Climatology (ETMC) and Task Team on the Marine Climate Data System (TT-MCDS) held a joint meeting at CLIMAR-4 (June 2014). At the meeting the MCDS implementation plan for Data Acquisition Centres (DACs) and Global Data Assembly Centres (GDACs) was updated. The meeting also recognised that there was a need to review Technical Regulations to take MCDS developments into consideration. This is in progress:
  East and West TT-MCDS teleconferences were held in December 2014 to discuss updates to the relevant sections of the WMO Guide to Marine Meteorological Services (No 471) and Manual on Marine Meteorological Services (No 558). New structures for the Marine Climatology sections were proposed with a view to having draft versions ready for ETMC-5 (June 2015). The membership of the TT-MCDS was also reviewed at the meeting.
  In 2014 the CMOC (Centre for Marine-Meteorological and Oceanographic Climate Data) application from the State Oceanic Administration (SOA) National Marine Data and Information Service (NMDIS) in Tianjin, China was successfully evaluated against the CMOC evaluation criteria proposed by the ETMC and Data Management Coordination Group (DMCG). A draft resolution for submission at the 17th WMO congress has been prepared to approve China as the first official CMOC.

- WIS DCPC: Both GCCs have been identified as 'Data Collection & Production Centres' (DCPCs) for the WMO Information System (WIS) and are able to provide nearly 19.3 million MQCS-checked and flagged observations received by the GCCs from 1996 to 2014. Additionally, all contributed original records are saved and available at http://gisc.dwd.de/GISC_DWD/toExtendedSearch.do

- HQCS: In 2014 the new Higher Quality Control Standard (HQCS) developed by DWD was used as the basis for a software package for automatic quality check to be used by the new MCDS GDACs).

Documentation of the code was translated into English and will be made available in 2015. New features include a new spatial check and an integrated land-sea-mask with an accuracy of 0.1 degree which helps to identify observations with on-land-positions and a climatology check based on the background fields using the ERA-Interim-Reanalysis 1981 – 2010.

- Problems uncovered**:** : During the first quarter of 2013 the GCCs discovered problems with coding of relative humidity in TurboWin version 5 and with the UK GCC processing of IMMT-4 and 5 data. RMs were made aware while both GCCs worked to resolve the issues. Problems with the UK processing software have now been rectified and the relative humidity issue will be addressed in the next TurboWin release. All contributed data affected by the TurboWin relative humidity problem are corrected before the next quarterly exchange.

**APPENDIX B**

**Global Collecting Centre**

**Annual Report 2014**

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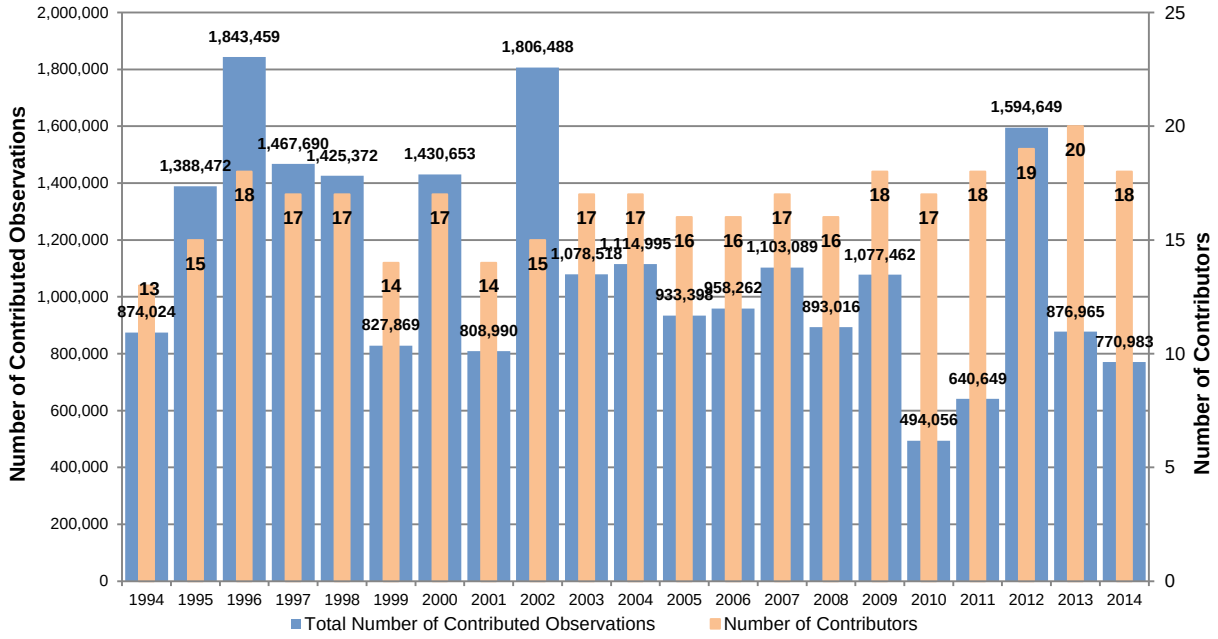
**Summary**
In 2014, the GCCs received data from 18 Contributing Members, 2 fewer than the record high of 20 in 2013 (see Figure 1). Similarly, the number of observations contributed declined for the second consecutive year. The majority of the observations were made in the last two years, with the oldest records dating back to 1987.
All data, original and MQC-checked, are available on the German WMO Information System (WIS) GISC http://gisc.dwd.de/GISC_DWD/toSimpleSearch.do.

**Background**
The two Global Collecting Centres (GCCs) for JCOMM's Marine Climatological Summaries Scheme (MCSS) were set up in 1993 to improve data flow and quality of delayed-mode Voluntary Observing Ship (VOS) data. Data is received regularly by the GCCs (Figure 1 and Appendix A) from the MCSS Contributing Members (CMs) (Appendix B). This is then quality ensured to the Minimum Quality Control Standard (MQCS-7) and, once quarterly, made available to Responsible Members (RMs) via FTP. For further information about the MCSS and GCCs work, terms of reference, data format and QC standards see WMO Manual 558 and WMO Guide 471.

*Figure 1: Numbers of contributed observations and active Contributing Members by year since*

*GCCs began to operate*




## VOS Data Volumes 2014

- 770,983 observations were received and processed by the GCCs during 2014.
- 18 CMs contributed data out of a total of 27 registered Members/Member States.
- 1,008 VOS ships made observations in 2014.
- The observation dates of the contributed data ranged from 1987 to 2014, however, 92% of the data were observed in the last two years, 2013 and 2014.
- 72% of the received observations were coded in IMMT-4 format and 4% in the most recent IMMT-5 format.
- 22% of the received observations were coded in the older IMMT-3 format, and 1% still in IMMT-1 and IMMT-2 format.

*Figure 2: Number of observations by CMs for each quarter of 2014.*
*(CMs without any contribution in 2014 are marked in red)*

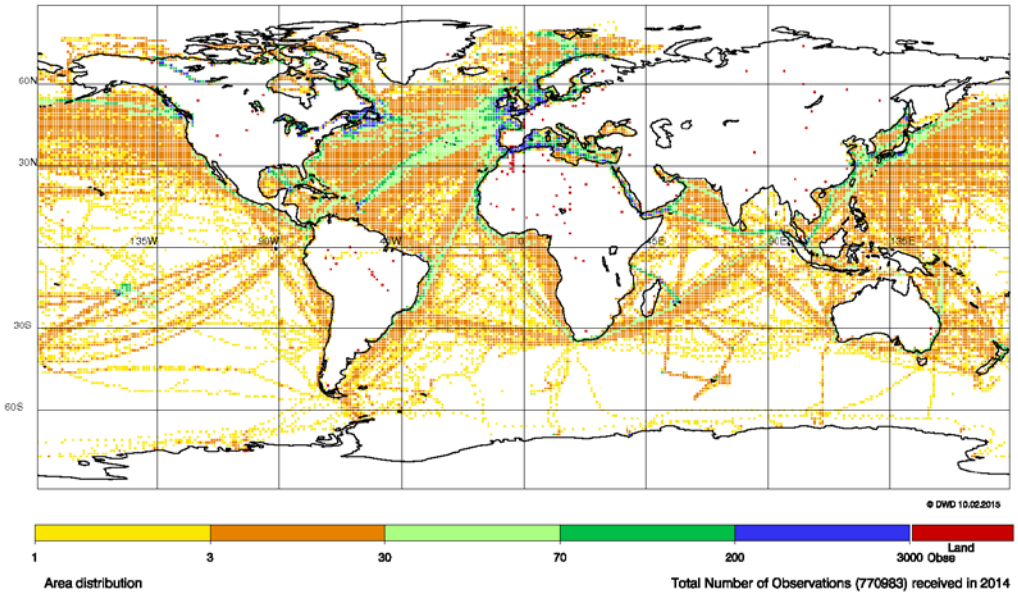
**Number of CM Observations 2014**

| Country Name | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter | Total |
|---|---|---|---|---|---|
| Argentina | | | | | |
| Australia | 28 | 448 | 1.224 | | 1.700 |
| Brazil | | | | | |
| Canada | | | | 310.490 | 310.490 |
| Croatia | | 9.910 | | | 9.910 |
| France | 47.462 | | 42.410 | 25.962 | 115.834 |
| Germany | 37.449 | | 6.770 | 28.070 | 72.289 |
| Greece | | | | | |
| Hong Kong, China | 937 | | 586 | 2.848 | 4.371 |
| India | | | | | |
| Ireland | 180 | | | 19.754 | 19.934 |
| Israel | | | | | |
| Italy | | | | | |
| Japan | 1.053 | 4.818 | 3.561 | 1.387 | 10.819 |
| Kenya | | | | | |
| Malaysia | 133 | | 30 | 108 | 271 |
| Netherlands | 4.128 | 5.996 | 7.198 | 5.926 | 23.248 |
| New Zealand | 3.316 | | | 1.660 | 4.976 |
| Nigeria | | | | | |
| Norway | 14.175 | 14.033 | 15.075 | 15.790 | 59.073 |
| Poland | | | | 1.117 | 1.117 |
| Russian Federation | 5.004 | 5.003 | 5.003 | 2.795 | 17.805 |
| Singapore | | | | | |
| South Africa | 447 | 74 | | | 521 |
| Sweden | | 20.800 | | | 20.800 |
| United Kingdom | 41.719 | 18.300 | 8.707 | 17.178 | 85.904 |
| USA | 3.125 | 3.968 | 2.225 | 2.603 | 11.921 |
| | | | | | |
| **18 of 27 Contributing Countries** | **159.156** | **83.350** | **92.789** | **435.688** | **770.983** |

**VOS Data Quality 2014**

- When evaluated against the MQCS the majority of the reported elements were again found to be of good quality. Such elements were assigned a QC Flag of '1' meaning 'element appears correct'. For example frequently reported elements such as air pressure, wind direction, wind speed and sea surface temperature were flagged with a '1' in over 98% of cases, and air temperature in 92% of cases.
- There were 174 observations (0.02%) showing on-land positions. These are plotted as red dots in Figure 3.
- The TurboWin coding problem of the previous year persists leading to a number of IMMT-4 and -5 files being submitted with erroneous relative humidity values. These data were identified and the corrected files made available on the German GISC (Global Information System Centre). Until the coding problem is resolved, the GCCs will correct the data before processing and distribution.
- No previously exchanged datasets had to be corrected in 2014.
- Quarterly analysis of the exchanged datasets identified 171 duplicate observations (0.02%) that were rejected by the MQCS. Analysis of the yearly dataset highlighted that the number of observations rejected increased to 226. These observations failed MQC but were included at quarterly exchange.
- Many observations containing erroneous positions were selected and, after consultation with the appropriate CM, were deleted.
- Before the quarterly data exchanges the duplicates due to previously submitted observations were deleted. Unfortunately, duplicate contributions or files that were later present in another quarter cannot be identified.
- The RM USA (NOAA) supports the ICOADS (International Comprehensive Ocean-Atmosphere Data Set) with the quarterly MQC-checked dataset from the GCCs.

*Figure 3: Distribution of observations received in 2014*




**VOSClim Class Data 2014**

- 521,280 observations were received and processed from VOSClim registered ships by the GCCs during 2014.
- This makes up 68% of data received by the GCCs from the VOS fleet in 2014.
- 8 of the 11 CMs with registered VOSClim ships submitted observations (Figure 4) in 2014.
- In 2014, the GCCs received data from over 358 listed VOSClim ships.
- 200,261 of the VOSClim observations (38%) contained the VOSClim defined additional elements.
- The CMs France and Japan provided 100% of VOSClim elements in the VOSClim reports.

*Figure 4: VOSClim class observations submitted by CMs for each quarter of 2014 (CMs without any contribution in 2014 are marked in red)*

**Total Number of Observations from VOSClim-Ships / Number of Observations with VOSClim-Elements from VOSClim-Ships / Number of Observations with VOSClim-Elements from not listed ships 2014**

| Country Name | 1st Quarter | | | 2nd Quarter | | | 3rd Quarter | | | 4th Quarter | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Canada | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 301.060 | 0 | 0 | 301.060 | 0 | 0 |
| France | 45.515 | 45.515 | 1.245 | 0 | 0 | 0 | 39.855 | 39.855 | 1.385 | 24.425 | 24.425 | 1.537 | 109.795 | 109.795 | 4.167 |
| Germany | 8.707 | 7.807 | 443 | 0 | 0 | 0 | 2.511 | 2.149 | 436 | 7.998 | 7.198 | 83 | 19.216 | 17.154 | 962 |
| Hong Kong, China | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 47 |
| India | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Japan | 0 | 0 | 0 | 3.026 | 3.026 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.026 | 3.026 | 0 |
| Netherlands | 3.364 | 3.352 | 471 | 3.705 | 3.670 | 775 | 5.297 | 5.270 | 1.431 | 2.667 | 2.474 | 187 | 15.033 | 14.766 | 2.864 |
| New Zealand | 991 | 941 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 991 | 941 | 2 |
| United Kingdom | 32.351 | 25.036 | 1.082 | 15.925 | 11.188 | 166 | 6.802 | 4.682 | 353 | 12.988 | 9.590 | 586 | 68.066 | 50.496 | 2.187 |
| USA | 2.947 | 2.945 | 44 | 688 | 682 | 377 | 308 | 308 | 1.117 | 150 | 148 | 361 | 4.093 | 4.083 | 1.899 |
| **8 of 11 countries** | 93.875 | 85.596 | 3.287 | 23.344 | 18.566 | 1.318 | 54.773 | 52.264 | 4.723 | 349.288 | 43.835 | 2.801 | **521.280** | **200.261** | **12.129** |

**Recent Developments**

**MCSS and GCC Anniversaries**
2014 marked the 50th anniversary of the founding of the marine climatological summaries scheme which was celebrated in a special session at the Fourth JCOMM Workshop on Advances in Marine Climatology (CLIMAR-4) in Asheville, USA. DWD put together a video highlighting the successes of the scheme featuring interviews with a number of experts who had been involved over the years. The 20th year of operation of the GCCs (2013) was also celebrated at the workshop. Over 22.5 million observations, contributed by 28 nations, were collected, quality checked and distributed by the GCCs.

**MCDS Developments**
Members of the Expert Team on Marine Climatology (ETMC) and Task Team on the Marine Climate Data System (TT-MCDS) met at CLIMAR-4 (June 2014). At the meeting the MCDS implementation plan for Data Acquisition Centres (DACs) and Global Data Assembly Centres (GDACs) was updated. The meeting also recognised that there was a need to review Technical Regulations to take MCDS developments into consideration.

East and West TT-MCDS teleconferences were held in December 2014 to discuss updates to the relevant sections of the WMO Guide to Marine Meteorological Services (No 471) and Manual on Marine Meteorological Services (No 558). New structures for the Marine Climatology sections were proposed with a view to having draft versions ready for ETMC-5 (June 2015). The membership of the TT-MCDS was also reviewed at the meeting.

In 2014 the CMOC (Centre for Marine-Meteorological and Oceanographic Climate Data) application from the State Oceanic Administration (SOA) National Marine Data and Information Service (NMDIS) in Tianjin, China was successfully evaluated against the CMOC evaluation criteria proposed by the ETMC and Data Management Coordination Group (DMCG). A draft resolution for submission at the 17th WMO congress has been prepared to approve China as the first official CMOC.

**Assisting CM**
DWD assisted Canada and the Netherlands in preparing their contributions in 2014.

**HQC development**
In 2014 the new Higher Quality Control Standard (HQCS) developed by DWD was used as the basis for a software package for automatic quality checks.
Documentation of the code was translated into English and will be made available in 2015.
New features include:
A new spatial check and an integrated land-sea-mask with an accuracy of 0.1 degree which helps to identify observations with on-land-positions.
A climatology check based on the background fields using the ERA-Interim-Reanalysis 1981 – 2010.

**VOSClim DAC**
The National Climatic Data Centre (NCDC) VOSClim Data Assembly Centre (DAC) has transitioned from using the NCDC maintained VOSClim ship list to the list produced by E-SURFMAR (EUCOS-Surface Marine Operational Service). The E-SURFMAR database is now the primary source for VOSClim ship metadata. The first GCC VOSClim report using the E-SURFMAR database was produced for the 4th quarter of 2014.

**Recommendations**

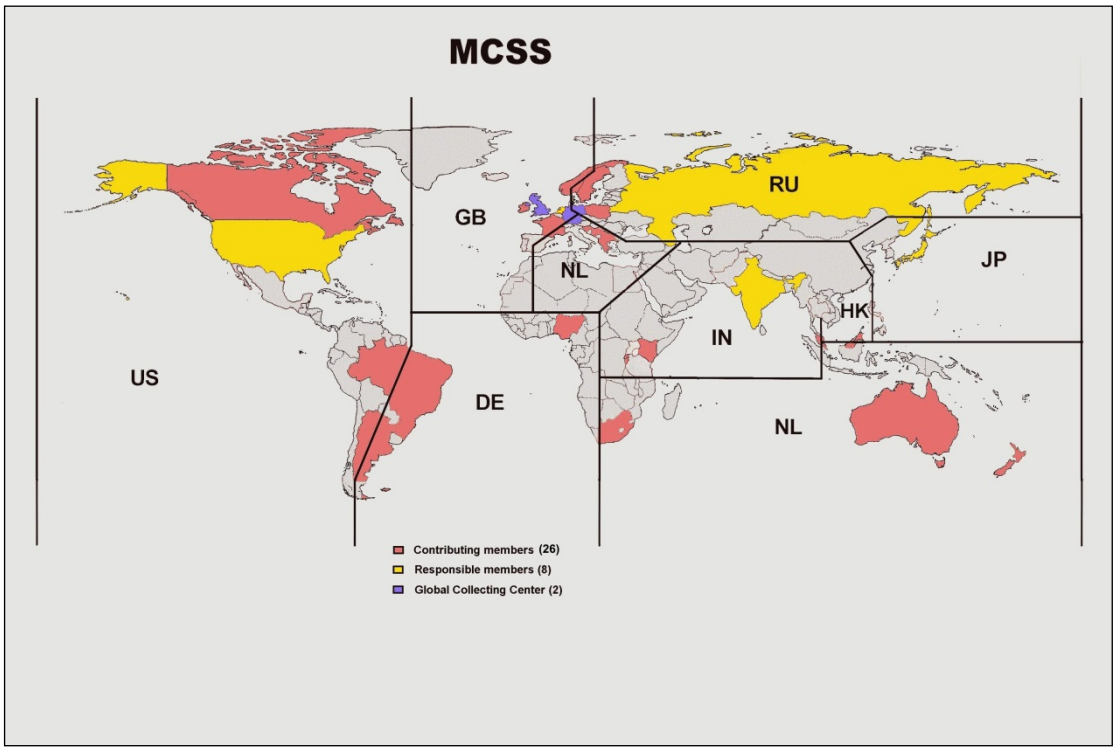
To improve data availability and quality, and in light of the recent developments, the GCCs make the following recommendations:

- CMs should submit their observations only once. If there is a requirement to resubmit data (e.g. quality improvements) then the GCCs should be made aware of this.
- CMs should submit data files in one IMMT format only – preferably now IMMT-5.
- Where problems arise that prevent a CM submitting its data e.g. when digitizing or converting into the IMMT format, GCCs should be asked for advice.
- By applying MQCS to data prior to submission, CMs can identify and solve significant problems, in particular issues within date, time and position.
- All VOSClim class ships should use the indicator for registered VOSClim ships in element 41 (observation Platform), in the newly adopted formats IMMT-4 and -5, with the option set to 4.
- All VOSClim class ship observations should include the additional VOSClim elements.
- CMs with VOS ships reporting the additional VOSClim elements should consider listing the vessels within the VOSClim program
- If possible convert all masked call signs (i.e. 'SHIP') back to the original ID prior to submission.
- CMs and RMs should stay up to date with TT-MCDS developments in order to ensure they know how they might be affected in the future or how they may contribute in the present. This can be done by attending meetings or reading workshop and session reports available on the JCOMM website.
- CMs and RMs should consider, if they wish to apply to be Data Acquisition Centres (DACs) and Global Data Assembly Centres (GDACs) in the future MCDS.

***Appendix A**: CM contribution by year since GCCs began operations in 1994*

| | ISO Alpha-2 code | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Number of Years with Contributions 1994 - 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Argentina | AR | | | | | | | | X | | X | X | X | X | X | X | | | | | | | 7 |
| Australia | AU | | | | | | | X | | X | X | X | X | | X | X | X | X | X | | X | X | 12 |
| Brazil | BR | X | X | X | X | | | | | | | | | | | | | | | | | | 4 |
| Canada | CA | | | | | | | | | | | | | | | | | | X | X | X | X | 4 |
| Croatia | HR | | | | X | X | X | X | X | | | | | | | | | | | | X | X | 7 |
| France | FR | X | X | X | X | X | | | X | | X | X | X | X | X | X | X | | X | X | X | X | 17 |
| Germany | DE | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 21 |
| Greece | GR | | | | | | | | | | | | | | | | | X | | X | X | | 3 |
| Hong Kong, China | HK | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 21 |
| India | IN | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | 20 |
| Ireland | IE | | | X | X | X | | | | X | | | | | | | X | X | X | X | | X | 9 |
| Israel | IL | | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | | 18 |
| Italy | IT | | | | | | | | | | | | | | | | | | | | X | | 1 |
| Japan | JP | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 21 |
| Kenya | KE | | | | | | | | | | | | | | | | | | | | | | 0 |
| Malaysia | MY | X | | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 19 |
| Netherlands | NL | X | X | X | | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | 19 |
| New Zealand | NZ | | | | | | | | | | | | | X | X | X | X | X | X | X | | X | 8 |
| Nigeria | NG | | | | | | | | | | | | | | | | | | | | | | 0 |
| Norway | NO | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | | | X | X | X | 18 |
| Poland | PL | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 21 |
| Russian Federation | RU | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 20 |
| Singapore | SG | | X | X | X | X | | | | | X | X | X | X | | | | | | X | | | 9 |
| South Africa | ZA | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | 16 |
| Sweden | SE | | | X | | | | | | | | | | | | | X | X | X | | X | X | 6 |
| United Kingdom | GB | X | X | X | X | X | X | X | | X | X | X | | X | X | X | X | X | X | X | X | X | 19 |
| United States | US | X | X | X | X | X | X | X | | X | X | | | | X | X | X | X | X | X | X | X | 17 |

***Appendix B:** Countries and regional responsibilities under the MCSS (updated 2009)*



***Appendix C**: List of acronyms*

| | |
|---|---|
| **APP** | Ancillary Pilot Project |
| **CM** | Contributing Member |
| **CMOC** | Centre for Marine Meteorological and Oceanographic Climate Data |
| **DAC** | Data Acquisition Centre |
| **DMCG** | Data Management Coordination Group |
| **DWD** | Deutscher Wetterdienst |
| **E-** | EUCOS Surface Marine Programme |
| **SURFMAR** | Expert Team on Marine Climatology |
| **ETMC** | File Transfer Protocol |
| **FTP** | |
| **GCC** | Global Collecting Centre (MCSS / JCOMM) |
| **GDAC** | Global Data Assembly Centre |
| **GISC** | Global Information System Centre (of WIS) |
| **HQCS** | Higher Quality Control Standard |
| **ICOADS** | International Comprehensive Ocean-Atmosphere Data Set (USA) |
| **IMMT** | International Maritime Meteorological Tape Format |
| **IOC** | Intergovernmental Oceanographic Commission of UNESCO |
| **IODE** | International Oceanographic Data and Information Exchange |
| **JCOMM** | Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology |
| **MCDS** | Marine Climate Data System |
| **MCSS** | Marine Climatological Summaries Scheme |
| **MQCS** | Minimum Quality Control Standard |
| **NCDC** | National Climatic Data Centre |
| **NMDIS** | National Marine Data and Information Service |
| **NOAA** | National Oceanic and Atmospheric Administration (USA) |
| **ODP** | Ocean Data Portal |
| **QC** | Quality Control |
| **RM** | Responsible Member |
| **SOA** | State Oceanic Administration |
| **SOT** | Ship Observations Team |
| **TT-MCDS** | Task Team on Marine Climate Data System of ETMC |
| **UK** | United Kingdom |
| **VOS** | Voluntary Observing Ship |
| **VOSClim** | VOS Climate (Subset for High Quality Data) |
| **WIS** | WMO Information System |
| **WMO** | World Meteorological Organization |

## APPENDIX C

## LAYOUT FOR THE INTERNATIONAL MARITIME METEOROLOGICAL TAPE (IMMT) FORMAT

## IMMT-5 (Version 5)

**Notes:**

(a) The representation for missing data in any field is all blank(s).

(b) Many of the "Codes" in the IMMT format match "symbolic letters" as defined in the *Manual on Codes* (WMO–No.306) for the traditional alphanumeric (e.g. FM 13) SHIP code. However, the elements added for the VOSClim project (as introduced for IMMT-2), for example, did not appear in WMO–No.306, thus an effort was made to select unique new Codes to avoid conflicts in meaning between symbolic letter groups in WMO–No.306 versus Codes defined only in IMMT.

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| 1 | 1 | $i_T$ | Format/temperature indicator | 3 – temperatures in tenths of °C<br>4 – temperatures in halves of °C<br>5 – temperatures in whole °C<br>[Note: codes 1-2 were previously used to refer to the obsolete IMMPC format; current codes all refer to the IMMT format] |
| 2 | 2-5 | AAAA | Year UTC | Four digits |
| 3 | 6-7 | MM | Month UTC | 01 – 12 January to December |
| 4 | 8-9 | YY | Day UTC | 01 – 31 |
| 5 | 10-11 | GG | Time of observation | Nearest whole hour UTC, WMO specifications |
| 6 | 12 | Qc | Quadrant of the globe | WMO code table 3333 |
| 7 | 13-15 | $L_aL_aL_a$ | Latitude | Tenths of degrees, WMO specifications |
| 8 | 16-19 | $L_oL_oL_oL_o$ | Longitude | Tenths of degrees |
| 9 | 20 | | Cloud height (h) and visibility (VV) measuring indicator | 0 – h and VV estimated<br>1 – h measured, VV estimated<br>2 – h and VV measured<br>3 – h estimated, VV measured |
| 10 | 21 | h | Height of clouds | WMO code table 1600 |
| 11 | 22-23 | VV | Visibility | WMO code table 4377 |
| 12 | 24 | N | Cloud amount | Oktas, WMO code table 2700; show 9 where applicable |
| 13 | 25-26 | dd | True wind direction | Tens of degrees, WMO code table 0877; show 00 or 99 where applicable |
| 14 | 27 | $i_w$ | Indicator for wind speed | WMO code table 1855 |
| 15 | 28-29 | ff | Wind speed | Units of knots or meters per second, hundreds omitted; values in excess of 99 knots are to be indicated in units of meters per second and $i_w$ encoded accordingly; the method of estimation or measurement and the units used (knots or meters per second) are indicated in element 14. Wind is at observation height or anemometer height (i.e. it is not reduced to 10m). |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| 16 | 30 | $s_n$ | Sign of temperature | WMO code table 3845 |
| 17 | 31-33 | TTT | Air temperature | Tenths of degrees Celsius |
| 18 | 34 | $s_t$ | Sign of dew-point temperature | 0 – positive or zero measured dew-point temperature<br>1 – negative measured dew-point temperature<br>2 – iced measured dew-point temperature<br>5 – positive or zero computed dew-point temperature<br>6 – negative computed dew-point temperature<br>7 – iced computed dew-point temperature |
| 19 | 35-37 | $T_dT_dT_d$ | Dew-point temperature | Tenths of degrees Celsius |
| 20 | 38-41 | PPPP | Air pressure | Tenths of hectopascals |
| 21 | 42-43 | ww | Present weather | WMO code table 4677 or 4680 |
| 22 | 44 | $W_1$ | Past weather | WMO code table 4561 or 4531 |
| 23 | 45 | $W_2$ | Past weather | WMO code table 4561 or 4531 |
| 24 | 46 | $N_h$ | Amount of lowest clouds | As reported for $C_L$ or, if no $C_L$ cloud is present, for $C_M$, in oktas; WMO code table 2700 |
| 25 | 47 | $C_L$ | Genus of CL clouds | WMO code table 0513 |
| 26 | 48 | $C_M$ | Genus of CM clouds | WMO code table 0515 |
| 27 | 49 | $C_H$ | Genus of CH clouds | WMO code table 0509 |
| 28 | 50 | $s_n$ | Sign of sea-surface temperature | WMO code table 3845 |
| 29 | 51-53 | $T_WT_WT_W$ | Sea surface temperature | Tenth of degrees Celsius |
| 30 | 54 | | Indicator for sea-surface temperature measurement | 0 – Bucket thermometer<br>1 – Condenser inlet<br>2 – Trailing thermistor<br>3 – Hull contact sensor<br>4 – “Through hull” sensor<br>5 – Radiation thermometer<br>6 – Bait tanks thermometer<br>7 – Others |
| 31 | 55 | | Indicator for wave measurement | Shipborne wave recorder: 0 – Wind sea and swell estimated<br>1 – Wind sea and swell measured<br>2 – Mixed wave measured, swell estimated<br>3 – Other combinations measured and estimated<br>Buoy: 4 – Wind sea and swell measured<br>5 – Mixed wave measured, swell estimated<br>6 – Other combinations measured and estimated<br>Other measurement system: 7 – Wind sea and swell measured<br>8 – Mixed wave measured, swell estimated<br>9 – Other combinations measured and estimated |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| 32 | 56-57 | $P_WP_W$ | Period of wind waves or of measured waves | Whole seconds; show 99 where applicable in accordance with Note (3) under specification of $P_WP_W$ in WMO–No.306. |
| 33 | 58-59 | $H_WH_W$ | Height of wind waves or of measured waves | Half-meter values. Examples: Calm or less than ¼m to be encoded 00; 3½m to be encoded 07; 7m to be encoded 14; 11½m to be encoded 23. |
| 34 | 60-61 | $d_{W1}d_{W1}$ | Direction of predominant swell waves | Tens of degrees, WMO code table 0877; encoded 00 or 99 where applicable. Blanks = no observation of waves attempted. |
| 35 | 62-63 | $P_{W1}P_{W1}$ | Period of predominant swell waves | Whole seconds; encoded 99 where applicable (see under element 32) |
| 36 | 64-65 | $H_{W1}H_{W1}$ | Height of predominant swell waves | Half-meter values (see under element 33) |
| 37 | 66 | $I_s$ | Ice accretion on ships | WMO code table 1751 |
| 38 | 67-68 | $E_sE_s$ | Thickness of ice accretion | In centimeters |
| 39 | 69 | $R_s$ | Rate of ice accretion | WMO code table 3551 |
| 40 | 70 | | Source of observation | 0 – Unknown<br>1 – Logbook (paper)<br>2 – National Telecommunication channels<br>3 – National Publications<br>4 – Logbook (electronic)<br>5 – Global Telecommunication channels (GTS)<br>6 – International Publications<br>[Note: Formerly (usage now discontinued): codes 1-3 also referred to “National data exchange,” and codes 4-6 also referred to “International data exchange”; distinction added between paper and electronic logbook] |
| 41 | 71 | | Observation platform | 0 – Unknown<br>1 – Selected ship<br>2 – Supplementary ship<br>3 – Auxiliary ship<br>4 – Registered VOSClim ship<br>5 – Fixed sea station (e.g., rig or platform)<br>6 – Coastal station<br>[Note: 7 – Reserved]<br>[Note: 8 – Reserved]<br>9 – Others/data buoy<br>[Note: Formerly (usage now discontinued): code 4 referred to “Automated station/data buoy;” and codes 7-8 referred to “Aircraft” and “Satellite,” respectively] |
| 42 | 72-78 | | Ship’s call sign | Ship’s call sign stored left-justified (with right-blank fill) as follows:<br>7-character call sign: columns 72–78<br>6-character call sign: columns 72–77<br>5-character call sign: columns 72–76<br>4-character call sign: columns 72–75<br>3-character call sign: columns 72–74 |
| 43 | 79-80 | | Country which has recruited the ship | According to the 2-character alphabetical codes assigned by the International Organization for Standardization (ISO) |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| 44 | 81 | | National use | |
| 45 | 82 | | Quality control indicator | 0 – no QC has been performed<br>1 – manual QC only<br>2 – automated QC only (such as using only MQC)<br>3 – automated QC only (with time sequence checks)<br>4 – manual and automated QC (superficial)<br>5 – manual and automated QC (superficial; with time-sequence checks)<br>6 – manual and automated QC (intensive; with time-sequence checks)<br>7 – [reserved]<br>8 – [reserved]<br>9 – national system of QC (information to be furnished to WMO) |
| 46 | 83 | $i_X$ | Weather data indicator | 1 – Manual<br>4 – Automatic: If present and past weather data included Code tables 4677 and 4561 used<br>7 – Automatic: If present and past weather data included Code tables 4680 and 4531 used |
| 47 | 84 | $i_R$ | Indicator for inclusion or omission of precipitation data | WMO code table 1819 |
| 48 | 85-87 | RRR | Amount of precipitation which has fallen during the period preceding the time of observation, as indicated by $t_R$ | WMO code table 3590 |
| 49 | 88 | $t_R$ | Duration of period of reference for amount of precipitation, ending at the time of the report | WMO code table 4019 |
| 50 | 89 | $s_w$ | Sign of wet-bulb temperature | 0 – positive or zero measured wet-bulb temperature<br>1 – negative measured wet-bulb temperature<br>2 – iced measured wet-bulb temperature<br>5 – positive or zero computed wet-bulb temperature<br>6 – negative computed wet-bulb temperature<br>7 – iced computed wet-bulb temperature |
| 51 | 90-92 | $T_bT_bT_b$ | Wet-bulb temperature | In tenths of degree Celsius, sign given by element 50 |
| 52 | 93 | a | Characteristic of pressure tendency during the three hours preceding the time of observation | WMO code table 0200 |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| 53 | 94-96 | ppp | Amount of pressure tendency at station level during the three hours preceding the time of observation | In tenths of hectopascal |
| 54 | 97 | $D_s$ | True direction of resultant displacement of the ship during the three hours preceding the time of observation | WMO code table 0700 |
| 55 | 98 | $v_s$ | Ship's average speed made good during the three hours preceding the time of observation | WMO code table 4451 |
| 56 | 99-100 | $d_{W2}d_{W2}$ | Direction of secondary swell waves | Tens of degrees, WMO code table 0877; encoded 00 or 99 where applicable. Blanks – no observation of waves attempted. |
| 57 | 101-102 | $P_{W2}P_{W2}$ | Period of secondary swell waves | Whole seconds; encoded 99 where applicable (see under element 32) |
| 58 | 103-104 | $H_{W2}H_{W2}$ | Height of secondary swell waves | Half-meter values (see under element 33) |
| 59 | 105 | $c_i$ | Concentration or arrangement of sea ice | WMO code table 0639 |
| 60 | 106 | $S_i$ | Stage of development | WMO code table 3739 |
| 61 | 107 | $b_i$ | Ice of land origin | WMO code table 0439 |
| 62 | 108 | $D_i$ | True bearing of principal ice edge | WMO code table 0739 |
| 63 | 109 | $z_i$ | Present ice situation and trend of conditions over the preceding three hours | WMO code table 5239 |
| 64 | 110 | | FM code version | 0 – previous to FM 24-V<br>1 – FM 24-V<br>2 – FM 24-VI Ext.<br>3 – FM 13-VII<br>4 – FM 13-VIII<br>5 – FM 13-VIII Ext.<br>6 – FM 13-IX<br>7 – FM 13-IX Ext.<br>8 – FM 13-X<br>9 – FM 13-XI<br>A – FM 13-XII Ext.<br>B – FM 13-XIII<br>C – FM 13-XIV Ext.<br>[Note: etc. for future configurations] |
| 65 | 111 | | IMMT version | 0 – IMMT version just prior to version number being included<br>1 – IMMT-1 (in effect from 2 Nov. 1994)<br>2 – IMMT-2 (in effect from Jan. 2003) |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| | | | | 3 – IMMT-3 (in effect from Jan. 2007)<br>4 – IMMT-4 (in effect from Jan. 2011)<br>5 – IMMT-5 (in effect from June 2012)<br>[Note: etc. for future configurations] |
| 66 | 112 | $Q_1$ | Quality control indicator for (h) | 0 – no QC has been performed on this element<br>1 – QC performed; element appears correct<br>2 – QC performed; element appears inconsistent with other elements<br>3 – QC performed; element appears doubtful<br>4 – QC performed; element appears erroneous<br>5 – QC performed; element changed (possibly to missing) as a result<br>6 – QC flag amended: element flagged by CM as correct (1), but according to MQCS still appears suspect (2-4) or missing (9)<br>7 – QC flag amended: element flagged by CM as changed (5), but according to MQCS still appears suspect (2-4)<br>8 – [reserved]<br>9 – element is missing |
| 67 | 113 | $Q_2$ | QC indicator for (VV) | - idem - |
| 68 | 114 | $Q_3$ | QC indicator for (N and clouds: elements 12, 24–27) | - idem - |
| 69 | 115 | $Q_4$ | QC indicator for (dd) | - idem - |
| 70 | 116 | $Q_5$ | QC indicator for (ff) | - idem - |
| 71 | 117 | $Q_6$ | QC indicator for ($s_n$ and TTT) | - idem - |
| 72 | 118 | $Q_7$ | QC indicator for ($s_t$ and $T_dT_dT_d$) | - idem - |
| 73 | 119 | $Q_8$ | QC indicator for (PPPP) | - idem - |
| 74 | 120 | $Q_9$ | QC indicator for (weather: ww, $W_1$, $W_2$; elements 21–23) | - idem - |
| 75 | 121 | $Q_{10}$ | QC indicator for ($s_n$ and $T_WT_WT_W$) | - idem - |
| 76 | 122 | $Q_{11}$ | QC indicator for ($P_WP_W$) | - idem - |
| 77 | 123 | $Q_{12}$ | QC indicator for ($H_WH_W$) | - idem - |
| 78 | 124 | $Q_{13}$ | QC indicator for (swell: elements 34–36, 56–58) | - idem - |
| 79 | 125 | $Q_{14}$ | QC indicator for ($i_RRRRt_R$) | - idem - |
| 80 | 126 | $Q_{15}$ | QC indicator for (a) | - idem - |
| 81 | 127 | $Q_{16}$ | QC indicator for (ppp) | - idem - |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| 82 | 128 | $Q_{17}$ | QC indicator for ($D_s$) | - idem - |
| 83 | 129 | $Q_{18}$ | QC indicator for ($v_s$) | - idem - |
| 84 | 130 | $Q_{19}$ | QC indicator for ($s_w$ and $T_bT_bT_b$) | - idem - |
| 85 | 131 | $Q_{20}$ | QC indicator for ships' position | - idem - |
| 86 | 132 | $Q_{21}$ | Version identification for Minimum Quality Control Standard (MQCS) | 1 – MQCS-1 (Original version, Feb. 1989): CMM-X<br>2 – MQCS-2 (Version 2, March 1997) CMM-XII<br>3 – MQCS-3 (Version 3, April 2000) SGMC-VIII<br>4 – MQCS-4 (Version 4, June 2001): JCOMM-I<br>5 – MQCS-5 (Version 5, July 2004): ETMC-I<br>6 – MQCS-6 (Version 6, November 2009) ) JCOMM-III<br>7 – MQCS-7 (Version 7, in effect from June 2012) JCOMM-IV<br>[Note: etc. for future configurations] |
| | | | Additional Requirements for VOSClim: | |
| 87 | 133-135 | HDG | Ship's heading; the direction to which the bow is pointing, referenced to true North | (001-360); e.g.<br>360 = North<br>090 = East |
| 88 | 136-138 | COG | Ship's ground course; the direction the vessel actually moves over the fixed earth and referenced to True North | (000-360); e.g.<br>360 = North<br>000 = No Movement<br>090 = East |
| 89 | 139-140 | SOG | Ship's ground speed; the speed the vessel actually moves over the fixed earth | (00-99); Round to nearest whole knot |
| 90 | 141-142 | SLL | Maximum height in meters of deck cargo above Summer maximum load line (reference level) | (00-99); Round to nearest whole meter |
| 91 | 143 | $s_L$ | Sign of departure of reference level | 0 = positive or zero, 1 = negative |
| 92 | 144-145 | hh | Departure of reference level (Summer maximum load line) from actual sea level | Difference to the nearest whole meter (00-99) between the Summer maximum load line and the sea level (water line); positive when the Summer maximum load line is above the level of the sea and negative if below the water line |
| 93 | 146-148 | RWD | Relative wind direction in degrees off the bow | Relative wind direction; e.g. 000 = no apparent relative wind speed (calm conditions on deck). Reported direction for relative wind = 001-360 degrees in a clockwise direction off the bow of the ship. When directly on the bow, |

| *Element Number* | *Character Number* | *Code* | *Element* | *Coding procedure* |
|---|---|---|---|---|
| | | | | RWD = 360. |
| 94 | 149-151 | RWS | Relative wind speed indicated by $i_w$ (knots or m $s^{-1}$) | Reported in either whole knots or whole meters per second (e.g. 010 knots or 005 m $s^{-1}$). Units established by $i_w$ (element 14) [Note: RWS is a 3-character field to store values of RWS larger than ff (if $i_w$ indicates knots), e.g. ff=98 knots, RWS=101 knots; see also element 15.] |
| 95 | 152 | $Q_{22}$ | QC indicator for (HDG) | [Note: coding as for element 66] |
| 96 | 153 | $Q_{23}$ | QC indicator for (COG) | – idem – |
| 97 | 154 | $Q_{24}$ | QC indicator for (SOG) | – idem – |
| 98 | 155 | $Q_{25}$ | QC indicator for (SLL) | – idem – |
| | 156 | | blank | [Note: Formerly (usage now discontinued): QC indicator for ($s_L$); now $Q_{27}$ serves as the indicator for both $s_L$ and hh] |
| 99 | 157 | $Q_{27}$ | QC indicator for ($s_L$ and hh) | – idem – |
| 100 | 158 | $Q_{28}$ | QC indicator for (RWD) | – idem – |
| 101 | 159 | $Q_{29}$ | QC indicator for (RWS) | – idem – |
| 102 | 160-163 | RH | Relative humidity | Tenths of Percentage |
| 103 | 164 | RHi | Relative humidity indicator | 0 – Relative humidity in tenths of Percentage, measured and originally reported<br>1 – Relative humidity in whole Percentage, measured and originally reported<br>[Note: 2 – Reserved]<br>3 – Relative humidity in tenths of Percentage, computed<br>4 – Relative humidity in whole Percentage, computed |
| 104 | 165 | AWSi | AWS indicator | 0 – No Automated Weather Station (AWS)<br>1 – AWS<br>2 – AWS plus Manual Observation |
| 105 | 166-172 | IMOno | IMO number | Seven digits (or left justified with right-blank fill) |

## APPENDIX D

## MINIMUM QUALITY CONTROL STANDARD (MQCS)

## MQCS-7 (Version 7)

**Notes:**

(a) See the specifications for setting quality control Indicators $Q_1$ to $Q_{29}$ at the end of this Annex

(b) Δ = space (ASCII 32)

| ***Element*** | ***Error*** | ***Action*** |
|---|---|---|
| 1 | $i_T \neq 3 - 5$, Δ | Correct manually otherwise 3 |
| 2 | AAAA ≠ valid year | Correct manually otherwise reject |
| 3 | MM ≠ 01 - 12 | Correct manually otherwise reject |
| 4 | YY ≠ valid day of month | Correct manually otherwise reject |
| 5 | GG ≠ 00 - 23 | Correct manually otherwise reject |
| 6 | Qc ≠ 1, 3, 5, 7 | Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$ |
| | $Q_c$ = Δ | $Q_{20} = 2$ |
| 7 | $L_aL_aL_a \neq$ 000-900 | Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$ |
| | $L_aL_aL_a$ = ΔΔΔ | $Q_{20} = 2$ |
| 8 | $L_oL_oL_oL_o \neq$ 0000-1800 | Correct manually and $Q_{20} = 5$, otherwise $Q_{20} = 4$ |
| | $L_oL_oL_oL_o$ = ΔΔΔΔ | $Q_{20} = 2$ |
| | $L_aL_aL_a = L_oL_oL_oL_o$ = ΔΔΔ(Δ) | Correct manually otherwise reject |
| *Time sequence checks* | | |
| | Change in latitude > 0.7°/hr | Correct manually otherwise $Q_{20} = 3$ |
| | Change in longitude > 0.7 °/hr when lat. 00-39.9 | Correct manually otherwise $Q_{20} = 3$ |
| | Change in longitude > 1.0 °/hr when lat. 40-49.9 | Correct manually otherwise $Q_{20} = 3$ |
| | Change in longitude > 1.4 °/hr when lat. 50-59.9 | Correct manually otherwise $Q_{20} = 3$ |
| | Change in longitude > 2.0 °/hr when lat. 60-69.9 | Correct manually otherwise $Q_{20} = 3$ |
| | Change in longitude > 2.7 °/hr when lat. 70-79.9 | Correct manually otherwise $Q_{20} = 3$ |
| 9 | Indicator ≠ 0-3, Δ | Correct manually, otherwise Δ |
| 10 | h ≠ 0-9 | Correct manually and $Q_1 = 5$, otherwise $Q_1 = 4$ |
| | h = Δ | $Q_1 = 9$ |
| 11 | VV ≠ 90-99 | Correct manually and $Q_2 = 5$, otherwise $Q_2 = 4$ |
| | VV = ΔΔ | $Q_2 = 9$ |
| 12 | N ≠ 0-9, Δ | Correct manually and $Q_3 = 5$, otherwise $Q_3 = 4$ |
| | $N < N_h$ | Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$ |
| 13 | dd ≠ 00-36, 99 | Correct manually and $Q_4 = 5$, otherwise $Q_4 = 4$ |
| | dd = ΔΔ | $Q_4 = 9$ |
| | dd versus ff | |
| | dd = 00, ff ≠ 00 | Correct manually and $Q_4$ or $Q_5 = 5$ otherwise $Q_4 = Q_5 = 2$ |
| | dd ≠ 00, ff = 00 | Correct manually and $Q_4$ or $Q_5 = 5$ otherwise $Q_4 = Q_5 = 2$ |
| 14 | $i_w \neq 0, 1, 3, 4$ | Correct manually, otherwise $Q_5 = Q_{29} = 4$ |
| 15 | ff > 80 knots | Correct manually and $Q_5 = 5$, otherwise $Q_5 = 3$ |
| | ff = ΔΔ | $Q_5 = 9$ |
| 16 | $s_n \neq 0, 1$ | Correct manually, otherwise $Q_6 = 4$ |
| 17 | TTT = ΔΔΔ | $Q_6 = 9$ |
| | If -25 > TTT >40 then | |
| | when Lat. < 45.0 | |
| | TTT < -25 | $Q_6 = 4$ |
| | TTT > 40 | $Q_6 = 3$ |
| | when Lat. ≥ 45.0 | |
| | TTT < -25 | $Q_6 = 3$ |
| | TTT > 40 | $Q_6 = 4$ |
| *TTT versus humidity parameters* | | |
| | TTT < WB (wet bulb) | Correct manually and $Q_6 = 5$, otherwise $Q_6 = Q_{19} = 2$ |

| ***Element*** | ***Error*** | ***Action*** |
|---|---|---|
| | TTT < DP (dew point) | Correct manually and $Q_6 = Q_7 = 5$, otherwise $Q_6 = Q_7 = 2$ |
| 18 | $s_t \neq 0, 1, 2, 5, 6, 7$ | Correct manually, otherwise $Q_7 = 4$ |
| 19 | DP > WB | Correct manually and $Q_7 = 5$, otherwise $Q_7 = Q_{19} = 2$ |
| | DP > TTT | Correct manually and $Q_7 = 5$, otherwise $Q_7 = Q_6 = 2$ |
| | WB = DP = ΔΔΔ | $Q_7 = Q_{19} = 9$ |
| 20 | 930 > PPPP > 1050 hPa | Correct manually and $Q_8 = 5$, otherwise $Q_8 = 3$ |
| | 870 > PPPP > 1070 hPa | Correct manually and $Q_8 = 5$, otherwise $Q_8 = 4$ |
| | PPPP = ΔΔΔΔ | $Q_8 = 9$ |
| 21 | ww = 22-24, 26, 36-39, 48, 49, 56, 57, 66-79, 83-88 | Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$ |
| | 93-94 and latitude <20° | Correct manually and $Q_9 = 5$, otherwise $Q_9 = 3$ |
| | if $i_x = 7$: $w_a w_a$ = 24 - 25, 35, 47-48, 54-56, 64-68, 70-78, 85-87 and latitude <20° | Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$ |
| 22, 23 | $W_1$ or $W_2$ = 7 and latitude <20° | Correct manually and $Q_9 = 5$, otherwise $Q_9 = 4$ |
| | $W_1 < W_2$ | Correct manually and $Q_9 = 5$, otherwise $Q_9 = 2$ |
| | $W_1 = W_2$ = ww = ΔΔΔΔ | $Q_9 = 9$ |
| 24-27 | N = 0, and $N_h C_L C_M C_H \neq 0000$ | Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$ |
| | N = Δ, and $N_h C_L C_M C_H \neq$ ΔΔΔΔ | Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$ |
| | N = 9, and not ($N_h$ =9 and $C_L C_M C_H \neq$ ΔΔΔ | Correct manually and $Q_3 = 5$, otherwise $Q_3 = 2$ |
| | N=Δ, and $N_h C_L C_M C_H$=ΔΔΔΔ | $Q_3 = 9$ |
| 28 | $s_n \neq 0, 1$ | Correct manually otherwise $Q_{10} = 4$ |
| 29 | $T_W T_W T_W$ = ΔΔΔ | $Q_{10} = 9$ |
| | if -2.0 > $T_w T_w T_w$ > 37.0 then when Lat. < 45.0 | |
| | $T_W T_W T_W$ < -2.0 | Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$ |
| | $T_w T_w T_w$ > 37.0 | Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$ |
| | when Lat. ≥ 45.0 | |
| | $T_W T_W T_W$ < -2.0 | Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 3$ |
| | $T_W T_W T_W$ > 37.0 | Control manually and $Q_{10} = 5$, otherwise $Q_{10} = 4$ |
| 30 | Indicator ≠ 0-7, Δ | Correct manually, otherwise Δ |
| 31 | Indicator ≠ 0-9, Δ | Correct manually, otherwise Δ |
| 32 | 20 < $P_w P_w$ < 30 | $Q_{11} = 3$ |
| | $P_W P_W$ ≥ 30 and ≠ 99 | $Q_{11} = 4$ |
| | $P_W P_W$ = ΔΔ | $Q_{11} = 9$ |
| 33 | 35< HwHw < 50 | $Q_{12} = 3$ |
| | $H_W H_W$ ≥ 50 | $Q_{12} = 4$ |
| | $H_W H_W$ = ΔΔ | $Q_{12} = 9$ |
| 34 | $d_{w1}$ $d_{w1} \neq$ 00-36, 99 | Correct manually and $Q_{13} = 5$, otherwise $Q_{13} = 4$ |
| | $swell_1 = swell_2$ = Δ | $Q_{13} = 9$ |
| 35 | 25 < $P_{w1} P_{w1}$ < 30 | $Q_{13} = 3$ |
| | $P_{w1} P_{w1}$ ≥ 30 and ≠ 99 | $Q_{13} = 4$ |
| 36 | 35 < $H_{w1} H_{w1}$ < 50 | $Q_{13} = 3$ |
| | $H_{w1} H_{w1}$ ≥ 50 | $Q_{13} = 4$ |
| 37 | $I_s \neq$ 1-5, Δ | Correct manually, otherwise Δ |
| 38 | $E_s E_s \neq$ 00-99, □ ΔΔ | Correct manually, otherwise ΔΔ |
| 39 | $R_s \neq$ 0-4, Δ | Correct manually, otherwise Δ |
| 40 | Source ≠ 0-6 | Correct manually, otherwise Δ |
| 41 | Platform ≠ 0-9 | Correct manually, otherwise Δ |
| 42 | No call sign | Insert manually, mandatory entry |
| 43 | No country code | Insert manually |
| 44 | No Quality Control | |
| 45 | Q ≠ 0-6, 9 | Correct manually, otherwise Δ |
| 46 | $i_x \neq$ 1-7 | Correct manually, otherwise Δ |
| 47 | $i_R$ = 0-2 and RRR = 000, □ ΔΔΔ | Correct manually, otherwise $Q_{14} = 4$ |
| | $i_R$ = 3 and RRR ≠ ΔΔΔ | Correct manually, otherwise $Q_{14} = 2$ |
| | $i_R$ = 4 and RRR ≠ ΔΔΔ | Correct manually, otherwise $Q_{14} = 2$ |
| | $i_R \neq$ 0- 4 | Correct manually, otherwise $Q_{14} = 4$ |
| 48 | RRR ≠ 001-999 and iR = 1, 2 | Correct manually and $Q_{14} = 5$, otherwise $Q_{14} = 2$ |
| 49 | $t_R \neq$ 0-9, Δ | Correct manually and $Q_{14} = 5$, otherwise $Q_{14} = 4$ |
| 50 | $s_w \neq$ 0, 1, 2, 5, 6, 7 | Correct manually, otherwise $Q_{19} = 4$ |
| 51 | WB < DP | Correct manually and $Q_{19} = 5$, otherwise $Q_{19} = Q_7 = 2$ |
| | WB = ΔΔΔ | $Q_{19} = 9$ |

| ***Element*** | ***Error*** | ***Action*** |
|---|---|---|
| | WB > TTT | Correct manually and $Q_{19}$= 5, otherwise $Q_{19}=Q_6=2$ |
| 52 | a ≠ 0-8 | Correct manually and $Q_{15}$ = 5, otherwise $Q_{15}$ = 4 |
| | a = 4 and ppp ≠ 000 | Correct manually and $Q_{15}$ or $Q_{16}$ = 5, otherwise $Q_{15}=Q_{16}=2$ |
| | a =1,2,3,6,7,8 and ppp=000 | Correct manually and $Q_{15}$ or $Q_{16}$ = 5, otherwise $Q_{15}=Q_{16}$ = 2 |
| | a = Δ | $Q_{15}$ = 9 |
| 53 | 250 ≥ ppp > 150 | Correct manually and $Q_{16}$ = 5, otherwise $Q_{16}$ = 3 |
| | ppp > 250 | Correct manually and $Q_{16}$ = 5 otherwise $Q_{16}$ = 4 |
| | ppp = ΔΔΔ | $Q_{16}$ = 9 |
| 54 | $D_s$ ≠ 0-9 | Correct manually and $Q_{17}$ = 5, otherwise $Q_{17}$ = 4 |
| | $D_s$ = Δ | $Q_{17}$ = 9 |
| 55 | $V_s$ ≠ 0-9 | Correct manually and $Q_{18}$ = 5, otherwise $Q_{18}$ = 4 |
| | $V_s$ = Δ | $Q_{18}$ = 9 |
| 56 | $d_{w2}d_{w2}$ ≠ 00-36, 99, ΔΔ | Correct manually and $Q_{13}$ = 5, otherwise $Q_{13}$ = 4 |
| 57 | 25 < $P_{w2}P_{w2}$ < 30 | $Q_{13}$ = 3 |
| | $P_{w2}P_{w2}$ ≥ 30 and ≠99 | $Q_{13}$ = 4 |
| 58 | 35 < $H_{w2}H_{w2}$ < 50 | $Q_{13}$ = 3 |
| | $H_{w2}H_{w2}$ ≥ 50 | $Q_{13}$ = 4 |
| 59 | $c_i$ ≠ 0-9, Δ | Correct manually, otherwise Δ |
| 60 | $S_i$ ≠ 0-9, Δ | Correct manually, otherwise Δ |
| 61 | $b_i$ ≠ 0-9, Δ | Correct manually, otherwise Δ |
| 62 | $D_i$ ≠ 0-9, Δ | Correct manually, otherwise Δ |
| 63 | $z_i$ ≠ 0-9, Δ | Correct manually, otherwise Δ |
| 64 | version ≠ 0-9, A-C, Δ | Correct manually, otherwise Δ |
| 65 | version ≠ 0-4, Δ | Correct manually, otherwise Δ |
| 86 | Minimum Quality Control Standard (MQCS) version identification | 1= MQCS-1 (Original version, Feb. 1989) CMM-X<br>2= MQCS-2 (Version 2, March 1997) CMM-XII<br>3= MQCS-3 (Version 3, April 2000) SGMC-VIII<br>4= MQCS-4 (Version 4, June 2001) JCOMM-I<br>5= MQCS-5 (Version 5, July 2004) ETMC-I<br>6 = MQCS-6 (Version 6, November 2009) JCOMM-III)<br>7 = MQCS-7 (Version 7, in effect from June 2012) JCOMM-IV |
| 87 | HDG ≠ 001-360 | Correct manually and $Q_{22}$ = 5, otherwise $Q_{22}$ = 4 |
| | HDG = ΔΔΔ | $Q_{22}$ = 9 |
| 88 | COG ≠ 000-360 | Correct manually and $Q_{23}$ = 5, otherwise $Q_{23}$ = 4 |
| | COG = ΔΔΔ | $Q_{23}$ = 9 |
| 89 | SOG ≠ 00 - 99 | Correct manually and $Q_{24}$ = 5, otherwise $Q_{24}$ = 4 |
| | SOG = ΔΔ | $Q_{24}$ = 9 |
| | SOG > 33 | Correct manually and $Q_{24}$ = 5, otherwise $Q_{24}$ = 3 |
| 90 | SLL ≠ 00-99 | Correct manually and $Q_{25}$ = 5, otherwise $Q_{25}$ = 4 |
| | SLL = ΔΔ | $Q_{25}$ = 9 |
| | SLL > 40 | Correct manually and $Q_{25}$ = 5, otherwise $Q_{25}$ = 3 |
| 91 | $s_L$ ≠ 0,1 | Correct manually and $Q_{27}$ = 5, otherwise $Q_{27}$ = 4 |
| 92 | hh ≠ 00 – 99 | Correct manually and $Q_{27}$ = 5, otherwise $Q_{27}$ = 4 |
| | hh = ΔΔ | $Q_{27}$ = 9 |
| | hh >= 13 | Correct manually and $Q_{27}$ = 5, otherwise $Q_{27}$ = 3 |
| | hh < -01 | Correct manually and $Q_{27}$ = 5, otherwise $Q_{27}$ = 4 |
| 93 | RWD ≠ 000 - 360, 999 | Correct manually and $Q_{28}$ = 5, otherwise $Q_{28}$ = 4 |
| | RWD = ΔΔΔ | $Q_{28}$ = 9 |
| 94 | RWS ≠ 000 - 999 | Correct manually and $Q_{29}$ = 5, otherwise $Q_{29}$ = 4 |
| | RWS = ΔΔΔ | $Q_{28}$ = 9 |
| | RWS > 110 kts | Correct manually and $Q_{29}$ = 5, otherwise $Q_{29}$ = 3 |
| *RWD versus RWS* | | |
| | RWD = 000, RWS ≠ 000 | Correct manually and $Q_{28}$ or $Q_{29}$ = 5, otherwise $Q_{28} = Q_{29} = 2$ |
| | RWD ≠ 000, RWS = 000 | Correct manually and $Q_{28}$ or $Q_{29}$ = 5, otherwise $Q_{28} = Q_{29} = 2$ |

| ***Element*** | ***Error*** | ***Action*** |
|---|---|---|
| ***Specifications for setting quality control Indicators $Q_1$ to $Q_{29}$*** | | |
| 0 | No quality control (QC) has been performed on this element | |
| 1 | QC has been performed; element appears to be correct | |
| 2 | QC has been performed; element appears to be inconsistent with other elements | |
| 3 | QC has been performed; element appears to be doubtful | |
| 4 | QC has been performed; element appears to be erroneous | |
| 5 | The value has been changed as a result of QC | |
| 6 | The original flag is set “1” (correct) and the value will be classified by MQCS as inconsistent, dubious, erroneous or missing | |
| 7 | The original flag is set “5” (amended) and the value will be classified by MQCS as inconsistent, dubious, erroneous or missing | |
| 8 | Reserve | |
| 9 | The value of the element is missing | |