

**WORLD METEOROLOGICAL ORGANIZATION
&
GLOBAL CLIMATE OBSERVING SYSTEM**

**CBS LEAD CENTRES FOR GCOS
COORDINATION MEETING**

Fifth Session

(Cambridge, UK, 7–9 September 2016)

FINAL REPORT

GCOS-203



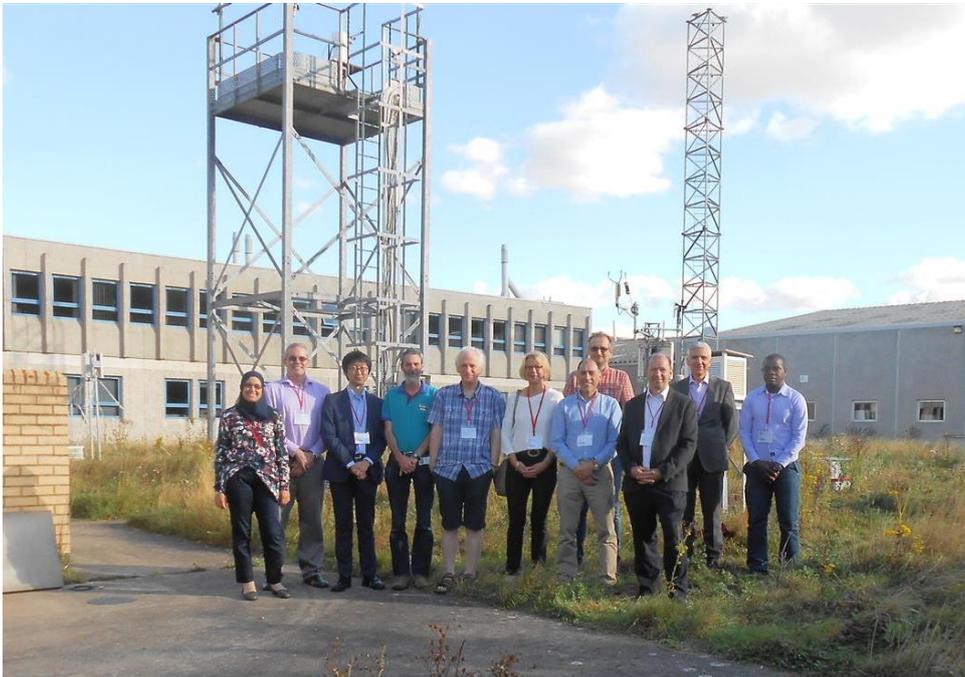
WMO General Regulations 42 and 43

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. S/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).



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EXECUTIVE SUMMARY

The CBS Lead Centres for GCOS Climate Observing System (CBS-LC-GCOS) Coordination Meeting was held at the British Antarctic Survey (BAS), Cambridge, UK, from 7 to 9 September 2016. Unfortunately, there was no representative from Australia (RA-V) and because of delays in getting a visa the representative from Iran (RA-II) could not attend.

The Coordination Meeting considered reports from individual Lead Centres' activities and the GCOS Monitoring and Analysis Centres. It reviewed their activities, results of monitoring performance reports and their Terms of Reference. The relevant components from WMO Integrated Global Observing System (WIGOS) were presented to the meeting, including areas for future collaboration and contribution.

This Meeting also incorporated members of the Advisory Group on GCOS Surface Network (GSN) and GCOS Upper Air Network (GUAN) (AGG), which is an informal group of the GCOS Atmospheric Observational Panel on Climate (AOPC) focusing on performance and technical issues in the networks. The Chairperson of the AGG, Phil Jones, agreed to act as the chairperson of this 5th Coordination Meeting.

The joint Coordination and AGG Meeting agreed on a number of actions, some of which will be channeled to relevant WMO expert teams and GCOS panels.

The Coordination Meeting expressed its appreciation to its hosts, British Antarctic Survey, for its excellent organization and hospitality. Of particular note was the short tours offered to the cold-water aquarium and the ice-core facility (Fig 1), giving a unique opportunity to observe the scientific work in Antarctica primarily in connection to climate-change. Some of the group also experienced punting on the Cam thanks to the hospitality of the Met Office (Fig 2).

PREVIOUS MEETINGS

First Coordination Meeting – Tehran, Iran 2007

Second Coordination Meeting – Geneva, Switzerland, November 2009

Third Coordination Meeting – Hamburg, Germany, October 2011

Fourth Coordination Meeting – Santiago, Chile, October 2013



(Fig 1)



(Fig 2)

GENERAL SUMMARY

1. OPENING OF THE SESSION

The CBS Lead Centres for GCOS (CBS-LC-GCOS) Coordination Meeting was held at the British Antarctic Survey (BAS), Cambridge, UK, from 7 to 9 September 2016.

The meeting was opened by Professor Phil Jones (University of East Anglia), who expressed his appreciation to the CBS Lead Centres for GCOS for their important contributions to GCOS and welcomed the participants to Cambridge. He also thanked BAS for hosting the meeting.

Steve Colwell (BAS), as the local host, welcomed the participants, explained the meeting logistics and offered the support of BAS should anyone have any questions/issues during their stay in Cambridge.

Mr Tim Oakley, GCOS Secretariat, also welcomed the Lead Centre representatives to the meeting. He apologized for the delay in holding this bi-annual meeting since the 4th meeting in Chile (October 2013) but this was owing to issues with getting the authorization within WMO, as in 2016 we had entered a new 4-year financial. He looked forward to the discussions and outcomes of the meeting, in particular with the inclusion of representatives from the AGG. He also welcomed the representative from the WMO Integrated Global Observing System (WIGOS) Project Office, Mr Luis Filipe Nunes, who would present on current work on WIGOS Data Quality Management Monitoring System (WDQMS) and WIGOS Metadata (WMD), which was of significant relevance to the work of this group.

There was a tour-de-table where each of the participants introduced themselves and their expectations for the meeting.

The Coordination Meeting adopted the [Agenda](#) for the meeting, which is reproduced at the beginning of this report. The list of participants is given in Annex III.

2. REVIEW OF CBS-LC-GCOS-4 RECOMMENDATIONS

The Coordination Meeting reviewed the recommendations from the fourth meeting held in Santiago, Chile, in October 2013. Most had been implemented, were time-expired or would be discussed further during the Coordination Meeting. It was agreed that a new action list would be produced from this meeting, which is listed under agenda item 11.

3. UPDATE FROM GCOS AND WMO SECRETARIAT

Mr Tim Oakley provided an overview of the work, aims and priorities of GCOS, with a particular reference to all the essential climate variables (ECVs) and their expert panels. He then informed the Coordination Meeting on the relevant decisions of the GCOS Atmospheric Observation Panel on Climate (AOPC) and GCOS Steering Committee (GCOS SC), such as:

- The GCOS Status report published in 2015 and the new GCOS Implementation Plan which is in the final stages of approval and will be presented to COP-22 in Morocco (November 2016);
- The close links between GCOS and WIGOS in supporting, and ensuring data access, across a broad range of observing systems, in particular the work on data quality monitoring, metadata and requirements (see below).

He summarized the areas of particular importance to this meeting's discussions as follows:

- The review of the latest monitoring reports from the Lead Centres and monitoring/archive centres, and an agreement on the method and timing of future reports, both in informing the GCOS Secretariat and relevant WMO expert teams or working groups;
- To encourage the use of new monitoring tools, not only on the availability of monthly CLIMATs but also looking at data quality and issues with data coding and communication;

- The implementation of Daily CLIMAT information and the coding of CLIMAT messages in BUFR.

Mr Luis Filipe Nunes presented an update on the WIGOS project. WIGOS, as a WMO foundational activity addressing the observing needs of the weather, climate, water and environmental services of its Members, consists in a framework for integrating all WMO observing systems and WMO contributions to co-sponsored observing systems, such as GCOS, under a common regulatory and management framework, which was developed for the global level during the Implementation Phase (2012-2015).

The Pre-operational Phase of WIGOS (2016-2019) has started with an increased emphasis on regional and national activities, focusing on five main priority areas:

- (i) National WIGOS Implementation;
- (ii) WIGOS regulatory and guidance material;
- (iii) WIGOS Information Resource, including OSCAR;
- (iv) WIGOS Data Quality Monitoring System (WDQMS) and
- (v) Regional WIGOS Centers.

The Observing Systems Capability Analysis and Review tool (OSCAR) supports the WIGOS (and the Rolling Review of Requirements) through three databases: requirements, space capabilities and surface capabilities. OSCAR/Surface which replaces WMO Pub. 9, Volume A, was developed jointly by WMO and MeteoSwiss, and became operational on May 2, 2016.

The WIGOS Data Quality Monitoring System (WDQMS) aims to be a near real-time system for monitoring data availability and data quality of all WIGOS components at regional and national levels. It consists in three main functions: the Monitoring, the Evaluation (and reporting) and the Incident Management Functions (the method of follow-up and tracking observing and reporting issues).

The regional structure of WIGOS should be based on Regional WIGOS Centres (RWC), which will support Members in the implementation of WIGOS, initially focusing on two mandatory functions: metadata in OSCAR/Surface and the WDQMS. Optional functions may be adopted such as the regional/national assistance with: coordination of WIGOS projects, observing network management and capacity development activities. They will liaise with relevant WMO Centres in their regions, in particular with: Instrument Centres, Climate Centres and Training Centres. The RWCs may be implemented either centrally, at an overall regional level, or at sub-regional level, e.g., aligned with the natural geographic or linguistic boundaries of the Region. RWCs may also be implemented either as monolithic entities taking on the responsibility for all the required functionalities, or as virtual centres, in which a consortium share the responsibilities under the coordination of a lead organization. The plan for the WIGOS Pre-operational Phase contains the following key milestones: 2017-Establishment of one or more RWC in pilot mode, 2018-Operational phase of initial RWC, 2019-Establishment of RWCs covering all WMO Regions.

Further information on the WIGOS regulatory material and guidance documents is available from the following links:

<http://www.wmo.int/pages/prog/www/wigos/WRM.html>

<http://www.wmo.int/pages/prog/www/wigos/WGM.html>

4. REPORTS FROM CBS LEAD CENTRES FOR GCOS

Presentations were made by the representatives of CBS-LC-GCOS drawing on the key points of their 2016 reports as follows (order determined by table seating). These presentations can be downloaded from : <ftp://ftp.bas.ac.uk/src/CBS-LC-GCOS%205/>

4.1. RA-VI (Europe) – Germany (DWD)

Mrs Christiana Lefebvre presented a summary of the Lead Centre report for RA-VI (Europe). She introduced the activities at the Deutscher Wetterdienst (DWD) that does not only comprise the GSN stations of RA VI (140) but all stations providing CLIMAT reports. In 2015, one GSN station of RA VI (08181 Barcelona) stopped reporting CLIMAT. Different examples showed the problem of incorrect month-year-indicators and incorrect data within the CLIMAT reports and the action taken.

DWD publishes all received CLIMAT reports with quality controlled and if necessary corrected month-year-indicator and format in monthly data files in its Climate Data Center (CDC), which are accessible via <ftp://ftp-cdc.dwd.de/pub/CDC/> → observations global → CLIMAT → monthly → raw. The data are provided six weeks after the end of the concerning month to include also retarded reports.

The monitoring of the 24 GUAN stations in RA-VI showed, that all stations worked in 2015 and that 20 stations performed at least two soundings a day, but at the beginning of 2016 37789 Yerevan, Armenia stopped performing radiosoundings.

World Weather Records (WWR) for 2015 were received from 16 (of 42) countries in RA-VI. There is the problem, that from some countries the station notes are missing and that the WWR may be provided by different ways and not only via the CBS Lead Centres.

4.2. RA-IV (North and Central America, Caribbean) – USA (NOAA/NCDC)

Mr Bryant Korzeniewski, representing the National Center for Environmental Information (NCEI) and WMO RA-IV, presented the status of NCEI being the GCOS Archive Centre and the status of NCEI being the Lead Centre for GSN and GUAN in WMO RA-IV. He briefed the meeting attendees about NCEI's Archive Holdings which include hourly and synoptic data in the Integrated Surface Dataset (ISD), daily data in the Global Historical Climatology Network (GHCN-Daily) dataset, use of CLIMAT Messages in the GHCN-Monthly dataset and the International Surface Temperature Initiative (ISTI) databank. Mr Korzeniewski also reviewed the status of GSN and GUAN data submissions received by NCEI over the 2015 data-year with it being the Lead Centre for WMO RA-IV for GSN and GUAN and the overall Lead Centre for GUAN.

4.3. RA-II (Asia) - Japan Meteorological Agency (JMA)

Mr Hirotaka Sato presented a summary of the Lead Centre report for RA-II (Asia). The performance of GSN and GUAN stations in JMA's area of responsibility (AOR) has been good as a whole. This situation has been maintained by collaborative efforts of JMA and concerning NMHSs to resolve problems on each occasion. In addition, for selected NMHS staff members, JMA has held an annual training course including a lecture on CLIMAT messages and the related activities of the CBS Lead Centres for GCOS, which is also considered to have contributed to the good performance in JMA's AOR.

4.4. RA-III (South America) – Chile (DMA)

Mr Gaston Torres (Direccion Meteorologica de Chile) presented a summary of his lead centre report, the key points were as follows:

- The GSN Network consists of 99 stations, of which 1 is listed as an island. Peru has added 7 stations. On having compared with previous years, this shows an increase;
- The GUAN stations are 18, and all stations are working. As indicated by the countries, six (6) stations launch radiosondes twice a day, these are: five stations from Brazil and one from Chile the other stations only once a day. There are six (6) GUAN stations in the region that are recorded just below the minimum requirement. In Chile there are three (3) stations and to solve this problem the balloons of 350g were replaced by those of 600g.
- For the GSN, it is important to mention that Region III has 16 silent stations, of which 11 belong to Brazil due to staffing problems; one station from Ecuador, which closed from 1993; and Suriname has only one station and this station has been silent for several years with no communication to the focal point;
- In relation of the performance of the countries, received CLIMAT messages from all countries show percentages close to 100 percent except for Bolivia and Colombia. Assessing CLIMAT messages for correctness indicates that the stations with major problems are from Bolivia and Venezuela;
- On average, 89% of the stations a CLIMAT report was received and 70 percent of these were without format errors. At present in Region III, the National Meteorological and Hydrological Services (NMHS) that generate CLIMAT in BUFR format are Argentina, Brazil, Chile;

- When analyzing the functioning of the countries compared with previous periods (2013-2014–2015), the most important is Peru, Paraguay and Ecuador that show some progress, the rest of the countries showed a decrease especial Bolivia and Colombia. However, when looking from 2006 there was progress until 2010, from 2010 to 2016 it has remained around 80%;
- It is suggested to convene a regional workshop for coding of CLIMAT en BUFR.

4.5. Antarctica – British Antarctic Survey (BAS)

Mr Steve Colwell presented a summary of the lead centre report for Antarctica. The British Antarctic Survey (BAS) carries out the GCOS monitoring for the Antarctic region and does this in conjunction with the WMO Antarctic Task Team and Scientific Committee on Antarctic Research (SCAR) expert group on Operational Meteorology in the Antarctic. It maintains web-pages at https://legacy.bas.ac.uk/met/jds/met/SCAR_oma.htm where statistics about quantity and quality of observations on the Global Telecommunication System (GTS) are displayed. If problems are noticed by BAS then the country is contacted to attempt to rectify the problem.

4.6. RA-I (Africa) – Mozambique (INM)

Mr Jose Alberto Sequeira presented a summary of his lead centre report, the key points were as follows:

- Most of the invalid data in the CLIMAT Codes which are received were found in precipitation. We know that, in CLIMAT code, the monthly precipitation total should be rounded to the nearest mm, but we see that some stations write all number with the decimal part;
- Even with efforts coming from WMO and other organizations to increase the volume of available data, we see that in some countries from RA-I the volume of data received over the GTS at the Offenbach collecting data center is decreasing according to DWD monitoring center;
- In RA-I are there many silent stations in countries where the national focal point do not give any information about them;
- The list of GCOS National focal points needs to be updated.

4.7. RA-I (Africa) – Morocco, Direction de la Météorologie Nationale (DMN)

Ms Kenza Khomsi presented a summary of the lead centre report for RA-I (Africa). A presentation was given on “DMN CBS Lead Centre Activities for GSN and GUAN Data” reminding the responsibility area and the objectives of the lead center. The statistics related to the reception of CLIMAT messages and reports were exposed. Undertaken actions and main identified problems were discussed.

4.8. RA-V (South-West Pacific) – Australia, Bureau of Meteorology (BOM) & RA-II & IV (Asia & Europe) – Iran, Islamic Republic of Iran Meteorological Organization (IRMO)

Representatives from these Lead Centres were unable to attend the meeting but reports were provided and summarized by Mr Oakley. These reports will be further analysed by the monitoring and analysis centres to see if there are any points that need following up after the meeting.

The 2016 annual reports from the Lead Centres and monitoring/analysis centres will be made available on the GCOS website.

(see <http://www.wmo.int/pages/prog/gcos/index.php?name=CBSLeadCentres>).

5. REPORT FROM GCOS ANALYSIS/MONITORING CENTERS

Mr Bryant Korzeniewski, the representative of NCEI, which also serves as the GCOS Archive Centre reported on the activities of the centre, (see item 4.2).

Mr Hirotaka Sato gave a presentation on the “GSN Difference List” as a new activity of GSNMCs after the previous meeting. This list has been shared with the Lead Centres and the Secretariat since October 2013 and provided information on the difference of CLIMAT message reception between DWD and JMA. It was demonstrated that the “GSN Difference List” was helpful for finding persisting problems on CLIMAT message reception.

6. REPORT FROM GCOS NETWORK MANAGER

Mr Tim Oakley presented his 2015 network report, where many of the points had already been covered in the reports under agenda items 4 and 5. The summary statistics for the GSN and GUAN from NCEI and National Centre for Environmental Prediction (NCEP) showed no significant improvement in network performance since the last meeting in 2013, and RA-I was still the worst performing region. Whilst many of the issues of no CLIMAT (GSN/Regional Basic Climatological Network (RBCN)) or TEMP (GUAN) messages were associated with the lack of resources in the country for operations and maintenance, there was still a proportion of data loss owing to communications and coding issues. Despite the fact that since 2001 when CBS agreed that RBCN stations should also report monthly CLIMAT messages, it is disappointing that there are still a significant proportion of countries that are not following this recommendation.

The 2016 update to the GSN and GUAN station lists, as approved by AOPC in March 2016, was made available to the participants. There were no changes to the GUAN station list, and a slight overall increase (+6) to the total numbers of GSN stations. Mr Oakley apologized that these updated lists had not been made available earlier. It is planned for the future that updates to GSN and GUAN will be undertaken through the OSCAR/Surface platform which should make the information available in a more timely manner.

7. REPORTS FROM NATIONAL ACTIVITIES RELEVANT TO THIS MEETING

There were no national reports of activities made available to this meeting, although the opportunity was taken to tour some of the departments of BAS to see their work in Antarctica.

8. REVIEW AND DEMONSTRATION OF NEW MONITORING TOOLS AND PERFORMANCE REPORTS

This part of the meeting allows new, or updated, methods of monitoring, and the associated performance reports, to be demonstrated to the meeting. With limited time only select examples can be presented, along with the potential benefit to the Lead Centres in their role of monitoring the GSN and GUAN networks. The following three methods were demonstrated to the meeting:

8.1. EUMETNET WMO Quality Monitoring Portal.

Mr Tim Oakley demonstrated the European Union METeorological NETwork (EUMENET) WMO Quality Monitoring Portal which is currently hosted by DWD (Germany). In 2016 a new component was added for WMO monitoring which in its initial phase was the GSN station list. Primarily developed as an operational tool, this system allows the user to monitor the availability, timeliness and data quality in real-time for all GSN stations which transmit SYNOP messages over the GTS. Whilst this strictly does not relate to the monthly CLIMAT messages, it does show that a station is operational and for the first time allows a detailed analysis of the data quality of the reported pressure, temperature, humidity and wind, as compared to the European Centre for Medium Range Weather Forecast (ECMWF) Numerical Weather Prediction (NWP) background fields. Lead Centres were encouraged to review the GSN stations under their responsibility and report to the country focal points any stations which exhibit significantly large biases and standard deviations (ECMWF OB-FG). It is possible that a future upgrade to this monitoring will include the availability of CLIMAT messages.

Website link - <https://eucos.dwd.de/ravi>.

8.2. WIGOS Data Quality Monitoring System (WDQMS)

Mr Luis Filipe Nunes demonstrated to the meeting the WDQMS demonstration project in RA-I and introduced the concept of WIGOS monitoring centres.

The demonstration project in RA-I was one of the outcomes of the second WIGOS Workshop on Quality Monitoring (QM) and Incident Management (IM), Geneva, December 2015. It aims at testing the WDQMS concept and its major functions: QM, Evaluation (Ev), and IM. The operations started in early July 2016 and will run through to November 2016. A workshop scheduled for December 2016, will assess the results and consolidate the concept. Two Member countries are

actively participating in the project: Kenya, running an operations pilot centre, and Tanzania. Four NWP Centres (ECMWF, NCEP, JMA, DWD) are providing monitoring results in near real time and EUMETNET is also providing technical support and guidance. Training and tools have been made available, such as an online monitoring information/processing system with geographic visualization, complemented by the EUCOS/WMO Quality Monitoring Portal and a Wikipage developed by ECMWF. For the IM a prototype Google-site was developed for raising, communicating and following incidents, as well as making available all relevant information, such as email addresses, links to the monitoring tools, description and guidance for the procedures to be followed by participating countries, repository and summary of incident tickets.

The Plan for the WIGOS pre-operational phase includes the following milestones, regarding the WDQMS: i) end 2016: Initial WIGOS (GOS land stations) QM capability at some NWP centres, Ev and IM functions and functional specifications developed; ii) 2016-2017: workshop(s) for Joint Technical Commission for Oceanography and Marine Meteorology in-situ Observing Programmes Support centre (JCOMMOPS), Global Atmospheric Watch (GAW), GCOS, Global Cryosphere Watch (GCW) and hydrology; iii) end 2017: mechanisms for routine reports of QM results to Executive Council (EC), RAs and Members; iv) End 2018: Full WIGOS (GOS surface-based components) operational QM&IM functionality and initial QM capability for all WIGOS components; mechanisms and RWC in place to handle IM actions and support Members to improve data availability and quality.

Website link - <http://128.65.196.37/wdqms/>

8.3. Japan Meteorological Agency (JMA) – ClimatView.

During the presentation given by Mr Hirotaka Sato a demonstration of the JMA ClimatView tool, which is a web application for viewing monthly temperature and precipitation data based on CLIMAT messages, was given. See following link:

Website link - <http://ds.data.jma.go.jp/gmd/tcc/tcc/products/climate/climatview/frame.php>.

9. STATUS OF METADATA RECORDS BY THE CBS-LC-GCOS

At a previous CBS-LC-GCOS meeting there were extensive discussions on the collection of metadata for the GSN stations, in particular photographs showing the location, exposure and the surrounding land of the stations. Since the last meeting in Santiago, the WIGOS programme has developed the WIGOS Metadata Standard and this has been partially implemented in the WMO OSCAR/Surface system (see link below). The meeting agreed that OSCAR/Surface should be used as the primary source of all metadata for the GSN and GUAN stations, and several actions were agreed to take this forward (see agenda item 11).

OSCAR website link - <https://oscar.wmo.int/surface/index.html>.

10. ITEMS FOR DISCUSSIONS (including AOB)

A number of 'common' items were raised during the presentations and postponed for later discussions. Many of these have resulted in actions listed under agenda item 11, with some of the key discussions summarized below:

10.1 National Focal Points

All Lead Centres reported that their main issues when chasing missing or erroneous CLIMAT and Upper-Air data are with the GCOS focal points, either not responding or the contact information provided being invalid. It was also agreed that the current document, maintained by WMO, is out of date. During further discussions, the meeting was made aware of the WMO Country Profile Database and for certain examples this seemed to have more up-to-date information. Tim Oakley agreed to action this with his WMO colleagues to ensure that the most up to date information was available to the Lead Centres.

10.2 Daily CLIMAT

The meeting was updated on the progress with the 'daily' CLIMAT messages, with the agreed and tested method being that of appending the daily totals to the monthly CLIMAT messages. The BUFR code format has been approved by the relevant CBS expert team and test messages have been successfully exchanged between NCEI and the UK Met Office. However, it was not clear as to whether the need for WMO Members to implement this change had been agreed by CBS, and if implemented, whether the monitoring centres and data users were able to accept the change or make use of the additional information. Subsequently, the chairperson was told that the issue will be raised at the next CBS session in November 2016.

10.3 World Weather Records (WWR)

It was felt by many of the Lead Centres that the annual update of the WWR was causing a number of issues and that it was not as efficient and effective as the 10 year update. The governance on the LC to do his work was also unclear, and some question the benefit/uniqueness of this additional information.

10.4 Corrections and Quality Control

There was some concern expressed at the meeting that corrections, primarily for coding errors in the CLIMAT message, are not being communicated between the Lead and Monitoring centres. It was agreed that DWD, JMA and NCEI would develop an improved process, whereby they will inform the relevant contacts on data quality issues with the CLIMAT messages.

10.5 Workshops on CLIMAT

The Copernicus Climate Change Service (C3S <http://climate.copernicus.eu/>) will fund a number of projects to improve data access in real time and also in data rescue. A number of regional workshops are planned to take place during 2017–2019. Since these will involve many NMHSs, it would be useful to include in these a presentation about the Lead Centres and CLIMAT messages.

10.6 BUFR coding and Station Identifiers

The meeting discussed these two topics and agreed on several actions to improve the understanding of the changes, the software available to implement the change and to assess the impact at the monitoring and archive centres.

10.7 Extremes

One of the purposes of the C3S workshops is to improve the assessment of extremes in near real-time monitoring. Improvements should come through the daily CLIMAT messages discussed earlier, but the workshops are also appropriate events for raising awareness.

11. MEETING RECOMMENDATIONS AND REQUESTS TO CBS

A.1 – All Lead Centres and Monitoring Centres to review the WMO/WIGOS guidance document on the new station identifier, and report back to the GCOS Network Manager with regards any issues with the change and, if applicable, how it will be implemented in their system/processes.

A.2 – All Lead Centres and Monitoring Centres to make themselves aware of, and start to use, the WMO OSCAR/Surface system as the primary source of information for all station metadata. Any issues, or suggested changes, should be reported through the facility provided with OSCAR/Surface but also communicated by Email to the GCOS Network Manager.

A.3 – Luis Filipe Nunes to discuss with the OSCAR project team about inputting historical metadata (including station pictures) for climate stations. If possible a suitable demonstration could be using NCEI's Historical Observing Metadata Repository (HOMR) database through a 'machine to machine' transfer, which can be discussed at the next session of the Task Team on WIGOS metadata (Dec 2016).

A.4 – Phil Jones will table the future development of the GSNMC website and statistics for discussion at the next AOPC meeting (Mar 2017), requesting a decision on the needs and requirements.

A.5 – Given the GSNMC 2016 Report showing a significant increase in the percentage of rainfall reports failing QC for 2015 across many regions, Christiana Lefebvre was asked to work with the Global Precipitation Climatology Centre (GPCC) to gain more details on what has caused this change in network performance. It was suggested that a future improvement would be a regular report to the Lead Centres highlighting the stations that have failed the QC.

A.6 – Currently the GSNMC reports compare the CLIMAT report availability each month as received at DWD and JMA. Christiana Lefebvre and Bryant Korzeniewski agreed to investigate whether this can also incorporate NCEI statistics.

A.7 – JMA GSNMC to send the monthly comparison report on received CLIMAT at DWD and JMA to all Lead Centre and GCOS Network Manager.

A.8 – Further discussion between GSNMC (DWD and JMA), GSNAC (NCEI) and GCOS Network Manager on the process to report, and update, corrections to CLIMAT messages.

A.9 – More work is needed to understand the impact, and how it will be implemented, of the daily CLIMAT appended to monthly CLIMAT reports. Bryant Korzeniewski to discuss with Jay Lawrimore about how this might be implemented, Phil Jones to raise at the next AOPC meeting.

A.10 – World Weather Records – Phil Jones to discuss with Ross Vose about the status of the World Weather Records, in particular, the annual update much of which is being facilitated by the Lead Centres and whether they are still required. The outcome of these discussions will be raised at the next AOPC.

A.11 – National Focal Points for GCOS and related climatological data (RBCN). Tim Oakley to work with Chief WWW and Director GCOS on the update and management of the list and whether this should now be using the WMO country profile database.

A.12 – Coding of CLIMAT – Training workshop & tools, BUFR and future daily CLIMAT. Tim Oakley agreed to discuss this further within WMO, including the possibility of an on-line tool for coding CLIMAT messages. All LC to assess the status within their region and report back to GCOS Network Manager.

A.13 – CLIMAT BUFR – Monitoring and Archive centres to assess not only those stations reporting BUFR CLIMAT but also the content. Are the BUFR messages the same as ASCII or do they contain more information?

A.14 – All to review the Regional WIGOS Centres (RWC) concept and see how this can work with CBS-LC-GCOS in the future, both the good and bad points. This should be reported back to Luis Filipe Nunes and Tim Oakley.

(RWC concept approved by EC-68 is available here:

https://drive.google.com/a/wmo.int/file/d/0B8DhC1GSWSmxd3lZZjVRdjJYRIk/view?usp=drive_web)

A.15 – All annual reports to be available by mid-March 2017 so information can be used as input at the AOPC meeting (2017 meeting is 28–31 March).

A.16 – Tim Oakley to arrange WebEX or something similar for 2017 and the next meeting in 2018.

12. NEXT MEETING

The next meeting is planned to be held in the 2nd half of 2018. There were no offers at this time to host the next meeting. It was also agreed that the GCOS Network Manager would arrange an on-line meeting (WebEx) prior to the next AOPC (end March 2017) to provide an opportunity to review and discuss the 2016 reports.

13. CLOSURE OF THE SESSION

The session closed on Friday 9 September 2016 at 1500 hours.

**TERMS OF REFERENCE
OF THE CBS LEAD CENTRES FOR GCOS FOR SUBMISSION TO CBS-XIV**

In support of the Global Framework for Climate Services, especially by improving quality and sustainability of climate data, the Lead Centres for GCOS will:

1. Diagnose problems in the Regional Basic Climatological Networks (RBCNs) and the Antarctic Observing Network (AntON), with the emphasis on the GSN and GUAN, by using the available monitoring reports, such as those produced by the GCOS Monitoring and Analysis Centres and major WMO NWP Centres;
 2. Liaise with nominated National Focal Points for GCOS and related Climatological Data, and other responsible officials, to rectify identified problems so as to improve data and metadata availability and quality;
 3. Coordinate activities with other GCOS CENTRES and/or other WMO CENTRES as appropriate;
 4. Report to CBS and GCOS on actions taken, progress achieved, concerns and recommendations on a yearly basis in a time frame that corresponds to planned AOPC and CBS meetings;
 5. Assist AOPC in the design of GSN and GUAN and Regions in the design of RBCNs/AntON;
 6. Assist the WMO Secretariat in maintaining the list of National Focal Points for GCOS and related Climatological Data.
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AREAS OF RESPONSIBILITIES OF THE CBS LEAD CENTRES FOR GCOS

- **Morocco (RA I)** is responsible for stations in: Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Comoros Island Côte d'Ivoire, Egypt, Gabon, Ghana, Gambia, Guinea, Guinea Bissau, Guinea Equatorial, Liberia, Libyan Arab Jamahiriya, Madagascar, Mali, Niger, Nigeria, Mauritania, Morocco, Senegal, Sierra Leone, Sao Tome and Principe, Sudan, Togo, Tunisia.
 - **Mozambique (RA I)** is responsible for stations in: Angola, Botswana, Burundi, Canary Island, Comoros Island, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, the Ocean Islands (St. Helena Island, Ascension Island, Martin de Vivies, Iles Crozet, Iles Kerguelen), Rwanda, Seychelles, Somalia, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.
 - **Iran (RA II and part of RA VI)** is responsible for stations in: Afghanistan, Armenia, Azerbaijan, Bahrain, India, Iran, Jordan, Kazakhstan, Kyrgyzstan, Maldives, Nepal, Oman, Pakistan, Qatar, Russian Federation, Saudi Arabia, Sri Lanka, Syria, Tajikistan, Turkey, United Arab Emirates, Yemen.
 - **Japan (RA II)** is responsible for stations in: Brunei, Cambodia, China, Hong Kong China, Japan, Laos, Malaysia, Mongolia, Myanmar, Philippines, Republic of Korea, Singapore, Thailand, Vietnam.
 - **Chile (RA III)** is responsible for all stations in RA III.
 - **USA (RA IV)** is responsible for most stations in RA IV plus Hawaii.
 - **Australia (RA V)** is responsible for most stations in RA V, except those countries noted for Japan and Hawaii (USA).
 - **Germany (RA VI)** is responsible for most stations in RA VI, except those countries noted for Iran.
 - **UK (British Antarctic Survey)** is responsible for stations in Antarctica.
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