

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

**CBS LEAD CENTRES FOR GCOS
COORDINATION MEETING**

Sixth SESSION

(Asheville, USA, 11-13 September 2018)

FINAL REPORT

GCOS-225



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. 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).



CONTENTS	PAGES
WMO General Regulations 42 and 43	2
Agenda	4
Executive Summary and Previous Meetings	5
General Summary	6 - 12
Recommendations	13
TOR of the CBS Lead CENTRES for GCOS	Annex I
Areas of Responsibilities of the CBS Lead CENTRES for GCOS	Annex II
List of Participants	Annex III

AGENDA

1. OPENING OF THE SESSION
 - 1.1 Welcome from NCEI and GCOS
 - 1.2 Tour to Table
 - 1.3 Adoption of the agenda
 - 1.4 Working arrangements
2. REVIEW OF CBS-LC-GCOS-5 RECOMMENDATIONS
3. UPDATE FROM GCOS AND WMO SECRETARIAT
4. REPORTS FROM CBS LEAD CENTERS FOR GCOS
 - 4.1 RA-IV (Europe) – Germany (DWD)
 - 4.2 RA IV (North and Central America, Caribbean) – USA (NOAA/NCDC)
 - 4.3 RA-II (Asia) - Japan Meteorological Agency (JMA)
 - 4.4 RA-III (South America) – Chile (DMA)
 - 4.5 RA-I (Africa) – Mozambique (INM)
 - 4.6 Antarctica – British Antarctic Survey (BAS) – Remote
 - 4.7 RA-V (South-West Pacific) – Australia (BOM) – Remote
 - 4.8 RA-I (Africa) – Morocco (DMN) & RA-II & IV (Asia & Europe) – Iran (IRMO)
5. REPORT FROM GCOS ARCHIVE/MONITORING CENTER
6. REPORT FROM GCOS NETWORK MANAGER
7. REPORT FROM NATIONAL ACTIVITIES RELEVANT TO THIS MEETING
8. REVIEW AND DEMONSTRATION OF THE NEW PERFORMANCE REPORTS
9. STATUS OF META DATA RECORDS BY THE CBS-LC-GCOS
10. ITEMS FOR DISCUSSIONS
 - 10.1 Collection of World Weather Records (WWR)
 - 10.2 Collection of Climatological Standard Normals (CLINO) 1981-2010 (and 1991-2020)
 - 10.3 10.3 Daily Climate Report
 - 10.4 10.4 Focal Points
11. REVIEW OF TERMS OF REFERENCE (ANNEX – I)
12. MEETING RECOMMENDATIONS AND REQUESTS TO CBS
13. NEXT MEETING
14. CLOSURE OF THE MEETING

EXECUTIVE SUMMARY

The CBS Lead Centres for GCOS (CBS-LC-GCOS) Coordination Meeting was held at the National Centre for Environmental Information (NCEI), Asheville, USA, from 11 to 13 September 2018. Unfortunately, representatives from Australia (RA-V), Iran (RA-II), Morocco (RA-I) and UK (Antarctica) were unable to attend but several were able to join the meeting remotely.

The Coordination Meeting considered reports from individual Lead Centres' activities, GCOS Monitoring Centres and of the GCOS Archive Centre; it reviewed their activities, results of monitoring performance reports and their Terms of Reference.

Jay Lawrimore, agreed to act as the chair of this 6th Coordination Meeting.

The Coordination Meeting agreed on a number of recommendations, some of which will be channeled to various WMO and GCOS bodies through the WMO and GCOS Secretariats.

The Coordination Meeting expressed its appreciation to its hosts, NCEI, for its excellent organization and hospitality. The meeting venue at 'the collider' was ideal for our discussions and we had the added excitement of Hurricane Florence approaching the East Coast of the United States (see picture below).

PREVIOUS MEETINGS

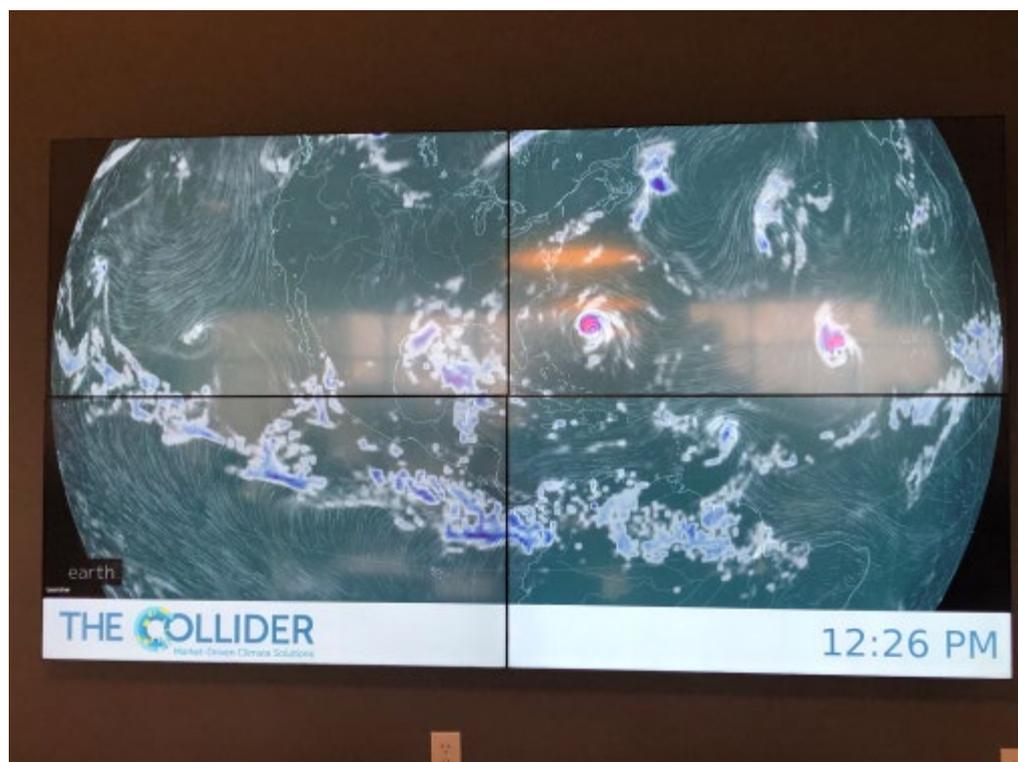
First Coordination Meeting – Iran 2007

Second Coordination Meeting – Geneva 2009

Third Coordination Meeting – Hamburg, Germany, October 2011

Fourth Coordination Meeting – Santiago, Chile, October 2013

Fifth Coordination Meeting – Cambridge, UK, September 2016



GENERAL SUMMARY

1. OPENING OF THE SESSION

The CBS Lead Centres for GCOS (CBS-LC-GCOS) Coordination Meeting was held at the National Centres for Environmental Information (NCEI), Asheville, USA, from 11 to 13 September 2018.

The meeting was opened at 0930 on 11th September in 'the Collider', Asheville. Mr Josh Dorfman, Chief Executive Officer of The Collider welcomed the participants and provided a presentation on the history of The Collider and the importance of its collaboration with the National Centers for Environmental Information and its many partners throughout the world. He also noted the connections with industry leaders, entrepreneurs, academics, adaptation innovators, and climate scientists for creating synergy and developing climate solutions to 21st century problems.

Jay Lawrimore (NCEI), as the local host, welcomed the participants, explained the meeting logistics and offered the support of NCEI should anyone have any questions/issues during their stay in Asheville.

Mr Tim Oakley, GCOS Secretariat, also welcomed the Lead Center representatives to the meeting on behalf of the WMO Secretary General and the Director of GCOS. He looked forward to the discussions and outcomes of the meeting, and encouraged the participants to take every opportunity to discuss their work and challenges as the nominated representative of their Lead Centre and/or Archive/Monitoring Centre.

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

Following the presentations from the LC under agenda item 4 and 5, the Coordination Meeting reviewed the recommendations from the Fifth meeting held in Cambridge, UK, in September 2018.

Most either had been addressed or were time-expired, with four being taken forward with the recommendations from this meeting (see section 12).

(Post meeting note from DWD with respects to 5th -A.4 - DWD started a redesign of the GSNMC Website (www.gsnmc.dwd.de). The range of products will be extended to integrate CLIMATs in BUFR format and of the RBCN network following decisions of the Atmospheric Observation Panel for Climate (AOPC). DWD provides financial support on an annual basis for the services of a software company. The first results will be presented in 2019.)

3. UPDATE FROM GCOS AND WMO SECRETARIAT

Mr Tim Oakley provided an update from both the WMO and GCOS secretariat. Significant changes are taking place within the structure of the Technical Commissions and Regional Associations, which will be proposed for adoption by the next WMO Congress (2019). These changes are likely to have a significant impact on the working governance (i.e. Terms of Reference) in the future. Also the transition of the WIGOS programme into operations, with the introductions of regional centres for monitoring and data quality management will also have an impact on the team. However, at the moment there are no proposal or recommendations on how CBS-LC-GCOS should change, so the current work practices and terms of reference under the guidance of the Commission for Basic Systems (CBS) remain valid.

As there were a few new faces around the table, and via WebEx, Tim Oakley summarized the key responsibilities of GCOS, through its reports to the UNFCC, the GCOS status report (2015) and the new GCOS Implementation Plan (2016). Several actions in the Implementation Plan are directly relevant to the work of CBS-LC-GCOS and much of the monitoring of the CLIMAT messages are fulfilled through the work of the LC's at NCEI, DWD and JMA. He concluded with some 2017 monitoring tables, which are widely communicated within GCOS and WMO, and that will be discussed in more detail under agenda items 6 and 8.

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 2017 reports as follows:

4.1. RA-IV (Europe) – Germany (DWD)

Mrs Christiana Lefebvre gave two presentations.

In her first presentation she showed the results of the GSN Monitoring Centre for 2017 and the first part of 2018 shown on the GSNMC website (www.gsnmc.dwd.de). She stressed, that the results concerning the availability of GSN stations include CLIMAT reports received in TAC (FM 71) and BUFR format. Though some countries such as Chile, Ireland and Norway provide CLIMAT reports only in BUFR, TAC reports from these countries are disseminated in the GTS. Obviously there are centres, generating those from BUFR CLIMAT. The monthly reception rate of GSN stations continued to vary between 80 and 85 % on a global scale. Among all WMO regions, the reception rate of GSN stations from RA I remained the lowest with 50-60 %. The annual report of the GSNMC for 2017 including further information will be provided by November/December of this year. Unfortunately, a modification in the software of generating the GSN data sets in December 2017, which are also published on the GSN website led to the missing of the data from those countries generating the CLIMAT reports in TAC and BUFR format (such as Sweden, Germany, Australia). The data sets will be updated. To meet the modified requirements of the GSN monitoring, DWD started an update of the GSNMC website and provides financial support on an annual basis for the services of a software company. The first results will be available in 2019.

In her second presentation Christiana Lefebvre gave an overview about the actions taken by the CBS LC for RA VI at DWD. The LC addressed to the national focal points to solve different problems in CLIMAT reports and pointed to the missing of the list of 'National Focal Points for GCOS and related climatological Data' on the WMO website. It supported the Expert Team on Climate Data Management Systems (ET-CDMS) to generate statistics about the provision of correct CLIMAT messages from all RBCN stations of the world per year from 2006 to 2016. The result of the study was presented by D. Stuber and B. Bannerman at the CCI-17- TECO in April 2018. In the follow up the LC answered the question of Indonesia about problems in there data. Results from the comparison of the content of CLIMATs provided in TAC (FM 71) and BUFR format from the same Met Service were presented as well as evaluations of air pressure at station level and at sea level from which discrepancies in the barometer height published in OSCAR may be derived. The monitoring of the 24 GUAN stations in RAVI showed that all stations are working. The receipt of World Weather Reports (WWR) for 2017 was higher than for 2016 with submissions from 24 (of 42) countries up to September). Some counties had to adopt the data format to the guidelines (WMO-No. 1184). The annual collection of WWR requires a more effective proceeding by terminating different ways to provide the WWR.

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

Mr Bryant Korzeniewski, representing NCEI and WMO RA IV, presented the status of NCEI being the Lead Centre for GSN and GUAN in WMO RA IV. He reviewed the status of GSN and GUAN Data Submissions received by NCEI over the 2017 Data-Year with it being the Lead Centre for WMO RA IV for GSN and GUAN and the Overall Lead Centre for GUAN. An overview of NCEI's

Version Update of the GUAN Monthly Reports was provided which now utilized NCEI's IGRA Version 2 Dataset and incorporated the "30 hPA and above" and "10 hPA and above" levels and improves observation counts for the temperature, dewpoint depression, and wind observation height levels. Bryant Korzeniewski also advised on NCEI's collection of the World Weather Records (WWR) Submissions Process.

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

Mr

Kenji Kamiguchi presented the 2017 Lead Centre report on behalf of JMA. Any recommendations from the resulting discussions are captured under agenda item 11.

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

Mr Gaston Torres (DMC) presented a summary of the Lead Centre Report for RA-III (South America). He introduced the activities at Lead Centre and status of the network GCOS, GSN and GUAN. The performance monitoring corresponds to the period May 2017 to June 2018.

The number of GSN stations in 2017-2018 remained at 101, on average, 82% of the stations were received (CA), and 70 percent were without errors (CC). The number of GUAN stations remained at 18, since 2014 and all stations are working and performing accordingly.

The region III has 5 silent stations, of which 3 belong to Brazil, one station of Ecuador and Suriname has only one station

In relation of the performance of the countries, all countries show percentage about 70 percent except Colombia, Peru and Venezuela.

The general index is 74% considering that Venezuela decreased from index 0.72 to 0.1

Peru, presents problems in the sending of the Bulletin, only 25% of the bulletins were received and in all cases the errors reach 75%. Venezuela is one of the countries that presents the greatest problems in sending the bulletin and in the quality of the data.

4.5. RA-I (Africa) – Mozambique (INM)

Mr Jose Sequeira presented the 2017 Lead Centre report on behalf of INM. Any recommendations from the resulting discussions are captured under agenda item 11.

4.6. Antarctica – British Antarctic Survey (BAS) – Remote

Mr Steve Colwell presented remotely his report for Antarctica, summarized as follows:

The British Antarctic Survey carries out the GCOS monitoring for the Antarctic region and maintains web pages jointly with SCAR (Scientific Committee for Antarctic Research) which has the latest news from Antarctica and also the monitoring results for each station and automatic weather station. These include the monitoring of CLIMAT messages, TEMP messages and Synoptic messages and also include graphs of the synoptic data received see https://legacy.bas.ac.uk/met/jds/met/SCAR_oma.htm.

BAS produces basic CLIMAT messages for many of the Antarctic stations by using the information in the synoptic messages that are transmitted. CLIMAT message are produced if 90% or more of the synoptic messages on the main synoptic hours are present, they are indicated by a B in this table https://legacy.bas.ac.uk/met/jds/met/climat_2018.html

SCAR and WMO are also encouraging the national Antarctic operators to update their stations details in OSCAR/SURFACE.

4.7. RA-V (South-West Pacific) – Australia (BOM) - Remote

Mr Douglas Cheetham presented remotely his report summarised as follows:

The Australian Bureau of Meteorology reinstated the focal point for Region V LC in late 2017. Since this time, we have commenced communications with Region V national focal points.

The performance indicators for Region V, for CLIMAT and GUAN programs reflect common problems, with regards to funding, changes to national programs not reflected in OSCAR and general degradation in performance. Region V lead centre are committed to engaging with Region V national weather services with the aim of improving the CLIMAT and GUAN performance. We are also following up with Region V NWS to collate the WWR and Climate Normals at the earliest convenience.

During 2017 period since Australia last attended a CBS GCOS LC meeting, we have undertaken:

- a review of the Automated Weather Station network, and are seeking to implement ISO9000 accreditation for this observing system.
- upgraded the continental upper air network to RS41 radiosondes, Antarctic stations to be upgraded in early 2019 following Year of Polar Prediction activities.
- a comparison of RS41-SG and RS92-SGP radiosondes at Darwin, Australia, with a follow up scheduled for February 2019.
- reinstated 2 radiosonde soundings per day at Giles (94461) and Willis Island (94299) GUAN stations

As a side note on some of the items raised during the week, it appears that the two 'red dots' in the GSN coverage are Marree Comparison (94450) and Tibooburra Post Office (94485).

MARREE COMPARISON – 94480

- CLIMAT reporting for Marree was transferred to MAREE AERO (95480) in 2015, however it appears that the GSN classification was not transitioned at that time. On Bureau internal systems, the GSN status was removed from MARREE COMPARISON in 2015, back dated effective to May 97. However neither Vol A or OSCAR were updated to reflect these changes.

Recommendation – Remove GSN from MAREE COMPARISON (94480) and request GSN status be applied to MAREE AERO (95480) to restore coverage at that location.

TIBOOBURRA POST OFFICE – 94485

- Manual observations station with long record. Observer retired from service in 2015. Similar to Maree Comparison above, an automated station Tibooburra Airport (95485) was installed at the local aerodrome in 2000, with RBSN and CLIMAT messages transferred to this location. The GSN classification was not transferred to the automated station, resulting in the discrepancy between CLIMAT, RBCN and GSN networks.

Recommendation – Remove GSN from TIBOOBURRA POST OFFICE (94485) and request GSN status be applied to TIBOOBURRA AIRPORT (95485) to restore coverage at that location.

We have also been in touch with Kiribati Weather Service daily this week, and are working to provide some surplus weather balloons to them as soon as practicable to restore their GUAN program. Will advise the outcome as this progresses.

4.8. RA-I (Africa) – Morocco (DMN) & RA-II & IV (Asia & Europe) – Iran (IRMO)

Representatives from these lead centres were unable to attend the meeting, however a presentation provided by Morocco (DMN) was summarized by Mr Tim Oakley.

The 2017 annual reports from the lead centres and archive/monitoring centres will be made available on the GCOS website.

5. REPORT FROM GCOS ARCHIVE/MONITORING CENTERS

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

6. REPORT FROM GCOS NETWORK MANAGER

Mr Tim Oakley presented his 2017 monitoring report on the GSN and GUAN performance to the meeting. Whilst both networks in all WMO Regions were far from optimum, there were indications of even further deterioration of the networks in RA-I (Africa) and to a lesser extent RA-III (South America). The primary reasons for these networks poor performance continue to be the lack of resources, and skills, in the operations and maintenance of the instrumentation, and for the GUAN the provision of consumables.

The projects undertaken by the GCOS Cooperation Mechanism were also presented but due to the lack of new funds into the trust fund this has been limited to only ongoing projects or those directly targeted by the sponsoring country.

7. REPORTS FROM NATIONAL ACTIVITIES RELEVANT TO THIS MEETING

Mr Michael Brewer provided an overview of NCEI's Center for Weather and Climate and three additional presentations were provided by other NCEI staff on national activities relevant to this meeting. Mr Derek Arndt and Ms Ahira Sanchez-Lugo provided an overview of NCEI's climate monitoring activities and the importance of GCOS Lead Centre activities in support of monitoring and assessment activities. They noted in particular that the CLIMAT/GSN observations supported by the Lead Centers are critical to their ability to monitor change and variation in global surface temperatures. They also noted that the GUAN upper air data are an important component of understanding trends in tropospheric temperatures.

Ms Shelley McNeill provided an overview of NCEI's metadata repository, the Historical Observing Metadata Repository (HOMR) and NCEI's contribution to the Copernicus C3S service Lot 2 Global Land and Marine Observations Database project. A major goal of this project is the integration of Monthly / Daily / Hourly land surface datasets and the ICOADS marine data. This effort can be aided by NMHSs of member states in sharing available digital surface meteorological holdings, with a particular focus upon:

- Sub-daily synoptic reports and the early pre-GTS record to support the production of reanalysis products
- Rain-gauge data which will contribute to reliable quantitative gridded maps like the E-OBS dataset.

Any member having data they wish to share and contribute to the Copernicus C3S service Lot 2 Global Land and Marine Observations Database should make contact via email to simon.noone@mu.ie.

Mr Xungang Yin provided an overview of the NCEI/GCOS Lead Center archive for upper air data, the Integrated Global Radiosonde Archive (IGRA v2). This dataset consists of historical and near-

real-time radiosonde and pilot balloon observations from around the globe. It was created by merging data from multiple sources and applying a suite of carefully designed quality control procedures. This presentation noted that IGRA maintains current and historical data for GUAN stations. Receipt and completeness data for GUAN stations showed that areas with the most complete set of soundings reaching at least 30 and 10 hPa include Regions II, IV, and VI.

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

The meeting reviewed in more detail the monitoring statistics presented by Tim Oakley under agenda item 6. Further information was given on specific examples of poor performance and several recommendations on the outcome of these discussions were agreed.

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

This agenda item was not discussed in detail as a separate topic, but metadata items/issues were raised under many of the previous agenda items. It was agreed that the WMO OSCAR/surface database and the WMO Country Profile database will be the primary location for all metadata relevant for CBS-LC-GCOS. Several recommendations on issues with regards the use of these databases were agreed.

10. ITEMS FOR DISCUSSIONS (including AOB)

10.1. Collection of World Weather Records (WWR)

10.2. Collection of Climatological Standard Normals (CLINO) 1981-2010 (and 1991-2020)

Mr Peer Hechler (WMO) joined the meeting remotely, to present the above two agenda items and contribute to the discussion, and any issues, raised by the CBS-LC-GCOS representatives. The key points were as follows:

WWR:

- Minimize manual efforts; assist Members in adherence to WMO-No. 1186 (specifically re formatting)
- Review WMO-No. 1186 (there are some mistakes)
- Stop regular submission to wcdmp@wmo.int to ease data flow
- Communicate findings of LC to Members (Annex to next call to make Members aware of 'often to be observed issues')
- Promote WWR submission among Members to increase participation in WWR collection significantly
- Clarify role of Mozambique Lead Centre in WWR collection process
- Doug Cheetham to be contact point for RA V Lead Centre

CLINO:

- Lead Centres requested to check correct formatting of CLINO submissions before forwarding is to NCEI
- Consider assistance to developing Members in calculating CLINO correctly
- NCEI to check ftp solution to overcome Lead Centre file size limitations
- Initiate discussion with Members re date of 1991-2020 CLINO submission (accelerated submission arrangement vs quality assurance; provisional vs final CLINO etc. pp.; take into account lessons from 1981-2010 collection)

Ongoing support from the CBS-LC-GCOS to these two important activities was captured in a recommendation (see agenda item 11)

10.3 Daily Climate Report

A presentation on the need for, and history of development of, a Daily CLIMAT message was provided by Mr Jay Lawrimore. Over the last 20 years there has been a growing demand for indices and measures of the climate that also consider extremes. For many extreme measures, monthly CLIMAT data are insufficient. This need is not just for timeliness, but principally for data that is compatible with long historic daily series developed and made available by NMSs.

In 2012 ICT-IOS recommended a solution based on use of a monthly transmission of daily climate observations in BUFR format. NCEI in cooperation with WMO's IPET-DRMM and NOAA/NWS developed a template for transmission of daily climate observations in BUFR format. 3 07 074 – Supplemental daily extreme temperature and precipitation values for monthly climate report.

NMHCs can use the template to provide 31 Daily observations for

- Time of Observation for Temperature
- Daily Maximum Temperature
- Daily Minimum Temperature
- Daily Mean Temperature (if differs from max+min/2)
- Time of Observation for Precipitation
- Total Daily Precipitation
- Depth of New Snowfall
- Depth of Total Snow on the Ground

Available resources to aid countries in developing a monthly transmission of daily climate observations via this template include Demonstration software that can be modified for country-specific encode/decode of daily climate observations: <ftp://ftp.ncdc.noaa.gov/pub/data/dailyclimat/> . Also Table D available at

http://www.nco.ncep.noaa.gov/sib/decoders/BUFRLIB/toc/dfbfmstab/bufrtab.TableD_STD_0_24 and https://github.com/gbvalor/bufr2synop/blob/master/share/BUFR_24_0_0_TableD_en.csv .

By the nature of the BUFR format and the large number of observations required each month

- The level of complexity required will likely be high
- The quality of observations may suffer at least initially due to the complexity
- Training will be needed

A general discussion around this topic raised the following points:

- Consider training for Members to handle BUFR encoding
- Discuss with CCI ET on Data Development and Stewardship ways to efficiently monitor the trial phase
- Check implications of potentially different observing periods for various variables (example of Australia: wind from midnight to midnight, temperature from 9 a.m. to 9 a.m. etc)

- LC report to request clarification on the governance with coding questions within WMO.

10.4 Focal Points

It was agreed that the current list of GCOS Focal Points should be accessed from the WMO Country Profile Database (WMO-CPD see link below), however, this information is not currently available from the WMO-CPD. Mr Tim Oakley agreed to follow this up within WMO.

WMO Country Profile Database Link – <https://www.wmo.int/cpdb>

11. MEETING RECOMMENDATIONS AND REQUESTS TO CBS

Carried forward from fifth meeting, updated as necessary:

5th –A.1 – All Lead Centres and Monitoring Centres to review the WMO/WIGOS 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.

5th –A.5 – Given the GSNMC 2016 Report showing a significant increase in the % of Rainfall reports failing QC for 2015 across many regions, Christiana Lefebvre was asked to work with the 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.

(Post meeting note from DWD – The problem is the increase in incorrect encoding of precipitation totals. Most of these errors in the monthly precipitation data can be attributed to the known “factor 10” problem (precipitation amounts reported in 1/10 mm instead of mm) and to monthly totals greater than 0 and less than 1 mm, which has to be encoded with „9999“. Countries, which often have these errors are Mongolia and China.)

5th –A.15 – All annual reports to be available within 3 months of the end of the year

5th –A.16 – Tim Oakley will arrange a WebEx to discuss the annual reports during April and May.

New recommendations:

6th –A.1 – CBS-LC-GCOS RA-III (DMA Chile) to continue communication with regards the loss of CLIMAT messages from Peru and Venezuela. If necessary seek the support of GCOS to further emphasize the importance of the CLIMAT messages.

6th –A.2 – CBS-LC-GCOS RA-IV (NCEI USA) to investigate further the rules on CLIMAT coding if too many missing days in month. At present they don't code the CLIMAT message whereas in other regions they do.

6th –A.3 – It was confirmed that primary source of Metadata for CBS-LC-GCOS continues to be the WMO system OSCAR/Surface. All LC should continue to report issues, and any errors, with OSCAR/Surface, in terms of the GSN, RBCN and GUAN stations to the GCOS Network Manager.

6th –A.4 – CBS-LC-GCOS RA-IV (NCEI USA) to follow up on the 3 station changes in Canada and relay the correct process to request changes of the GSN station list through GCOS.

6th –A.5 – CBS-LC-GCOS RA-V (BOM, Australia) to follow up on the 2 station in Australia reporting zero CLIMATs and relay the correct process to request changes of the GSN station list through GCOS.

6th –A.6 – BUFR CLIMAT – Difference between TAC & BUFR coding (JMA & DWD presentations). These issue/errors in the BUFR CLIMAT need to be document and reported to the relevant expert body in WMO for further action. CBS-LC-GCOS RA-VI (DWD, Germany) agreed to document the issue and send it to GCOS/CCI for follow-up action within WMO.

6th –A.7 – The document on ‘height of pressure measurement, different metadata (DWD presentation)’ will be circulated to the relevant CBS-LC-GCOS for follow-up action with the countries responsible for the station. The correct metadata must be checked and updated in OSCAR/Surface.

6th –A.8 – It was agreed that the Mozambique LC would assist Morocco LC in the collection of WWR from RA-I. Peer Hechler will organize this.

6th –A.9 – Following comments from LC representatives, Peer Hechler agreed to an update to the guidance to Members on the collection of WWR, in particular to whom to send the reports to.

6th –A.10 – All CBS-LC-GCOS are kindly requested to continue their support to the collection mechanism for World Weather Records including:

- (i) collecting WWR submissions from Members within their area of responsibility,
- (ii) checking the correct format of Members’ WWR submissions and seek Members’ assistance in submitting correctly formatted WWRs, where needed, and
- (iii) to forward correctly formatted WWR submissions to NCEI for qc and global storage/archival. CBS Lead Centres for GCOS are further requested to support the collection of Climatological Standard Normals in the same manner as *described above for WWR*.

6th –A.11 – GCOS Network Manager to follow up on the GCOS Focal point list in the WMO Country Profiler Database which is no longer available.

6th –A.12 – GCOS Network Manager to follow up in the metadata for St Helena GSN in OSCAR/Surface which is assigned to USA but should be UK.

6th – A.13 – Bryant Korzeniewski to generate a list of GSN & RBCN stations which have zero CLIMAT over the last year. Tim will distribute this list to LC’s for action with their countries of responsibility.

6th – A.14 – Bryant Korzeniewski will take the RBCN list out of OSCAR surface and compare this with their 2015 list. In future use the OSCAR surface RBCN list.

12. NEXT MEETING

12.1. The next meeting is planned to be held in the second half of 2020, with an offer from Mr Jose Sequeira (INM) to host the meeting in Mozambique. This is subject to obtaining the necessary travel funds for the participants and authorization within WMO.

13. CLOSURE OF THE SESSION

13.1. The session closed on Thursday 13 September 2018 at 1300 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.
-

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.
-

LIST OF PARTICIPANTS

CHILE Gaston TORRES	Head of Climatology Direccion Meteorologica de Chile Avenida Portales 3450 Estación Central Santiago de Chile Santiago Chile Tel.: +562 4364519 / +562 4364503 Fax. +562 6814902 E-mail. gtorres@meteochile.cl
GERMANY Christiana LEFEBVRE	Senior Meteorologist Deutscher Wetterdienst Bernhard Nocht-Str. 76 20359 Hamburg Germany Tel.: +49 69 8062 6230 Fax: +49 69 8062 6249 E-mail: christiana.lefebvre@dwd.de
JAPAN Kenji KAMIGUCHI	Assistant Scientific Officer Climate Prediction Division Global Environment and Marine Department Japan Meteorological Agency 1-3-4 Otemachi, Chiyoda-ku 100-8122 Tokyo Japan Tel.: +81 3 3212 8341 Fax: +81 3 3211 8406 E-mail: climatemonitor@met.kishou.go.jp
MOZAMBIQUE Jose Alberto SEQUEIRA	Head of Observation Division Mozambique Meteorological Office Rua Mukumbura, 164 MAPUTO Mozambique Tel.: +25821491150 Fax: +25821491150 E-mail: jose_s@inam.gov.mz
USA Jay LAWRIMORE	NOAA National Centres for Environmental Information (NCEI) Centre for Weather and Climate (CWC) 151 Patton Avenue, Room 514 Asheville, NC 28801-5001 Tel.: +1(828)2714307 Fax: +1 (828)2714022 E-mail: jay.lawrimore@noaa.gov
USA Bryant KORZENIEWSKI	NOAA National Centres for Environmental Information (NCEI) Centre for Weather and Climate (CWC) 151 Patton Avenue, Room 514 Asheville, NC 28801-5001 Tel.: +1(828)2714307 Fax: +1 (828)2714022 E-mail: bryant.korzeniewski@noaa.gov

WMO Secretariat	
GCOS Secretariat	
Tim OAKLEY	GCOS Implementation Project Manager GCOS Secretariat Tel: +41 22 730 8068 Fax: +41 22 730 8052 E-mail: toakley@wmo.int tim.oakley@metoffice.gov.uk