Activities of Lead Centre for GCOS Networks for the WMO RA VI in the year 2025

DEUTSCHER WETTERDIENST (DWD) HAMBURG, GERMANY

1. Evaluation of availability, completeness and correctness of CLIMAT reports

On a routine basis, DWD applies a quality control regarding availability and formal compliance of CLIMAT reports at the 21st of a month. This refers to the CLIMAT stations included in the GCOS Surface Network (GSN), the former Regional Basic Climatological Network (RBCN) and the former Antarctic Observing Network (AntON). These deprecated networks are still part of the GCOS monitoring, because decisions regarding the future network affiliation and registering of CLIMAT reporting stations have not yet been made.

Furthermore, DWD performs a two-tier quality control of all received CLIMAT messages. The format check is followed by an automatic and manual check of the main parameter values. The results of the quality control are the basis for various monitoring products. Furthermore, DWD checks the associated metadata.

The Lead Centre (LC) continued to increase the availability of CLIMAT data:

- by ingesting CLIMAT reports into the GTS/WIS received by e-mail from NMHS that are not or not well connected,
- by informing in the course of a month about missing CLIMAT reports, severe errors or in case of receiving an incorrect data month,
- by distributing monthly monitoring results to all Lead Centres and the GCOS Network Manager. The results contain information about missing GSN stations and format problems of CLIMAT reports received by the 20th of a month.

DWD informs the concerned NMHS directly by addressing the respective National Focal Points (WMO RA VI). For other WMO regions the relevant Lead Centre is approached with the request to contact the NMHS in charge.

Most errors belonged to the following categories:

- no or incorrect month-year indicator (TAC and BUFR),
- other errors in section 0 (incorrect spelling of code name CLIMAT, other invalid characters) (TAC),
- invalid text/characters within the other sections (TAC),
- format errors (e.g. too short/too long groups, usage of “-“ for negative temperature values), blanks within groups (TAC),
- content errors (e.g. extreme temperature values instead of mean values, incorrect numeric scales) (TAC and BUFR),
- binary code errors (BUFR),
- correct month-year indicator, but data from a different month (mostly TAC).

The NMHS of 70 countries were contacted in 2025 with the request to send or rectify their CLIMAT reports. For RA VI the respective NHMS was contacted directly. For a NMHS associated with a different RA, the responsible Lead Centre was informed.

The NMHS of 20 countries were contacted in 2025 due to general issues, e.g. no CLIMAT messages at all, no BUFR, repeatedly incorrect messages, submission problems.

1.1. Availability and correctness of GSN Stations in the RA VI

The number of GSN stations in the RA VI remained at 141 stations by the end of 2025. The annual average of received CLIMAT reports (evaluation of performance indicators CA for availability) was 90,1 %. The performance indicators CC reveal a rate of correct CLIMAT messages of 94,7 %. The validness rate is 99,9 % for temperature values and 96,2 % for precipitation values.

Silent GSN stations in RA VI are:

Iceland:	04048 Vestmannaeyjar reported up to April 2013. Its current status in OSCAR/Surface is closed.
Macedonia:	13577 Lazaropole since January 2014
Albania:	13615 Tirana since September 2010
Croatia:	14236 Zagreb since March 2020. Observations continued quickly after an earthquake, but there are issues with the homogeneity of the time series. DHMZ is working on this.
Italy:	16022 and 16258 since January 2025, 16550 since December 2024
Cyprus:	17600 Paphos
Russian Fed.:	26359 Puskinskiy Gory since August 2018
Ukraine:	33915 Askaniya-Nova since September 2022
Syria:	40001 Kamishli since October 2012
	40022 Latakia since November 2013
	40061 Palmyra since November 2013
Jordan:	40250 H-4 Rwashed since March 2020

The GSN Monitoring Centre cannot yet process CLIMAT reports from stations without a WMO station number. This currently affects the new GSN station Pogány repülőtér (Hungary, WSI 0-348-1-39115), which is therefore missing in the GSN monitoring results.

Performance of GSN stations 2025 in RA VI by country (performance indicators CA and CC range between 0 and 1, NIL messages are classified as incorrect)

Country	CA	CC
Albania	0,00	-
Armenia	1,00	1,00
Austria	1,00	1,00
Azerbaijan	0,92	0,36
Belarus	1,00	0,96
Belgium	0,83	1,00
Bosnia and Herzegovina	1,00	1,00
Croatia	0,00	-
Cyprus	0,50	1,00
Czech Republic	1,00	1,00
Denmark	1,00	1,00
Estonia	1,00	1,00
Faroe Islands	1,00	1,00
Finland	1,00	1,00
France	1,00	1,00
Georgia	0,75	0,89
Germany	1,00	1,00
Greece	1,00	1,00
Greenland	1,00	0,93
Hungary	1,00	1,00
Iceland	0,75	1,00
Ireland	1,00	1,00
Israel	1,00	1,00
Italy	0,23	0,71
Jordan	1,00	0,25
Latvia	1,00	1,00
Lithuania	1,00	0,92
Luxembourg	1,00	0,92
Malta	1,00	0,92
Moldova, Rep. Of	1,00	1,00
Netherlands	1,00	1,00
North Macedonia, Rep. Of	0,00	-
Norway	1,00	1,00
Poland	1,00	1,00
Portugal	1,00	1,00
Romania	1,00	1,00
Russian Federation	0,95	0,94
Slovakia	1,00	1,00
Spain	1,00	1,00
Sweden	1,00	1,00
Switzerland	1,00	1,00
Syrian Arab Rep.	0,00	-
Turkey	1,00	0,99
Ukraine	0,92	0,73
U. Kingdom of Great Britain and N.-Ireland	1,00	1,00

1.2. Availability of CLIMAT messages in BUFR

Most of the RA VI countries provide CLIMAT reports in BUFR as well as in TAC format. By the end of 2025 13 NMHS disseminated CLIMAT reports only in TAC format and 11 NMHS only in BUFR format.

In early 2025 the Lead Centre contacted seven NMHS in the RA VI region that didn't provide BUFR reports. One country (Finland) migrated to BUFR. Two NMHS answered that they are working on the migration. The other NMHS haven't been able to perform the migration due to problems or didn't answer.

1.3. Comparison of the receipt of GSN stations at JMA/DWD and NCEI

JMA, NCEI and DWD continued evaluating the receipt status of GSN stations. This fulfilment of an action item from the 2016 GCOS Lead Centres Meeting bases on JMA's monthly GSN difference lists. They include GSN stations, which were only received by either DWD or JMA and those, which were missing by both.

In contrast to JMA the evaluations from NCEI categorize GSN stations reporting with an incorrect or missing month-year indicator as not received. CLIMAT messages consisting of only "NIL" are included as not received in both evaluations.

2. Availability of GUAN Stations

The number of GUAN stations in RA VI remained at 24. The basis for the following information are the GUAN summaries from NCEP (https://www1.ncdc.noaa.gov/pub/data/gcos/). With an update of the Integrated Global Radiosonde Archive (IGRA) in February 2023 the radiosonde reports back to 2014 have been augmented with BUFR data. This also applies to the GUAN summaries. The WMO WDQMS monitoring (https://wdqms.wmo.int/gcos/land_upper-air) shows only the availability of observations in BUFR format.

The yearly totals mostly reached from approx. 650 to 900 observations per station. More soundings (ca. 1450) were reported by station 10393 Lindenberg (Germany). The NCEP GUAN summaries showed that most stations performed soundings at 00 and 12 UTC. 08508 Lajes (Azores/Portugal) and 15614 Sofia (Bulgaria) didn't provide reports for 00 UTC. No observations were available from station 33345 Kiev (Ukraine) and 37789 Yerevan (Armenia). 40265 Mafraq (Jordan) provided only three soundings.

Nearly all soundings reached 10 hPa and above. However, the soundings from station 02836 Sodankyla (Finland), 15420 Bucuresti (Romania) and station 27459 Nizhnij Novgorod (Russ. Fed.) only partly reached 10 hPa. From station 17130 Ankara (Turkey) no sounding reached 10 hPa.

Most stations provide upper air observations in TAC and BUFR format. From station 02836 Sodankyla (Finland) and 15420 Bucuresti (Romania) only half of the observations are available in BUFR. From station 17130 Ankara (Turkey) no BUFR reports were available. From station 03005 Lerwick (UK), 03808 Camborne (UK) and 04270 Mittarfik Narsarsuaq (Greenland) no summaries about BUFR reporting are available in the WDQMS due to an issue with the webtool caused by the WIGOS Station Identifier of these stations. This problem will be fixed soon. BUFR reports from station 17607 Athalassa (Cyprus) are no longer available in the WDQMS, because its GUAN nomination has been removed (no notification to GCOS).

3. GSN Monitoring Products

The GSNMC website www.gsnmc.dwd.de shows – besides the GSN – also the CLIMAT stations of the RBCN and AntON. These networks were migrated to RBON and are therefore deprecated, as explained in section 1 of this report.

An extract of the GSN monitoring results (number of daily observations, CLIMAT section 1, groups 8 and 9) serves as a basis for the GCOS surface monitoring within the WIGOS Data Quality Monitoring System (https://wdqms.wmo.int/gcos/land_surface).

4. Further Activities

For the GCOS Network Manager the LC produced an evaluation about the rates of CLIMAT availability by country for the years 2020-2024 (spreadsheet and map plots).

Upon request from the GCOS Lead Centre in Morocco statistics on the format of all CLIMAT messages received by DWD (TAC, BUFR or both) from the area of responsibility of the LC Morocco in 2023 and 2024 were compiled.

For the WMO Secretariat the receipt of DAYCLI messages in the year 2024 (incl. template usage and encoding of WSI) was summarized.

In the context of a training course in climate data management to the Kuwait Meteorological Department (KMD) Météo-France requested statistics on the availability and quality of CLIMAT messages sent by the KMD.

A. Andersson
T. Leiding
E. Rosskamp
O. Steinke
C. Wixforth

Deutscher Wetterdienst
Business Unit Climate and Environment
Bernhard-Nocht-Str. 76
20359 Hamburg
GERMANY
E-mail: cbs-lc-gcos.ravi@dwd.de