

## Activities of the Lead Centre for GCOS networks for the WMO RA VI in the year 2023

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

On a routine basis, DWD applies a near real-time quality control regarding availability and correctness of CLIMAT reports. This refers to all CLIMAT stations worldwide included in the GCOS Surface Network (GSN), the former Regional Basic Climatological Network (RBCN) and the former Antarctic Observing Network (AntON). A transition of these deprecated networks to RBON has not yet been performed for the GCOS monitoring, because decisions regarding the registering of CLIMAT reporting stations are still pending.

The automatic quality control includes checks regarding the formal compliance of the messages. TAC format is checked as well as BUFR format, if TAC is not available. The results of the quality control are the basis for various monitoring products. Furthermore, DWD checks the associated metadata and the quality of the observed geophysical parameters.

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

- by ingesting CLIMAT reports into the GTS received via e-mail from NMHS that are not or not well connected,
- by pointing NMHS to missing CLIMAT reports in the course of a month,
- by informing in case of receiving an incorrect month,
- by informing about severe errors in the reports,
- by distributing the monthly monitoring results to the Lead Centres and the GCOS Network Manager. They contain information about missing GSN stations and format problems of CLIMAT reports received by the 20th of a month. DWD informed the concerned NMHS directly by addressing the respective National Focal Points (NFP). Alternatively, 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 nearly 60 countries were contacted in 2023 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, contact was established via the responsible Lead Centre. If this attempt was not successful, the NHMS was contacted directly by DWD.

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

The number of GSN stations in RA VI remained at 139 stations in 2023. The annual average of received stations was 88,9 %. The performance indicators CC reveal a rate of correct CLIMAT messages of 93,1 %. The validness rate is 99,8 % for temperature values and 96,9 % 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.
- Cyprus: 17600 Paphos
- Russian Fed.: 26359 Puskinskiy Gory since August 2018  
34927 Krasnodar-Kruglik since July 2017
- Azerbaijan: 37989 Astara since October 2020
- Syria: 40001 Kamishli since October 2012  
40022 Latakia since November 2013  
40061 Palmyra since November 2013
- Jordan: 40250 H-4 Rwashd since March 2020. Traditional weather station was closed in June 2018, since then AWS, also closed now.

Sweden ceased CLIMAT dissemination in November 2023. After intervention of the Lead Centre RA VI and the GCOS network manager SMHI resumed the CLIMAT generation and also submitted the missing data months retroactively.

### *1.2. Availability of CLIMAT stations in BUFR*

In 2023 there were still countries which didn't provide CLIMAT reports in BUFR format. Most of the RA VI countries provide BUFR as well as TAC. By the end of 2023 15 NMHS disseminated CLIMAT reports only in TAC format and ten NMHS only in BUFR format.

### 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 differ lists. They include GSN stations, which were only received by either DWD or JMA and those, which were missing by both.

In contrast to the JMA differ lists 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 now. The WMO WDQMS monitoring ([https://wdqms.wmo.int/gcos/land\\_upper-air](https://wdqms.wmo.int/gcos/land_upper-air)) shows only the availability of observations in BUFR format.

The yearly totals mostly reached from approx. 700 to 1000 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 (Acores) provided reports only for 12 UTC and station 40265 Mafraq (Jordan) only for 00 UTC at approx. 180 days. No observations were available from stations 37789 Yerevan (Armenia) and 33345 Kiev (Ukraine).

Most stations provide upper air observations in TAC and BUFR format. From station 17130 Ankara (Turkey), 04270 Mittarfik Narsarsuaq (Greenland) and 03808 Camborne no BUFR reports were available.

Nearly all soundings reached 10 hPa and above. However, no sounding from station 17130 Ankara (Turkey) reached a level >30 hPa.

## 3. GSN Monitoring Products

The redesigned GSNMC website [www.gsnmc.dwd.de](http://www.gsnmc.dwd.de) (published in March 2020) shows – besides the GSN – also the CLIMAT stations of the RBCN and AntON. Both networks were migrated to the WIGOS Regional Basic Observing Network (RBON) in June 2022 and are therefore deprecated now. The GSN monitoring has not yet been adapted in this regard. Within RBON an identification mechanism for stations which are expected to report CLIMAT is still missing.

An extract of the GSN monitoring results (number of daily observations, CLIMAT groups 8 and 9) serves as a basis for the GCOS surface monitoring within the WIGOS Data Quality Monitoring System (<https://wdqms.wmo.int/>). During the development process an issue with the GSN datasets had been identified. The BUFR CLIMAT reports processed by the GSNMC at JMA didn't contain the section 1 groups 8 and 9. This problem was resolved by JMA in February 2023.

#### *4. Participation at the 7th Lead Centres for GCOS workshop in Geneva, Switzerland*

A. Andersson, T. Leiding and E. Roszkamp joined the Lead Centre for GCOS workshop in Geneva, Switzerland from 7th to 9th November 2023.

DWD presented its activities on behalf of the Lead Centre RA VI and informed among others about the quality control of global CLIMAT reports and special activities within the last years, e.g. evaluations for the WMO Expert Team on Data Requirement for Climate Services (ET-DRC), collection of WWR, comparison of TAC and BUFR and the connection of the Lead Centres to the WIGOS Incident Management System (IMS).

In a second presentation results and topics of the GSN Monitoring Centre at DWD were shown including an introduction about the redesigned GSNMC website and information about the integration of GSN dataset contents into the WIGOS Data Quality Monitoring System (WDQMS). Furthermore, some issues like the transition to RBON and the implementation of WIGOS Station Identifiers were pointed out.

Furthermore A. Andersson, T. Leiding and E. Roszkamp contributed to the discussions regarding the future performance and governance of the GCOS Lead Centres and other topics such as the coordination with WIGOS centres, Focal Points, BUFR and DAYCLI.

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