**GCOS Network Management**

The GCOS Secretariat is reporting regularly on the GCOS Surface Network (GSN), the GCOS Upper-Air Network (GUAN) and the GCOS Cooperation Mechanism (GCM), including the station list update, monitoring statistics for past and current years and current and recent observations projects undertaken by the GCOS network management.

A key component to report, update and encourage the work and responsibilities of the Lead Centres is the bi-annual meeting between the Lead Centre Representatives, WMO and GCOS. The last meeting was held in Cambridge, UK in September 2016 and tentatively the next meeting is to take place in Asheville, USA (September 2018).

Since January 2016 additional monitoring of the GSN stations has been provided through the EUMETNET Quality Monitoring Portal (<https://eucos.dwd.de/ravi/>). This enhanced QMP not only provides real-time availability and timeliness statistics for surface and upper-air messages received at DWD (Offenbach, Germany) but also measurement quality as compared with NWP background fields (ECMWF).

**1.1 Network Station List (2018 update, yet to be approved by AOPC)**

GCOS Surface Network (GSN)

|  |  |  |
| --- | --- | --- |
| RA-I | 155 Stations (0) | No Changes |
| RA-II | 258 Stations (0) | No Changes |
| RA-III | 101 Stations (0) | No Changes |
| RA-IV | 178 Stations (0) | No Changes |
| RA-V | 151 Stations (0) | No Changes |
| RA-VI | 138 Stations (0) | No Changes |
| ANTON | 42 Stations (0) | No Changes |
| **TOTAL** | **1023 Stations** |  |

GCOS Upper Air Network (GUAN)

|  |  |  |
| --- | --- | --- |
| RA-I | 23 Stations (0) | No Changes |
| RA-II | 38 Stations (0) | No Changes |
| RA-III | 18 Stations (0) | No Changes |
| RA-IV | 24 Stations (0) | No Changes |
| RA-V | 38 Stations (0) | No Changes |
| RA-VI | 24 Stations (0) | No Changes |
| ANTON | 12 Stations (0) | No Changes |
| **TOTAL** | **177 Stations (0)** |  |

1.2 Performance Report of the GSN

The following statistics are an annual summary of the monthly CLIMAT messages in the GCOS Climate Archive (National Climate Environmental Information, NCEI, US). According to the GCOS requirements a fully compliant GSN/RBCN shall have 12 CLIMAT reports. The values represents the 2017 percentage (Oct 2016 to Sept 2017) of stations that are compliant and those that are partially or non-compliant. In brackets are the statistics for 2016, 2015, 2014, 2013, 2012 and 2011 respectively.

**GCOS Surface Network (GSN)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Region** | **No.** | **12**  **Monthly CLIMAT** | **6 - 11**  **Monthly CLIMAT** | **1 - 5**  **Monthly CLIMAT** | **0**  **Monthly CLIMAT** |
| RA-I | 155 | **36%** (40,29,29,32,28, 23) | **30%** (25,31,33,33,36,39) | **4%** (9,15,10,10,11,14) | **30%** (26,25,28,25,25,24) |
| RA-II | 258 | **81%** (83,78,71,73,73,75) | **13%** (10,14,21,19,19,19) | **0%** (2, 2, 3, 2, 2, 1) | **6%** (5, 6, 5, 6, 6, 5) |
| RA-III | 101 | **57%** (65,61,76,89,84,69) | **20%** (29,35,20,6,13,28) | **17%** (0, 0, 1, 0, 0, 0) | **6%** (6, 4, 3, 5, 3, 3) |
| RA-IV | 178 | **89%** (90,88,88,88,81,80) | **7%** (7, 9,10,11,17,18) | **4%** (2, 2, 1, 1, 1, 1) | **0%** (1, 1, 1, 0, 1, 1) |
| RA-V | 151 | **62%** (67, 66,70,63,58,52) | **20%** (15,16,17,16,23,34) | **2%** (3, 4, 1, 7, 7, 1) | **16%** (15,14,13,14,12,11) |
| RA-VI | 138 | **82%** (84,77,80,82,78,81) | **7%** (7,14, 9,12,17,15) | **4%** (2, 3, 5, 2, 1, 0) | **7%** (7, 6, 6, 4, 4, 4) |
| ANTON | 42 | **81%** (81,77,79,60,45,50) | **19%** (17,19,19,36,43,33) | **0%** (2, 2, 2, 2, 5, 12) | **0%** (0, 2, 0, 2, 7, 5) |

**Regional Basic Climatological Network (RBCN, includes the GSN above)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Region** | **No**. | **12**  **Monthly CLIMAT** | **6 - 11**  **Monthly CLIMAT** | **1 - 5**  **Monthly CLIMAT** | **0**  **Monthly CLIMAT** |
| RA-I | 723 | **18%** (23,16,17,19,13,12) | **22%** (17,22,20,20,23,22) | **6%** (8, 11, 8, 7,12,13) | **54%** (52,51,55,54,52,53) |
| RA-II | 664 | **78%** (80,73,71,73,67,57) | **14%** (12,17,18,15,22,30) | **1%** (1, 2, 4, 4, 1, 2) | **7%** (8, 8, 7, 8, 10, 11) |
| RA-III | 298 | **59%** (64,63,73,81,73,65) | **14%** (22,25,14, 6,15,23) | **12%** (1, 0, 1, 1, 1, 0) | **15%** (13,12,12,12,11,12) |
| RA-IV | 337 | **80%** (80,78,78,72,67,66) | **8%** (8, 10, 11, 18, 18, 18) | **3%** (2, 3, 3, 2, 2, 3) | **9%** (10, 9, 8, 8, 13, 13) |
| RA-V | 247 | **60%** (64,63,64,59,56,50) | **21%** (16,18,21,17,24,34) | **2%** (4, 4, 1, 9, 6, 3) | **17%** (16,15,14,15,14,13) |
| RA-VI | 594 | **85%** (85,79,81,77,77,74) | **5%** (5, 12, 8, 13, 15, 18) | **1%** (1, 1, 3, 3, 1, 1) | **9%** (9, 7, 7, 7, 7, 7) |

RA-I is the poorest performing region, with only 36% of stations meeting the minimum requirement, and 30% not providing any CLIMAT messages, this has not significantly changed, neither better or worse, over the last 7 years. Thus whilst this continues to reinforce the need for GCOS to focus its support in this region, it also highlights that recent efforts to improve these statistics have had little impact. The drop in RA-III statistics of fully compliant stations was due to CLLIMAT messages from Peru not being reported.

For the RBCN network, which includes the GSN, the situation is even worse in RA-I with only 18% of stations meeting the minimum requirement. Regions I, III, IV and V show a significant increase in the percentage of stations with zero reports (RBCN versus GSN), suggesting that not all countries are sending CLIMAT messages for their RBCN stations, in addition to the GSN stations.

1.3 Performance Report of the GUAN

The following table is the 2017 summary for the GCOS Upper-Air Network (GUAN) monitoring against the GCOS minimum requirements (25 daily soundings to 30hPa per month) for each region, according to the monthly statistics provided by NCEP. In brackets are the same statistics for 2016, 2015, 2014, 2013, 2012 and 2011. For 2012 and 2011 these are based on availability according to NCEI.

|  |  |  |
| --- | --- | --- |
| **Region** | **Number**  **of GUAN stations** | **% meeting minimum GCOS requirements in 2017**  **(% for 2016, 2015, 2014, 2013, 2012 and 2011)** |
| RA-I | 23 | 30% (39%, 35%, 39%, 46%, 48%, 57%) |
| RA-II | 38 | 89% (87%, 87%, 87%, 87%, 87%, 87%) |
| RA-III | 18 | 61% (61%, 67%, 72%, 67%, 89%, 78%) |
| RA-IV | 24 | 92% (87%, 79%, 83%, 75%, 83%, 87%) |
| RA-V | 38 | 79% (84%, 79%, 76%, 74%, 84%, 87%) |
| RA-VI | 24 | 87% (87%, 87%, 87%, 83%, 92%, 87%) |
| ANTON | 12 | 67% (58%, 67%, 58%, 58%, 83%, 83%) |

Eleven (11) of the GUAN stations (6%) were ‘Silent’ (zero reported TEMP observations) during 2017, which is the highest since this monitoring was started in 2011. In 2016 and 2015 it was seven (7), 2014 and 2013 it was three, four (4) in 2012 and five (5) in 2011.

The key points for each region are as follows:

In Region I, only 30% of the GUAN stations have met the minimum requirement for 2017, compared with 39% for 2016, which continues, by some margin, to be the worst performing region. This poor, and worsening, performance is mainly associated with the necessary funding required to operate and maintain an upper-air station. Communication with the station at a technical level to establish the cause of the poor performance continues to be a challenge and often means that relatively simple issues can go unaddressed for long periods of time. In addition there are an increasing number of stations that have problems and failures with their hydrogen generator systems which has resulted in a period of long-term inactivity. Three (3) stations were in-active during the period; Vacoas, Mauritius (Radiosonde consumables); Khartoum, Sudan (Hydrogen system); and Dar es Salaam, Tanzania (Hydrogen system). Eight (8) stations had at least 1 month with zero reported TEMP observations; 61641; 62414; 63985; 64910; 67774; 68110; 68592 and 68816.

The performance in Region II in 2017 was similar to that for the previous years, with 4 stations not meeting the minimum requirement. No stations were completely in-active during the period, although the station in Pakistan (41780) is only launching PILOT balloons and with no TEMP soundings for 7 years, it is not meeting the GUAN requirements. The two stations in Thailand (48327 Chiang Mai and 48453 Bangna) both had lengthy periods of inactivity owing to radiosonde supply issues, similar to 2016.

The performance in Region III in 2017 was the same as 2016 but slightly worse than for the period 2013-2015, and a marked decrease from 2011-12, with 7 stations not meeting the minimum requirement. Three (3) stations were completely inactive, Manus 82332 and Fortaleza 82397, Brazil (Equipment and Hydrogen system) and San Cristobal 84008, Ecuador (Equipment and staffing issues).

The performance in Region IV in 2017 was again an improvement on the previous year, with 2 stations not meeting the minimum requirement. No stations were completely in-active during the period but two (2) stations, 76654 and 78762, had at least 1 month with zero reported TEMP observations.

Region V was slightly worse in 2017 compared to 2016, with 8 stations not meeting the minimum requirement. Four (4) stations were completely in-active during the period, Honiara, Solomon Islands; Vanuatu, Bauerfield; Rarotonga, Cook Islands and Port Moresby, PNG, all due to having no radiosonde consumables. Three (3) stations, 91610, 94302 and 96315, had at least 1 month with zero reported TEMP observations.

The performance in Region VI in 2017 was the same as for the previous 3 years, with 3 stations not meeting the minimum requirement. Only Yerevan, Armenia, had a period of inactivity owing to a fault with the hydrogen system, which was resolved at the end of March 2017.

The performance in the Antarctica region in 2017 was a small improvement than for 2016, with 4 stations not meeting the minimum requirement. No stations were completely in-active during the period. Halley Bay (89022) had an extensive period of inactivity owing to the station needing to be relocated for safety reasons.

**1.4 GCOS Cooperation Mechanism (GCM)**

The GCM is the system improvement and resource mobilization activity of the GCOS programme. It has been established following a decision by the UNFCCC SBSTA in 2004 (UNFCCC Decision 5/CP.5) in order “to enable developing countries to collect, exchange, and utilize data on a continuing basis in pursuance of the UNFCCC”. Since then, more than 3 million USD have been raised over the years to accomplish projects dedicated to improve climate observation systems. The following projects have been completed in 2017, or are still on-going:

* Engagement of a consultant based in Harare, Zimbabwe, to work part-time (50%) in the support of GCOS projects in RA-I. The focus of the work is to re-established surface climate stations in Chad and Mali using funds kindly provided by Greece. New Instrumentation, incorporating a non-mercury temperature solution, has been delivered and implemented in Chad;
* Support for the operations of the GUAN station at Yerevan, Armenia was sponsored by Japan in 2016, with a new competitive tender for 400 units each of radiosondes and balloons, managed by GCOS. Unfortunately, the installed Hydrogen Generator became unserviceable in 2016 and further funds from Japan was necessary for the repair, service and local staff training, which was completed in April 2017;
* Support for the operations of the GUAN station at Nairobi, Kenya was sponsored by Switzerland since 2016, with a new competitive tender for 800 units of radiosondes (including a new supplier, ground-system and local staff training) and 400 balloons, managed by GCOS;
* Support to the CATCOS project (Switzerland), through a fund (20,000 chf) made available to support ongoing operations and emergency maintenance. The agreement between WMO and CATCOS will be signed early in 2018 and will be in-force for 2 years.