

GCOS Surface Network (GSN) GCOS Upper Air Network (GUAN) Network Performance Summary

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**Period – April 2018 to March 2019
(Includes statistics from 2011 to 2017)**

Network Station List (2019 update)

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) | Canada 71600 (Sable Is.) to 73025 (Fisherman's Is.?) 71185 (Daniel's Harbour) to 73024 (Same name) 71197 (Port-Aux-Basques) to 73026 (Channel Port..) 71915 (Coral Harbour A) to 71134 (Coral Harbour RCS) 71945 (Fort Nelson A) to 71594 (Fort Nelson) 71869 (Prince Albert A) to 73002 (Prince Albert Glass Field) 71842 (Sioux Lookout A) to 73017 (Sioux Lookout A/P) 71603 (Yarmouth A) to 71884 (Yarmouth RCS) 71609 (Slave Lake AWOS A) to 71693 (Slave Lake RCS) Green denotes changed implemented (CLIMAT reports) |
| 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) | Russian Federation 28698 (Omsk) to 28695 (Same station and location. Change to identifier) |
| 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) | |

The above changes will be submitted to the next AOPC meeting (March 2019) for approval. If approved a 2019 update for the GSN and GUAN stations list will be published.

Network Performance

GCOS Surface Network (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 represent the 2018 percentage (Oct 2017 to Sept 2018) of stations that are compliant and those that are partially or non-compliant. In brackets are the statistics for 2017, 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 | 37% (31, 40, 29, 29, 32, 28, 23) | 23% (34, 25, 31, 33, 33, 36, 39) | 5% (3, 9, 15, 10, 10, 11, 14) | 35% (32, 26, 25, 28, 25, 25, 24) |
| RA-II | 258 | 76% (79, 83, 78, 71, 73, 73, 75) | 17% (15, 10, 14, 21, 19, 19, 19) | 1% (0, 2, 2, 3, 2, 2, 1) | 6% (6, 5, 6, 5, 6, 6, 5) |
| RA-III | 101 | 61% (63, 65, 61, 76, 89, 84, 69) | 16% (15, 29, 35, 20, 6, 13, 28) | 4% (6, 0, 0, 1, 0, 0, 0) | 19% (16, 6, 4, 3, 5, 3, 3) |
| RA-IV | 178 | 86% (86, 90, 88, 88, 88, 81, 80) | 11% (12, 7, 9, 10, 11, 17, 18) | 1% (1, 2, 2, 1, 1, 1, 1) | 2% (1, 1, 1, 1, 0, 1, 1) |
| RA-V | 151 | 64% (61, 67, 66, 70, 63, 58, 52) | 18% (21, 15, 16, 17, 16, 23, 34) | 3% (3, 3, 4, 1, 7, 7, 1) | 15% (15, 15, 14, 13, 14, 12, 11) |
| RA-VI | 138 | 77% (82, 84, 77, 80, 82, 78, 81) | 14% (8, 7, 14, 9, 12, 17, 15) | 1% (2, 2, 3, 5, 2, 1, 0) | 8% (8, 7, 6, 6, 4, 4, 4) |
| ANTON | 42 | 81% (83, 81, 77, 79, 60, 45, 50) | 17% (12, 17, 19, 19, 36, 43, 33) | 2% (5, 2, 2, 2, 2, 5, 12) | 0% (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 | 22% (18, 23, 16, 17, 19, 13, 12) | 15% (22, 17, 22, 20, 20, 23, 22) | 5% (5, 8, 11, 8, 7, 12, 13) | 58% (55, 52, 51, 55, 54, 52, 53) |
| RA-II | 664 | 69% (77, 80, 73, 71, 73, 67, 57) | 22% (14, 12, 17, 18, 15, 22, 30) | 1% (1, 1, 2, 4, 4, 1, 2) | 8% (8, 8, 8, 7, 8, 10, 11) |
| RA-III | 298 | 59% (60, 64, 63, 73, 81, 73, 65) | 14% (13, 22, 25, 14, 6, 15, 23) | 5% (8, 1, 0, 1, 1, 1, 0) | 22% (19, 13, 12, 12, 12, 11, 12) |
| RA-IV | 337 | 74% (77, 80, 78, 78, 72, 67, 66) | 12% (10, 8, 10, 11, 18, 18, 18) | 3% (2, 2, 3, 3, 2, 2, 3) | 11% (11, 10, 9, 8, 8, 13, 13) |
| RA-V | 247 | 59% (60, 64, 63, 64, 59, 56, 50) | 21% (19, 16, 18, 21, 17, 24, 34) | 3% (4, 4, 4, 1, 9, 6, 3) | 17% (17, 16, 15, 14, 15, 14, 13) |
| RA-VI | 594 | 81% (85, 85, 79, 81, 77, 77, 74) | 9% (5, 5, 12, 8, 13, 15, 18) | 1% (1, 1, 1, 3, 3, 1, 1) | 9% (9, 9, 7, 7, 7, 7, 7) |

RA-I is the poorest performing region, with only 37% of stations meeting the minimum requirement, and 35% not providing any CLIMAT messages, this has not significantly changed, neither better or worse, over the last 8 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 recent drop in RA-III statistics of fully compliant stations was due to CLIMAT messages from Peru not being received at NCEI.

For the RBCN network, which includes the GSN, the situation is even worse in RA-I with only 22% of stations meeting the minimum requirement. Regions I and IV 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.

GCOS Upper Air Network (GUAN)

The following table is the 2018 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 2017, 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 2018 (% for 2017, 2016, 2015, 2014, 2013, 2012 and 2011) |
|------------|-------------------------|--|
| RA-I | 23 | 22% (30%, 39%, 35%, 39%, 46%, 48%, 57%) |
| RA-II | 38 | 87% (89%, 87%, 87%, 87%, 87%, 87%, 87%) |
| RA-III | 18 | 72% (61%, 61%, 67%, 72%, 67%, 89%, 78%) |
| RA-IV | 24 | 92% (92%, 87%, 79%, 83%, 75%, 83%, 87%) |
| RA-V | 38 | 79% (79%, 84%, 79%, 76%, 74%, 84%, 87%) |
| RA-VI | 24 | 87% (87%, 87%, 87%, 87%, 83%, 92%, 87%) |
| Antarctica | 12 | 67% (67%, 58%, 67%, 58%, 58%, 83%, 83%) |

Eleven (11) of the GUAN stations (6%) were 'Silent' (zero reported TEMP observations) during 2018 and 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 22% of the GUAN stations have met the minimum requirement for 2018, compared with 30% for 2017, and which continues, by some margin, to be the worst performing region. This poor, and worsening (8% down on 2017), 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. Six(6) stations were in-active during the period; Dakar, Senegal (Unknown); Vacoas, Mauritius (Radiosonde consumables); Aswan, Egypt (Unknown); Khartoum, Sudan (Hydrogen system); Dar es Salaam, Tanzania (Hydrogen system); and Abidjan, Ivory Coast (Hydrogen system). A further nine (9) stations had at least 1 month with zero reported TEMP observations; 61052; 63450; 63741; 63985; 64910; 67083; 67774; 68110; and 68592.

The performance in Region II in 2018 was similar to that for the previous years, with five (5) 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 8 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 2017. The Russian Federation station at Omsk(28698) changed the WMO identifier used to report the TEMP observations in November for which the monitoring statistics have not taken into account.

The performance in Region III in 2018 was a small improvement over the previous two years, with 5 stations not meeting the minimum requirement. The three (3) stations which were inactive in 2017 restarted operations and as a result there were no completely inactive stations.

The performance in Region IV in 2018 was the same as the previous year with 2 stations not meeting the minimum requirement. No stations were completely in-active during the period but two (2) stations, 37789 and 80001, had at least 1 month with zero reported TEMP observations.

Region V was the same as for 2017, 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. Two (2) stations, 91610 and 96315, had at least 1 month with zero reported TEMP observations.

The performance in Region VI in 2018 was the same as for the previous 4 years, with 3 stations not meeting the minimum requirement. Only Yerevan, Armenia, had a period of inactivity due to a lack of consumables.

The performance in the Antarctica region in 2018 was the same as for the previous year, 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 relocating for safety reasons. Novolazaravskaja (Russian Federatio) has been inactive since August.

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 was raised to accomplish projects dedicated to improve climate observation systems. The following projects have been completed in 2017, or are still on-going:

- Support for the ongoing operations of the GUAN station at Gan, Maldives was sponsored by GCOS in 2018, with a new competitive tender for 400 units each of radiosondes and balloons, managed by GCOS. These will be delivered in the 1st quarter of 2019.
- Support for the ongoing operations of the GUAN station at Yerevan, Armenia was sponsored by Japan in 2018, with a new competitive tender for 400 units each of radiosondes and balloons, managed by GCOS. These will be delivered in the 2nd quarter of 2019.
- 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.
- Support for the ongoing operations of the GUAN station at Nairobi and a new station at Lodwar, Nairobi was organized in collaboration with the HIGHWAY project (managed by WMO using funds from UK). This involved a technical assessment of the systems at the two locations sponsored and an agreed action plan between HIGHWAY, GCOS and the Kenyan Meteorological Office. Procurement projects for 800 units of radiosondes and balloons and a new Hydrogen Generator System for Nairobi, is being managed by GCOS (through WMO) and will be delivered in the 2nd quarter of 2019.
- Support for the restart of operations of the GUAN station at Dar Es Salaam, Tanzania was organized in collaboration with the HIGHWAY project (managed by WMO using funds from UK). This involved a technical assessment of the system and an agreed action plan between HIGHWAY, GCOS and the Tanzanian Meteorological Agency. Procurement projects for 800 units of radiosondes and balloons and a new Hydrogen Generator System for Dar Es Salaami, is being managed by GCOS (through WMO) and will be delivered in the 3rd quarter of 2019.
- Support for the ongoing operations of the UAN station at Entebbe, Uganda was organized in collaboration with the HIGHWAY project (managed by WMO using funds from UK). This involved a technical assessment of the system and an agreed action plan between HIGHWAY, GCOS and the Uganda National Meteorological Administration. Procurement projects for 800 units of radiosondes and balloons and the service/maintenance of the Hydrogen Generator System for Entebbe, is being managed by GCOS (through WMO) and will be delivered in the 3rd quarter of 2019.