

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

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**Period – April 2019 to March 2020
(Includes statistics from 2011 to 2018)**

Network Station List (2020 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 71828 (Schefferville) to 73075 (Schefferville Cote-Nord) (No CLIMAT message as yet from 73075 but SYNOP reports)
RA-V	151 Stations (0)	No Changes
RA-VI	138 Stations (0)	Austria 11146 (Sonnblick) to 11343 (Sonnblick - Autom) (Change already implemented CLIMAT message now 11343)
ANTON	42 Stations (0)	No Changes
TOTAL	1023 Stations	

GCOS Upper Air Network (GUAN)

RA-I	23 Stations (0)	Senegal 61641 (Dakar-yoff) to 61660 (Dakar-diass-aibd) (Met Service has relocated the operational radiosonde to the new airport of Diass and monitoring shows reports from 61660. No official communication from Senegal so I have chased. I would expect this to be confirmed.)
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)	Australia 94294 (Townsville Aero) to 95282 (Woodstock) (94294 closed on 16/01/2020; 95282 started on 12/12/2019)
RA-VI	24 Stations (0)	No Changes
ANTON	12 Stations (0)	No Changes
TOTAL	177 Stations (0)	

The above changes will be submitted to AOPC Chairs (March 2020) for electronic approval. The 2020 update will be published in April 2020.

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 2019 percentage of stations that are compliant and those that are partially or non-compliant. In brackets are the statistics for 2018, 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	26% (37, 31, 40, 29, 29, 32, 28, 23)	33% (21, 34, 25, 31, 33, 33, 36, 39)	6% (5, 3, 9, 15, 10, 10, 11, 14)	35% (37, 32, 26, 25, 28, 25, 25, 24)
RA-II	258	76% (74, 79, 83, 78, 71, 73, 73, 75)	17% (14, 15, 10, 14, 21, 19, 19, 19)	1% (5, 0, 2, 2, 3, 2, 2, 1)	6% (7, 6, 5, 6, 5, 6, 6, 5)
RA-III	101	72% (52, 63, 65, 61, 76, 89, 84, 69)	5% (24, 15, 29, 35, 20, 6, 13, 28)	9% (1, 6, 0, 0, 1, 0, 0, 0)	14% (23, 16, 6, 4, 3, 5, 3, 3)
RA-IV	178	82% (88, 86, 90, 88, 88, 88, 81, 80)	16% (7, 12, 7, 9, 10, 11, 17, 18)	1% (4, 1, 2, 2, 1, 1, 1, 1)	1% (1, 1, 1, 1, 1, 0, 1, 1)
RA-V	151	66% (62, 61, 67, 66, 70, 63, 58, 52)	15% (21, 21, 15, 16, 17, 16, 23, 34)	4% (1, 3, 3, 4, 1, 7, 7, 1)	15% (16, 15, 15, 14, 13, 14, 12, 11)
RA-VI	138	81% (75, 82, 84, 77, 80, 82, 78, 81)	7% (15, 8, 7, 14, 9, 12, 17, 15)	3% (1, 2, 2, 3, 5, 2, 1, 0)	9% (9, 8, 7, 6, 6, 4, 4, 4)
ANTON	42	88% (84, 83, 81, 77, 79, 60, 45, 50)	10% (14, 12, 17, 19, 19, 36, 43, 33)	2% (2, 5, 2, 2, 2, 2, 5, 12)	0% (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	17% (22, 18, 23, 16, 17, 19, 13, 12)	19% (15, 22, 17, 22, 20, 20, 23, 22)	6% (4, 5, 8, 11, 8, 7, 12, 13)	58% (59, 55, 52, 51, 55, 54, 52, 53)
RA-II	664	71% (67, 77, 80, 73, 71, 73, 67, 57)	19% (17, 14, 12, 17, 18, 15, 22, 30)	2% (7, 1, 1, 2, 4, 4, 1, 2)	8% (9, 8, 8, 8, 7, 8, 10, 11)
RA-III	298	74% (57, 60, 64, 63, 73, 81, 73, 65)	3% (15, 13, 22, 25, 14, 6, 15, 23)	5% (1, 8, 1, 0, 1, 1, 1, 0)	18% (27, 19, 13, 12, 12, 12, 11, 12)
RA-IV	337	71% (75, 77, 80, 78, 78, 72, 67, 66)	18% (10, 10, 8, 10, 11, 18, 18, 18)	3% (4, 2, 2, 3, 3, 2, 2, 3)	8% (11, 11, 10, 9, 8, 8, 13, 13)
RA-V	247	55% (57, 60, 64, 63, 64, 59, 56, 50)	13% (23, 19, 16, 18, 21, 17, 24, 34)	4% (2, 4, 4, 4, 1, 9, 6, 3)	28% (18, 17, 16, 15, 14, 15, 14, 13)
RA-VI	594	84% (79, 85, 85, 79, 81, 77, 77, 74)	5% (10, 5, 5, 12, 8, 13, 15, 18)	3% (1, 1, 1, 1, 3, 3, 1, 1)	8% (10, 9, 9, 7, 7, 7, 7, 7)

RA-I is the poorest performing region, with only 26% 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 9 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.

For the RBCN network, which includes the GSN, the situation is even worse in RA-I with only 17% of stations meeting the minimum requirement. All regions show an 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, this is particular significant for RA-I.

GCOS Upper Air Network (GUAN)

The following table is the 2019 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 ECMWF. In brackets are the same statistics for 2011 to 2018. For 2013 to 2018 these are based on availability according to NCEP, and for 2011 to 2012 to NCEI.

Region	Number of GUAN stations	% meeting minimum GCOS requirements in 2019 (% for 2018, 2017, 2016, 2015, 2014, 2013, 2012 and 2011)
RA-I	23	22% (22%, 30%, 39%, 35%, 39%, 46%, 48%, 57%)
RA-II	38	87% (87%, 89%, 87%, 87%, 87%, 87%, 87%, 87%)
RA-III	18	72% (72%, 61%, 61%, 67%, 72%, 67%, 89%, 78%)
RA-IV	24	96% (92%, 92%, 87%, 79%, 83%, 75%, 83%, 87%)
RA-V	38	79% (79%, 79%, 84%, 79%, 76%, 74%, 84%, 87%)
RA-VI	24	92% (87%, 87%, 87%, 87%, 87%, 83%, 92%, 87%)
Antarctica	12	67% (67%, 67%, 58%, 67%, 58%, 58%, 83%, 83%)

Twelve (12) of the GUAN stations (7%) were 'Silent' (zero reported TEMP observations) during 2019, which is the highest since this monitoring was started in 2011. In 2018 and 2017 it was eleven (11), 2016 and 2015 it was seven (7), 2014 and 2013 it was three (3), 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 2019, compared with the same for 2018 and 30% for 2017, and which continues, by some margin, to be the worst performing region. This very poor, and not improving (same as 2018 and 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. Seven (7) stations were in-active during the period; Dakar, Senegal (Unknown); Vacoas, Mauritius (Radiosonde consumables); Khartoum, Sudan (Hydrogen system); Addis Ababa, Ethiopia (Unknown); Dar es Salaam, Tanzania (Hydrogen system); Harare, Zimbabwe (Unknown); and King Shaka Airport, South Africa (Hydrogen system). A further nine (8) stations had at least 1 month with zero reported TEMP observations; 61052; 62414; 63741; 63985; 64910; 65578; 68110; and 68906.

The performance in Region II in 2019 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 9 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 2018, and the Maldives station at Gan (43599) had a lengthy outage of its hydrogen system.

The performance in Region III in 2019 was the same as for 2018, with 5 stations not meeting the minimum requirement. Two (2) stations had lengthy periods of inactivity; 82397 Fortaleza, Brazil (5 months) and 84008 San Cristobal, Ecuador (10 months).

The performance in Region IV in 2019 was an improvement on the previous year with only 1 stations not meeting the minimum requirement (78762 Juan Santamaria, Costa Rica). No stations were completely in-active during the period but four (4) stations, 76654, 78397, 78954 and 78988, had at least 1 month with zero reported TEMP observations.

Region V was the same as for 2018 and 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, 91643 and 96315, had at least 1 month with zero reported TEMP observations.

The performance in Region VI in 2019 was an improvement on previous years, with 2 stations not meeting the minimum requirement. Two (2) stations, 17130 and 37789, had at least 1 month with zero reported TEMP observations.

The performance in the Antarctica region in 2019 was the same as for the previous year, with 4 stations not meeting the minimum requirement. One (1) station was completely in-active during the period; 89512 Novolazaravskaja (Russian Federation). Halley Bay (89022) had an extensive period of inactivity owing to the station needing relocating for safety reasons. Base Marambio (89055) has very few observations each month.

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 3.5 million USD was raised to accomplish projects dedicated to improving climate observation systems. The following projects were completed in 2019, or are still on-going:

- Support for the ongoing operations of the GUAN station at Gan, Maldives was sponsored by GCOS in 2019/20, with a new competitive tender for 400 units each of radiosondes and balloons, managed by GCOS. These were delivered in the 1st quarter of 2019. In February 2020 an order for a replacement power-supply unit for the Hydrogen Generator system was placed.
- Support for the ongoing operations of the GUAN station at Yerevan, Armenia was sponsored by Japan in 2019/20, with a new competitive tender for 400 units each of radiosondes and balloons, managed by GCOS. These were 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 was signed in 2018 for a period of 2 years, a no-cost 1-year extension was approved in early 2020.
- 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. Equipment and consumables were delivered & implemented during 2019 and both stations were operational at the end of 2019. Technical support through the GCOS Network Manager, through GCOS and the HIGHWAY project will continue through 2020.
- 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 Salaam, is being managed by GCOS (through WMO). Purchase orders have been issued but equipment delivery and implementation has been delayed. It is planned that this work will be completed by the 3rd quarter of 2020.
- 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. Emergency repair work was completed on the radiosonde ground-system and storage tank for the hydrogen generator, along with the installation of network communications. However there continues to be significant technical and capability issues, which the GCOS Network Manager and the HIGHWAY will continue to support during 2020.