

# The Global Observing System for Climate

## Report on the progress of the task team on the future of GUAN

*GRUAN ICM-10*

*23<sup>rd</sup>-27<sup>th</sup> April 2018*

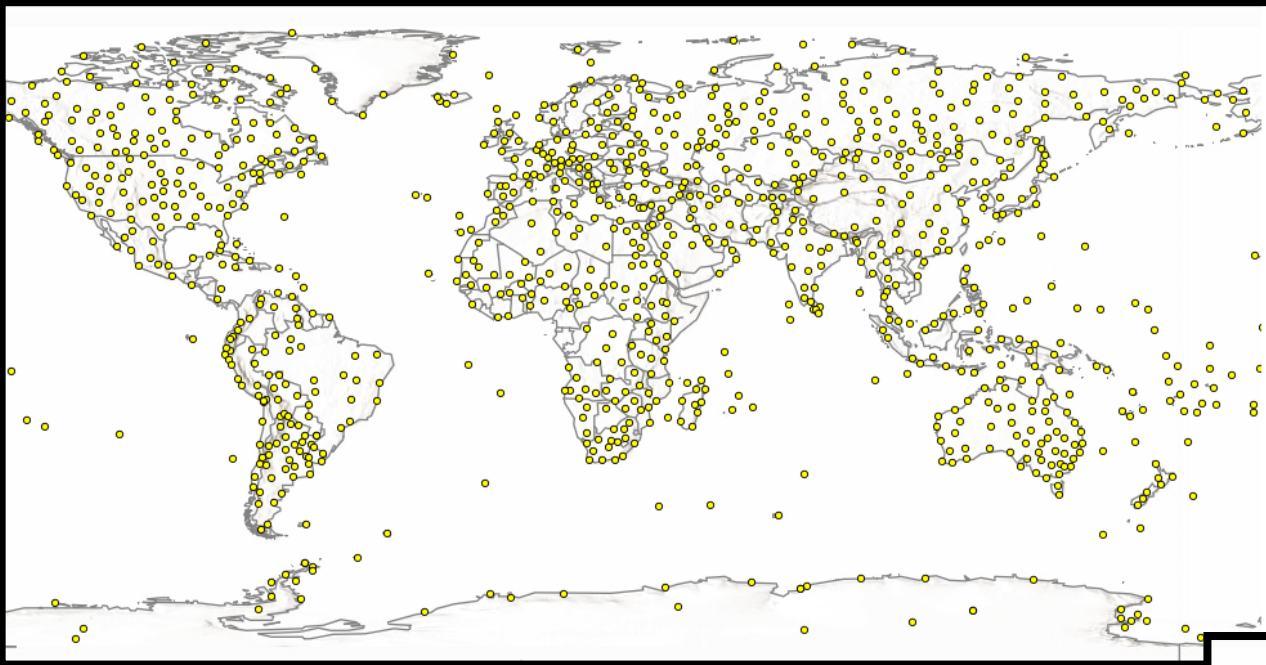
*Postdam, Germany*

**GCOS Secretariat, WMO**

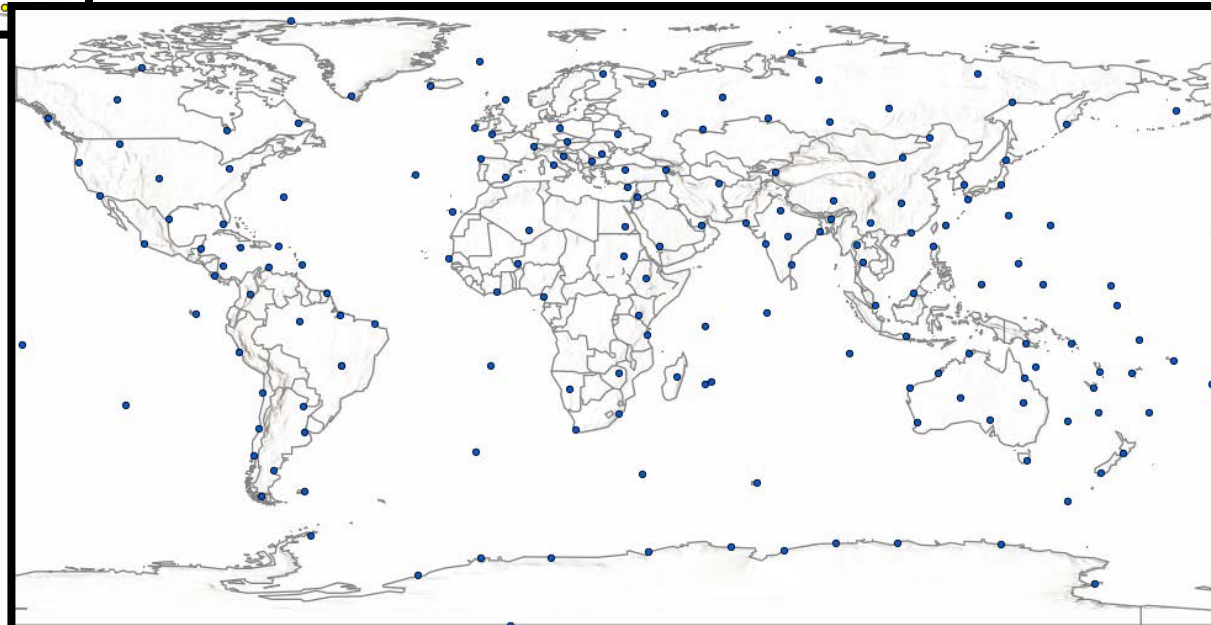
Tim Oakley, GCOS Network Manager

# GCOS Networks

**GCOS Surface Network (GSN) - 1023**



**GCOS Upper-Air Network (GUAN) - 177**



## GUAN

The scope of the GUAN is a global network with the spacing set at 5 to 10 degrees latitude, sufficient to resolve synoptic-scale waves. The desired parameters are temperature, pressure (geopotential height), wind, and humidity (at least in the troposphere). The inclusion criteria are:

- Commitment by NMHSs with regard to continuity;
- Length and quality of historical time series;
- Current measurement quality.

The purposes of the GUAN are the following:

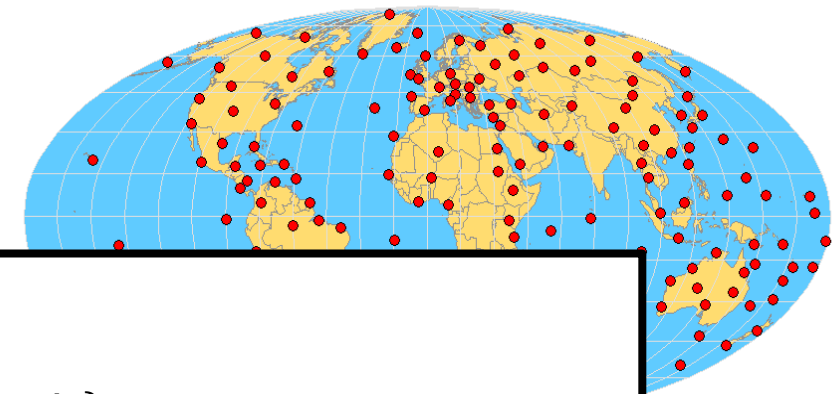
- To establish national commitments for the preservation of a minimum set of upper-air stations for the foreseeable future;
- To build a collection of validated data from these stations in standardized formats;
- To provide this information to the global climate community with no formal restrictions.

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## Why do we need to review the GUAN?

- Network now 20+ years old
- Significant changes in both technology and data users
- GUAN often cited as being of little difference from the comprehensive network
- Requirements more explicit on the needs and benefit of high quality data, demanding a stronger governance on data availability, timeliness, accuracy
- Operators (Mainly WMO Members) have forgotten their commitment
- Increasing pressure on resources
- 2014 GCOS network review meeting recommended an updated, more proactively managed network
- Operational monitoring, Tiered networks and programmes such as GAIA-CLIM have highlighted the weaknesses in the current system

# Task-Team GUAN



First  
5<sup>th</sup>-6<sup>th</sup>

## Membership

Chair (If no suitable candidate, agreed on a meeting by meeting basis)  
AOPC Expert – Peter Thorne ([peter.thorne@nuim.ie](mailto:peter.thorne@nuim.ie)) – Maynooth University (Ireland)  
GRUAN Expert – Richard Querel ([Richard.Querel@niwa.co.nz](mailto:Richard.Querel@niwa.co.nz)) – NIWA (New Zealand)  
NWP Expert – Bruce Ingleby ([bruce.ingleby@ecmwf.int](mailto:bruce.ingleby@ecmwf.int)) – ECMWF (UK)  
CBS/National Expert – Hiram Escabi ([hiram.escabi@noaa.gov](mailto:hiram.escabi@noaa.gov)) – NWS (USA)  
Satellite Expert – Marc Schroeder ([Marc.Schroeder@dwd.de](mailto:Marc.Schroeder@dwd.de)) – DWD (Germany)  
National Expert – (Large GUAN contribution – China, Japan, Russia?)  
GCOS Network Manager (Secretariat support) – Tim Oakley ([toakley@wmo.int](mailto:toakley@wmo.int)) (UK)  
GCOS AOPC SO (Secretariat support) – Caterina Tassone ([ctassone@wmo.int](mailto:ctassone@wmo.int)) (Switzerland)  
CIMO expert team on upper air systems representative – Later meeting, if required  
HMEI Observer – Later meeting, if required

### Action A13

Action

Benefit

Who

Time frame

Performance  
indicator

Annual cost

10 hPa, twice-daily

making

### Action A5:

Action	Encourage dual transmission of TAC and BUFR for at least 6 months and longer if inconsistencies are seen (to compare the two data streams for accuracy).
Benefit	Transition to BUFR does not introduce discontinuities in the datasets. BUFR allows metadata to be stored with data.
Who	Parties operating GSN stations for implementation
Time frame	Ongoing for implementation; review by 2018
Performance indicator	Proven capability to store BUFR messages giving same quality or better as TAC data
Annual cost	US\$ 100 000–1 million

Action

Benefit

Who

Time frame

Performance  
indicator

Annual cost

For radiosonde data and any other data that require substantive processing from the original measurement (e.g. digital counts) to the final estimate of the measurand (e.g. T and q profiles through the lower stratosphere); the original measured values should be retained to allow subsequent reprocessing.

Possibility to reprocess data as required, improved data provenance

HMEI (manufacturers), NMHSs, archival centres.

Ongoing.

Original measurement raw data and metadata available at recognized repositories

US\$ 100 000–1million

## ANNEX 4: SWOT ANALYSIS FOR GUAN (SUMMARY FROM MEETING)

<u>Strengths</u>	<u>Weaknesses</u>
<p>GUAN is a well known brand. It is regarded as high-quality Radiosonde observations. (even if this is only a perception) Common practices and an underpinning standard. Has documented governance through WMO technical regulations and GCOS documents.</p>	<p>The aims, requirements and user needs of GUAN are not known and/or have just been forgotten. No NMHS 'buy-in'. Passive not Active management (i.e. poor performance is not addressed) Little difference between GUAN and the Comprehensive network No auditing of GUAN and little outreach between GUAN operators Requirements and guidance has not been updated to reflect the change in technology and user needs</p>
<u>Opportunities</u>	<u>Threats</u>
<p>GUAN best practices and outreach can support the comprehensive network Utilised improved tools for Quality Management &amp; Visualisation Healthy competition in industry for the prestige of supplying GUAN stations Better alignment of GRAUN and GUAN, for example GRAUN products from GUAN stations.</p>	<p>Budget cuts and resource priorities are often targeted at radiosonde system consumables The pollution aspect of radiosondes Lack of clarity on the difference between GRAUN and GUAN might cause competition for resources</p>



# Vision for GUAN

- **Continuing under its current requirements is not an option**
- New focus on a guaranteed quality of observational data, according to updated requirements
- A subset of the comprehensive network based on quality assurance rather than a fixed network of stations. Adopting a tiered-network approach (Comprehensive-GUAN-GRUAN), as described by GAIA-CLIM
- Actively managed through a lead-centre, with a certification process, real-time monitoring and validated station list for the user community
- Process to identify gaps in global/regional networks, both in data sparse areas and least develop countries, to allow targeted support projects, using relevant cooperation and funding mechanisms (i.e. GCM, GCF, national bi-lateral programmes).

## 7. WORK PLAN (2018 AND 2019)

The following work-plan was agreed:

1. Meeting report to include draft SWOT and Vision (High-level statement), key points for individual presentations. Final version of meeting report will provide the agreed version of SWOT & Vision.

**(Lead Tim Oakley – Target Date Jan 2018)**

2. ISPra meeting document – Stated GUAN requirements will be taken as a starting point of a future GUAN. (Included as an Annex in the meeting report)

**(Lead Tim Oakley – Target Date N/A)**

3. Literature review for studies on the benefits of number of daily soundings, maximum height of measurements, scheduling, remote locations etc.

**(Lead GCOS Secretariat to coordinate, and all/AOPC to contribute – Target Date Feb 2018)**

4. Review (3) above, summarize and identify gaps. Articulate experiments that might close the gaps in scientific understanding.

**(Lead ?? – Target Date ??)**

5. BUFR (A5). Note the report of Bruce Ingleby, and support the resolution of issues identified.

**(Lead All Members – Target Date Ongoing)**

6. (A17) – GRUAN technical document about benefits of retaining raw data (Ruud Dirksen). Approach CIMO. Approach HMEI (GCOS Secretariat)

**(Lead Ruud Dirksen, GCOS Secretariat – Target Date ??)**

7. Update of (2) for draft specification for GUAN-II

**(Lead ?? – Target Date ??)**

8. High-level proposal for a redefined GUAN to be presented to WMO Congress (May 2019). Document would need to finalized by Jan 2019.

**(Lead tba – Target Date tba)**

9. Detailed proposal for a redefined GUAN to be presented to WMO EC (2020).

**(Lead tba – Target Date tba)**



## **Summary (Results)** - Presentation from Tony Reale (NOAA/NESDIS/STAR)

GCOS provides more balanced global distribution well suited to satellite product cal/val

SAT test system (blue) shows reduced bias and standard deviations using GCOS vs conventional observations (compare slides 9,10; 13,14; 21,22, 25,26) for Temp and Moisture (particularly at +/- 2hr)

Comparison show overall lower standard deviations (SAT and NWP) for temperature (particularly lower troposphere) using GUAN vs Conventional observations; not so evident for moisture

GUAN shows systematically higher vertical density of observations (more sig levels) manifested by higher frequency vertical oscillations, “wiggles”, in GUAN vs conventional plots

Higher percentage of GUANS extending about 50 and 20 hPa (9, 10)

Results for +/-6 vs +/- 2 show overall reduced sdev differences for SAT temp (10 vs 22), fairly similar for moisture (differences in respective global samples (6 vs 18) appears a factor for moisture bias).

Results cover summer period, I plan to take a look at winter period (results can also be provided for additional regional, instrument types, specific GUAN sites and GRUAN ...)

Suggest a few GUAN sites in tropical regions can help make up for the loss of ARM / GRUAN TWP sites at minimal cost ...



QUESTIONS



WMO



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UN  
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