



WMO/IOC/UNEP/ICSU  
GLOBAL CLIMATE OBSERVING  
SYSTEM (GCOS)

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**11th GRUAN Implementation-  
Coordination Meeting (ICM-11)**

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Session 7

Singapore  
20 - 24 May 2019

## GRUAN Site Report for Boulder

*(Submitted by Dale Hurst)*

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### **Summary and Purpose of this Document**

Report from the GRUAN site Boulder for the period January to December 2018.

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## Overview

The Boulder GRUAN site (Marshall Field Site) continued to launch Vaisala RS41 radiosondes along with our weekly ozone sounding payload (EnSci model 2Z ECC ozonesonde, InterMet model RS-1 radiosonde) and our monthly ozone and water vapor sounding payload (above plus NOAA frost point hygrometer, FPH). Data from all these sondes are submitted to GRUAN for processing, quality control and/or archival. Currently, none of these data streams are being processed, but that is about to change as the RS41 data product is nearing completion, as is the ECC ozonesonde data product. In the future, the FPH and InterMet radiosonde data may also be processed into a GRUAN data product. The GNSS receiving system (P041) located at the Boulder GRUAN site (Marshall Field Site) is operated and maintained by NCAR personnel who have not been engaged enough to submit their data to GRUAN. In a recent development, approval is currently being sought to move a GNSS receiving system owned by GFZ Potsdam from Table Mountain (Boulder) to Marshall Field Site. Because of GFZs high level of interest in GRUAN, this would become the GNSS receiving system of choice for the Boulder GRUAN site.

## Change and change management

There were no changes to any aspect of the Boulder GRUAN site during 2018. However, the change from RS92 to RS41 radiosondes did occur in December 2017. Since dual flights were being conducted at other mid-latitude sites in the USA (e.g., Beltsville, Table Mountain (CA) and SGP), it was decided the Boulder sites transition would rely on the findings of comparisons being performed at these other sites.

## Resourcing

As in previous years, NOAAs budget continued to tighten due to flat funding and increased operating costs. The US presidential election in 2020 will be a bellwether for the ability of NOAA/ESRL/GMD to continue operating and managing the Boulder GRUAN site.

## Operations

Unlike our ozone soundings, for which balloons are allowed to reach the burst point, our FPH soundings continued to include a valve in the balloon neck that starts to release helium from the balloon at about 16 hPa, preventing burst and permitting controlled descent of the balloon and contamination-free stratospheric water vapor measurements by the FPH. Hence, about 25% of our soundings do not

reach 10 hPa by design. In 2018 we also experienced some balloon quality problems that caused about 30% of the ozone soundings to not reach 10 hPa.

## Site assessment and certification

The Boulder GRUAN site has been certified (and was recertified in 2018)

## GRUAN-related research

I contribute to WG GRUAN by filling the role of co-chair of the Task Team of Site Representatives. I also serve as the site representative for the Boulder GRUAN site. During the last year the Technical Document 7, Review of Multiple-payload Radiosonde Sounding Configurations for Determining Best-Practice Guidance for GRUAN Sites, was published.

## GRUAN-related papers published in 2018:

I was a co-author on four peer-reviewed papers published in 2018 that have scientific connections to GRUAN. They were:

- Lossow, S., F. Khosrawi, M. Kiefer, K.A. Walker, J.-L. Bertaux, L. Blanot, J.M. Russell III, et al., The SPARC water vapour assessment II: Profile-to-profile comparisons of stratospheric and lower mesospheric water vapour data sets obtained from satellites, *Atmos. Meas. Tech. Discuss.*, <https://doi.org/10.5194/amt-2018-380>, 2018.
- Ortega, I., R.R. Buchholz, E.G. Hall, D.F. Hurst, A.F. Jordan, and J.W. Hannigan, Tropospheric water vapor profiles obtained with FTIR: comparison with balloon-borne frost point hygrometers and influence on trace gas retrievals, *Atmos. Meas. Tech.*, 12, 873-890, doi:10.5194/amt-12-873-2019, 2019.
- Lossow, S., D.F. Hurst, K.H. Rosenlof, G.P. Stiller, T. von Clarmann, S. Brinkop, M. Dameris, P. Jckel, D.E. Kinnison, J. Plieninger, D.A. Plummer, F. Ploeger, W.G. Read, E.E. Remsberg, J.M. Russell, and M. Tao: Trend differences in lower stratospheric water vapour between Boulder and the zonal mean and their role in understanding fundamental observational discrepancies, *Atmos. Chem. Phys.*, 18, 8331-8351, doi:10.5194/acp-18-8331-2018, 2018.
- Davis, S.M., K.H. Rosenlof, D.F. Hurst, H.B. Selkirk, and H. Voemel, Stratospheric Water Vapor [in State of the Climate in 2017], *Bull. Amer. Meteor. Soc.*, 99 (8), S54-S56, 2018.

## **WG-GRUAN interface**

No special assistance or support by the WG is required at this time.

## **Items for ICM-11 plenary discussions**

Updates on the progress of non-R23-cooled frost point hygrometers.

## **Other archiving centers**

We (NOAA/ESRL/GMD) archive our ozone and water vapor sounding data on an anonymous FTP server in Boulder. These data are also archived every six months at NDACC. The ozone and water vapor sounding data are now also archived at NOAAs National Centers for Environmental Information (NCEI) in Asheville, North Carolina.

## **Participation in campaigns**

There were no campaigns conducted at the Boulder GRUAN site during 2018. There were ozone and water vapor soundings performed in coordination with overpasses of Boulder by the Stratospheric Aerosols and Gas Experiment III instrument aboard the International Space Station (SAGE III/ISS). The ECC and FPH profiles are being used to validate the SAGE III/ISS ozone and water vapor data products. Data from all of these soundings have been submitted to GRUAN if a RS41 was included in the payload.

## **Future plans**

Our plan for 2019 is to stay the course and pray for a change of administration in 2020.



# GRUAN Site Report for Boulder (BOU), 2018

Reported time range is Jan 2018 to Dec 2018

Created by the Lead Centre

Version from 2019-05-09

## 1 General GRUAN site information

Object	Value
Station name	Boulder
Unique GRUAN ID	BOU
Geographical position	39.9500 °N, -105.2000 °W, 1743.0 m
Operated by	GMD   Global Monitoring Division, part of: ESRL   Earth System Research Laboratory, part of: NOAA   National Oceanic and Atmospheric Administration
Main contact	Hurst, Dale F.
WMO no./name	-
Operators	currently 5, changes +0 / -0
Sounding Site	1
GNSS	1

### 1.1 General information about GRUAN measurement systems

System	Name	Type	Setups	Measurements
BOU-GN-01	GNSS Site P041	GNSS	0	not operational
BOU-RS-01	Radiosonde Launch Site (Marshall)	Sounding Site	4	45

### 1.2 General comments from Lead Centre

No comments available from Lead Centre.

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## 2 System: GNSS Site P041 (BOU-GN-01)

<b>Object</b>	<b>Value</b>
System name	GNSS Site P041
Unique GRUAN ID	BOU-GN-01
System type	GNSS (GN - GNSS)
Geographical position	39.9495 °N, -105.1943 °W, 1728.8 m
Operated by	GMD   Global Monitoring Division, part of: ESRL   Earth System Research Laboratory, part of: NOAA   National Oceanic and Atmospheric Administration
Instrument contact	Hurst, Dale F.
Started at	-
Defined setups	-
Possible streams	-

### 2.1 Lead Centre comments

No comments available from Lead Centre.

### 3 System: Radiosonde Launch Site (Marshall) (BOU-RS-01)

Object	Value
System name	Radiosonde Launch Site (Marshall)
Unique GRUAN ID	BOU-RS-01
System type	Sounding Site (RS - Radiosonde)
Geographical position	39.9500 °N, -105.2000 °W, 1743.0 m
Operated by	GMD   Global Monitoring Division, part of: ESRL   Earth System Research Laboratory, part of: NOAA   National Oceanic and Atmospheric Administration
Instrument contact	Hurst, Dale F.
Started at	-
Defined setups	4 (RESEARCH, OZONE, FPH-OZONE, FPH)
Possible streams	FPH, IMET-1, RS41, RS80, RS92

#### 3.1 Lead Centre comments

##### 3.1.1 Dataflow

This dataflow includes data from the Vaisala RS41-SGP, ECC ozone sonde, FPH water vapour and Internet IMET-1. All soundings are submitted using the RsLaunchClient within a month after the launch.

#### 3.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCEI
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##### 3.2.1 Stream: ECC

ECC		43	43	
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##### 3.2.2 Stream: FPH

FPH		13	13	
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##### 3.2.3 Stream: IMET-1

IMET-1		43	43	
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##### 3.2.4 Stream: RS41

RS41		45	45	
RS41-GCA	001		3	
RS41-RAW	001		45	
RS41-EDT	001		45	
RS41-GDP-ALPHA	002		30	



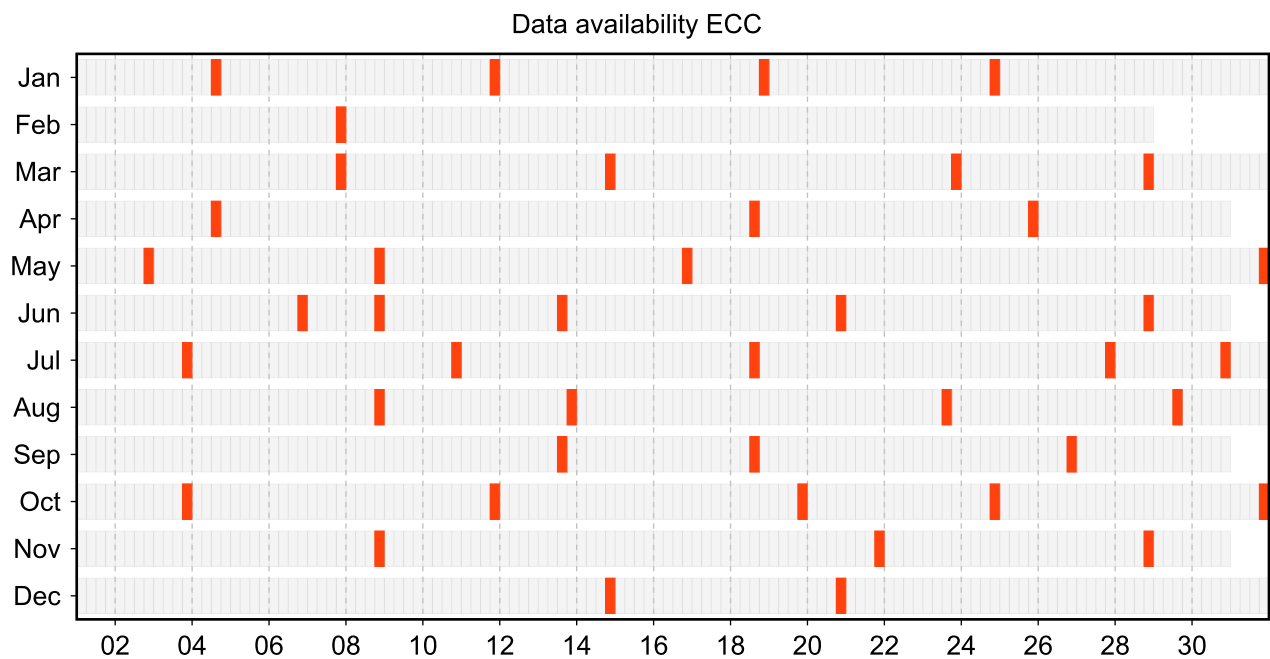
### 3.3 Data availability of data products

Available (green): All steps of processing have been successfully completed. The data file is available at LC (e.g. unapproved or uncertified GRUAN data products) and at NCEI (approved and certified GRUAN data products).

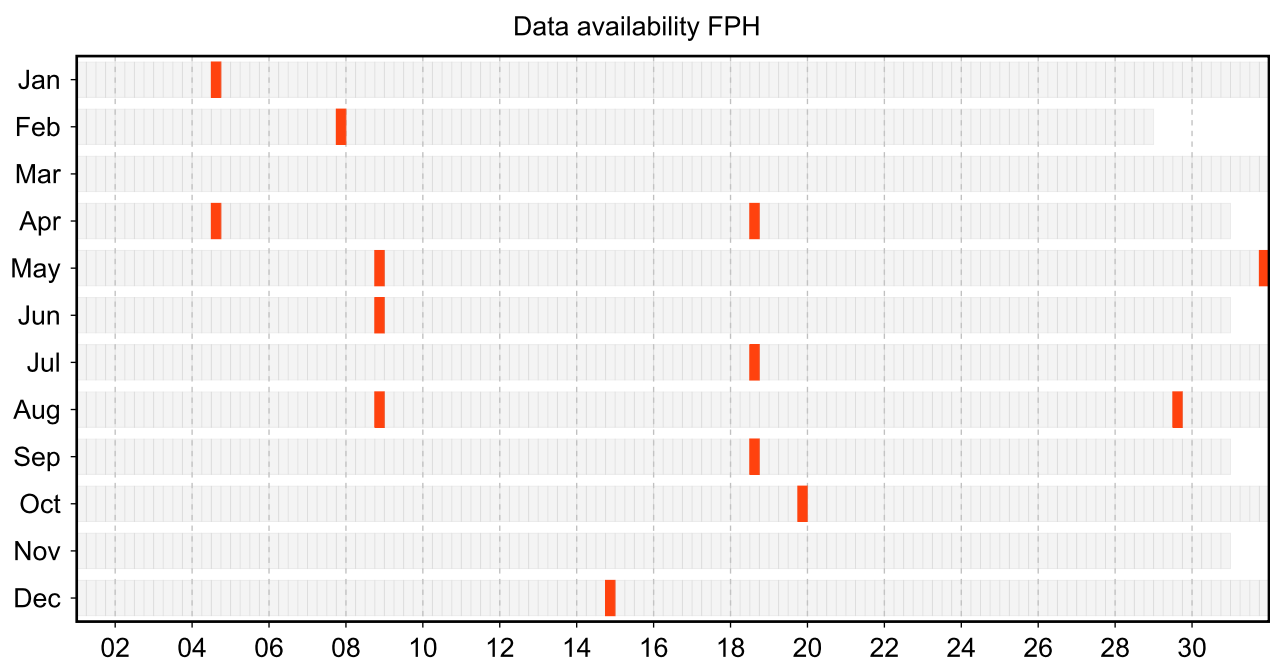
Unprocessed (yellow): The raw data file has been successfully converted to a GRUAN standardized raw data file format (NetCDF). The processing (e.g. GRUAN data processing) has not yet been done, or has not been completed. Reason may be a processing routine which does not yet exist, or software errors.

Original (red): The original raw data file is available (e.g. MWX). The raw data file was not converted to a GRUAN standardized raw data file format (NetCDF). Reason may be a converting routine which does not yet exist, or a corrupt original raw data file, or software errors.

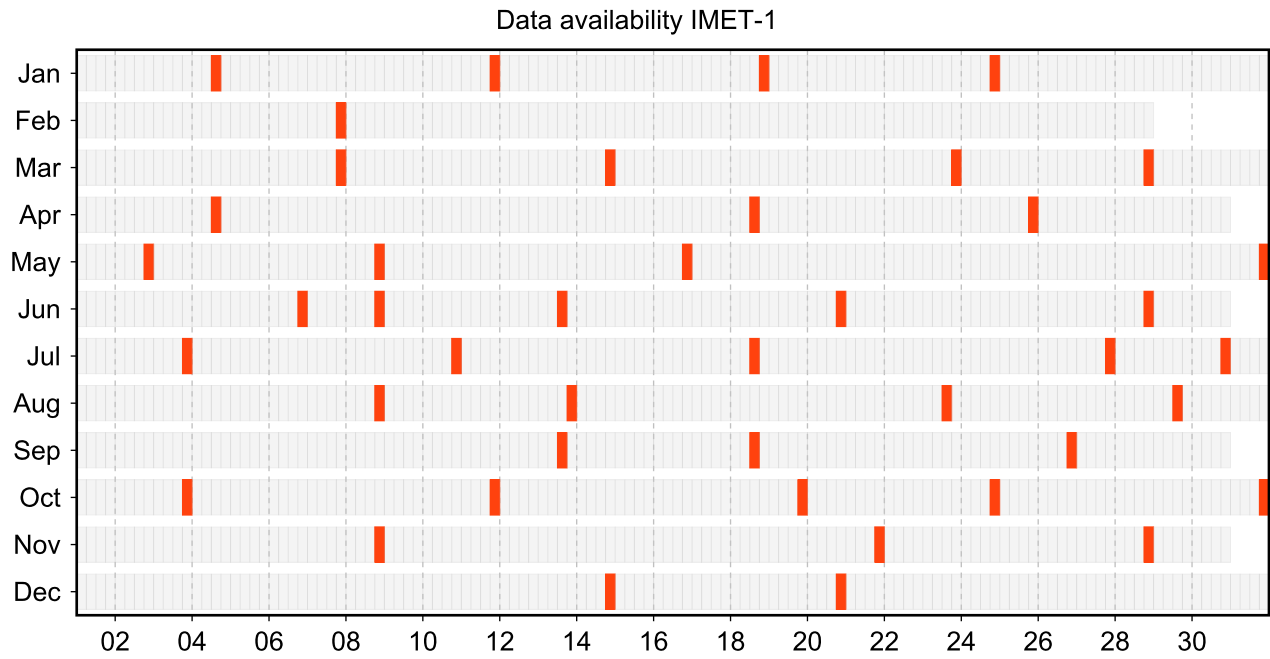
#### 3.3.1 Stream: ECC



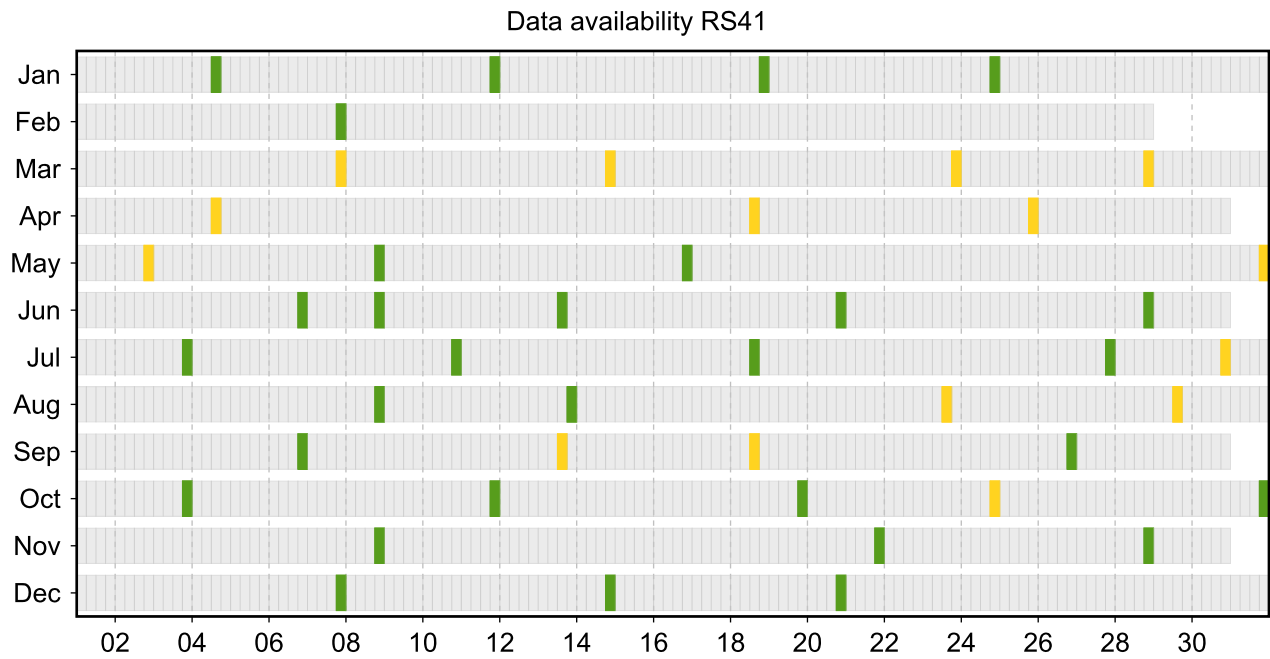
#### 3.3.2 Stream: FPH



### 3.3.3 Stream: IMET-1



### 3.3.4 Stream: RS41



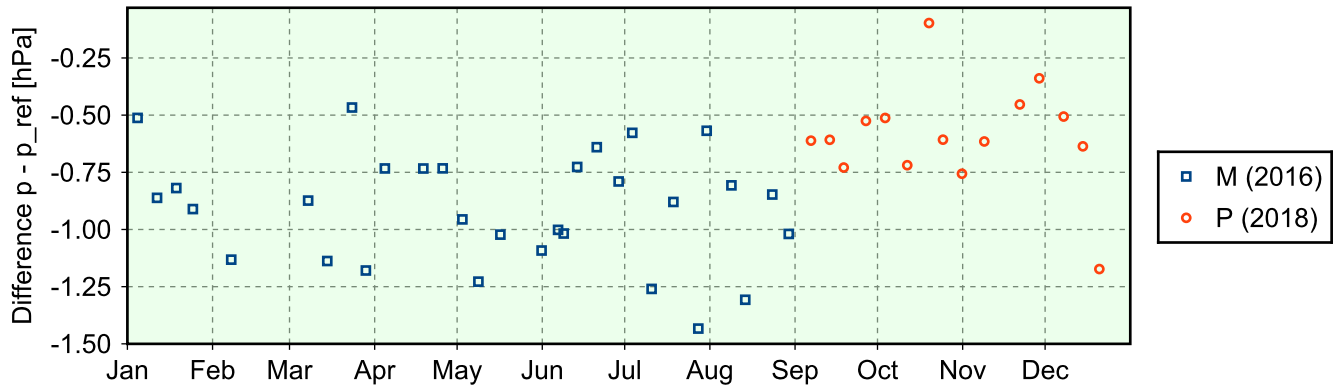
### 3.5 Instrument combinations of BOU-RS-01

Count	Instrument combination
13	ECC, FPH, IMET-1, RS41
30	ECC, IMET-1, RS41
2	RS41

### 3.6 Instrument ground check

#### 3.6.1 Stream: RS41

##### (1) GroundCheck: GC-RI41



##### (2) GroundCheck: GC-SHC

### 3.7 Measurement events

