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GLOBAL CLIMATE OBSERVING  
SYSTEM (GCOS)

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**12th GRUAN Implementation-  
Coordination Meeting (ICM-12)**

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Session 1

Virtual

16 - 20 November 2020

## GRUAN Site Report for Potenza

*(Submitted by Fabio Madonna)*

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

Report from the GRUAN site Potenza for the period January to December 2019.

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## Overview

Currently, only radiosounding measurements, routinely performed twice per week, are contributing to GRUAN data streams. RS41 radiosondes are manually launched, typically on Monday and Thursday between 30 and 60 minutes after sunset, and a manufacturer-independent pre-launch ground check, using the Standard Humidity Chamber (SHC) is regularly performed. An effort has been spent to launch balloons in correspondence of GNSS-RO or LEO satellite overpasses provided by the Lead Center (LC). During the reference period (from January to December 2019), 81 soundings were performed. Due to the lockdown enforced by the Italian government for the COVID-19 pandemic, balloon launches were stopped in the period from March 9th to May 28th of this year.

CNR is currently arranging the GNSS data transfer with GFZ. In next reporting period (2020), the automatic radiosonde launcher, will be upgraded and resume the launches after the stop occurred in 2016. In addition, a new GNSS antenna (Trimble), recently acquired, will be installed and made operational. Finally, the facility will undergo a major upgrade, due to the recent acquisition of a manual portable radiosounding system, a new Raman lidar for aerosol and water vapour profiling, a new microwave profiler (MWR), and a Doppler lidar for wind profiling. All the new instruments will be operational in the spring 2021.

## Change and change management

During the reporting period, there was no change in measurement programs, operating procedures, operators, instruments or expendables, data processing algorithms, data acquisition software, as well as in location of instruments and their operating environments. It must be only reported that the station is often launching balloons, according to the available resources, in correspondence of GNSS-RO or LEO satellite overpasses provided by the Lead Center (LC) when relevant overpasses occur during the week and within  $\pm 2$  hours of the sunset.

## Resourcing

The site of Potenza carries out GRUAN activities using not dedicated funds. As part of a national project aimed at strengthening the Italian research infrastructures, it was possible to refurbish and upgrade the automatic radiosonde launcher, as well as to acquire a spare manual launch system along with several other instruments of interest for the future network development. Moreover, funds are available to ensure 2 weekly launches for the next three years and possible additional resources for participation in measurement campaigns relevant for GRUAN. Finally, the Potenza site is hosting in its data center the filesafe backup for the full GRUAN data archive.

## Operations

No operational challenges or deviations from GRUAN procedures must be reported for the site of Potenza. For more than 90 % of launches performed during the reporting period the burstpoint pressure was below 10 hPa. Despite the international crisis in the availability and marketing of helium, currently used at the Potenza station to inflate balloons, no critical issues are expected in the supply of this gas in the next two years. However, it is technically possible to use hydrogen instead of helium in the future, if needed.

## Site assessment and certification

The site of Potenza was first certified in April 2015 and then recertified in May 2019.

## GRUAN-related research

CNR is leading the C3S 311a Lot3 contract of the Copernicus Climate Change Service (C3S) for the harmonization of GRUAN and IGRA radiosounding historical data archives. Harmonized data both for GRUAN and IGRA have been provided to C3S. GRUAN data are currently publicly available through the C3S Climate Data Store (CDS), while IGRA is going to be released by end of 2020. A bias-adjusted version of IGRA data, called RHARM (Radiosonde HARMonization) will be also provided through the CDS by the same time. The site worked on the preparation of a scientific paper to discuss the results of the experiment carried out, in cooperation with the Italian NMI (INRiM), to assess and compare the performance of RS92 to RS41 sondes. In the frame of the “TT Measurement scheduling and combination”, CNR has investigated the impact on the calculation of trends of temporal and spatial subsampling of radiosonde measurements; the results are discussed in a peer-reviewed paper. Finally, the Potenza site led the data analysis of the first assessment of performances of automatic radiosonde launchers also in view of their use in the GRUAN network. The methodology and results are described in a peer-reviewed paper.

GRUAN-related publications:

- Madonna, F., Tramutola, E., Sy, S., Serva, F., Proto, M., Rosoldi, M., Gagliardi, S., Amato, F., Mar-ra, F., Fassò, A., Gardiner, T., and Thorne, P. W.: Radiosounding HARMonization (RHARM): a new homogenized dataset of radiosounding temperature, humidity and wind profiles with uncertainty, *Earth Syst. Sci. Data Discuss.*, <https://doi.org/10.5194/essd-2020-183>, in review, 2020.
- Madonna, F.: Can Reference radiosounding measurements be used to improve historical time series? *Il Nuovo Cimento C*, Italian Physical Society, 2020, in press.

- SY S, Madonna F, Rosoldi M, et al. Sensitivity of trends to estimation methods and quantification of subsampling effects in global radiosounding temperature and humidity time series. *Int J Climatol.* 2020;123. <https://doi.org/10.1002/joc.6827>
- Madonna, F., Kivi, R., Dupont, J.-C., Ingleby, B., Fujiwara, M., Romanens, G., Hernandez, M., Calbet, X., Rosoldi, M., Giunta, A., Karppinen, T., Iwabuchi, M., Hoshino, S., von Rohden, C., and Thorne, P. W.: Use of automatic radiosonde launchers to measure temperature and humidity profiles from the GRUAN perspective, *Atmos. Meas. Tech.*, 13, 36213649, <https://doi.org/10.5194/amt-13-3621-2020>, 2020.

## **WG-GRUAN interface**

A WIGOS ID has been officially assigned to the Potenza site, even though the radiosounding data transmission through the WIS has been not established yet. For unknown reasons, the IT Met Service did not allow CNR to transmit the data yet. The GRUAN Working Group and GCOS secretariat may intervene to facilitate and speed up the communication with the Met Service.

## **Other archiving centers**

Referring strictly to those datasets relevant for GRUAN, GNSS data are also archived on the RING (Italian Integrated GPS network), while the datasets for aerosols and clouds are available via ACTRIS data portal [actris.nilu.no](https://actris.nilu.no) and on the AERONET data archive <https://aeronet.gsfc.nasa.gov>

## **Participation in campaigns**

During the reporting period, the site of Potenza was not involved in campaigns relevant for GRUAN research activities.

## **Future plans**

The site of Potenza is part of ACTRIS Research Infrastructure (RI) which is on the ESFRI roadmap and it has been acknowledged as one of most relevant Italian research facility. This funding source will allow to ensure the continuity of the GRUAN radiosonde and GNSS measurement programs at the Potenza site. Moreover, a major upgrade is expected at the facility by spring 2021 with the installation of several new instruments, already acquired, such as a manual portable radiosounding system, a new GNSS antenna, a new multi-wavelength Raman lidar for aerosol and water vapour profiling,

a new microwave profiler (MWR), and a Doppler lidar for wind profiling. Once established and operational, all these new instruments will be able to be involved in existing and future GRUAN measurement programs, such as GNSS, MWR and LIDAR.



# GRUAN Site Report for Potenza (POT), 2019

Reported time range is Jan 2019 to Dec 2019

Created by the Lead Centre

Version from 2020-11-05

## 1 General GRUAN site information

Object	Value
Station name	Potenza
Unique GRUAN ID	POT
Geographical position	40.6000 °N, 15.7200 °E, 760.0 m
Operated by	IMAA   Istituto di Metodologie per l'Analisi Ambientale, part of: CNR   Consiglio Nazionale delle Ricerche
Main contact	Madonna, Fabio
WMO no./name	-
Operators	currently 4, changes +0 / -0
Sounding Site	1
GNSS	1

### 1.1 General information about GRUAN measurement systems

System	Name	Type	Setups	Measurements
POT-GN-01	GNSS Site TITO	GNSS	0	not operational
POT-RS-01	Potenza Radiosonde Launch Site	Sounding Site	5	81

### 1.2 General comments from Lead Centre

No comments from Lead Centre.

## 2 System: GNSS Site TITO (POT-GN-01)

Object	Value
System name	GNSS Site TITO
Unique GRUAN ID	POT-GN-01
System type	GNSS (GN - GNSS)
Geographical position	40.6013 °N, 15.7237 °E, 770.0 m
Operated by	IMAA   Istituto di Metodologie per l'Analisi Ambientale, part of: CNR   Consiglio Nazionale delle Ricerche
Instrument contact	Madonna, Fabio
Started at	-
Defined setups	-
Possible streams	-

### 2.1 Lead Centre comments

#### 2.1.1 Dataflow

No GNSS dataflow to LC has been established yet.



### 3 System: Potenza Radiosonde Launch Site (POT-RS-01)

Object	Value
System name	Potenza Radiosonde Launch Site
Unique GRUAN ID	POT-RS-01
System type	Sounding Site (RS - Radiosonde)
Geographical position	40.6010 °N, 15.7237 °E, 760.0 m
Operated by	IMAA   Istituto di Metodologie per l'Analisi Ambientale, part of: CNR   Consiglio Nazionale delle Ricerche
Instrument contact	Madonna, Fabio
Started at	-
Defined setups	5 (OZONE, ROUTINE, ROUTINE2, RESEARCH, ROUTINE3)
Possible streams	ECC, RS41, RS92

#### 3.1 Lead Centre comments

##### 3.1.1 Dataflow

Sonde dataflow to GRUAN LC is operational since February 2011.

##### 3.1.2 General

Routine soundings are performed up to twice per week employing the Vaisala RS41-SG.

#### 3.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCEI
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##### 3.2.1 Stream: RS41

RS41		80	80	
RS41-RAW	001		80	
RS41-EDT	001		79	
RS41-GDP-ALPHA	001		14	
RS41-GDP-ALPHA	002		61	
RS41-GDP-ALPHA	003		28	
RS41-GDP-BETA	001		29	

##### 3.2.2 Stream: RS92

RS92		1	1	
RS92-INT	001		1	
RS92-RAW	002		1	
RS92-EDT	001		1	
RS92-GDP	002		1	

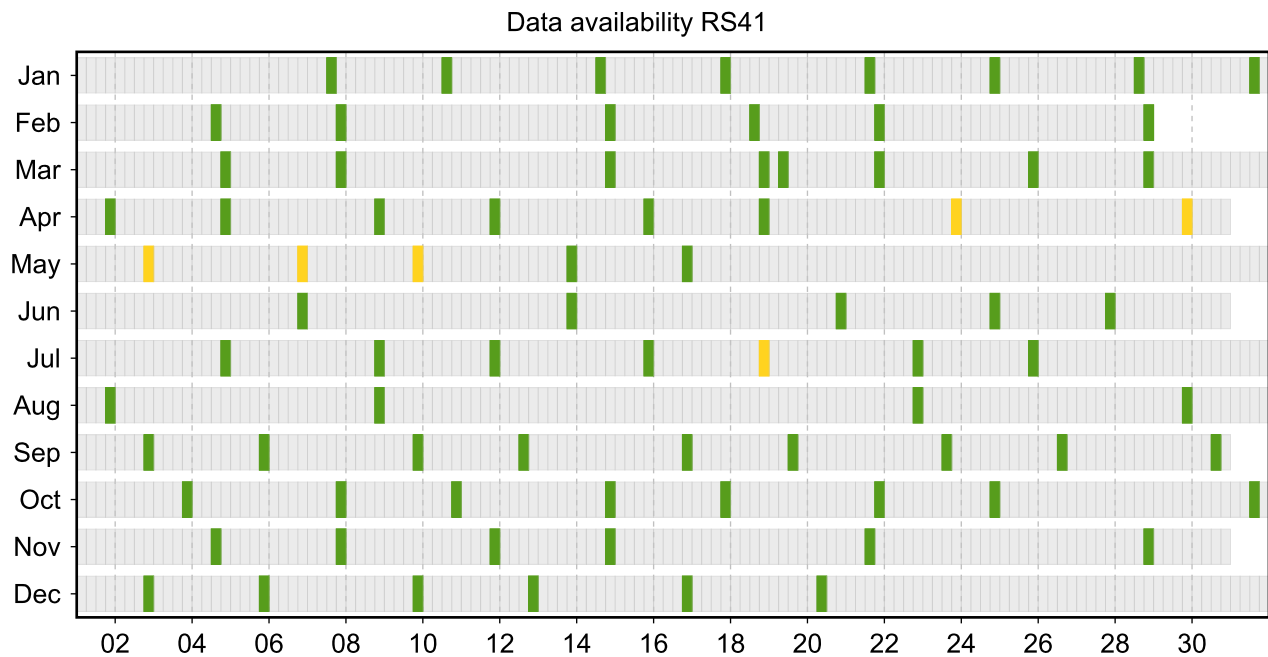
### 3.3 Availability of data products

Available (green): All steps of data processing have been successfully completed. The data product file is available at LC (e.g. files that didn't pass QA/QC or uncertified GRUAN data products) and/or at NCEI (a certified GRUAN data product file that did pass QA/QC).

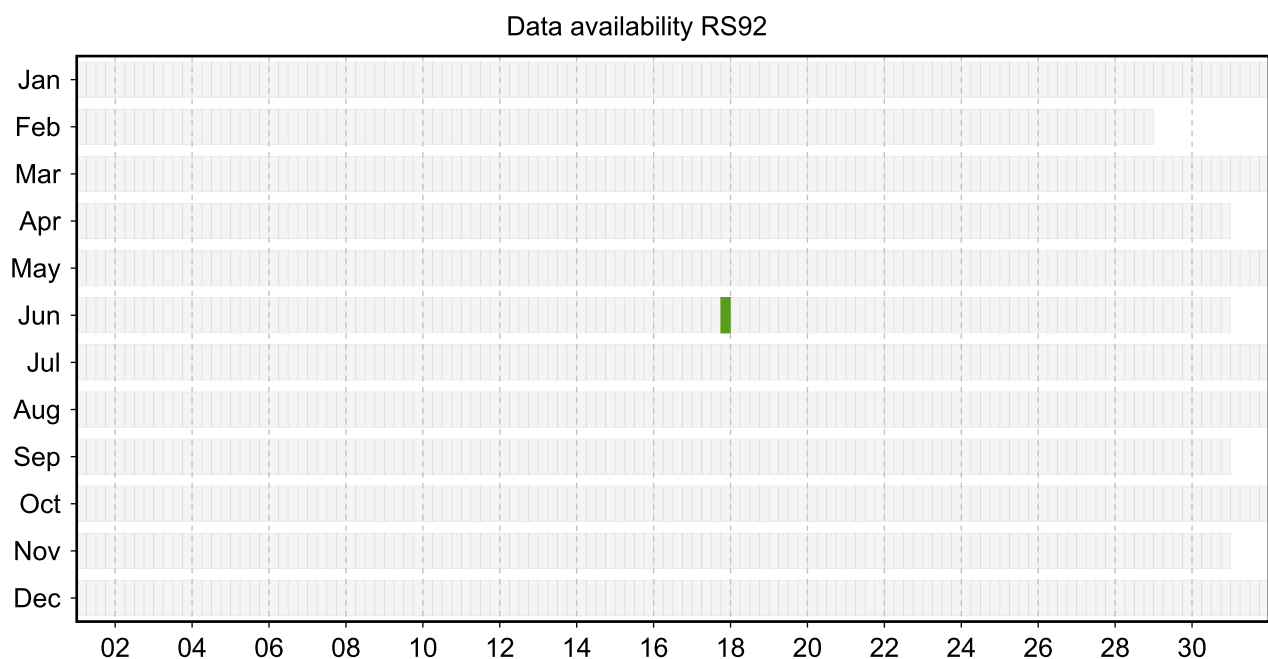
Unprocessed (yellow): The manufacturer-produced file with raw measurement data has been successfully converted into a GRUAN-standardized raw data format (NetCDF). The GRUAN data processing has not been performed or was aborted. Reasons for this may be a still missing GRUAN data processor or a processing-software error.

Original (red): The original, manufacturer-produced, raw data file is available (e.g. MWX data file) but was not converted into a GRUAN-standardized raw data format (NetCDF). Reasons for this may be missing data conversion software, a software error, or a corrupt data file.

#### 3.3.1 Stream: RS41



#### 3.3.2 Stream: RS92



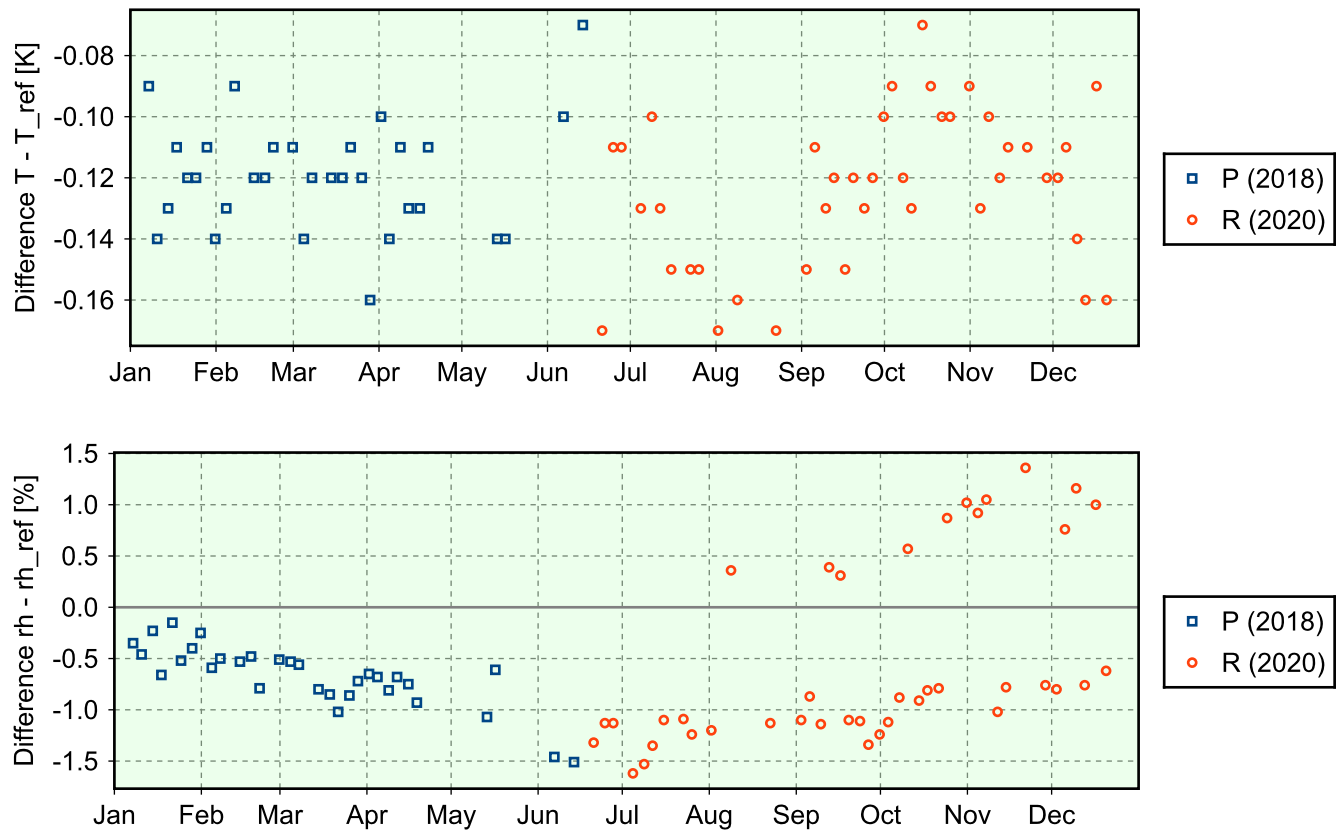
### 3.4 Instrument combinations of POT-RS-01

Count	Instrument combination
80	RS41
1	RS92

3.5 Instrument ground check

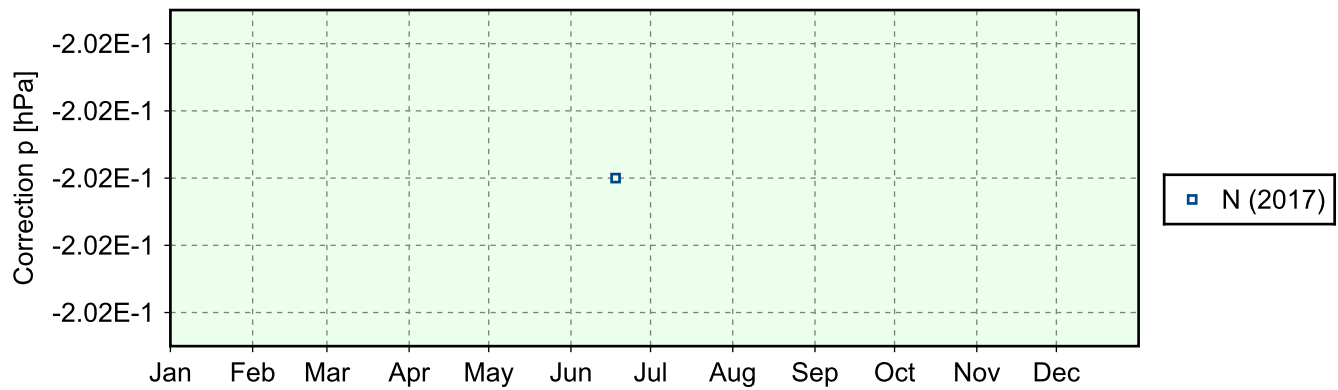
3.5.1 Stream: RS41

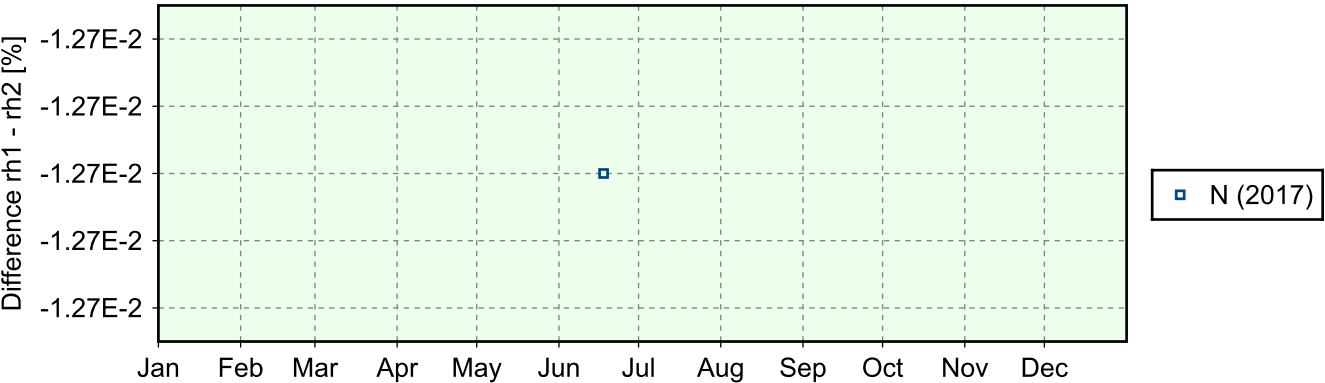
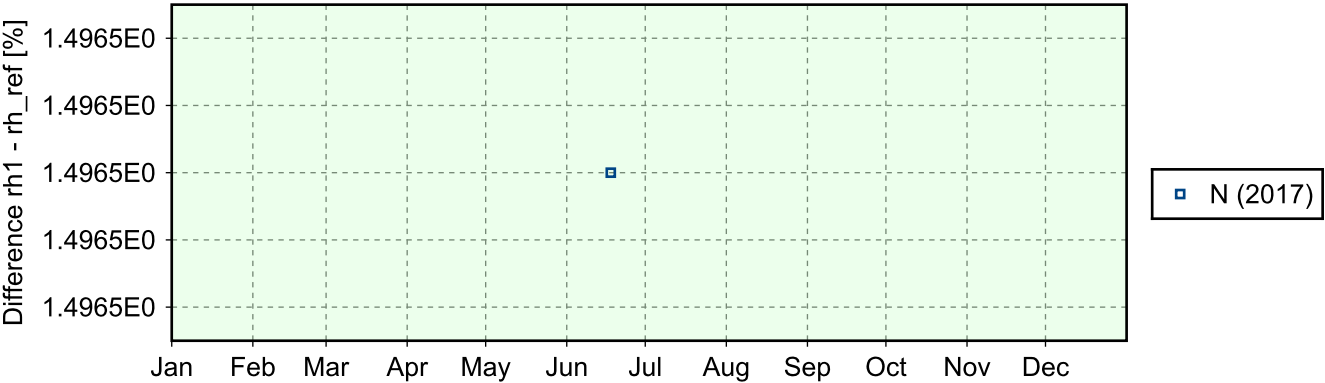
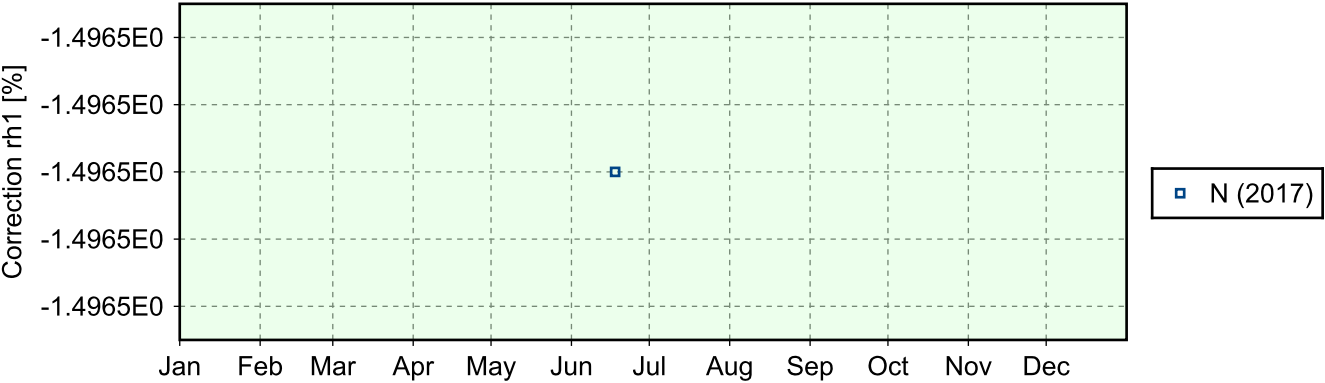
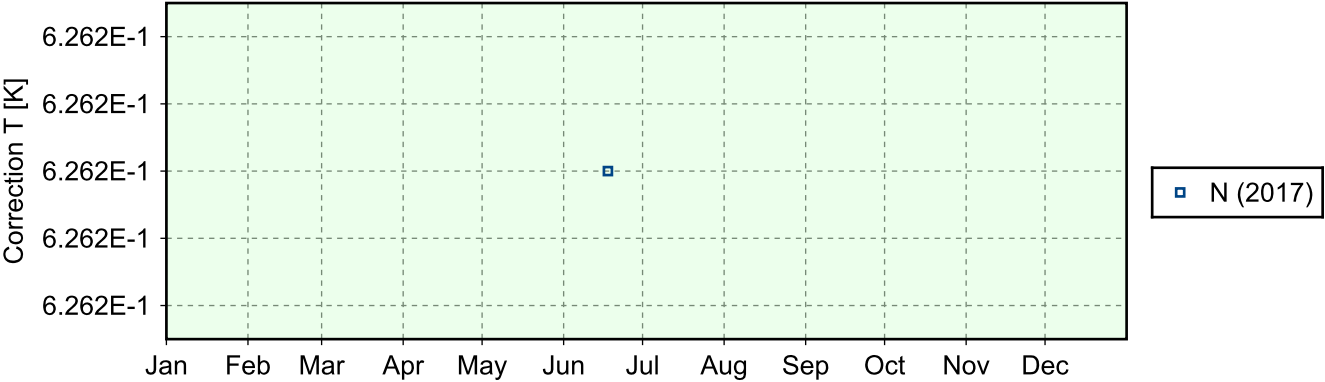
(1) GroundCheck: GC-SHC



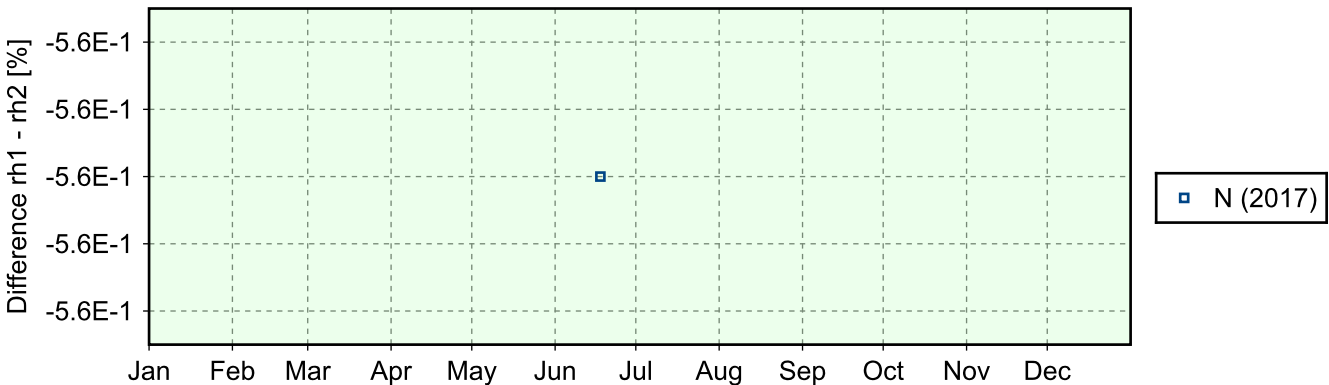
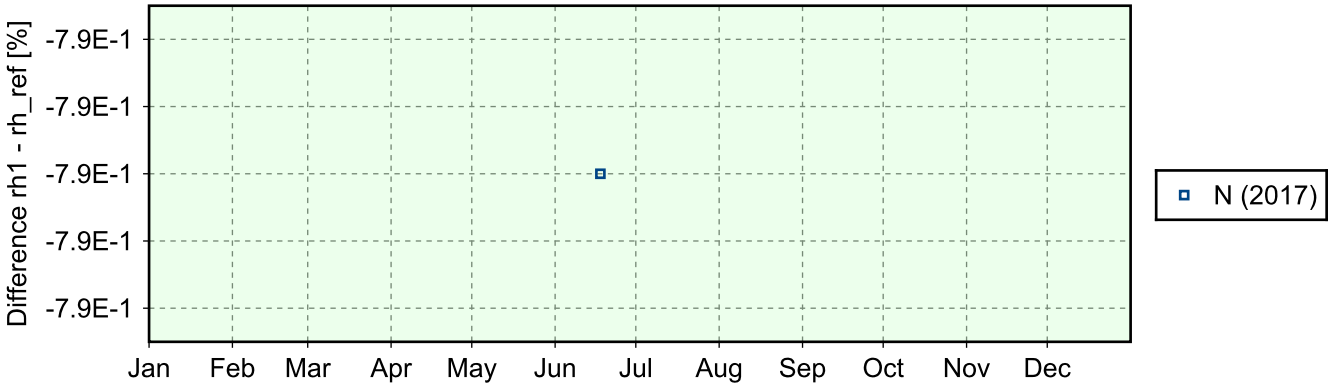
3.5.2 Stream: RS92

(1) GroundCheck: GC-GC25





(2) GroundCheck: GC-SHC



3.6 Measurement events

