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Session 1

GRUAN Site Report for La Réunion

(Submitted by Stephanie Evan)

Summary and Purpose of this Document

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

Overview

Réunion Island has three locations for launching radiosondes. The operational routine soundings are performed at Saint Denis, Le Chaudron by Météo-France (with the use of an automatic radiosonde launcher). Research flights are performed at the Maïdo Observatory by LACy/OPAR. Ozone soundings are performed at Gillot Airport by LACy/OPAR. The weekly ozonesondes (using M10 radiosonde and EN-SCI ECC ozonesonde) are launched from Gillot as part of SHADOZ and NDACC, and M10/CFH/IMET-1 sondes (COBALD and ECC sondes can sometimes be part of the payload) are launched from the Maïdo Observatory on a campaign basis, the data has transmitted to GRUAN when a campaign is taking place (e.g. the MORGANE campaign in May 2015 and CONCIRTO campaign in January/February 2019).

Change and change management

No changes

Resourcing

At the moment, there is no long-term plan to cover the cost of monthly CFH launches in La Réunion. The CONCIRTO project funded by the French National Research agency has financed 6 CFH / COBALD / ECC O3 in January/February 2019
`https://lacy.univ-reunion.fr/activites/programmes-de-recherche/anr-concirto`.

Operations

Currently we are not using the RSLaunchClient to submit the M10/ozone data from the weekly SHADOZ ozonesonde launch at the Gillot site but the ozone measurements for Réunion island are available at `https://tropo.gsfc.nasa.gov/shadoz/Reunion.html`. Currently raw M10 data collected at Le Chaudron in La Réunion and TRappes Palaiseau in Paris radiosonde sites are initially recorded at the sites local servers file system (or database). Both sites use automatic radiosonde launchers. Raw data are sent together with their accompanying site surface meteorological data and metadata. After processing, the M10 radiosonde data are sent to the GRUAN Lead Centre for archiving (backup) and storing in the central database of GRUAN products. The products are then distributed to the end users by the GRUAN Lead Centre but also by the AERIS data center in France. As an ozonesonde data product is not currently implemented within GRUAN, it is not clear whether we can use the same procedure used for the M10 radiosonde data product from Météo-France Le Chaudron in La Réunion and TRappes Palaiseau in Paris.

Site assessment and certification

All documents for the certification of the two french GRUAN sites, La Réunion and TRappes Palaiseau have been submitted to the GRUAN Lead Centre in June 2020 and are currently under review.

GRUAN-related research

Validation of the M10 GRUAN Data Product (GDP) has been done by conducting a comparison with Cryogenic Frostpoint Hygrometer water vapor sonde (CFH) & RS92 meteorological radiosondes launched from the Maïdo Observatory in Réunion Island (21S, 55E) for two seasons (dry/wet). In addition, the sonde (M10, RS92, CFH) measurements of RH are further compared with RH inferred from water vapor profiles acquired by a Raman water vapor lidar emitting at 355 nm operating at the observatory. GDP M10 vertical profile of temperature and relative humidity are compared for a total of 17 dual flights with CFH and a total of 26 dual flights with RS92 GDP. Maximum differences for multi-payload reaches 5 % RH and 0.2C around 12 km of altitude. As for the LIDAR comparison, the average difference is smaller than 5-7 % RH over the 2-12 km altitude range. This analysis demonstrates the good quality of the M10 GDP in a tropical environment and completes the study of Dupont et al. on the M10 radiosonde performance at midlatitude stations. Two studies have been published in Atmospheric Chemistry and Physics which should be of interest to the GRUAN community. In the first study (Evan et al.: Effect of deep convection on the tropical tropopause layer composition over the southwest Indian Ocean during austral summer, Atmos. Chem. Phys., 20, 1056510586,https://doi.org/10.5194/acp-20-10565-2020 2020, balloon-borne measurements of cryogenic frost-point hygrometer (CFH) water vapor, ozone and temperature and water vapor lidar measurements from the Maïdo Observatory on Réunion Island were used to study tropical cyclones influence on tropical tropopause layer (TTL) composition. The balloon launches were specifically planned using a Lagrangian model and Meteosat-7 infrared images to sample the convective outflow from tropical storm Corentin on 25 January 2016 and tropical cyclone Enawo on 3 March 2017. Both systems were associated with significant moistening in the upper troposphere. In the second study (Héron et al.: Impact of convection on the upper-tropospheric composition (water vapor and ozone) over a subtropical site (Réunion Island; 21.1° S, 55.5° E) in the Indian Ocean, Atmos. Chem. Phys., 20, 86118626, https://doi.org/10.5194/acp-20-8611-2020, 2020.

Further analysis of observations/model simulations of TTL cirrus clouds and convective influence on the TTL over the SWIO (the French ANR CONCIRTO project) is under way and should lead to several publications in 2021.

WG-GRUAN interface

None

Other archiving centers

The ozonesonde data are archived on the SHADOZ website:
`https://tropo.gsfc.nasa.gov/shadoz/Reunion.html` Recently, Réunion Island has become a global station of the GAW Network (Global Atmospheric Watch, WMO).

Participation in campaigns

The observational part of the CONCIRTO project will continue until march 2021
(4 launches CFH+COBALD+ECC Ozone).

Future plans

We are investigating how to finance monthly CFH observations at the Maïdo Observatory for the next 5 years.

GRUAN Site Report for LaReunion (REU), 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	LaReunion
Unique GRUAN ID	REU
Geographical position	-21.0797 °S, 55.3831 °E, 2165.0 m
Operated by	COOP-MF-OPAR | Cooperation between Meteo-France and OPAR
Main contact	Evan, Stephanie
WMO no./name	-
Operators	currently 9, changes +0 / -0
Sounding Site	3
Lidar	1
GNSS	2

1.1 General information about GRUAN measurement systems

System	Name	Type	Setups	Measurements
REU-GN-01	Maïdo GNSS Site MAIG	GNSS	0	not operational
REU-GN-02	Saint Denis GNSS Site STDE	GNSS	0	not operational
REU-LI-01	LIDAR 1200 Maïdo Raman Water Vapor Lidar	Lidar	0	0
REU-RS-01	Maïdo Radiosonde Launch Site	Sounding Site	4	24
REU-RS-02	Saint Denis Radiosonde Launch Site	Sounding Site	1	119
REU-RS-03	Gillot Ozonesonde Launch Site	Sounding Site	0	0

1.2 General comments from Lead Centre

1.2.1 General

No dataflow to GRUAN LC has been established yet. The operational data flow is in preparation and will start soon.

The GRUAN site REU includes three locations for launching radiosondes. The operational routine soundings are performed at REU-RS-02 (Saint Denis). Research flights are performed at REU-RS-01 (Maido). Ozone soundings are performed at REU-RS-01 (Gillot).

2 System: Maïdo GNSS Site MAIG (REU-GN-01)

Object	Value
System name	Maïdo GNSS Site MAIG
Unique GRUAN ID	REU-GN-01
System type	GNSS (GN - GNSS)
Geographical position	-21.0800 °S, 55.3800 °E, 2160.0 m
Operated by	OPAR | Observatoire de Physique de l'Atmosphère de la Réunion, part of: UNIV-REUNION | Univers de La Réunion
Instrument contact	Payen, Guillaume
Started at	2013-01-01
Defined setups	-
Possible streams	-

2.1 Lead Centre comments

2.1.1 Dataflow

No GNSS dataflow to LC has been established yet.

3 System: Saint Denis GNSS Site STDE (REU-GN-02)

Object	Value
System name	Saint Denis GNSS Site STDE
Unique GRUAN ID	REU-GN-02
System type	GNSS (GN - GNSS)
Geographical position	-20.8967 °S, 55.4950 °E, 46.0 m
Operated by	MF | Meteo-France
Instrument contact	Chambon, Paul
Started at	2018-01-23
Defined setups	-
Possible streams	-

3.1 Lead Centre comments

3.1.1 Dataflow

No GNSS dataflow to LC has been established yet.

4 System: LIDAR 1200 Maïdo Raman Water Vapor Lidar (REU-LI-01)

Object	Value
System name	LIDAR 1200 Maïdo Raman Water Vapor Lidar
Unique GRUAN ID	REU-LI-01
System type	Lidar (LI - Lidar)
Geographical position	-21.0800 °S, 55.3800 °E, 2160.0 m
Operated by	OPAR | Observatoire de Physique de l'Atmosphère de la Réunion, part of: UNIV-REUNION | Univers de La Réunion
Instrument contact	Keckhut, Philippe
Started at	2013-04-01
Defined setups	-
Possible streams	-

4.1 Lead Centre comments

4.1.1 Dataflow

No dataflow of lidar measurements to LC has been established yet.

5 System: Maïdo Radiosonde Launch Site (REU-RS-01)

Object	Value
System name	Maïdo Radiosonde Launch Site
Unique GRUAN ID	REU-RS-01
System type	Sounding Site (RS - Radiosonde)
Geographical position	-21.0797 °S, 55.3831 °E, 2164.6 m
Operated by	UNIV-REUNION | Univers de La Réunion
Instrument contact	Evan, Stephanie
Started at	-
Defined setups	4 (MALICCA-1, CFH, MORGANE, CONCIRTO)
Possible streams	CFH, COBALD, ECC, IMET-1, M10, RS41, RS92

5.1 Lead Centre comments

5.1.1 Dataflow

Data is available for all research and comparison launches performed during a campaign (CONCIRTO) in Januar 2019. It includes data of RS41, RS92, ECC ozone, CFH water vapor, and COBALD.

5.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCEI

5.2.1 Stream: CFH

CFH		6	6	

5.2.2 Stream: COBALD

COBALD		6	6	

5.2.3 Stream: ECC

ECC		6	6	

5.2.4 Stream: IMET-1

IMET-1		6	6	
IMET-1-RAW	001		5	

5.2.5 Stream: RS41

RS41		20	20	
RS41-RAW	001		20	
RS41-EDT	001		20	
RS41-GDP-ALPHA	001		19	
RS41-GDP-ALPHA	002		20	
RS41-GDP-ALPHA	003		18	
RS41-GDP-ALPHA	004		18	
RS41-GDP-BETA	001		20	

5.2.6 Stream: RS92

RS92		19	19	
RS92-INT	001		19	
RS92-RAW	002		19	
RS92-EDT	001		19	
RS92-GDP	002		16	

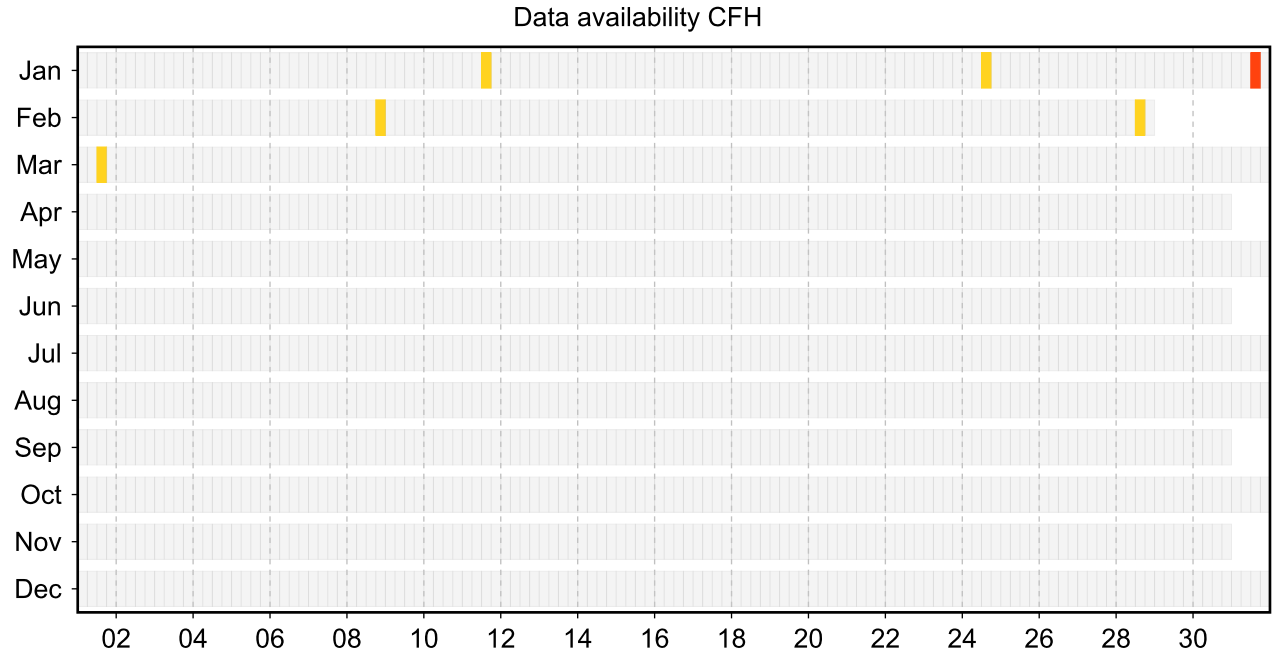
5.3 Availability of data products

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).

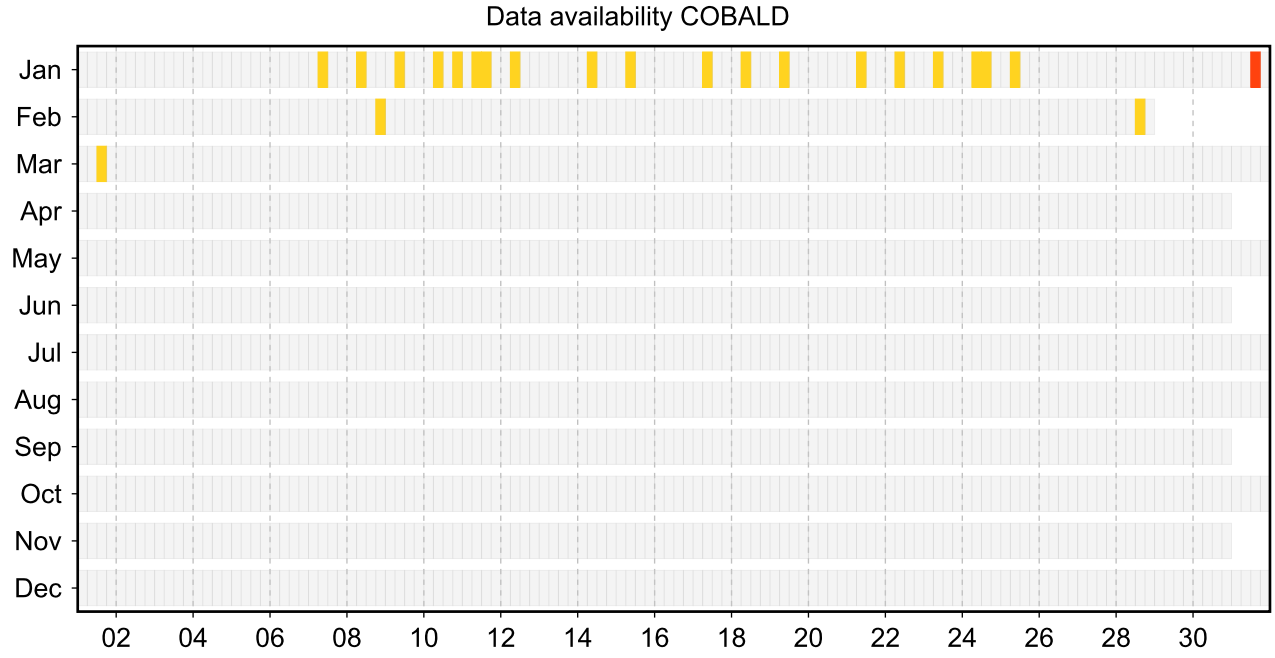
Unprocessed (yellow): The manufacturer-produced file with raw measurement data has been successfully converted into a GRUAN-standardized raw data format (NetCDF). The GRUAN data processing has not been performed or was aborted. Reasons for this may be a still missing GRUAN data processor or a processing-software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

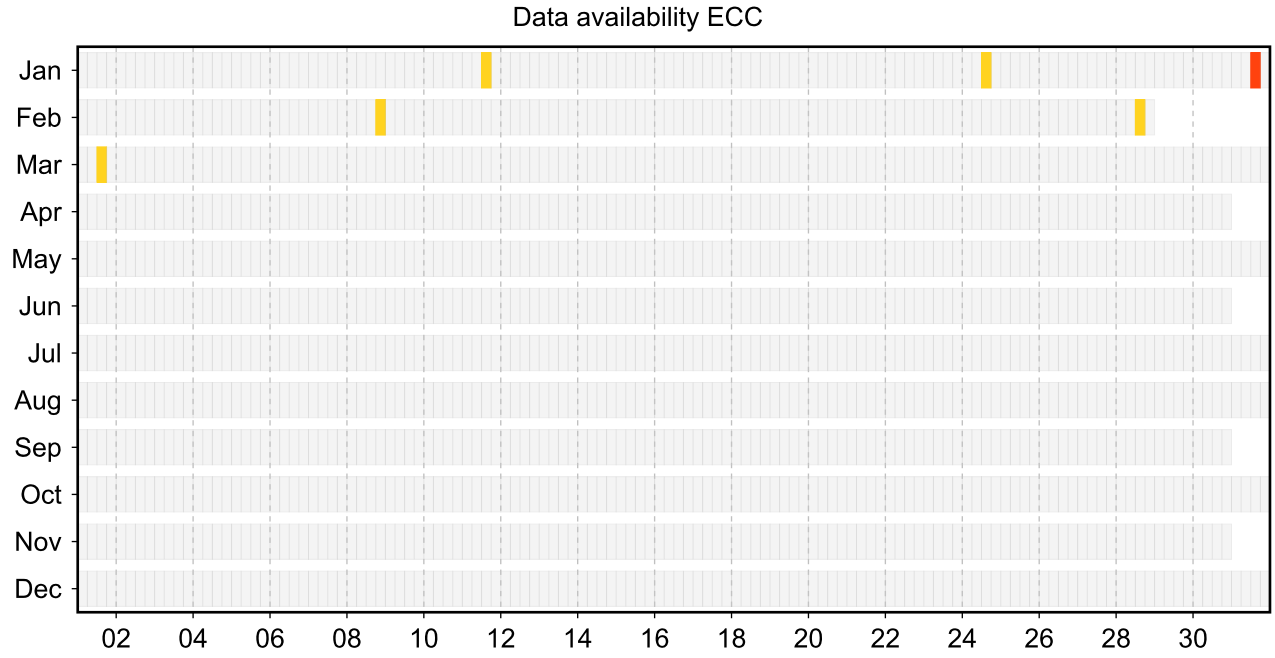
5.3.1 Stream: CFH



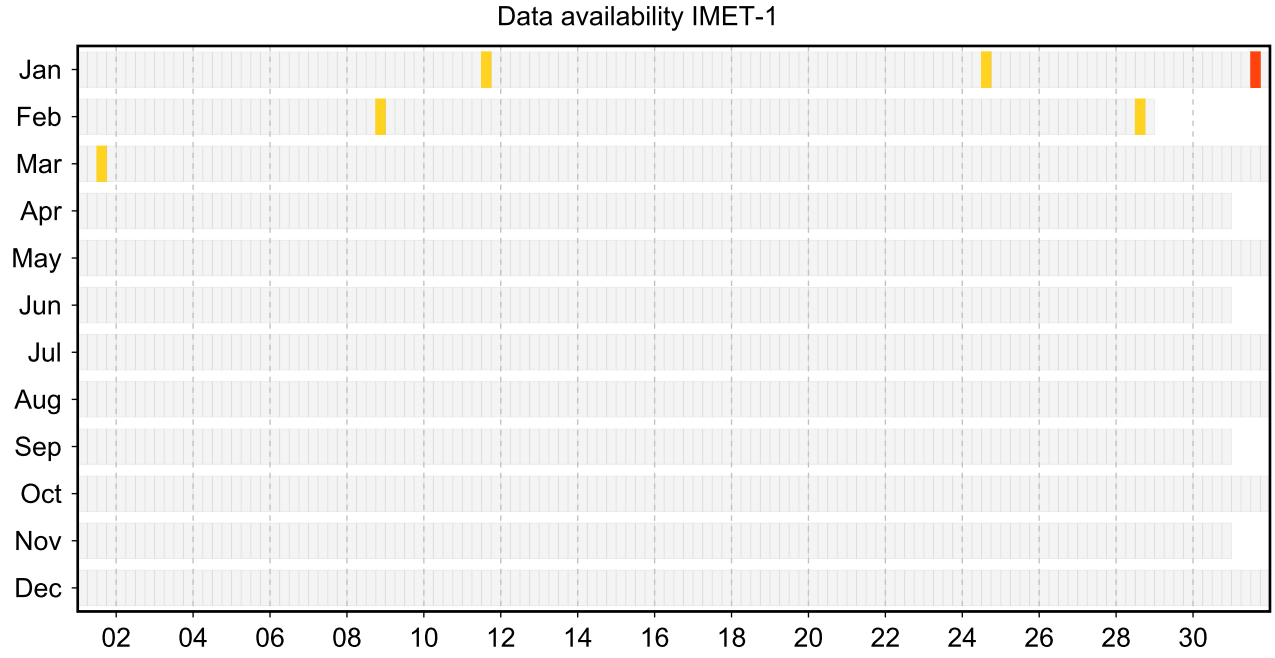
5.3.2 Stream: COBALD



5.3.3 Stream: ECC

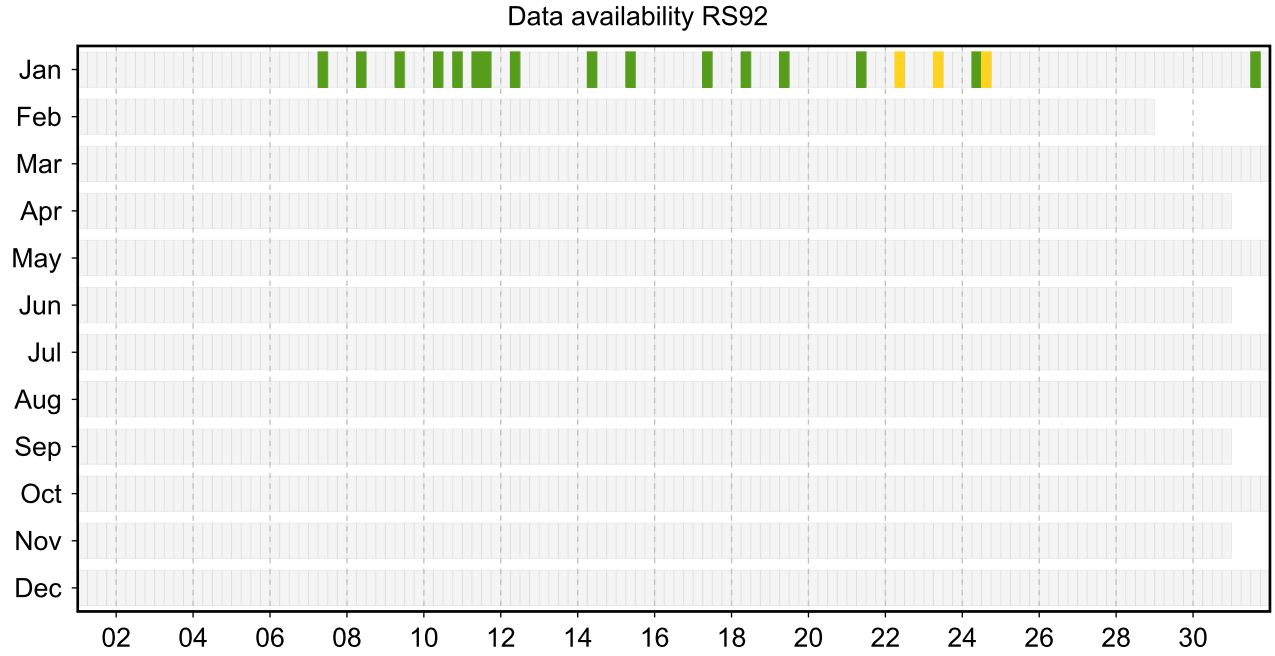


5.3.4 Stream: IMET-1



5.3.5 Stream: RS41

5.3.6 Stream: RS92



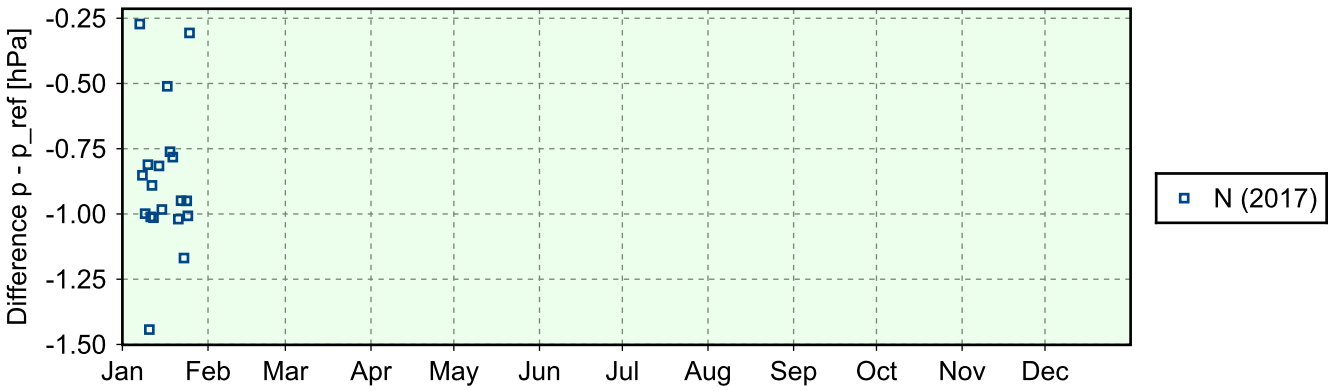
5.4 Instrument combinations of REU-RS-01

Count	Instrument combination
4	CFH, COBALD, ECC, IMET-1
1	CFH, COBALD, ECC, IMET-1, RS41, RS92
1	CFH, COBALD, ECC, IMET-1, RS92
1	2x RS41
17	RS41, RS92

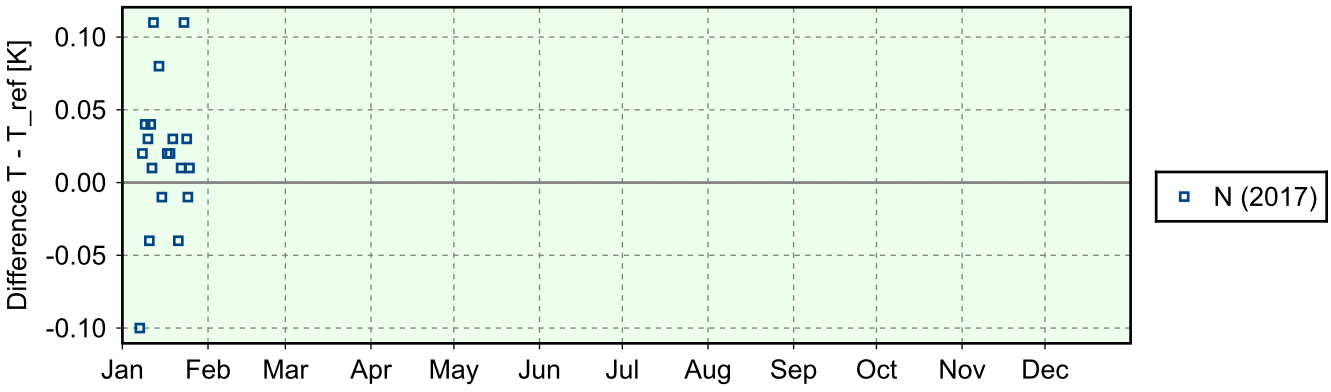
5.5 Instrument ground check

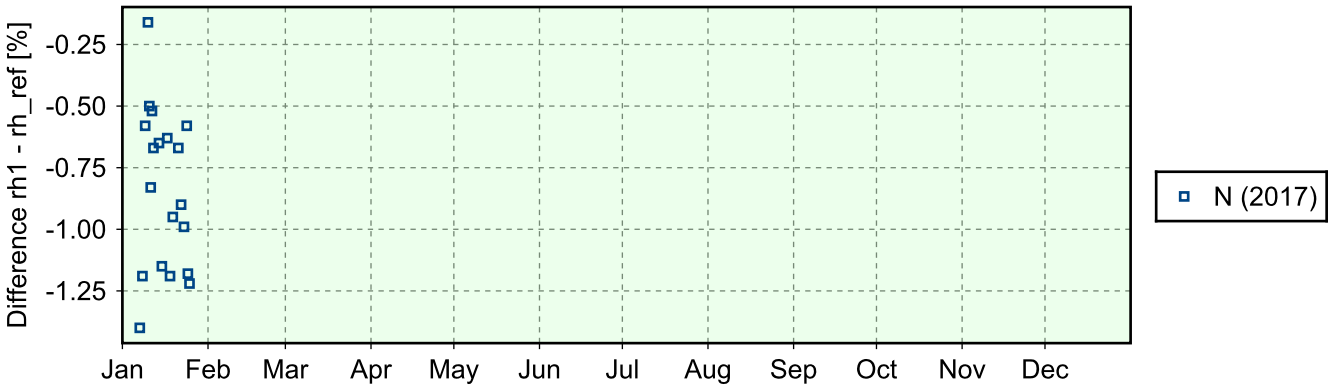
5.5.1 Stream: RS41

(1) GroundCheck: GC-RI41



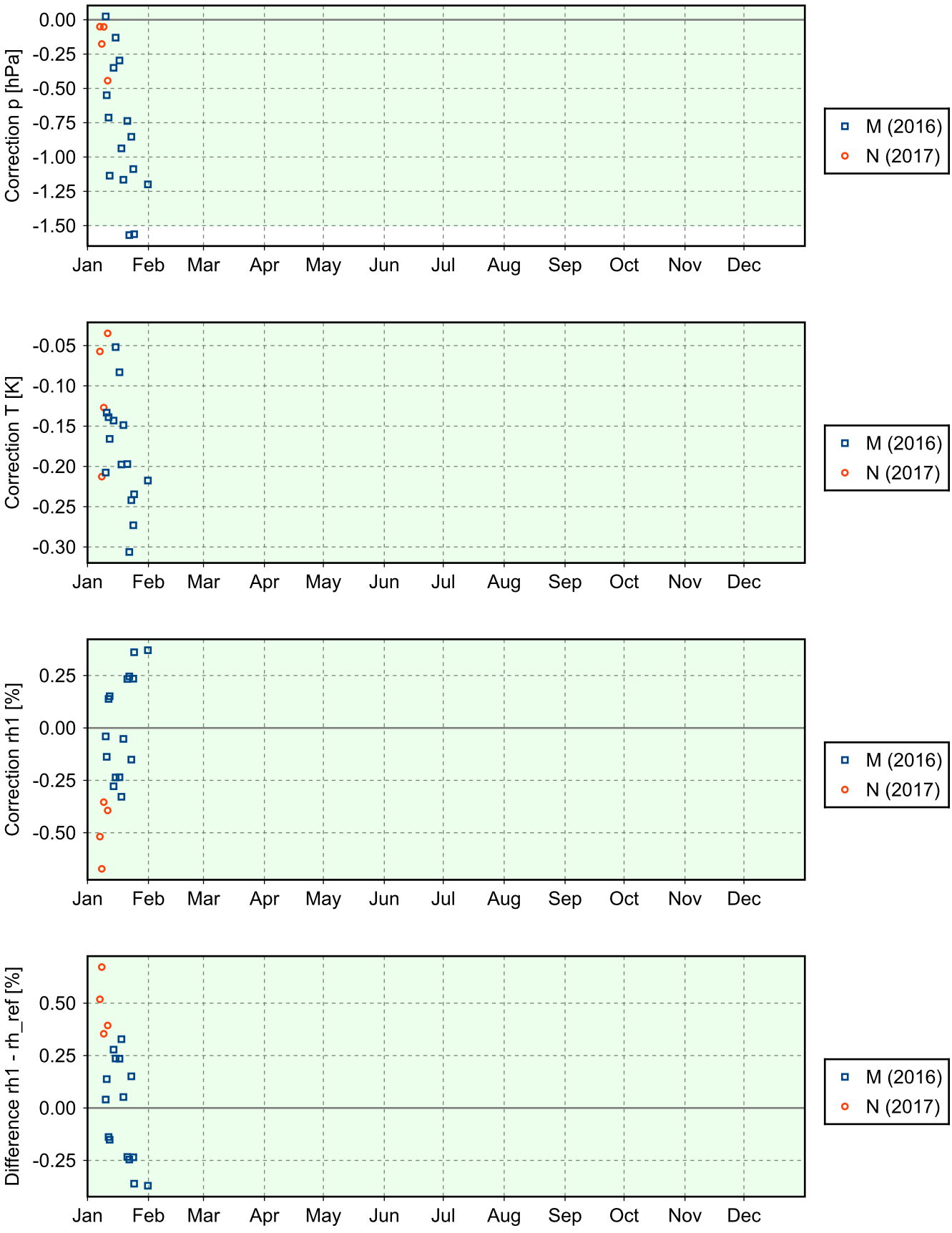
(2) GroundCheck: GC-SHC

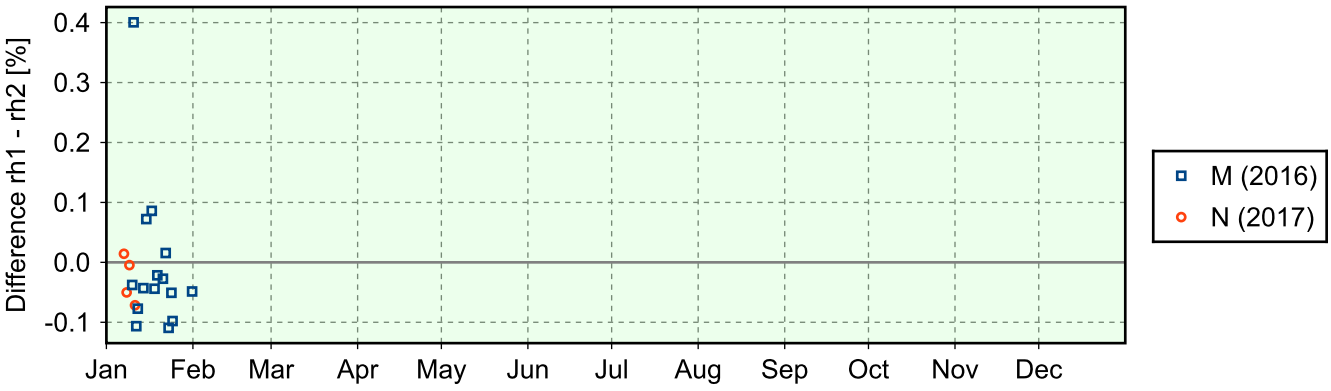




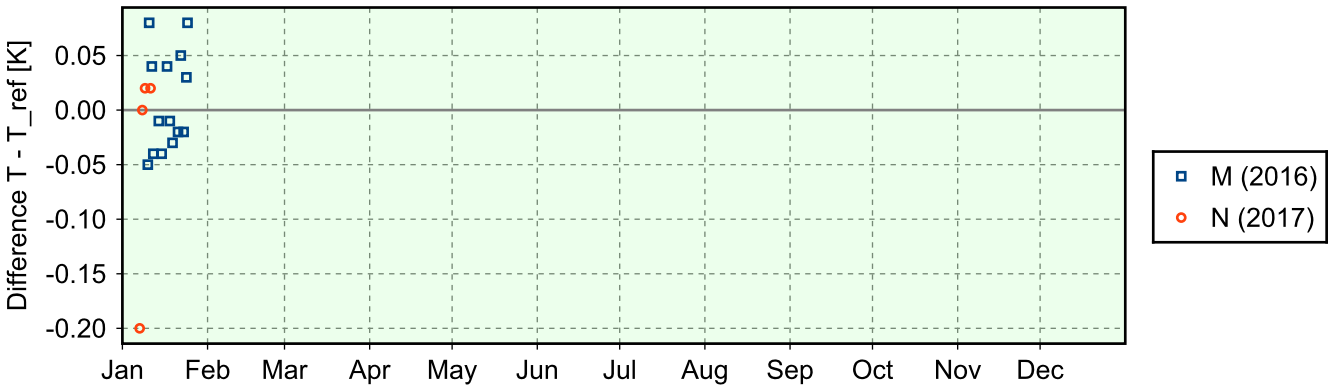
5.5.2 Stream: RS92

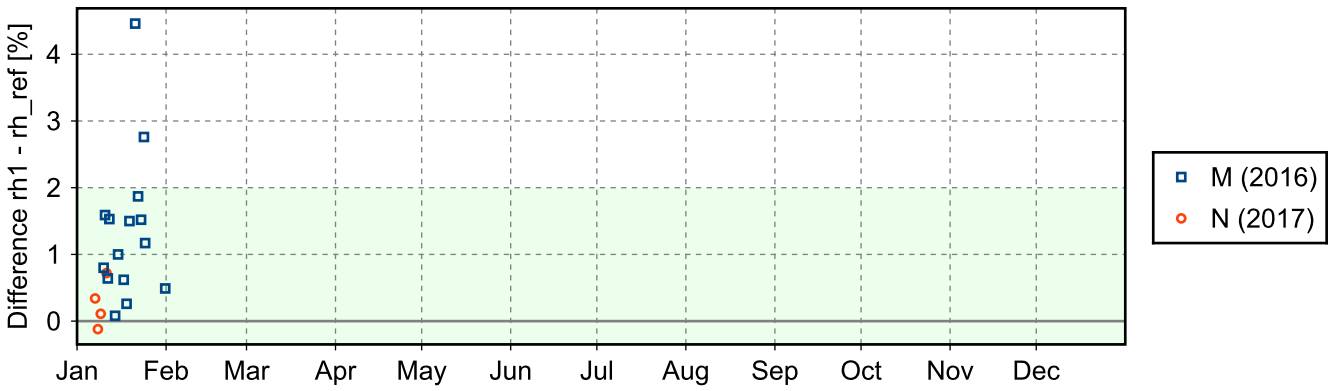
(1) GroundCheck: GC-GC25

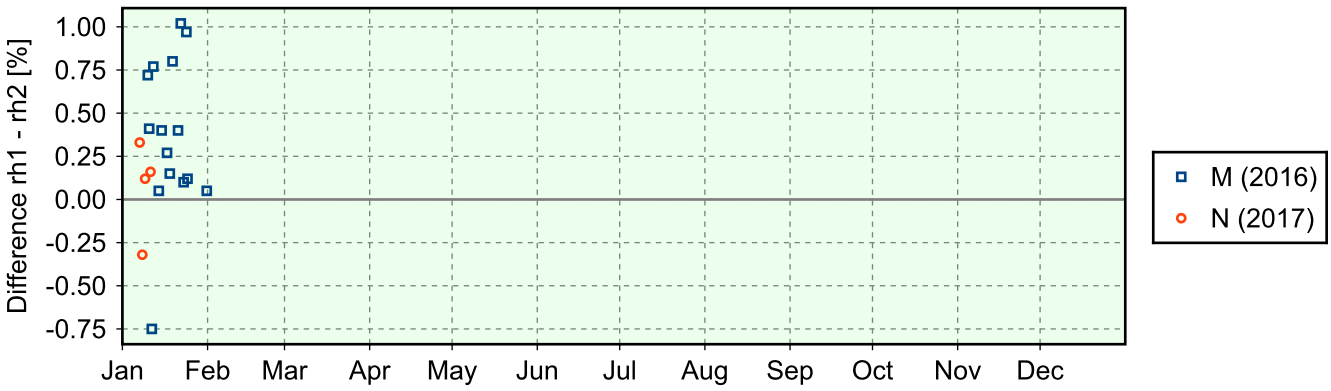




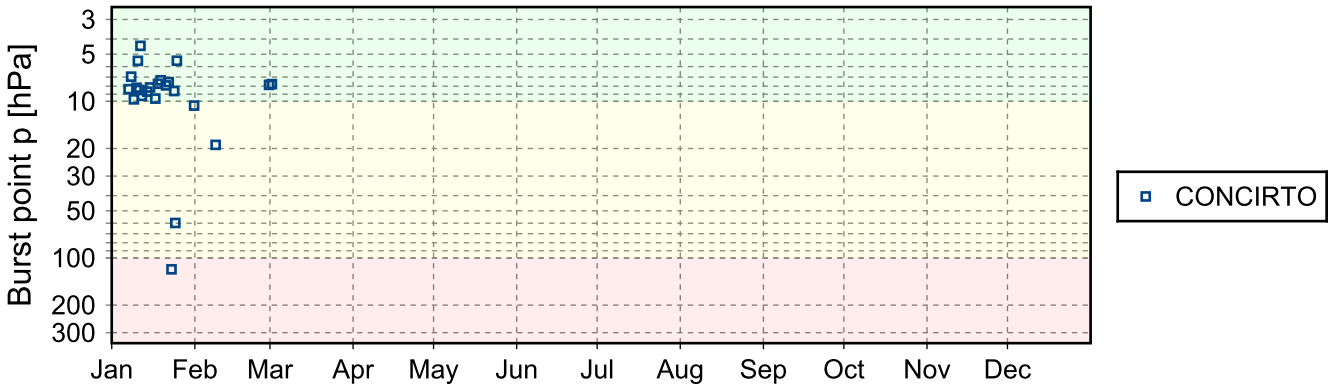
(2) GroundCheck: GC-SHC







5.6 Measurement events



6 System: Saint Denis Radiosonde Launch Site (REU-RS-02)

Object	Value
System name	Saint Denis Radiosonde Launch Site
Unique GRUAN ID	REU-RS-02
System type	Sounding Site (RS - Radiosonde)
Geographical position	-20.8967 °S, 55.4950 °E, 46.0 m
Operated by	MF | Meteo-France
Instrument contact	Marin, Frédéric
Started at	-
Defined setups	1 (AUTO1)
Possible streams	M10

6.1 Lead Centre comments

6.1.1 Dataflow

No dataflow of radiosonde measurements to LC has been established yet. The operational data flow is in preparation and will start soon.

6.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCEI

6.2.1 Stream: M10

M10		119	119	

6.3 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).

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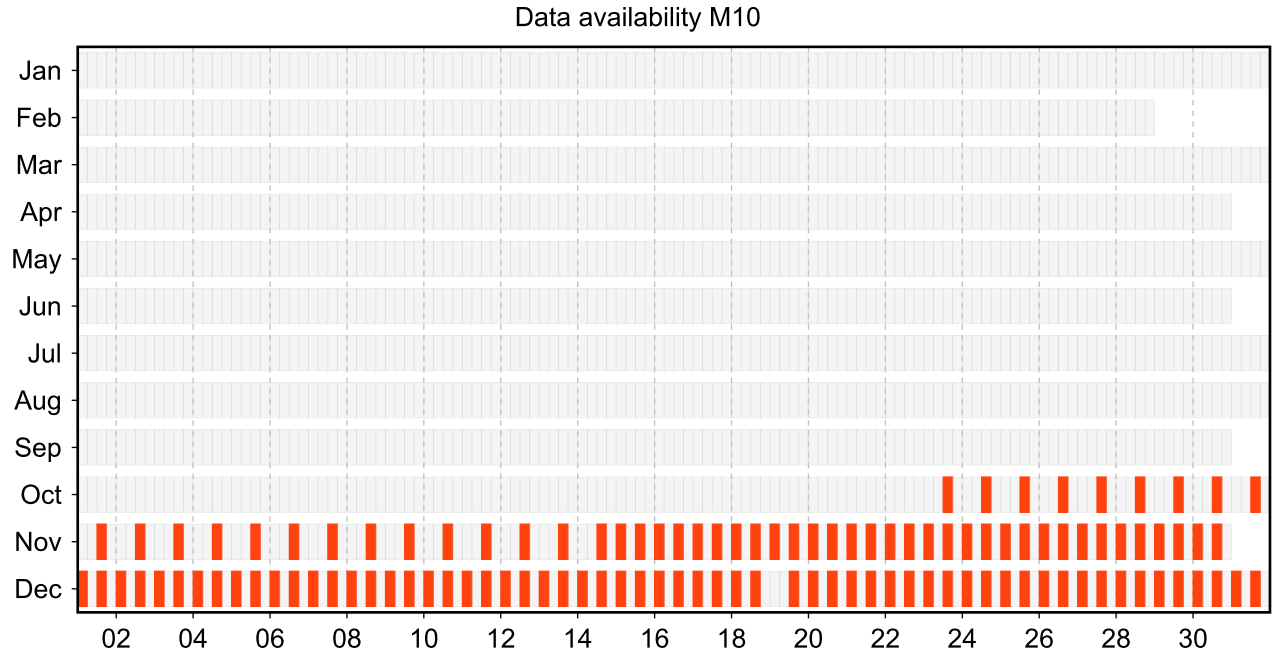
6.3.1 Stream: M10



6.4 Instrument combinations of REU-RS-02

Count	Instrument combination
119	M10

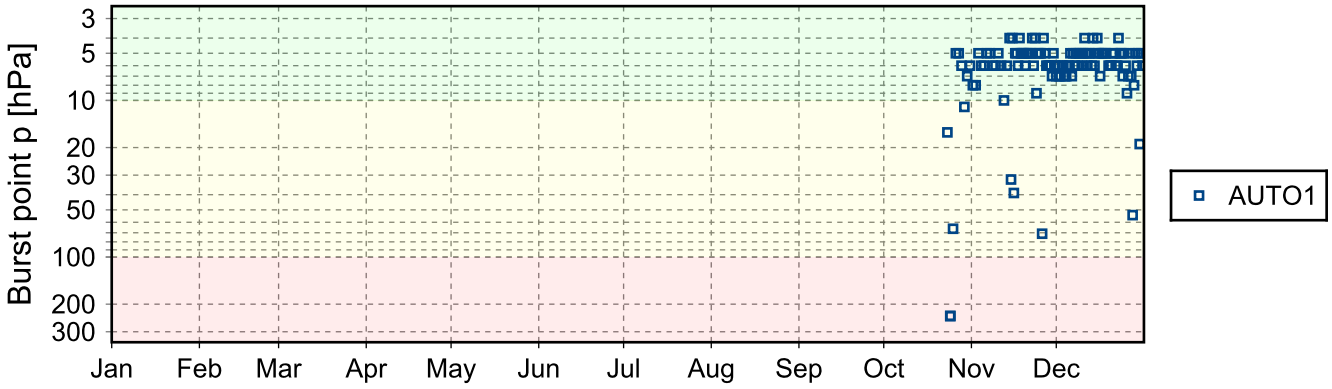
6.5 Instrument ground check

6.5.1 Stream: M10

(1) GroundCheck: GC-SHC

(2) GroundCheck: GC-TU(room)

6.6 Measurement events



7 System: Gillot Ozonesonde Launch Site (REU-RS-03)

Object	Value
System name	Gillot Ozonesonde Launch Site
Unique GRUAN ID	REU-RS-03
System type	Sounding Site (RS - Radiosonde)
Geographical position	-21.0600 °S, 55.4800 °E, 13.0 m
Operated by	UNIV-REUNION | Univers de La Réunion
Instrument contact	Evan, Stephanie
Started at	1998-01-01
Defined setups	-
Possible streams	-

7.1 Lead Centre comments

7.1.1 Dataflow

No dataflow of radiosonde and ozone measurements to LC has been established yet.