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**14th GRUAN Implementation-  
Coordination Meeting (ICM-14)**

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Session 5

La Réunion

28 November - 2 December 2022

## GRUAN Site Report for La Réunion

*(Submitted by Stéphanie Evan)*

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

Report from the GRUAN site La Réunion for the period January to December 2021.

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## Overview

Réunion Island has three measurement sites: the Maïdo observatory on the western part of the island (2160 m ASL), Gillot Airport (northern part of the island, 10 m ASL) and the University of La Réunion in Saint-Denis (northern part of the island, 80 m ASL). Weekly ozonesondes (using M10 radiosonde and EN-SCI ECC ozonesonde) are launched from Gillot as part of SHADOZ and NDACC, and M10/CFH sondes are launched from the Maïdo Observatory on a campaign basis.

## Change and change management

None

## Resourcing

The CONCIERTO ANR Project has financed CFH launches from 2018 until now. An R&D version of CFH with a new coolant design was launched in tandem with a R23-CFH in May 2021. The new CFH version uses dry ice and ethanol as coolant.

## Operations

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 is 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.

## Covid-19

With limited covid-19 restriction in 2021, normal operations of ozone and CFH launches have resumed in 2021.

## Site assessment and certification

The Technical document on the GRUAN data processing for the M10 radiosonde has been reviewed by several people and a revised version was submitted in March 2021. The documents for the certification of the La Réunion will be submitted by the end of 2022.

## GRUAN-related research

A nascent in situ cirrus was observed on January 11, 2019 in the tropical tropopause layer (TTL) over the southwestern Indian Ocean, with the use of balloon-borne instruments. Data from cryogenic frost point hygrometer (CFH) and Compact Optical Backscatter and Aerosol Detector (COBALD) instruments were used to characterize the cirrus and its environment. Optical modeling was employed to estimate the cirrus microphysical properties from the COBALD backscatter measurements. Newly formed ice crystals with radius  $< 1 \mu\text{m}$  and concentration  $\sim 500 \text{ m}^{-3}$  and concentration  $\sim 500500 \text{ L}^{-1}$  were reported at the tropopause. The relatively low concentration and CFH ice supersaturation (1.5) suggests a homogeneous freezing event stalled by a high-frequency gravity wave. The observed vertical wind speed and temperature anomalies that triggered the cirrus formation were due to a 1.5 km vertical-scale wave, as shown by a spectral analysis. This cirrus observation shortly after nucleation is beyond remote sensing capabilities and presents a type of cirrus never reported before. This emphasizes the need for a long-term monitoring system of the TTL composition, with this kind of CFH-COBALD joint measurements performed in Reinares et al. (2021), especially in tropical oceanic regions with scarce TTL in situ measurements. Adding an ozone sonde is also essential to better identify air mass origins.

Reinares Martínez, I., Evan, S., Wienhold, F. G., Brioude, J., Jensen, E. J., Thornberry, T. D., et al. (2021). Unprecedented observations of a nascent in situ cirrus in the tropical tropopause layer. *Geophysical Research Letters*, 48, e2020GL090936. <https://doi.org/10.1029/2020GL090936>

## WG-GRUAN interface

None

## Other archiving centers

The ozonesonde data are archived on the SHADOZ website:  
<https://tropo.gsfc.nasa.gov/shadoz/Reunion.html>

## Participation in campaigns

An intercomparison of a new design of the CFH (using dry ice and ethanol as coolant) and the traditional R23 CFH has been performed in May 2021. We will focus on the transition from R23 to dry ice+ethanol in future CFH launches in 2023.

The Hunga Tonga volcano erupted on January 15th. A week after the eruption, a rapid response experiment was organized at the Maïdo Observatory in Réunion Island. Due to zonal easterly winds in the stratosphere (20-50km), La Réunion Island was favorably located downwind of the plume. From 20 to 24 January 2022, multiple meteorological balloons carrying aerosol, H<sub>2</sub>O, SO<sub>2</sub> and ozone instruments were launched each night to provide key measurements of the volcanic plume composition.

## Future plans

Follow closely the evolution of CFH or FPH instruments with a new coolant design. Launch 4 payloads of POPS+FPH+Ozone instruments per year as part of the NOAA B2SAP project:

<https://csl.noaa.gov/projects/b2sap/>



# GRUAN Site Report for LaReunion (REU), 2021

Reported time range is Jan 2021 to Dec 2021

Created by the Lead Centre

Version from 2022-11-15

## 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	0
REU-RS-02	Saint Denis Radiosonde Launch Site	Sounding Site	1	417
REU-RS-03	Gillot Ozonesonde Launch Site	Sounding Site	0	0

### 1.2 General comments from Lead Centre

#### 1.2.1 General

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-03 (Gillot).

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

<b>Object</b>	<b>Value</b>
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)

<b>Object</b>	<b>Value</b>
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)

<b>Object</b>	<b>Value</b>
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)

<b>Object</b>	<b>Value</b>
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, CONCIERTO)
Possible streams	CFH, COBALD, ECC, IMET-1, M10, RS41, RS92

### 5.1 Lead Centre comments

#### 5.1.1 Dataflow

The dataflow of radiosonde measurements to LC is interrupted since March 2019 (after CONCIERTO campaign).

## 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

Sonde dataflow to the GRUAN LC is operational in a fully automated mode since September 2020.

Currently, the dataflow is interrupted since October 2021.

### 6.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCEI
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#### 6.2.1 Stream: M10

M10		417	417	
M10-GDP-BETA	001		387	

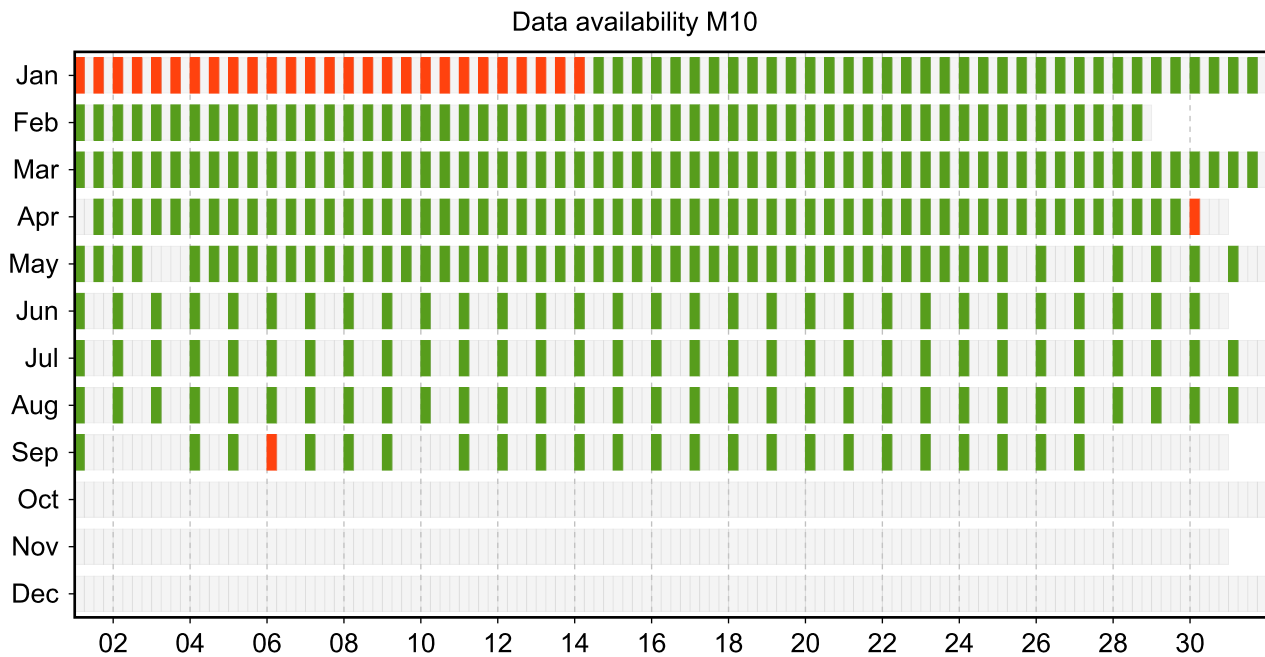
### 6.3 Availability of data products

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).

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.

#### 6.3.1 Stream: M10



### 6.4 Instrument combinations of REU-RS-02

Count	Instrument combination
417	M10

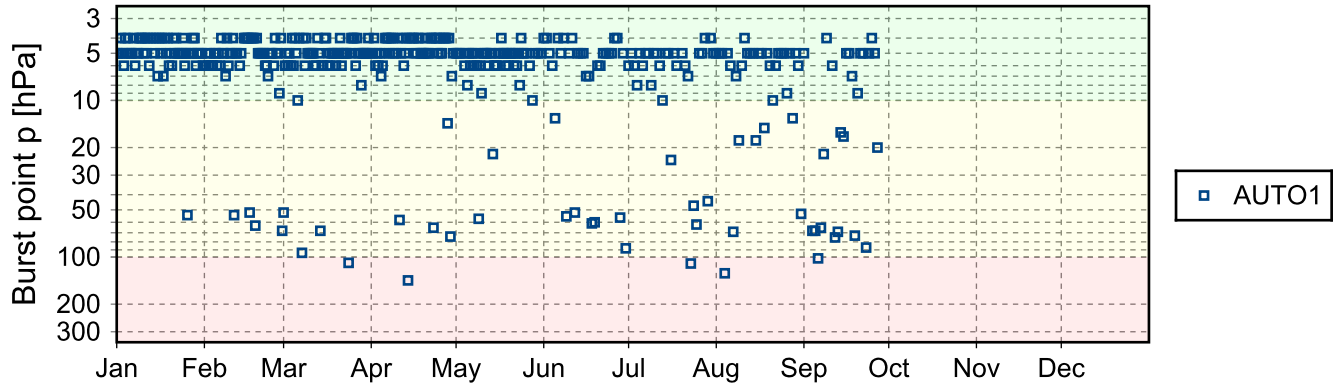
## 6.5 Instrument ground check

### 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)

<b>Object</b>	<b>Value</b>
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.