



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

Doc. 5.21
(19.II.2024)

**15th GRUAN Implementation-
Coordination Meeting (ICM-15)**

Session 5

Bern

11 March - 15 March 2024

GRUAN Site Report for Potenza

(Submitted by Marco Rosoldi)

Summary and Purpose of this Document

Report from the GRUAN site Potenza for the period January 2022 to December 2023.

Overview

Currently, the site of Potenza is contributing to GRUAN data streams by 3 weekly launches of RS41 radiosondes. One launch is carried out with an automatic launcher, typically on Monday at 00:00 UTC, and two launches are performed with a manual system, on Thursday typically at 12:00 UTC and between 30 and 120 minutes after sunset. For manual launches, a manufacturer-independent pre-launch ground check is performed using the standard humidity chamber SPRH100. When not too demanding for the Potenza site team, radiosondes are launched in correspondence (within ± 3 hours) of the GNSS-RO or LEO satellite relevant overpasses provided by the LC. For 2022 and 2023, 54 and 76 (28 and 65 up to 01/29/2024) radiosoundings have been submitted to the GRUAN LC, respectively. These radiosoundings are fewer than those expected according to the above launches schedule, due both to the unexpected failure of the manual radiosounding system's PC, with the temporary loss of the related data from September 2022 to April 2023, and a reduction in helium supply and launches number in the period July-September 2023. However, manual radiosoundings data in the period 09/2022-04/2023 are being recovered with the support of a specialized IT company and will be delivered to the GRUAN LC as soon as possible. About GRUAN future data streams, although GNSS data processing has been successfully tested, it has not yet been possible to establish it on a routine basis due to the lack of dedicated personnel. However, it is expected to submit data on a regular basis in the coming months, supported by newly acquired site team personnel. Moreover, the site facility has recently been upgraded with the acquisition of new remote sensing instruments for the atmospheric profiling of temperature and humidity (by Raman lidar and microwave radiometer), trace gases (by high resolution Fourier-transform infrared (FTIR) spectrometer), wind fields (by Doppler lidar), aerosols (by multiwavelength polarization/Raman lidar), clouds and precipitation (by polarimetric Doppler radar, ceilometer and microwave radiometer). This will allow the current GRUAN data flow at the site to be extended to other GRUAN-certified measurement programs, such as MWR and LIDAR.

Change and change management

During the reporting period, the Vaisala automatic radiosonde launcher (ARL), not working since 2016, has been put back into operation and updated. Since May 2022, launches with the ARL restarted and related GRUAN data stream was successfully established. As for personnel changes, the new site manager Marco Rosoldi has taken over from Fabio Madonna, who has become co-chair of the GCOS Working Group on GRUAN (WG-GRUAN). Moreover, two new personnel units have been acquired, who contribute to radiosoundings operations and will contribute to future GRUAN activities. Finally, no changes to be reported in measurement programs, operating procedures, expendables,

data processing algorithms, data acquisition software, as well as in location of instruments and their operating environments.

Resourcing

The site of Potenza, although it does not have resources specifically dedicated to GRUAN activities, is one of the most important Italian facilities of the pan-European research infrastructure ACTRIS (Aerosol, Clouds and Trace Gases Research Infrastructure, <https://www.actris.eu>, established as an ERIC infrastructure since April 2023. This status has made it possible, in addition to the ARL update and the acquisition of several other instruments of interest for future GRUAN data streams (see Overview section), also the acquisition of a portable Vaisala radiosounding system, for field measurement campaigns, two new standard humidity chambers, to ensure GRUAN operating procedures continuity and perform laboratory experiments relevant for GRUAN, and a new radiosounding system to launch GRAW radiosondes. Moreover, two new personnel units have been acquired, who will contribute to the site GRUAN activities. Finally, the site will continue to host in its data center the filesafe backup for the full GRUAN data archive. In conclusion, instrumental, financial and personnel resources can support and extend current GRUAN measurement programs and related research activities.

Operations

There are no operational challenges or deviations from GRUAN procedures to be reported. For 98% of radiosoundings submitted to the GRUAN LC during the reporting period, the related GDP has been released and for 97% the burst point pressure was below 10 hPa. Although in the period July-September 2023 in Italy there was a significant limitation in the supply of helium, currently in use at the station to inflate balloons, no critical issues are currently expected for the helium supply in coming years.

Covid-19

The restrictions imposed by the Italian government to access the facility, in order to deal with the Covid-19 pandemic emergency, contributed to a reduction of radiosondes' launches in the period January-March 2022.

Site assessment and certification

The site of Potenza, certified for the first time in April 2015 and then recertified in May 2019, has been recently recertified in February of this year.

GRUAN-related research

Since November 2021, the site team is leading the Copernicus Climate Change Service C3S2 311 Lot2 contract, for the access and the harmonization of reference, baseline and comprehensive radiosounding historical data via the Copernicus Climate Data Store (CDS, <https://cds.climate.copernicus.eu/#!/home>). Within the contract activities, an updated version of harmonized GRUAN dataset, including the processing of Vaisala RS41 radiosondes, will be released. Moreover, updates of IGRA and RHARM (Radiosonde HARMonization), a bias-adjusted version of IGRA based on a novel algorithm designed and implemented by the site team, are also planned. Moreover, the site team is currently involved in the EUMETSAT project VICIRS - Development of vicarious calibration tools for MWI and ICI using radiosoundings, led by CNR-IMAA and devoted to the design of the calibration and validation phase of ICI and MWI satellite sensors using the most recent data from GRUAN and RHARM. Finally, the site team is co-chairing the GRUAN Task Team “Measurement scheduling and combination”.

GRUAN-Documents:

- GRUAN-RP-5: Cloud Observations <https://www.gruan.org/documentation/gruan/rp/gruan-rp-5>

GRUAN-related publications:

- Rannat, K., H. Keernik, and Madonna, F.: The Novel Copernicus Global Dataset of Atmospheric Total Water Vapour Content with Related Uncertainties from GNSS Observations. *Remote Sensing*, 15(21), 5150. <https://doi.org/10.3390/rs15215150>, 2023.
- Madonna, F., Essa, Y. H., Marra, F., Serva, F., Gardiner, T., Sarakhs, F. K., Tramutola, E., and Rosoldi, M.: Uncertainties on climate extreme indices estimated from U.S. Climate Reference Network (USCRN) near-surface temperatures. *Journal of Geophysical Research: Atmospheres*, 128, e2022JD038057. <https://doi.org/10.1029/2022JD038057>, 2023.
- Rosoldi, M., Coppa, G., Merlone, A., Musacchio, C., and Madonna, F.: Intercomparison of Vaisala RS92 and RS41 Radiosonde Temperature Sensors under Controlled Laboratory Conditions. *Atmosphere*, 13, 773. <https://doi.org/10.3390/atmos13050773>, 2022.

- Madonna, F., Tramutola, E., SY, S., Serva, F., Proto, M., Rosoldi, M., Gagliardi, S., Amato, F., Marra, F., Fassó, A., Gardiner, T. and Thorne, P.W.: The new Radiosounding HARMonization (RHARM) data set of homogenized radiosounding temperature, humidity, and wind profiles with uncertainties. *Journal of Geophysical Research: Atmospheres*, 127, e2021JD035220. <https://doi.org/10.1029/2021JD035220> , 2022.

WG-GRUAN interface

At the moment, no support and assistance actions from the WG-GRUAN are required for site operations.

Other archiving centers

As for GRUAN relevant datasets, GNSS data are also archived on the GPS Italian Integrated Network (RING, <http://ring.gm.ingv.it/>), while data for aerosols and clouds are available via the ACTRIS Data Centre portal (<https://dc.actris.nilu.no/>) and the AERONET data archive (<https://aeronet.gsfc.nasa.gov>).

Participation in campaigns

During the reporting period, the site was not involved in GRUAN-relevant measurement campaigns.

Future plans

For 2024, the site of Potenza will continue and consolidate the current GRUAN data stream, as well as extend it to GNSS. Moreover, it is planned to carry out the first atmospheric measurements with the MEISEI SKYDEW chilled mirror hygrometer, coupled with the RS41 radiosonde, and with the GRAW radiosondes, for their comparison with RS41 and investigating the feasibility of developing a new GDP for these radiosondes in collaboration with the LC. As for personnel changes, the plan is to hire a research fellow and/or PhD student to support the site operations and related research. Finally, in the coming years, it is planned to carry out laboratory experiments with climatic chambers, in order to characterize performances and differences of different radiosonde models in temperature

and humidity measurements, and to extend the site GRUAN data stream to MWR and LIDAR, once formal GDPs have been defined.



GRUAN Site Report for Potenza (POT), 2022

Reported time range is Jan 2022 to Dec 2022

Created by the Lead Centre

Version from 2024-03-01

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	Rosoldi, Marco
WMO no./name	0-20008-0-POT null
Operators	currently 4, changes +0 / -0
Sounding Site	2
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	28
POT-RS-02	Automatic Potenza Launch System (Autosonde AS15)	Sounding Site	1	27

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	Rosoldi, Marco
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	Rosoldi, Marco
Started at	-
Defined setups	5 (OZONE, ROUTINE, ROUTINE2, RESEARCH, ROUTINE3)
Possible streams	ECC, RS41, RS92

3.1 Lead Centre comments

3.1.1 Dataflow

Soundings are submitted from January to September.

3.1.2 General

This is the manual launching site.

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

There is good performance in terms of burst altitude which is regularly 10 hPa and higher.

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		28	28	
RS41-RAW	001		28	
RS41-EDT	001		28	
RS41-GDP	001		27	

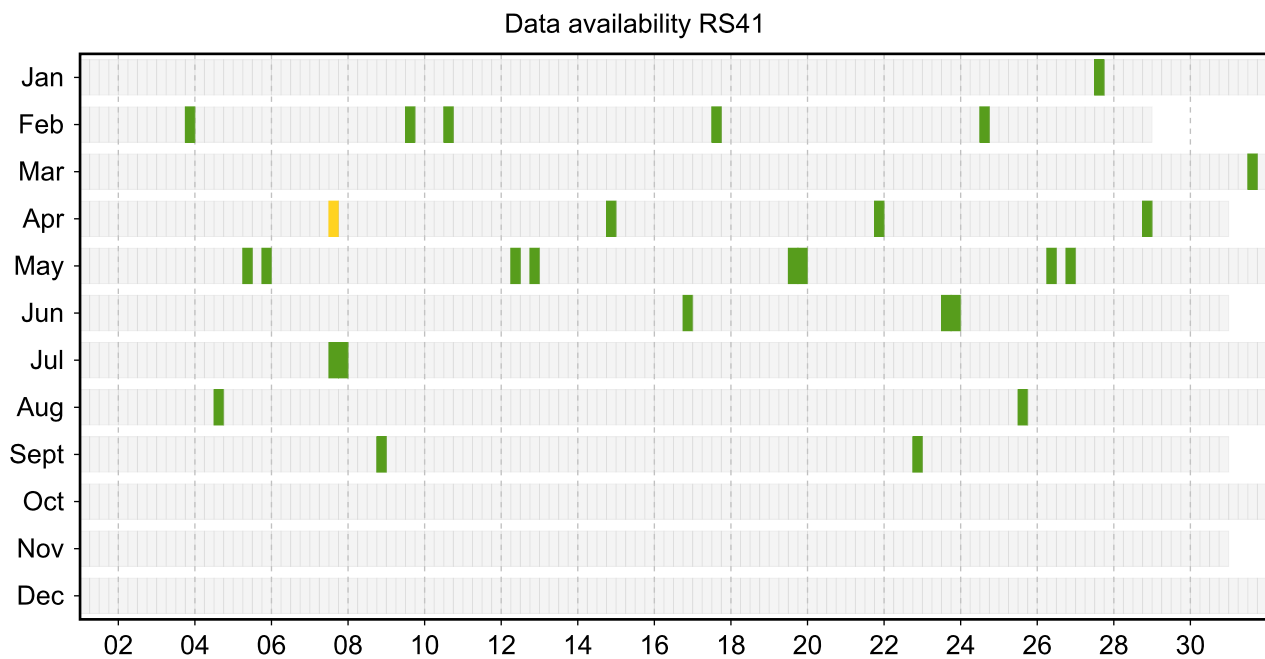
3.3 Availability of data products

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



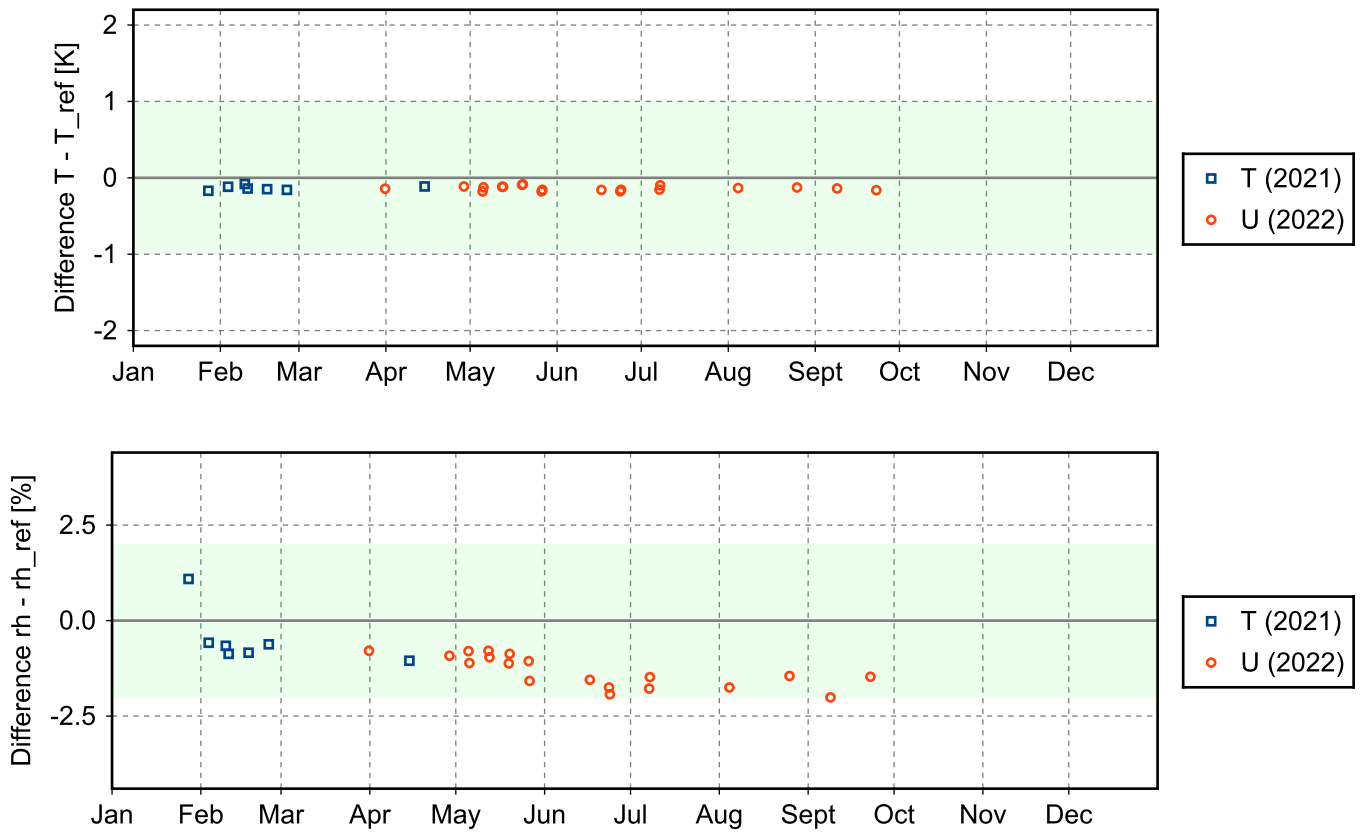
3.4 Instrument combinations of POT-RS-01

Count	Instrument combination
28	RS41

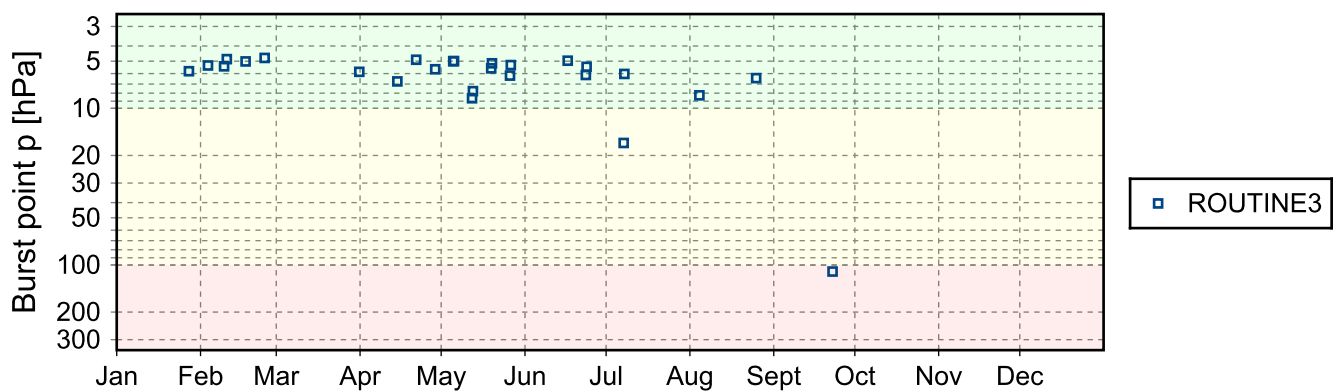
3.5 Instrument ground check

3.5.1 Stream: RS41

(1) GroundCheck: GC-SHC



3.6 Measurement events



4 System: Automatic Potenza Launch System (Autosonde AS15) (POT-RS-02)

Object	Value
System name	Automatic Potenza Launch System (Autosonde AS15)
Unique GRUAN ID	POT-RS-02
System type	Sounding Site (RS - Radiosonde)
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
Instrument contact	Rosoldi, Marco
Started at	2022-03-01
Defined setups	1 (AUTO1)
Possible streams	RS41

4.1 Lead Centre comments

4.1.1 Dataflow

No soundings using the autolauncher system are submitted.

4.1.2 General

This is the autolauncher system.

4.2 GRUAN data products

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

RS41		27	27	
RS41-RAW	001		27	
RS41-EDT	001		27	
RS41-GDP	001		27	

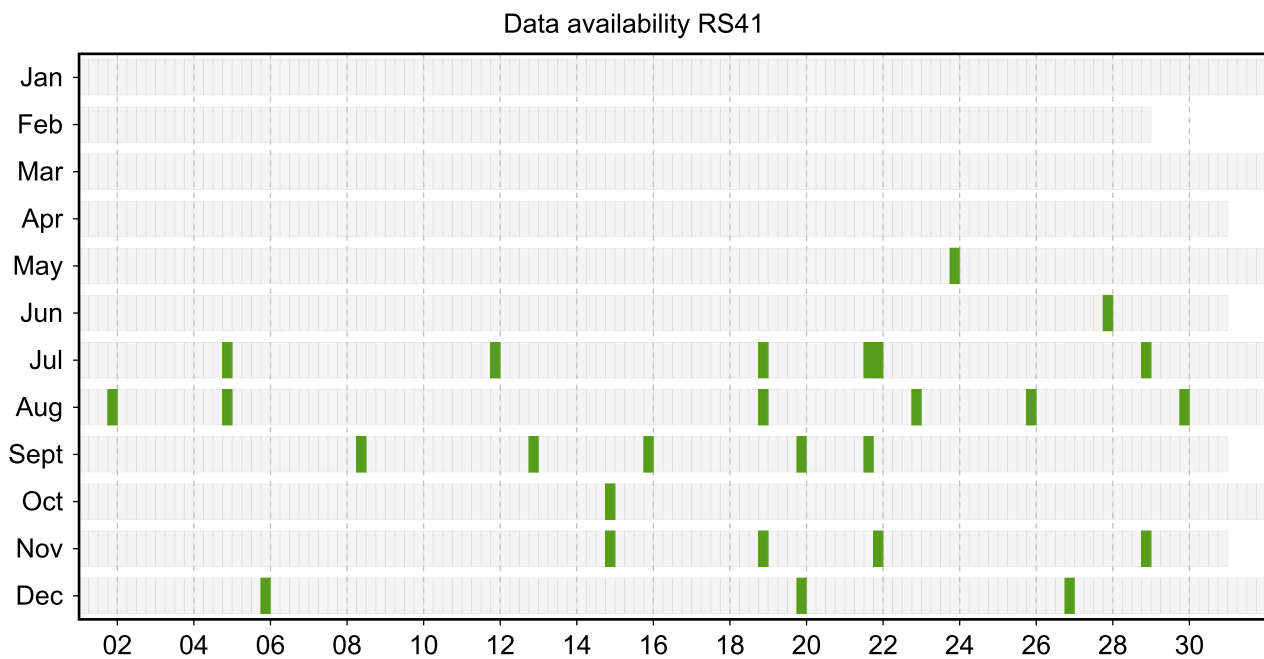
4.3 Availability of data products

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.

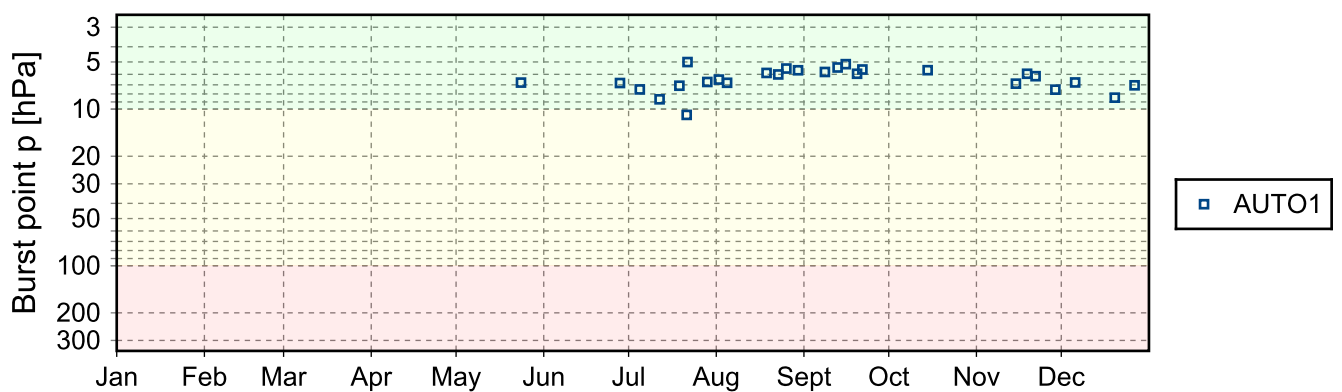
4.3.1 Stream: RS41



4.4 Instrument combinations of POT-RS-02

Count	Instrument combination
27	RS41

4.6 Measurement events





GRUAN Site Report for Potenza (POT), 2023

Reported time range is Jan 2023 to Dec 2023

Created by the Lead Centre

Version from 2024-03-01

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	Rosoldi, Marco
WMO no./name	0-20008-0-POT null
Operators	currently 4, changes +0 / -0
Sounding Site	2
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	46
POT-RS-02	Automatic Potenza Launch System (Autosonde AS15)	Sounding Site	1	30

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	Rosoldi, Marco
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	Rosoldi, Marco
Started at	-
Defined setups	5 (OZONE, ROUTINE, ROUTINE2, RESEARCH, ROUTINE3)
Possible streams	ECC, RS41, RS92

3.1 Lead Centre comments

3.1.1 Dataflow

Soundings are submitted from May to November.

3.1.2 General

This is the manual launching site.

The current operational radiosonde is the Vaisala RS41.

There is good performance in terms of burst altitude which is regularly 10 hPa and higher.

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		46	46	
RS41-RAW	001		46	
RS41-EDT	001		46	
RS41-GDP	001		46	

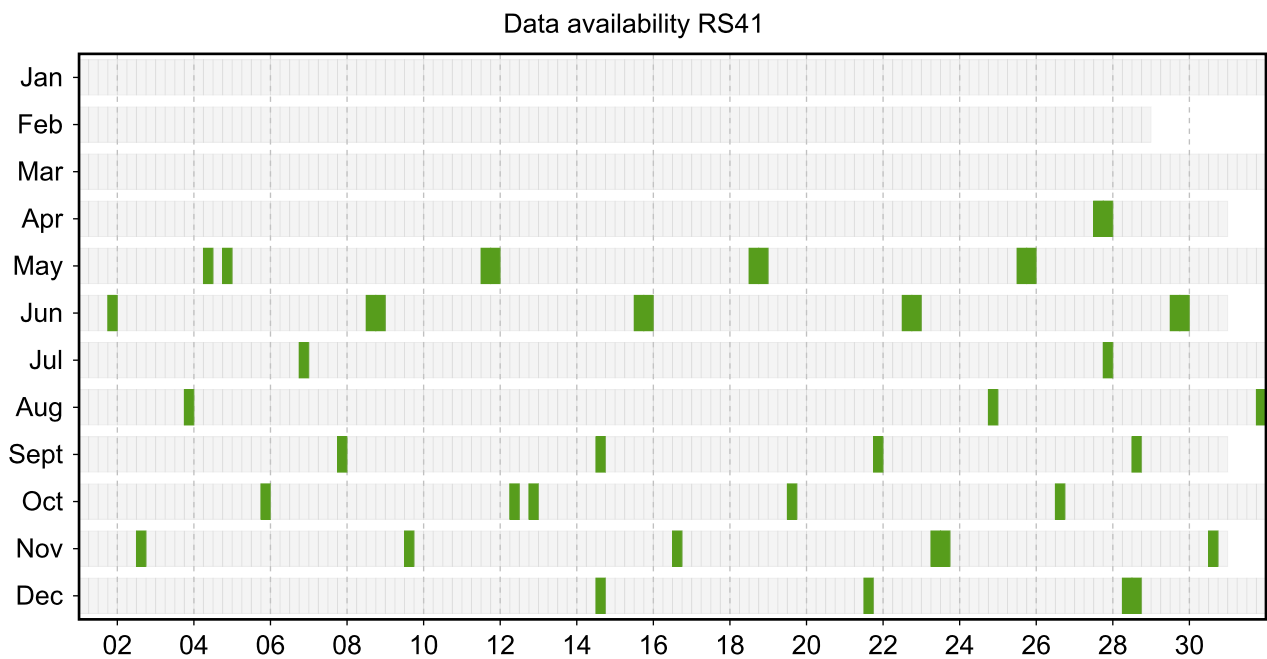
3.3 Availability of data products

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).

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3.3.1 Stream: RS41



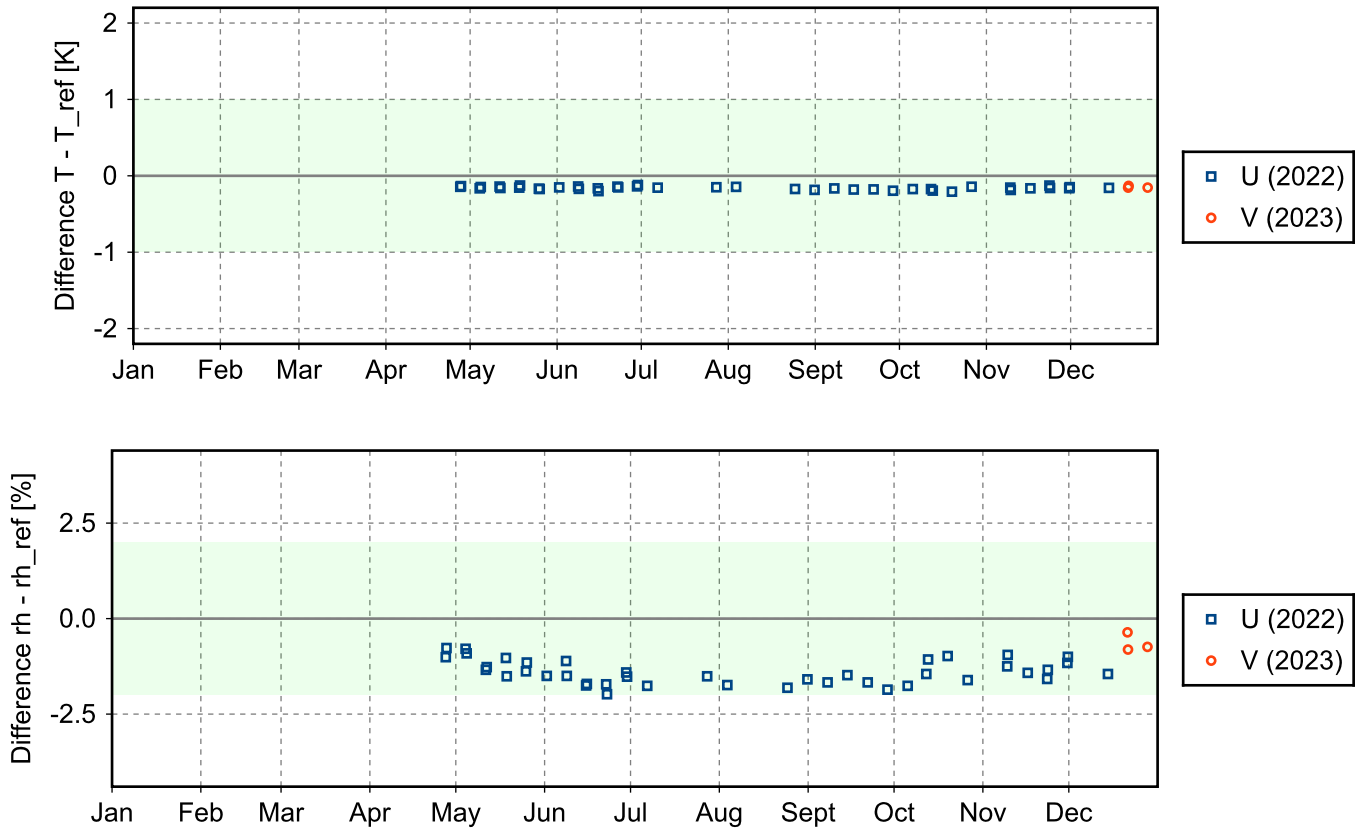
3.4 Instrument combinations of POT-RS-01

Count	Instrument combination
46	RS41

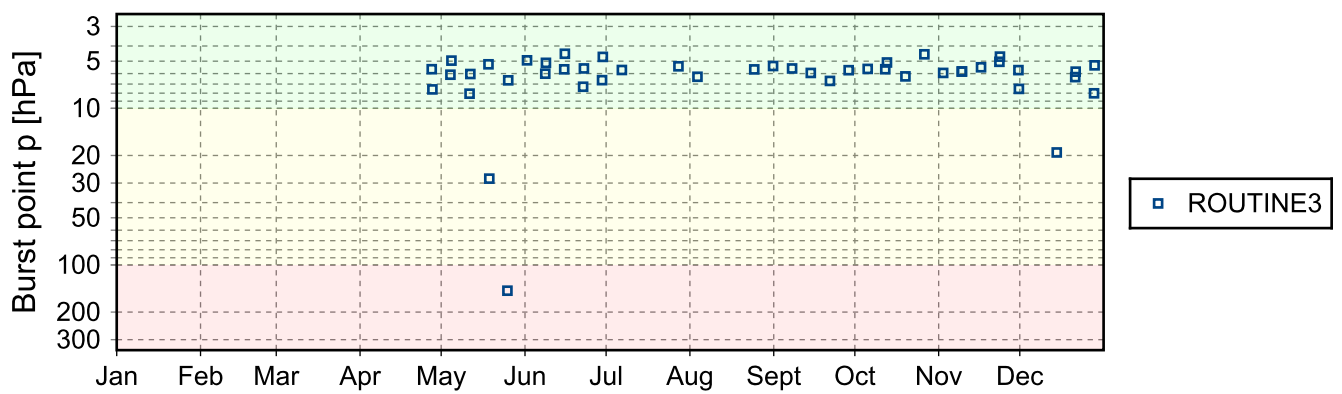
3.5 Instrument ground check

3.5.1 Stream: RS41

(1) GroundCheck: GC-SHC



3.6 Measurement events



4 System: Automatic Potenza Launch System (Autosonde AS15) (POT-RS-02)

Object	Value
System name	Automatic Potenza Launch System (Autosonde AS15)
Unique GRUAN ID	POT-RS-02
System type	Sounding Site (RS - Radiosonde)
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
Instrument contact	Rosoldi, Marco
Started at	2022-03-01
Defined setups	1 (AUTO1)
Possible streams	RS41

4.1 Lead Centre comments

4.1.1 Dataflow

Soundings are submitted in complement to the manual launches.

4.1.2 General

This is the autolauncher system.

The current operational radiosonde is the Vaisala RS41.

There is good performance in terms of burst altitude which is regularly 10 hPa and higher.

4.2 GRUAN data products

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

RS41		30	30	
RS41-RAW	001		30	
RS41-EDT	001		30	
RS41-GDP	001		29	

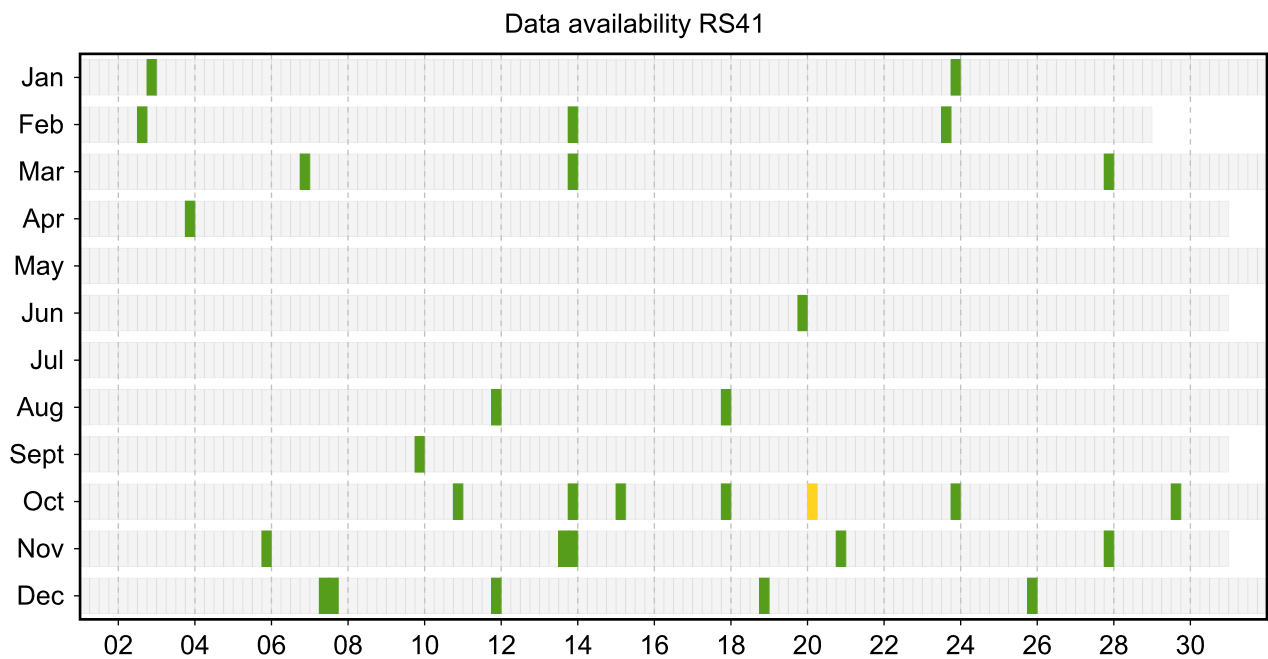
4.3 Availability of data products

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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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.

4.3.1 Stream: RS41



4.4 Instrument combinations of POT-RS-02

Count	Instrument combination
30	RS41

4.6 Measurement events

