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GRUAN Site Report for Potenza

(Submitted by Fabio Madonna)

Summary and Purpose of this Document

Report from the GRUAN site Potenza for the period January to December 2020.

Overview

Measurements from nighttime radiosoundings, routinely performed twice per week, is the only data stream available from GRUAN Potenza station. RS41 radiosondes are manually launched, typically on Monday and Thursday between 30 and 120 minutes after sunset. A manufacturer-independent pre-launch ground check is regularly performed using the standard humidity chamber SPRH100. According to the available resources, the radiosondes are launched in correspondence of the GNSS-RO or LEO satellite overpasses whose list is provided by the Lead Center (LC). Relevant overpasses occurring during the week (no Saturday and Sunday) and within ± 2 hours of the sunset are considered only.

During the reference period (from January to December 2020), 64 radiosoundings were performed, which are fewer than expected due to the interruption of the measurements in the period from March to May due to the Covid-19 pandemic, when the access to the facility was forbidden by the Governmental rules.

About future data streams, the site of Potenza is currently arranging the GNSS data transfer with GFZ (delayed due to the pandemic). In addition, the automatic radiosonde launcher, operating since 2004, has been upgraded and, depending on the available resources, it is expected to resume the automatic launches, stopped in 2016, within this year. Finally, the facility at Potenza is being upgraded due to the recent acquisition of new instruments, including a GNSS antenna (Trimble), a manual portable radiosounding system, an automatic Raman lidar for aerosol and water vapour profiling, a microwave profiler (MWR), and a Doppler lidar for wind profiling. However, also because of the restrictions for the Covid-19 pandemic, the installation and full operation of these new instruments has been delayed and it is expected by spring 2022.

Change and change management

During the reporting period, there were no relevant changes in station measurement programs, operating procedures, operators, instruments, data processing algorithms, data acquisition software, as well as in location of instruments and their operating environments.

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 manual portable launch system, along with several other instruments of interest for the future network development (see also the “Overview section”). Moreover, funds are available to ensure at least 3 weekly launches (two manual and one

automatic) for the next two years and possible additional resources for participation in measurement campaigns relevant for GRUAN. Finally, the site of Potenza 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 97% of launches performed during the reporting period the burst point pressure was below 10hPa. No critical issues are expected in coming year for the supply of helium, currently in use at the Potenza station to inflate balloons. However, the station is discussing the need to refurbish the radiosonde laboratory to install an hydrogen generator to replace the helium.

Covid-19

Due to the Covid-19 pandemic, the Italian government enforced restrictions (lockdown) which caused the interruption of radiosonde launches in the period from March 9th to May 28th, as well as the delay in the on-site installation and test of new instruments acquired in the frame of an Italian project and of interest for GRUAN.

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 must be released by June 2021. A bias-adjusted version of IGRA data, called RHARM (Radiosonde HARMonization) will be published as well. Two companion papers will be submitted in April 2021, the first for presenting the RHARM approach and homogenization algorithm, the second for showing the quality of the RHARM homogenized data of temperature, relative humidity and wind, as well as the comparison with other existing datasets.

A peer-reviewed paper to present and discuss the results of an experiment assessing the difference of the temperatures measured with Vaisala RS92 to RS41 radiosondes, carried out by CNR in cooperation with the Italian NMI (INRiM).

In response to an action of the GRUAN IP, the Potenza site led the data analysis of the first assessment of performances of automatic radiosonde launchers, in view of their official use within the GRUAN network. The methodology and results are described in a peer-reviewed paper. 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 another peer-reviewed paper.

Finally, a study was recently carried out by CNR to assess trends and uncertainties in the atmospheric boundary layer height estimated using low and high resolution radiosounding temperature profiles. Also in this case, results and methodology have been published in a peer-reviewed paper.

GRUAN-related publications:

- Madonna, F.; Summa, D.; Di Girolamo, P.; Marra, F.; Wang, Y.; Rosoldi, M. Assessment of Trends and Uncertainties in the Atmospheric Boundary Layer Height Estimated Using Radiosounding Observations over Europe. *Atmosphere* 2021, 12, 301. <https://doi.org/10.3390/atmos12030301>
- Madonna, F.: Can Reference radiosounding measurements be used to improve historical time series? *Il Nuovo Cimento* 43 C (2020) 121, Italian Physical Society, DOI: 10.1393/ncc/i2020-20121-5
- 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 (0-20008-0-POT) has been officially assigned to the Potenza station, although the radiosounding data transmission through the WIS has been not established yet. For unknown reasons, the IT Met Service did not provide any feedback to the CNR’s re-iterated request to transmit the data. As done in the past, we request the support of the GRUAN Working Group and of GCOS secretariat to solve this age-old issue pending with Met Service.

Other archiving centers

Referring strictly to 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) and through the AERONET data archive (<https://aeronet.gsfc.nasa.gov>)

Participation in campaigns

During the reporting period, the Potenza site 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 guarantees the availability of resources to ensure the continuity and consolidation of the current GRUAN measurement programs, as well as the participation in measurements campaigns interesting for GRUAN.

Moreover, a major upgrade is currently being implemented at the facility, which is expected to be finalized by spring 2022 with the installation and operation of several new instruments, such as the upgraded autolauncher, a manual portable radiosounding system, a GNSS antenna, a multi-wavelength Raman lidar for aerosol and water vapour profiling, a microwave profiler (MWR), and a Doppler lidar for wind profiling. Once established and operational, all the 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), 2020

Reported time range is Jan 2020 to Dec 2020

Created by the Lead Centre

Version from 2021-04-27

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	0-20008-0-POT null
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	63

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		63	63	
RS41-GCA	001		61	
RS41-RAW	001		63	
RS41-EDT	001		62	
RS41-GDP-ALPHA	003		17	
RS41-GDP-ALPHA	004		2	
RS41-GDP-BETA	001		61	
RS41-GDP-BETA	002		13	

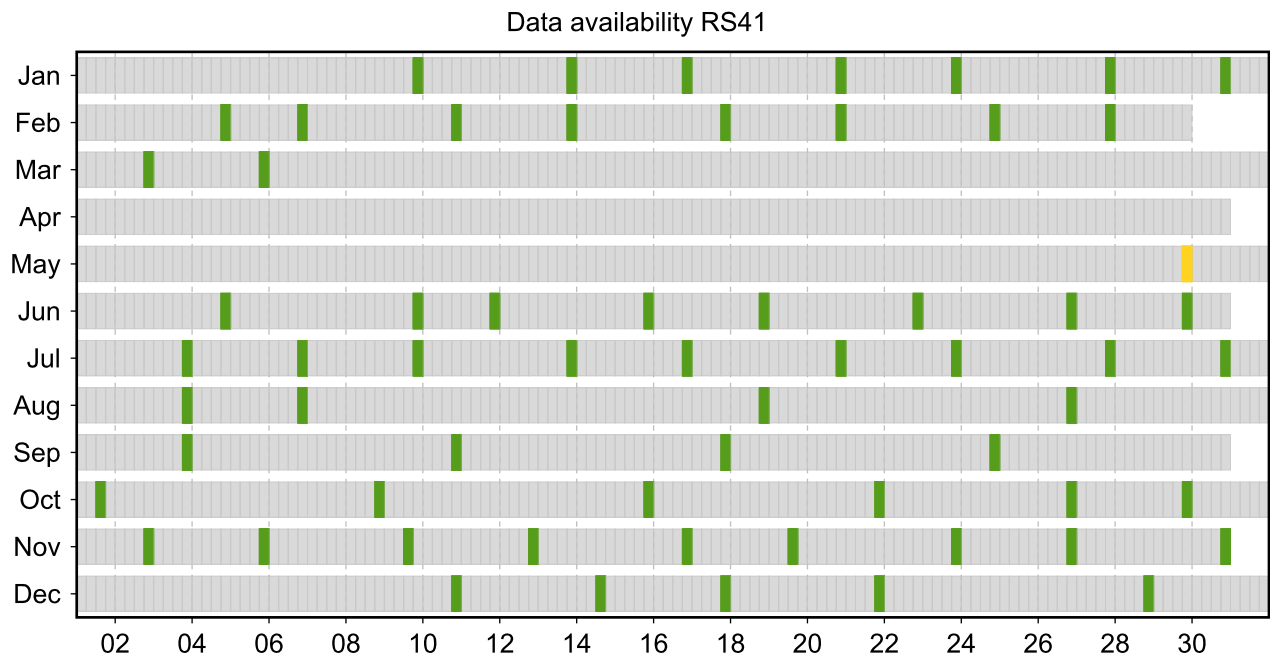
3.3 Availability of data products

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



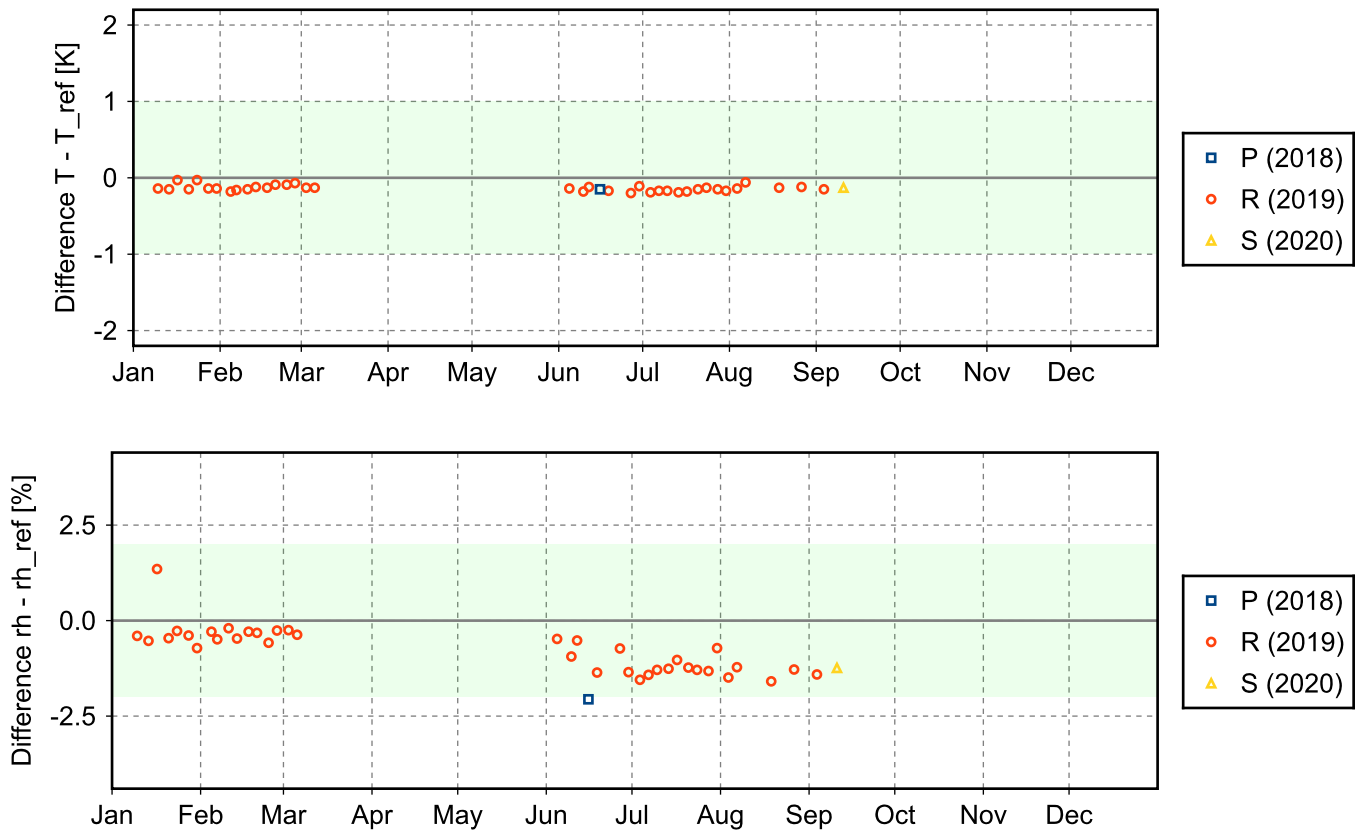
3.4 Instrument combinations of POT-RS-01

Count	Instrument combination
63	RS41

3.5 Instrument ground check

3.5.1 Stream: RS41

(1) GroundCheck: GC-SHC



3.6 Measurement events

