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GRUAN Site Report for Payerne

(Submitted by Giovanni Martucci)

Summary and Purpose of this Document

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

Overview

Operational programme, *PAY-RS-01/02*: The Vaisala RS41 is the official operational sonde at Payerne. It is launched twice per day at 11 and 23 UTC. Automatic flights from the AS15 Autosonde system are launched every midnight, weekend (noon and midnight) and official holidays (noon and midnight). An operator launches manual flights every working day at noon or (independently of the time of launch) in combination with an ozone sonde (three times per week). In 2020, 82 manual flights and 277 automatic flights have been performed and the data been sent to the LC.

UAI2022 special programme: Starting on 19th of March 2021, MeteoSwiss Payerne has started a programme of multi-payload GRUAN flights in the framework of the evaluation of the Modem M10 candidate GDP for the UAI2022 field campaign. Twenty flights, 7 with two Vaisala RS41 and one M10 on the same rig, and 13 flights with two RS41 and two M10 on the same rig have been realized between 19.0.21 and 23.05.22.

Both the operational and UAI2022 programmes have generated data that have been submitted to the LC. The operational flights are regularly submitted via RSLaunchClient to the LC, the UAI2022 programme flights have been submitted to the LC directly by Payerne for the RS41, the IPLS have provided the M10 GDP.

- *PAY-GN-01*

Contrary to what indicated in the 2021 GRUAN Site Report for Payerne, the Payerne GNSS data (Zenith Delay) are streamed daily by SwissTopo to the GFZ at Potsdam in daily 5-minute resolution RINEX files. In addition to this, the meteorological data from the SwissMetNet station of Payerne is sent to GFZ on RINEX format on a daily basis. The GFZ puts the Zenith Delay data obtained from SwissTopo on an ftp server. The data flow includes then all necessary data in order to perform an operational processing of GNSS-PW-GDP (as per communication of Galina Dick, on 27.06.2022).

- *PAY-LI-01*

The PAY-LI-01 is an operational all-day measurement of water vapour by the Raman lidar RALMO installed at Payerne. After a disruption of measurements started in July 2020 due to a laser failure, the normal measurement programme has been resumed in April 2021. *Data flow to LC*: no official automatic procedure are in place at GRUAN to ingest automatically the WV data from RALMO and to generate a GDP.

Change and change management

The operational PAY-RS-01/02 has been performed without interruption during the reporting period. In addition to the RS41 Vaisalas ground check, the standard humidity chamber (SHC) ground check

has been added to the pre-flight procedure of PAY-RS-01 (manual operational programme) since March 2021. The SHC ground check makes the PAY-RS-01 fully compliant with GRUAN. To ensure the long-term operability of the SHC. Two additional SHC have been purchased to Dr. Schultz and are now available for redundancy.

Resourcing

Resourcing challenges

- No changes in the staff composition during the reporting period of 2021.
- Instrumentation and staff units have not undergone any cut during 2021.

Funding:

The funding are of governmental origin and stable.

Operations

The data availability and the target achievement at the levels 100-30-10 hPa in 2020 has been globally (year performance) very good. However, the bursting levels at 30 hPa and 10 hPa have not been reached satisfactorily in the first month of 2021. The entire timeseries of burst altitude is provided in the plot below:

Covid-19

- COVID-19 pandemic has not affected the overall quality or data availability of operational *PAY-RS-01/02* GRUAN measurements at Payerne.
- COVID-19 pandemic has not affected the overall quality or data availability of operational *PAY-GN-01* GRUAN measurements at Payerne.
- COVID-19 pandemic has not affected the overall quality or data availability of operational *PAY-LI-01* measurements at Payerne.

Site assessment and certification

Payerne is a certified GRUAN site since September 2019.

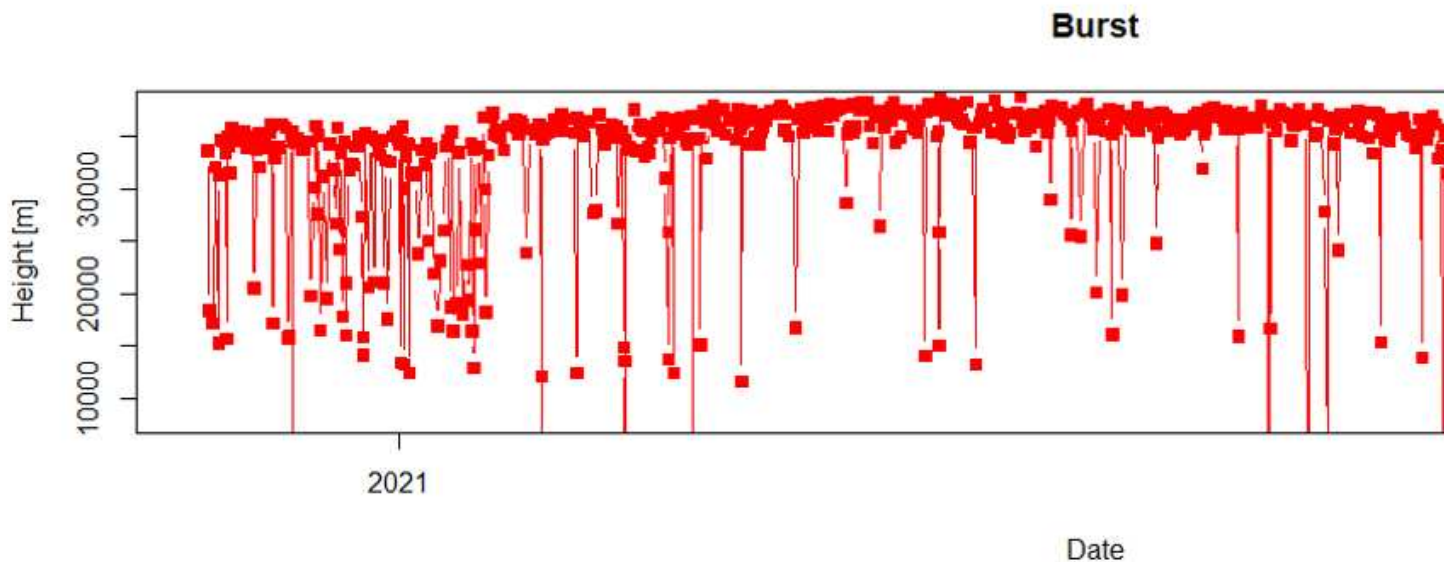


Figure 1: The reasons of the early burst altitude occurrences are assessed by a multi-factor analysis that includes balloon inflation flow rate, balloon type and Vaisala valve. More general monthly statistics from EUCOS and MeteoSwiss (MIS) are provided below.

GRUAN-related research

Task Team participation:

- Gonzague Romanens and Frédéric Vogt, MeteoSwiss, are members of the GRUAN *TT Radiosondes*.
- Giovanni Martucci is member of the GRUAN *TT Ancillary* under the specific task of LIDAR activities.
- A. Haefele, G. Martucci, G. Romanens, F. Vogt and C. Felix are part of the WMO task team on Upper Air Instrument Intercomparison, which has a direct impact on current GRUAN activities and testing and development of new GDP candidates.

In the framework of the UAI2022 and GRUAN activities, MeteoSwiss has performed twenty multi-payload flights: 7 flights with 2 Vaisala RS41 and 1 M10 on the same rig, and 13 flights with 2 RS41 and 2 M10 on the same rig. All flights have been processed by the LC and the IPSL to generate the GDP for the RS41 and the Modem M10, respectively.

2021 MIS/EUCOS

Pressure < 100 hPa = 728 / 730 = 99 %

Pressure < 30 hPa = 709 / 730 = 97 %

Pressure < 10 hPa = 679 / 730 = 93 %

Average burst Altitude for Manual launch

Average burst Altitude for Automatic launch

Date of flight	Payload
13.03.21	RS41 + RS41 + M10
24.03.21	RS41 + RS41 + M10
20.04.21	RS41 + RS41 + M10
22.04.21	RS41 + RS41 + M10
13.05.21	RS41 + RS41 + M10
17.05.21	RS41 + RS41 + M10
20.05.21	RS41 + RS41 + M10
17.06.21	RS41 + RS41 + M10 + M10
09.12.21	RS41 + RS41 + M10 + M10
15.12.21	RS41 + RS41 + M10 + M10
15.12.21	RS41 + RS41 + M10 + M10
16.12.21	RS41 + RS41 + M10 + M10
16.12.21	RS41 + RS41 + M10 + M10
19.01.22	RS41 + RS41 + M10 + M10
20.01.22	RS41 + RS41 + M10 + M10
12.04.22	RS41 + RS41 + M10 + M10
05.05.22	RS41 + RS41 + M10 + M10
12.05.22	RS41 + RS41 + M10 + M10
23.05.22	RS41 + RS41 + M10 + M10

MeteoSwiss PAY has also resumed the COBALD programme initiated in 2020. The nighttime

COBALD flights were initially scheduled to resume already in 2021, but they only have restarted in March 2022. They then will be reported in more detail in the 2022 GRUAN report.

List of published GRUAN-related scientific publications:

- Chouza, F., Leblanc, T., Brewer, M., Wang, P., Martucci, G., Haeefe, A., Vérémes, H., Duflot, V., Payen, G., and Keckhut, P.: The impact of aerosol fluorescence on long-term water vapor monitoring by Raman lidar and evaluation of a potential correction method, *Atmos. Meas. Tech.*, 15, 42414256, , 2022.
- Martucci, G., Navas-Guzmán, F., Renaud, L., Romanens, G., Gamage, S. M., Hervo, M., Jeannet, P., and Haeefe, A.: Validation of pure rotational Raman temperature data from the Raman Lidar for Meteorological Observations (RALMO) at Payerne, *Atmos. Meas. Tech.*, 14, 13331353, , 2021.

WG-GRUAN interface

No request

Other archiving centers

NDACC

Participation in campaigns

Upper Air Instrument Intercomparison 2022, Lindenberg, Germany, 8 August 16 September 2022

Future plans

- Finalization of the UAII2022 with publication of its final report.
- Possibility to add new radiosounding systems for testing as done with Modem, e.g. Graw.



GRUAN Site Report for Payerne (PAY), 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	Payerne
Unique GRUAN ID	PAY
Geographical position	46.8100 °N, 6.9500 °E, 491.0 m
Operated by	MSWISS Office fédéral de météorologie et climatologie MeteoSuisse
Main contact	Martucci, Giovanni
WMO no./name	06610 PAYERNE
Operators	currently 14, changes +0 / -6
Sounding Site	2
Lidar	1
GNSS	1

1.1 General information about GRUAN measurement systems

System	Name	Type	Setups	Measurements
PAY-GN-01	GNSS Site PAYE	GNSS	1	operational
PAY-LI-01	Payerne Raman WV Lidar (RALMO)	Lidar	1	0
PAY-RS-01	Payerne Radiosonde Launch Site	Sounding Site	8	255
PAY-RS-02	Automatic Payerne Launch System (Autosonde)	Sounding Site	1	505

1.2 General comments from Lead Centre

No comments from Lead Centre.

2 System: GNSS Site PAYE (PAY-GN-01)

Object	Value
System name	GNSS Site PAYE
Unique GRUAN ID	PAY-GN-01
System type	GNSS (GN - GNSS)
Geographical position	46.8121 °N, 6.9439 °E, 548.7 m
Operated by	MSWISS Office fédéral de météorologie et climatologie MeteoSuisse
Instrument contact	Martucci, Giovanni
Started at	-
Defined setups	1 (HOURLY)
Possible streams	-

2.1 Lead Centre comments

2.1.1 Dataflow

Dataflow of GNSS data to GRUAN LC and the GRUAN GNSS processing centre at GFZ has started in October 2018. The current dataflow includes converted raw data (RINEX) and instrument logs, containing all equipment changes.

Meteorological data are missing, therefore the operational processing as GNSS-PW-GDP cannot be performed at moment.

3 System: Payerne Raman WV Lidar (RALMO) (PAY-LI-01)

Object	Value
System name	Payerne Raman WV Lidar (RALMO)
Unique GRUAN ID	PAY-LI-01
System type	Lidar (LI - Lidar)
Geographical position	46.8100 °N, 6.9500 °E, 491.0 m
Operated by	MSWISS Office fédéral de météorologie et climatologie MeteoSuisse
Instrument contact	Martucci, Giovanni
Started at	2013-09-01
Defined setups	1 (TEST-1)
Possible streams	-

3.1 Lead Centre comments

3.1.1 Dataflow

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

4 System: Payerne Radiosonde Launch Site (PAY-RS-01)

Object	Value
System name	Payerne Radiosonde Launch Site
Unique GRUAN ID	PAY-RS-01
System type	Sounding Site (RS - Radiosonde)
Geographical position	46.8133 °N, 6.9434 °E, 491.0 m
Operated by	MSWISS Office fédéral de météorologie et climatologie MeteoSuisse
Instrument contact	Romanens, Gonzague
Started at	-
Defined setups	8 (ROUTINE, OZONE, RESEARCH, SRS-TEST, DUAL, ROUTINE2, ROUTINE3, OZONE2)
Possible streams	COBALD, ECC, M10, RS41, RS92, SRS-C34, SRS-C50

4.1 Lead Centre comments

4.1.1 Dataflow

Dataflow to GRUAN LC was running intermittently since September 2011.

Currently, the dataflow includes streams of the operational sonde Vaisala RS41-SG, COBALD backscatter sonde, and ECC ozone sonde. Launches are promptly recorded using the GruanToolRsLaunch (gtRsl) or the RsLaunchClient (RLC).

4.2 GRUAN data products

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

COBALD		2	2	
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4.2.2 Stream: ECC

ECC		141	141	
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4.2.3 Stream: RS41

RS41		266	266	
RS41-RAW	001		266	
RS41-EDT	001		256	
RS41-GDP	001		265	
RS41-GDP-BETA	002		125	
RS41-GDP-BETA	003		219	

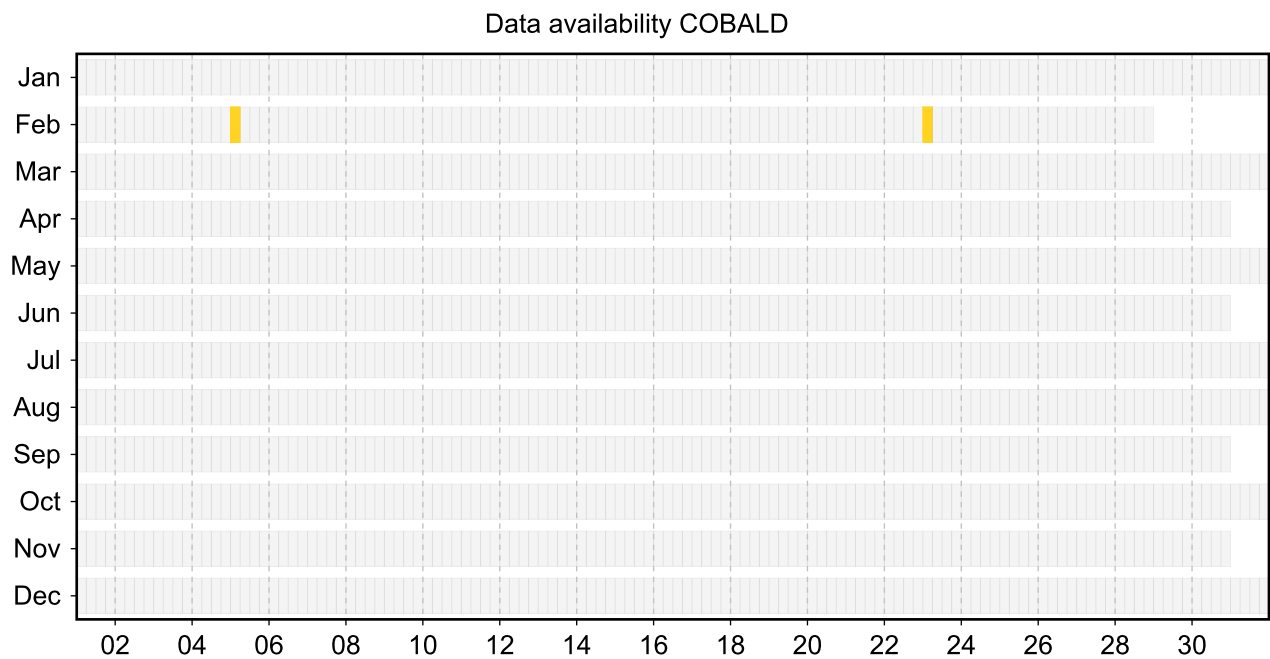
4.3 Availability of data products

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).

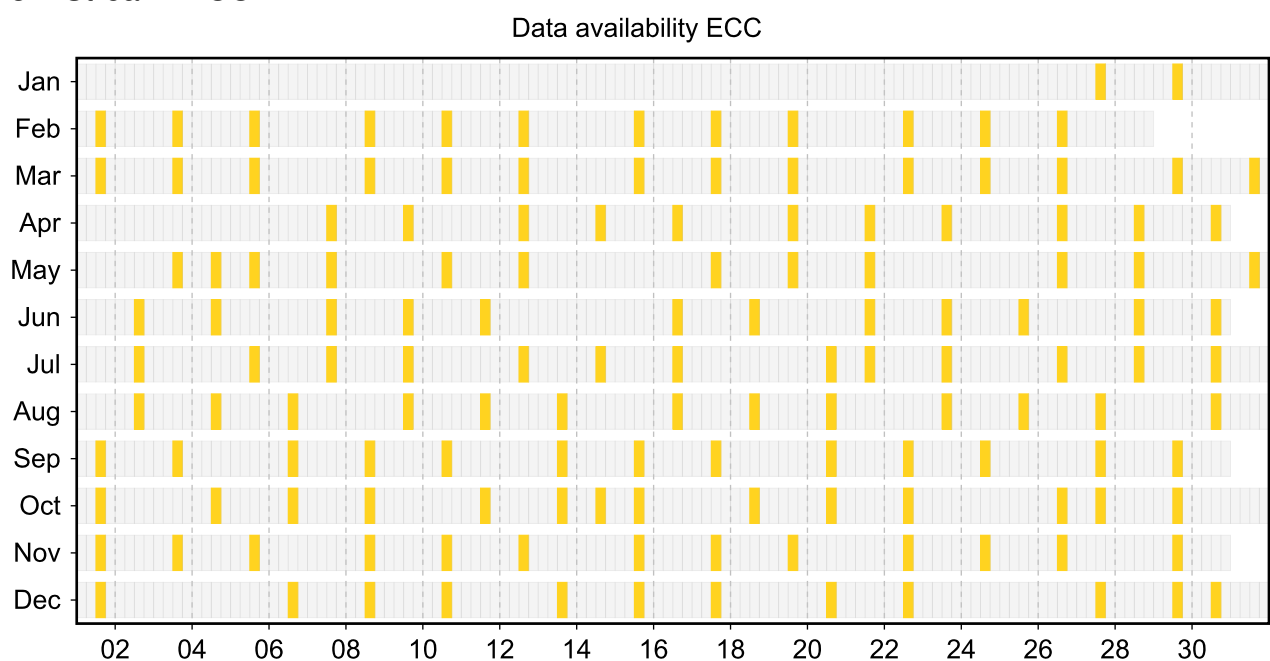
Unprocessed (yellow): The manufacturer-produced file with raw measurement data has been successfully converted into a GRUAN-standardized raw data format (NetCDF). The GRUAN data processing has not been performed or was aborted. Reasons for this may be a still missing GRUAN data processor or a processing-software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

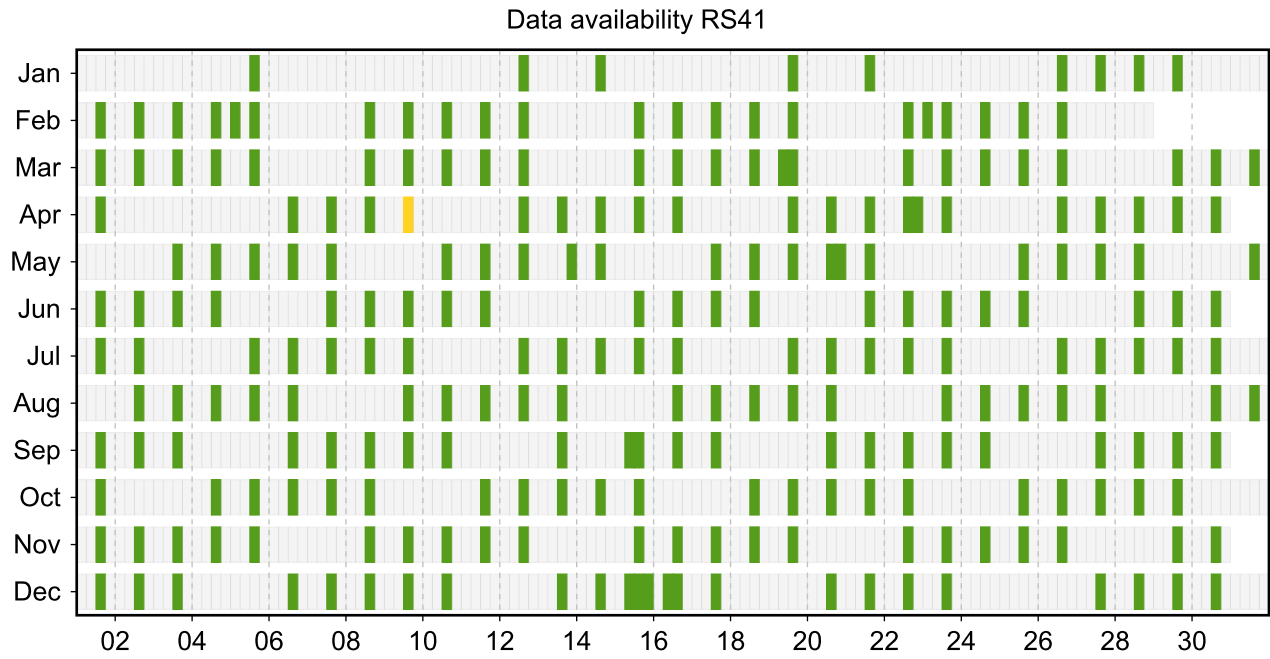
4.3.1 Stream: COBALD



4.3.2 Stream: ECC



4.3.3 Stream: RS41



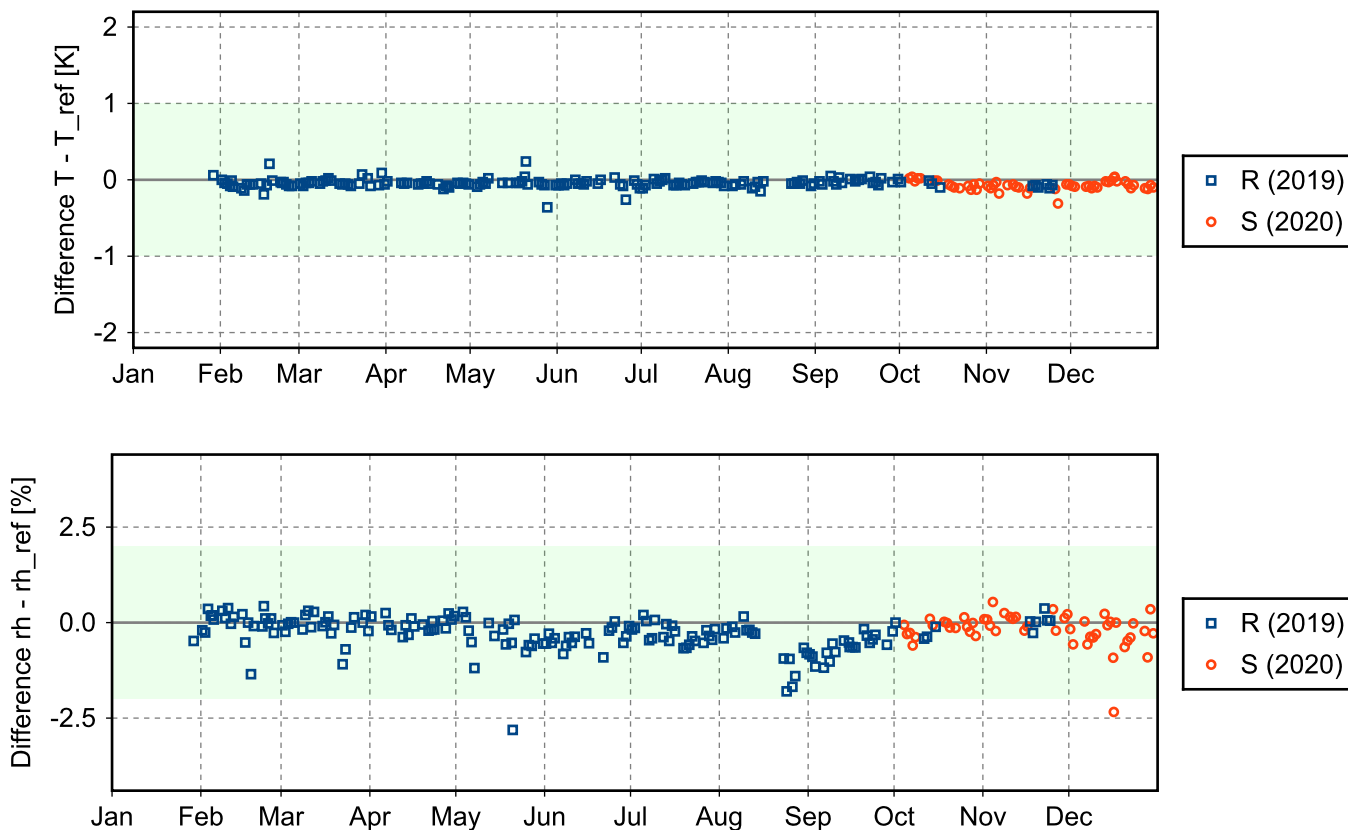
4.4 Instrument combinations of PAY-RS-01

Count	Instrument combination
2	COBALD, RS41
141	ECC, RS41
101	RS41
11	2x RS41

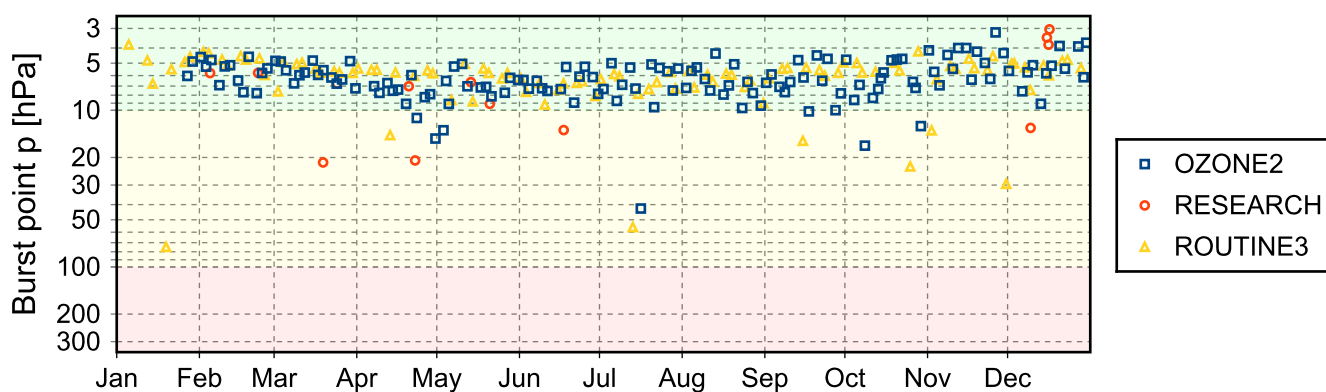
4.5 Instrument ground check

4.5.1 Stream: RS41

(1) GroundCheck: GC-SHC



4.6 Measurement events



5 System: Automatic Payerne Launch System (Autosonde) (PAY-RS-02)

Object	Value
System name	Automatic Payerne Launch System (Autosonde)
Unique GRUAN ID	PAY-RS-02
System type	Sounding Site (RS - Radiosonde)
Geographical position	46.8133 °N, 6.9434 °E, 490.0 m
Operated by	MSWISS Office fédéral de météorologie et climatologie MeteoSuisse
Instrument contact	Romanens, Gonzague
Started at	2018-03-19
Defined setups	1 (AUTO1)
Possible streams	RS41

5.1 Lead Centre comments

5.1.1 Dataflow

Dataflow of auto launcher system to GRUAN LC is running since October 2018. This dataflow includes stream of the operational sonde Vaisala RS41-SG (since March 2018). All launches are promptly recorded using the GruanToolRsLaunch (gtRs).

5.1.2 General

This auto launcher system was established in March 2018.

5.2 GRUAN data products

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

RS41		505	505	
RS41-RAW	001		505	
RS41-EDT	001		505	
RS41-GDP	001		502	
RS41-GDP-BETA	002		258	
RS41-GDP-BETA	003		435	

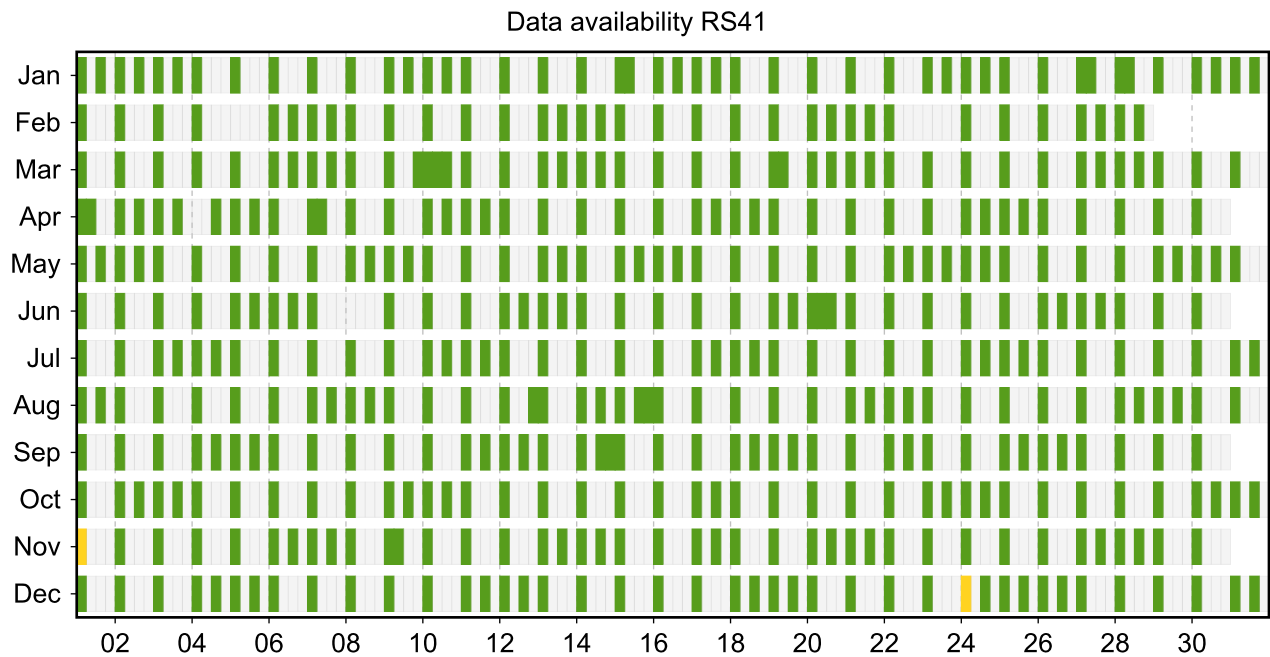
5.3 Availability of data products

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: RS41



5.4 Instrument combinations of PAY-RS-02

Count	Instrument combination
505	RS41

5.6 Measurement events

