



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

Doc. 1.15
(06.X.2020)

**12th GRUAN Implementation-
Coordination Meeting (ICM-12)**

Session 1

Virtual

16 - 20 November 2020

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 2019.

Overview

Consolidated measurement programmes:

- The multi-payload comparison programme (RS41, RS92, SRS-C34, SRS-C50) has been continued during 2019.
- The Vaisala RS41 is the official operational sonde at Payerne launched twice daily at 11 and 23 UTC. The RS41 is launched every midnight, weekend (noon and midnight) and official holidays (noon and midnight) automatically by the Vaisala AS15 Autosonde system. Operational flights with the Vaisala RS41 are launched manually every day of the week at noon and when the ozone sonde (three times per week) is launched together with the RS41 (independently of the time of launch).

GRUAN new product:

- Operational Raman lidar for temperature, humidity and aerosols. Continuous operation since 2008 with 50 % data availability on average. Nighttime measurements cover UTLS region.

Other GRUAN products available at PAY that may contribute to future GRUAN data stream as listed in the GRUAN Site Report for Payerne (PAY), 2019 (gsr_PAY_2019.pdf):

| 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 | 7 | 78 |
| PAY-RS-02 | Automatic Payerne Launch System (Autosonde) | Sounding Site | 1 | 478 |

The PAY-LI-01 is an operational all-day measurement of aerosol backscatter, water vapour and temperature. To the best of our knowledge, no official automatic procedure are in place at GRUAN to ingest automatically these products. A few successful and promising ad hoc tests have been conducted to acquire and process raw data from RALMO into GLASS.

Change and change management

- We have introduced a new method to store the radiosounding data in the format of standard levels in order to foster the climatology analysis at specific atmospheric levels.

- The number of operational radiosounding has been doubled (from 2 to 4 per day) during the period 15-April to 15-June to compensate the gap of measurements of AMDAR (airlines grounding due to COVID-19).
- Descent flight data have been started recording since April 2020.

Resourcing

Resourcing challenges:

- No changes in the staff composition during the year 2019.
- Instrumentation and staff units have not undergone any cut during 2019.

Funding:

- The funding are of governmental origin and stable.

Operations

Operational challenges:

The data availability and the target achievement at the levels 100-30-10 hPa has been excellent in 2019.

| Levels | Q1 | Q2 | Q3 | Q4 | Total |
|-----------------------------------|--------|--------|--------|--------|-------|
| Success rate reaching 100 hPa (%) | 96.00% | 100.0% | 98.00% | 100.0% | 99% |
| Success rate reaching 30 hPa (%) | 92.00% | 97.00% | 98.00% | 91.00% | 95% |
| Success rate reaching 10 hPa (%) | 92.00% | 93.00% | 91.00% | 88.00% | 91% |

Deviation from GRUAN operating procedure:

- The consolidated operational radiosounding measurement program consists of an automatic and manual procedure. Currently only the manual non-ozone sounding are automatically ingested into the GruanToolRsLaunch (gtRsl), for the year 2019, only 78 operational RS41 flights have been uploaded onto the LC database versus 478 automatic flight not uploaded.
- Currently PAY does not perform a routine SHC procedure prior to each flight.

Site assessment and certification

Payerne has been recertified as GRUAN site on September 2019.

GRUAN-related research

Task Team participation:

- Gonzague Romanens and Christian Felix, MeteoSwiss, are members of the GRUAN TT Radiosondes with the task to report on auto-launcher performances and GRUAN compatibility.
- Giovanni Martucci is member of the GRUAN TT Ancillary under the specific task of LIDAR activities.

List of in-preparation/submitted/published GRUAN-related scientific publications:

- Mahagammulla Gamage, S., Sica, R. J., Martucci, G., and Haeefe, A.: Retrieval of temperature from a multiple channel pure rotational Raman backscatter lidar using an optimal estimation method, *Atmos. Meas. Tech.*, 12, 58015816, <https://doi.org/10.5194/amt-12-5801-2019>, 2019
- Navas-Guzmán, F., Martucci, G., Collaud Coen, M., Granados-Muñoz, M. J., Hervo, M., Sicard, M., and Haeefe, A.: Characterization of aerosol hygroscopicity using Raman lidar measurements at the EARLINET station of Payerne, *Atmos. Chem. Phys.*, 19, 1165111668, <https://doi.org/10.5194/acp19-11651-2019>, 2019
- Hicks-Jalali, S., Sica, R. J., Haeefe, A., and Martucci, G.: Calibration of a water vapour Raman lidar using GRUAN-certified radiosondes and a new trajectory method, *Atmos. Meas. Tech.*, 12, 36993716, <https://doi.org/10.5194/amt-12-3699-2019>, 2019

WG-GRUAN interface

Enable an official GRUAN procedure to accept the automatic radiosounding programme that we perform at PAY.

Other archiving centers

- EARLINET: Lidar
- NDACC: Ozone Radiosounding + Lidar

Participation in campaigns

Nothing to be reported for the year 2019.

Future plans

Payerne has acquired 15 COBALD sondes that will be flown during the last trimester of 2020 and the first par of 2021. One of the objective of this programme is to study the vertical profile of the hygrosopicity through the lower troposphere and its validation with the lidar.



GRUAN Site Report for Payerne (PAY), 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 | 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 16, changes +0 / -0 |
| 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 | 7 | 78 |
| PAY-RS-02 | Automatic Payerne Launch System (Autosonde) | Sounding Site | 1 | 478 |

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 is 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 | 7 (ROUTINE, OZONE, RESEARCH, SRS-TEST, DUAL, ROUTINE2, ROUTINE3) |
| Possible streams | COBALD, ECC, 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. This dataflow included streams of the Meteolabor SRS-C34, Meteolabor SRS-C50, Vaisala RS92-SGP, Vaisala RS41-SG, and ECC ozone sonde.

Operational data flow of manual routine launches is working well. This dataflow includes stream of the operational sonde Vaisala RS41-SG. All launches are promptly recorded using the GruanToolRsLaunch (gtRsl).

Data flow of all manual research and ozone flights are interrupted since January 2018. An appropriate solution should be found in cooperation between site and LC.

4.2 GRUAN data products

| Product | Version | Soundings received | Available at LC | Distributed by NCEI |
|---------|---------|--------------------|-----------------|---------------------|
|---------|---------|--------------------|-----------------|---------------------|

4.2.1 Stream: RS41

| | | | | |
|----------------|-----|----|----|--|
| RS41 | | 78 | 78 | |
| RS41-RAW | 001 | | 77 | |
| RS41-EDT | 001 | | 77 | |
| RS41-GDP-ALPHA | 001 | | 3 | |
| RS41-GDP-ALPHA | 002 | | 63 | |
| RS41-GDP-ALPHA | 003 | | 31 | |
| RS41-GDP-BETA | 001 | | 31 | |

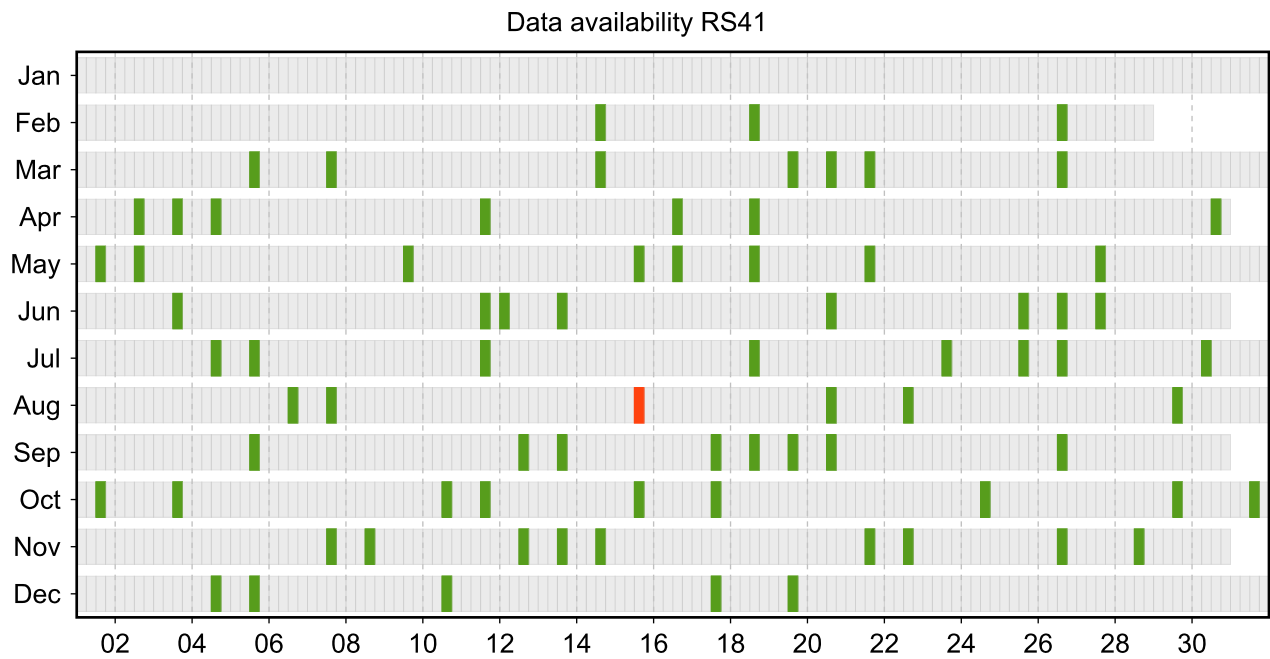
4.3 Availability of data products

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.

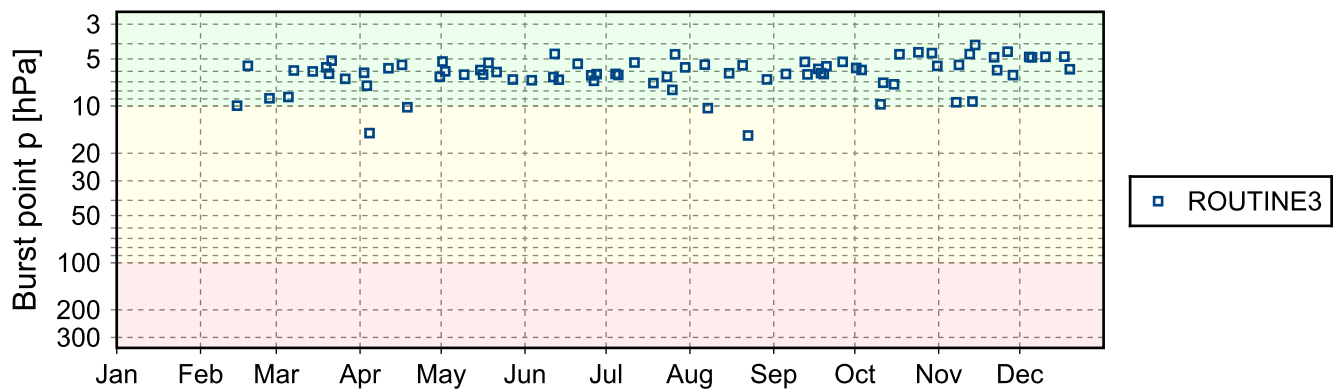
4.3.1 Stream: RS41



4.4 Instrument combinations of PAY-RS-01

| Count | Instrument combination |
|-------|------------------------|
| 78 | RS41 |

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 (gtRsI).

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 |
|---------|---------|--------------------|-----------------|---------------------|
|---------|---------|--------------------|-----------------|---------------------|

5.2.1 Stream: RS41

| | | | | |
|----------------|-----|-----|-----|--|
| RS41 | | 478 | 478 | |
| RS41-RAW | 001 | | 478 | |
| RS41-EDT | 001 | | 478 | |
| RS41-GDP-ALPHA | 001 | | 74 | |
| RS41-GDP-ALPHA | 002 | | 383 | |
| RS41-GDP-ALPHA | 003 | | 159 | |
| RS41-GDP-BETA | 001 | | 160 | |

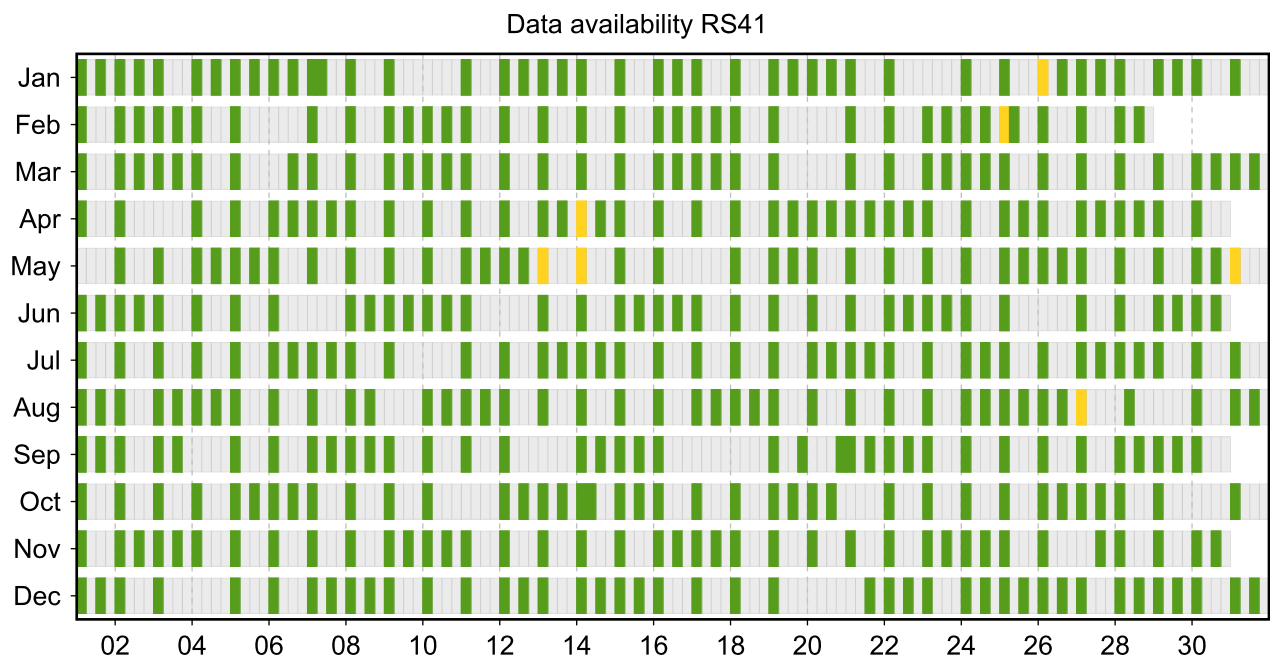
5.3 Availability of data products

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).

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5.3.1 Stream: RS41



5.4 Instrument combinations of PAY-RS-02

| Count | Instrument combination |
|-------|------------------------|
| 478 | RS41 |

5.6 Measurement events

