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

10th GRUAN Implementation-Coordination Meeting (ICM-10)
Potsdam, Germany
23 - 27 April 2018

Doc. 7.15
(13.IV.2018)

Session 7

GRUAN Site Report for Payerne

(Submitted by Dominique Ruffieux)

Summary and Purpose of this Document

Report from the GRUAN site Payerne for the period January to December 2017.

GRUAN Site Report for Payerne (PAY)

Reporting for the period January to December 2017
Date: 16-March-2018
Primary author: Dominique Ruffieux
(Dominique.Ruffieux@meteoswiss.ch)

Overview

1. Radiosounding MeteoSwiss is operating two types of flights:

   - Operational flights: The SRS-C34 radiosonde was in operation since January 2011. The first of February, 2017 MeteoSwiss switched its operational soundings from SRS-C34 to SRS-C50. Measurements are taken at UT00:00 and UT12:00. Data submission of the SRS-C34 GRUAN product using RsLaunchClient started on 1st of September 2014 and was sent on a regular basis until the transition to SRS-C50. Activation of data submission for SRS-C50 to GRUAN was initially foreseen, but this target has been canceled considering the evolution of the resources and operational sounding program in Payerne.

   - Research flights: Since January 2015, the Vaisala RS92-SGP is launched in parallel with SRSC34 radiosondes every week, alternating one flight during the night and one flight during the day. Since February 1st, 2017, a SRS-C50 is also added to this payload (but data from SRS-C50 are not transmitted to the LC). Vaisala RS41-SG was also added on this multiple payload on a regular basis. During one night flight per month a Meteolabor SnowWhite / COBALD sensor is added to the GRUAN launch for research purposes in collaboration with ETHZ. Unfortunately, because of SnowWhite sonde availability, this sonde was in fact not flown regularly.

2. Ancillary measurements

   - Raman LIDAR measurements are made automatically and continuously. Data submission is in preparation, first test with centralized processing have been successful. The Raman LIDAR at Payerne is operational (24H/7D) and measures profiles of water vapor mixing ratio, aerosol scattering ratio and temperature with an averaged data availability of 50% since 2008. Measurements in the lower stratosphere are possible during all clear nights (without cirrus!). A

procedure using the solar background measured by the LIDAR is used to calibrate automatically the water vapor product and is now operational. Following a realignment of the spectral unit the quality of the temperature product has been significantly improved. Plans are to submit data to NDACC in HDF format and to GRUAN using the Lidar-RunClient. Thierry Leblanc from NASA-JPL Table Mountain Facility (TMF) is the developer of the GRUAN Lidar Analysis Software Suite (GLASS). He has invited Payerne and Cabauw (KNMI-NL) LIDAR representatives to TMF for a week workshop (October 15-20, 2017) to create the GLASS metadata file and to initiate the retrieval of water vapor products to be stored into the GRUAN dataset. The retrieval results for the Payerne Raman LIDAR have been very promising. MeteoSwiss has played a key role in this phase of establishment of GLASS in the framework of GRUAN and will continue to act as reference in the evaluation of the water vapor retrieval by GLASS also in 2018.

- A microwave radiometer of type HATPRO, a radar wind profiler as well as a GPS receiver are operated at Payerne since 2007. Data are currently not submitted to GRUAN.

Change and change management

- The SRS-C50 is operated since February 1, 2017. To document changes between SRS-C34 and SRS-C50, comparisons are done by adding these radiosondes to the GRUAN research flights. This comparison will be undertaken during at least one more year. Due to limited human resources, it was not possible to evaluate the C50 uncertainties, therefore this dataset will only be used for internal analysis (documentation of the transition) and not transmitted to the LC.

- Starting 1 April, 2018, night-time and weekend operational launches will be made with a Vaisala auto-launcher AS15 using RS41-SG sondes and daytime soundings will be operated manually using also RS41-SG. Multiple payload GRUAN research flights will be still manually operated as before.

- Replacement of air conditioner in the Raman LIDAR cabin in November 2017. The temperature stability is not yet fully satisfactory and will be further optimized in 2018.

- Replacement of laser source of Raman LIDAR on 20-21 February 2018. The new laser provides 450 mJ @ 30 Hz with otherwise the same specifications as the former laser source.

Resourcing

During 2017 the GRUAN responsible person quit MeteoSwiss and his position was not renewed. In the meantime we found a minimal working power within the Upper-Air Division to maintain a

reduced activity dedicated to GRUAN. The final organization around GRUAN activities within Payerne will be communicated before the end of the year 2018, this topic remaining at high priority for MeteoSwiss.

Operations

Availability in SnowWhite sondes allowed us to fly only seven of those in 2017. Data from the GRUAN flights were transmitted to the LC at the end of 2017.

Site assessment and certification

During the GRUAN ICM-7 meeting in Matera, Italy, in February 2015 the Payerne GRUAN site became GRUAN certified for its Vaisala RS92 launches. Because of the passage toward an automatic Vaisala system and because of reduction of personnel in upper air division, the goal of certifying the Meteolabor C50 radiosonde was abandoned. Future certification could be reoriented towards the Vaisala RS41-SG automatically launched as well as to a 2-stage Peltier cooled frost point hygrometer currently under development at ETHZ.

GRUAN-related research

- With the specific GRUAN launches every week we are presently launching always a RS92 and a RS41-SG together with the SRS-C34 and SRS-C50. These multi-soundings help to test the Vaisala RS41-SG radiosonde. We are presently analyzing these weekly soundings for night- and day-time of the entire year 2014-2017 period.

- A collaboration of MeteoSwiss with ETHZ (Thomas Peter) started in January 2018 within a Global Atmosphere Watch Swiss (GAW-CH) project. This project aims to test, qualify and finalize a new 2-stage Peltier Cooled Frost-point Hygrometer PCFH that could possibly be certified by GRUAN as a reference sonde for humidity measurements.

- In collaboration with The University of Western Ontario (Prof. R.J. Sica) MeteoSwiss developed forward models for Rayleigh, Raman and Differential Absorption lidars and implemented 1D-var retrievals (Optimal Estimation Method) for temperature, humidity and ozone. OEM allows to compute a complete uncertainty budget on a profile by profile basis including an extensive set of sources of uncertainties. Furthermore, vertical resolution and measurement sensitivity can be derived from the averaging kernels completing the characterization of the retrievals. We consider this an important development for GRUAN to tackle measurement uncertainties of lidar measurements.

WG-GRUAN interface

Despite a reduction of resources from our side, the collaboration of the GRUAN Lead Centre with regard to the Payerne activities remains very fruitful.

Items for ICM-10 plenary discussions

The role and the importance of ancillary measurements, in particular lidar, within GRUAN should be discussed.

Other archiving centers

Radiosonde data are regularly transmitted to NDACC (via LC), WOUDC and NILU (ozone), GTS (TEMP and BUFR). LIDAR data are submitted to NDACC and ACTRIS.

Participation in campaigns

The Payerne Centre participated to the JOSIE ozone sonde comparison (October-November 2017).

Future plans

- Our present goal is to become GRUAN certified for Vaisala RS41-SG both manually as well as automatically launched radiosondes.
- Depending of the success of the GAW-CH project of the ETHZ, a certification of the PCFH sensor is envisaged.
- If an WMO International Upper-Air Campaign is organized in 2019 (possibly in Lindenberg), MeteoSwiss Payerne will be actively engaged.
- Further increase reliability, availability and performance of Raman LIDAR with the new laser source.
- Implement OEM for operational retrieval of water vapour.

Participating authors: Christian Felix, Alexander Haefele, Giovanni Martucci, Gonzague Romanens, Dominique Ruffieux (coordination)

GRUAN Site Report for Payerne (PAY), 2017

Reported time range is Jan 2017 to Dec 2017
Created by the Lead Centre
Version from 2018-04-06

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	Ruffieux, Dominique
WMO no./name	06610 PAYERNE
Operators	currently 12, changes +0 / -0
Sounding Site	1
Lidar	1
GNSS	1

1.1 General information about GRUAN measurement systems

System	Name	Type	Setups	Measurements
PAY-GN-01	GNSS Site PAYE	GNSS	0	not operational
PAY-LI-01	Payerne Raman WV Lidar (RALMO)	Lidar	1	0
PAY-RS-01	Payerne Radiosonde Launch Site	Sounding Site	6	100

1.2 General comments from Lead Centre

1.2.1 General

Good communications between station and GRUAN LC.

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	Philipona, Rolf
Started at	-
Defined setups	-
Possible streams	-

2.1 Lead Centre comments

2.1.1 Dataflow

No GNSS dataflow to GRUAN LC as yet.

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 LIDAR dataflow to GRUAN LC as 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	46.8100 °N, 6.9500 °E, 491.0 m
Operated by	MSWISS | Office fédéral de météorologie et climatologie MeteoSuisse
Instrument contact	Philipona, Rolf
Started at	-
Defined setups	6 (ROUTINE, OZONE, RESEARCH, SRS-TEST, DUAL, ROUTINE2)
Possible streams	COBALD, ECC, RS41, RS92, SRS-C34, SRS-C50

4.1 Lead Centre comments

4.1.1 Dataflow

Dataflow to GRUAN LC running intermittently since September 2011. This dataflow includes streams of the Meteolabor SRS-C34, Vaisala RS92-SGP, and Vaisala RS41 (since August 2014). All launches are promptly recorded using the RsLaunchClient.

The dataflow of operational soundings are temporarly stopped since 1 Februrary 2017, because sonde change from MeteoLabor SRS-C34 to MeteoLabor SRS-C50.

4.1.2 Data processing

An uncertified GRUAN data product for the Meteolabor SRS-C34 is available since September 2014. This data product includes an estimate of all measurement uncertainties. This is one of the first non-RS92 GRUAN data products.

4.1.3 General

Change of operational sonde from MeteoLabor SRS-C34 to MeteoLabor SRS-C50 was on 1 February 2017.

4.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCEI

4.2.1 Stream: RS41

RS41		49	49	
RS41-RAW	001		49	
RS41-EDT	001		47	

4.2.2 Stream: RS92

RS92		47	47	
RS92-RAW	001		47	
RS92-RAW	002		47	
RS92-EDT	001		47	
RS92-GDP	002		46	38

4.2.3 Stream: SRS-C34

SRS-C34		50	50	

4.2.4 Stream: SRS-C50

SRS-C50		1	1	

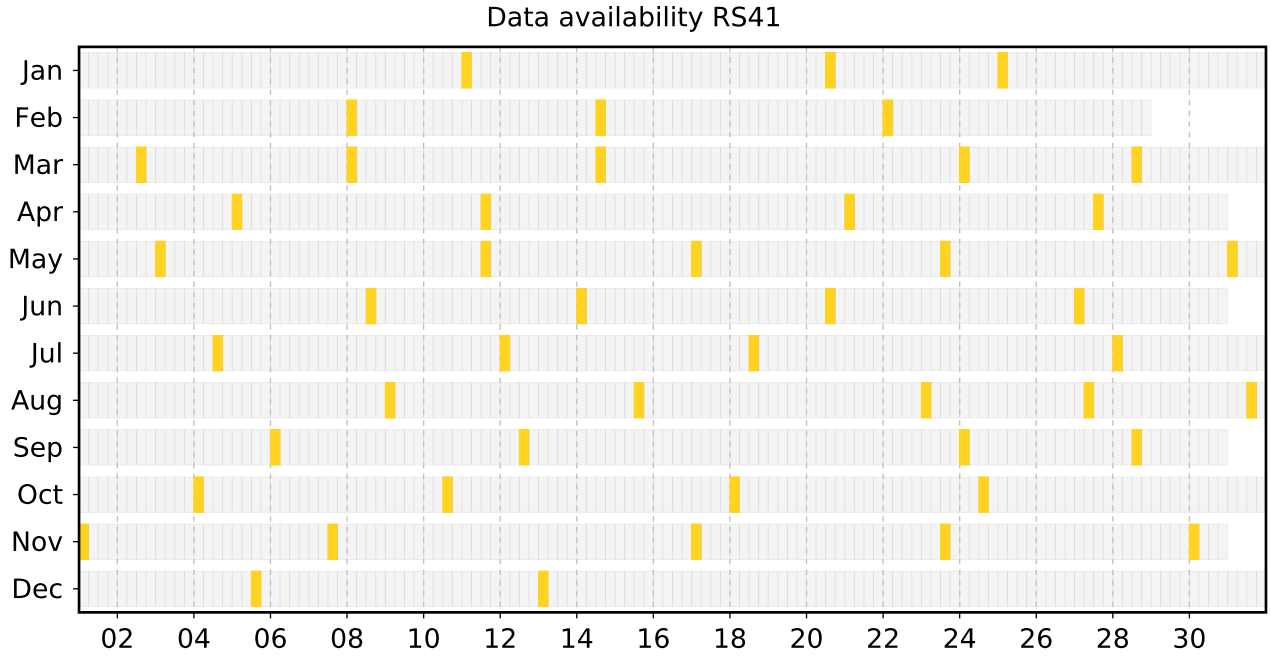
4.3 Data availability of data products

Available (green): All steps of processing have been successfully completed. The data file is available at LC (e.g. unapproved or uncertified GRUAN data products) and at NCEI (approved and certified GRUAN data products).

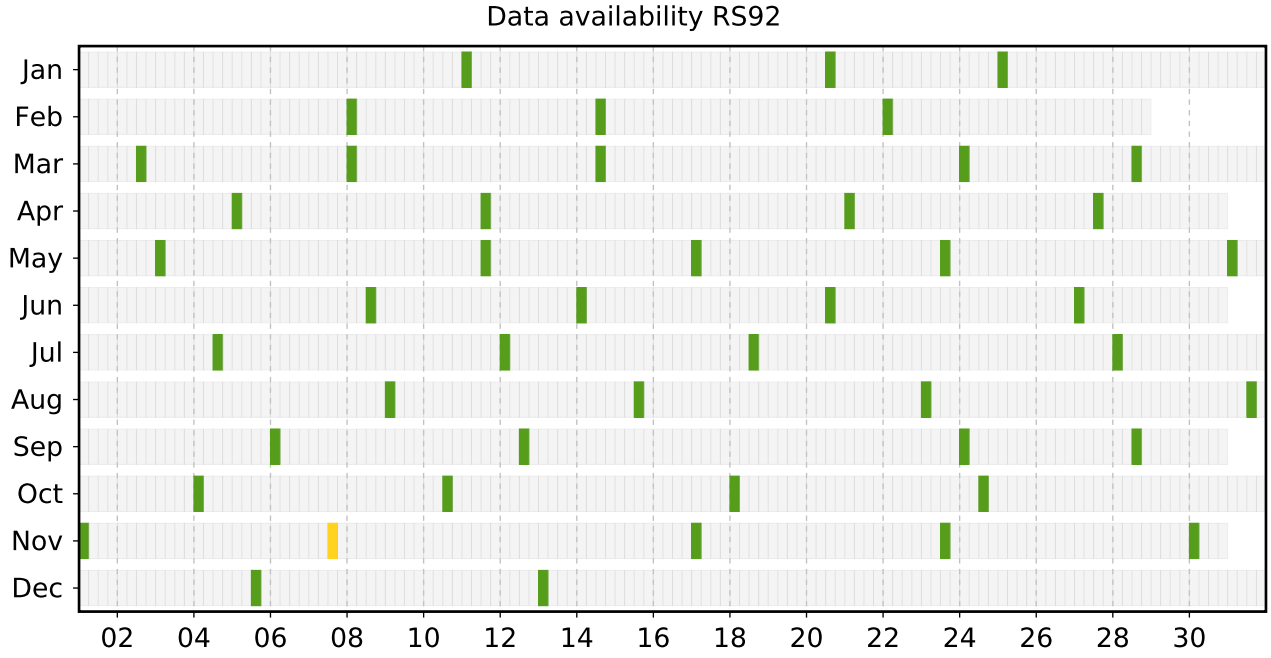
Unprocessed (yellow): The raw data file has been successfully converted to a GRUAN standardized raw data file format (NetCDF). The processing (e.g. GRUAN data processing) has not yet been done, or has not been completed. Reason may be a processing routine which does not yet exist, or software errors.

Original (red): The original raw data file is available (e.g. MWX). The raw data file was not converted to a GRUAN standardized raw data file format (NetCDF). Reason may be a converting routine which does not yet exist, or a corrupt original raw data file, or software errors.

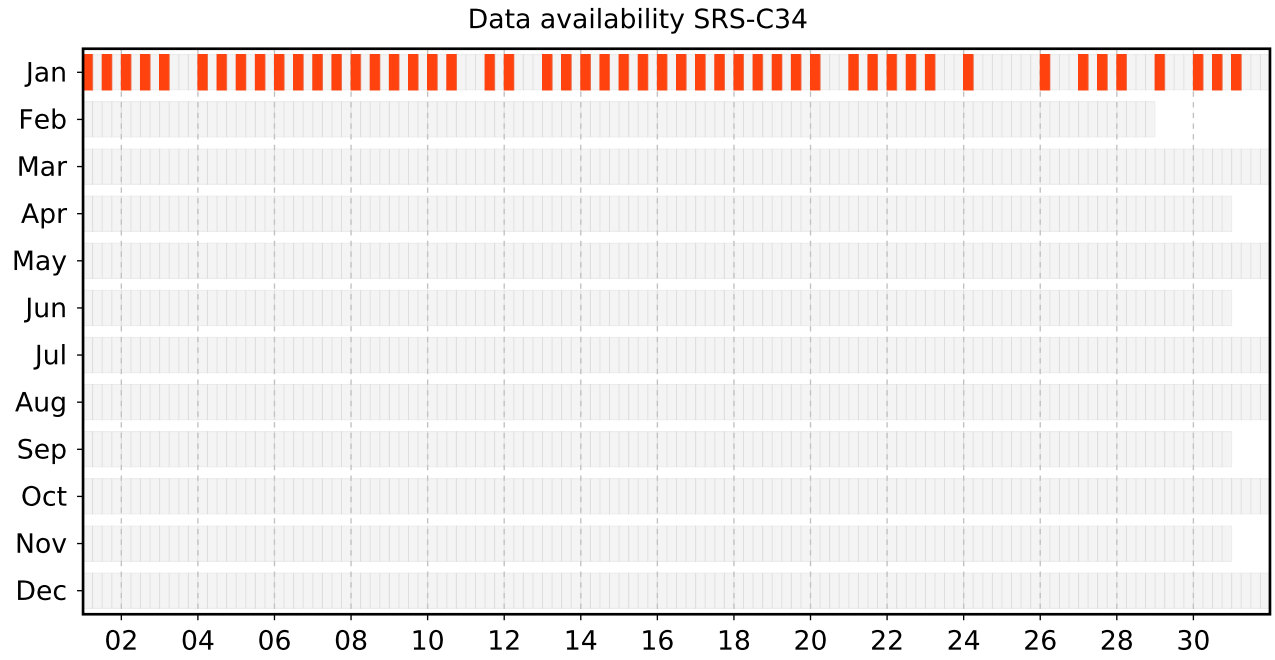
4.3.1 Stream: RS41



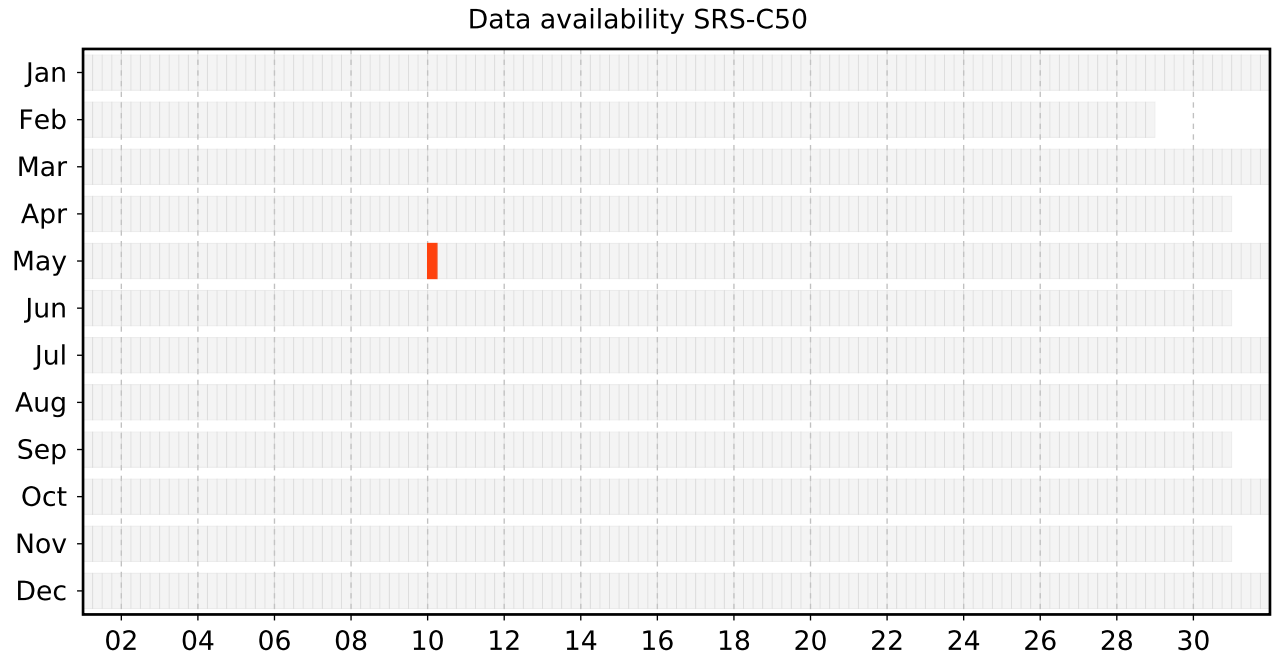
4.3.2 Stream: RS92



4.3.3 Stream: SRS-C34



4.3.4 Stream: SRS-C50

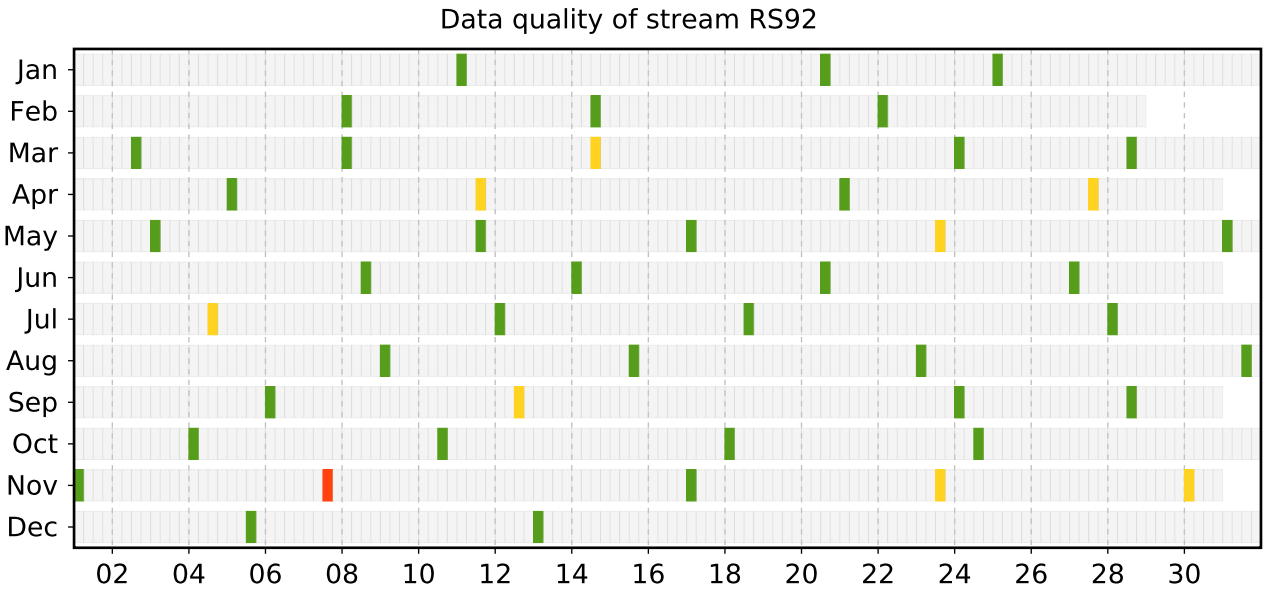


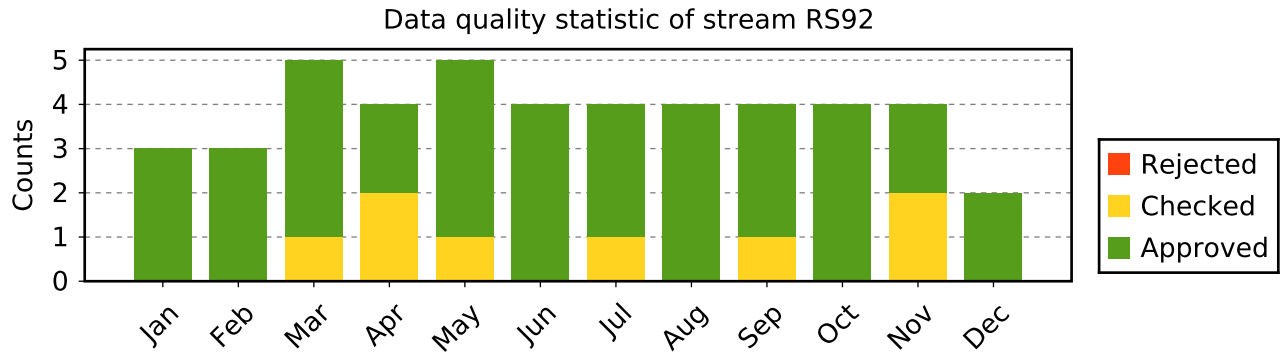
4.4 Data quality of current GRUAN data products

Month	Total	GRUAN Data Quality			Issues				
		Approved	Checked	Rejected	Meta-data	Process.	Press	Temp	RH

4.4.1 Stream: RS92 (Product: RS92-GDP-002)

Jan	3	3							
Feb	3	3							2
Mar	5	4	1						2
Apr	4	2	2				1	1	
May	5	4	1					1	
Jun	4	4							
Jul	4	3	1					1	
Aug	4	4							
Sep	4	3	1				1		1
Oct	4	4							
Nov	4	2	2					1	1
Dec	2	2							
Sum	**46**	**38**	**8**				**2**	**4**	**6**





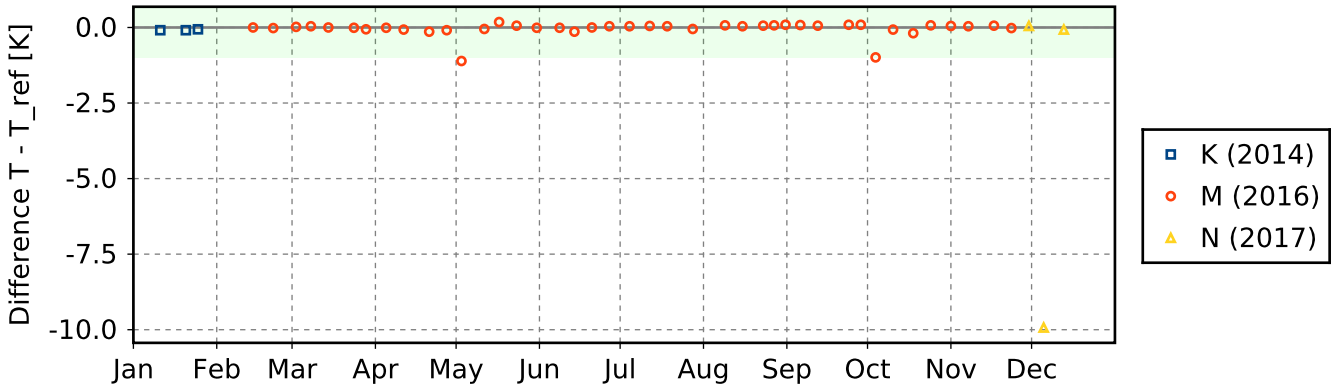
4.5 Instrument combinations of PAY-RS-01

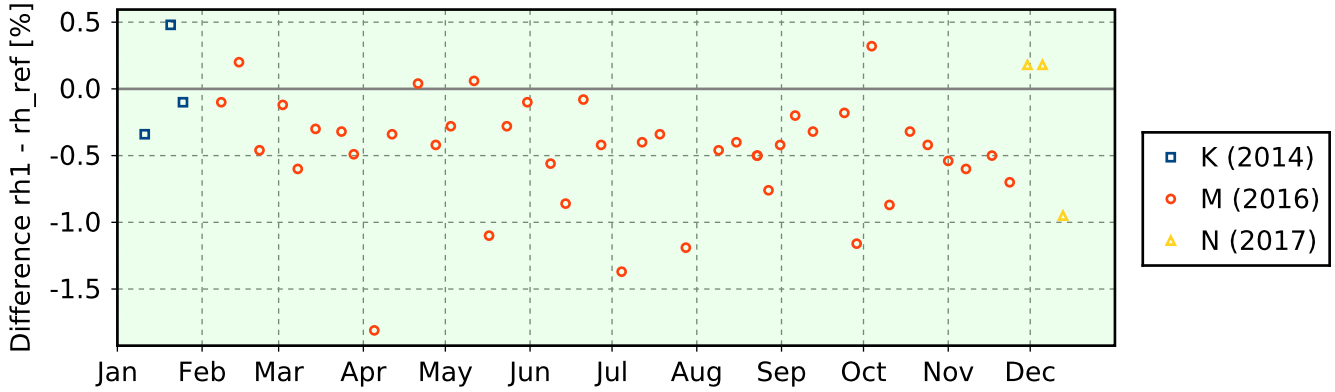
Count	Instrument combination
2	RS41
47	RS41, RS92
50	SRS-C34
1	SRS-C50

4.6 Instrument ground check

4.6.1 Stream: RS41

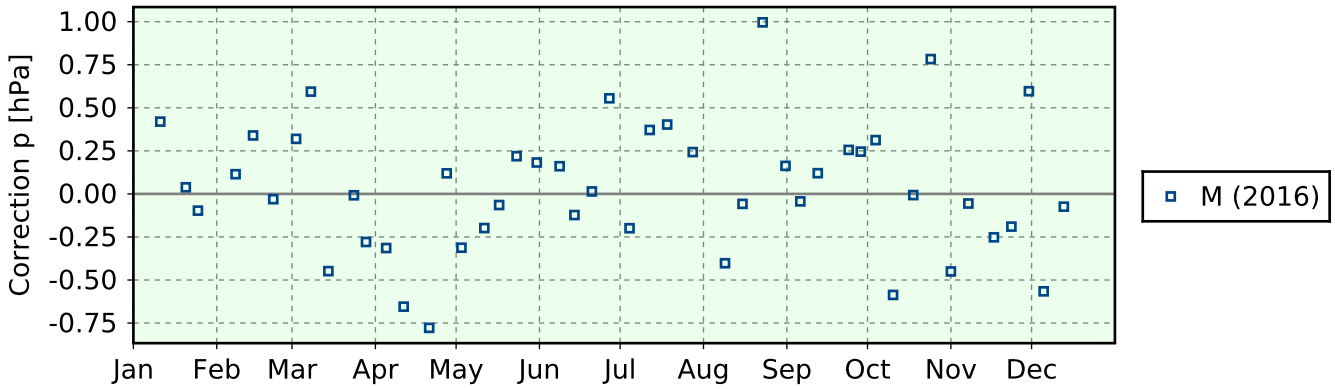
(1) GroundCheck: GC-SHC

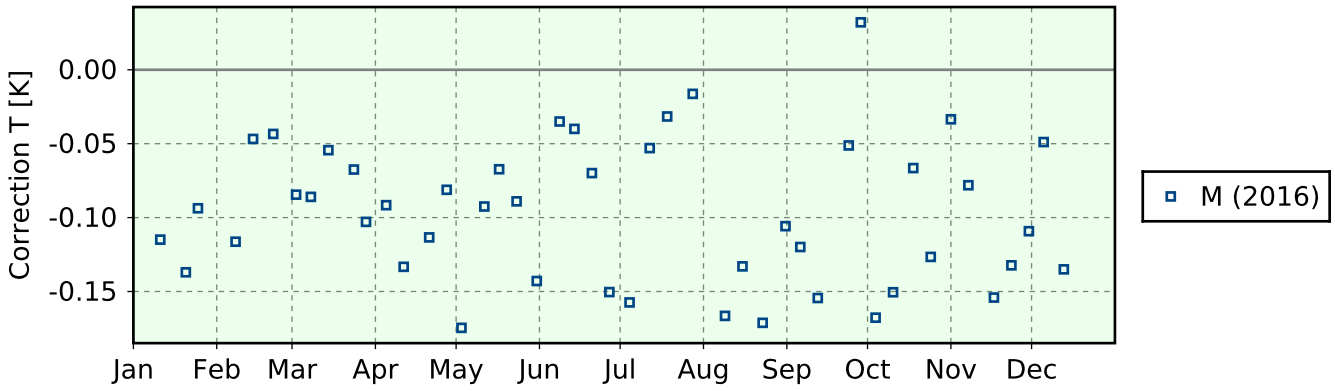


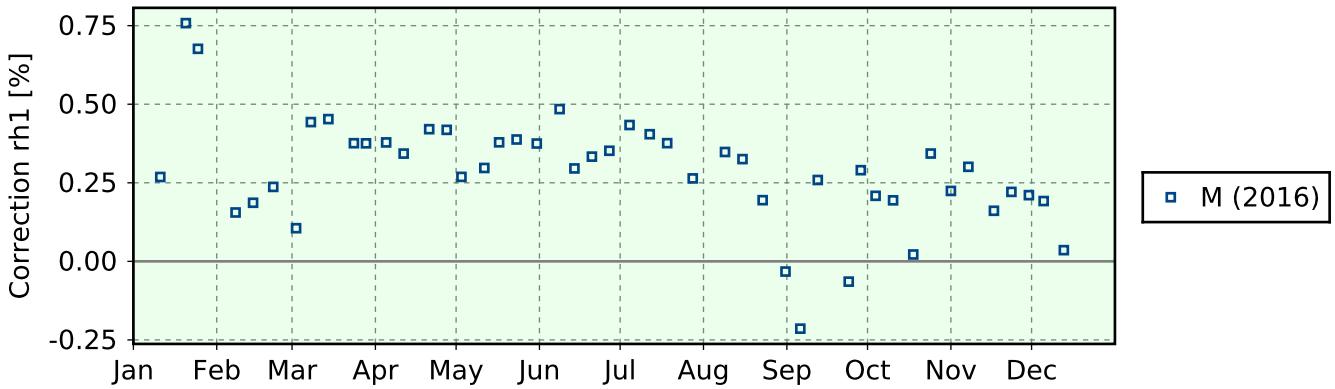


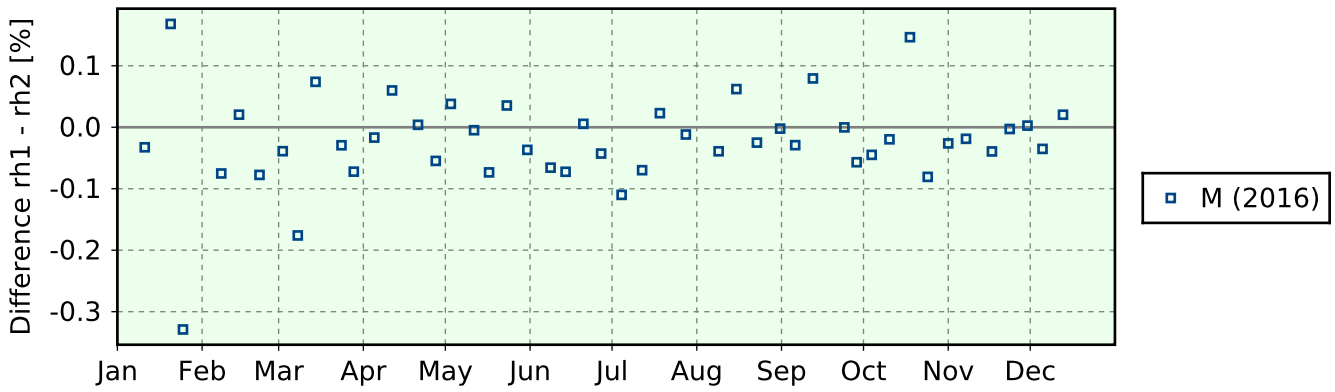
4.6.2 Stream: RS92

(1) GroundCheck: GC-GC25

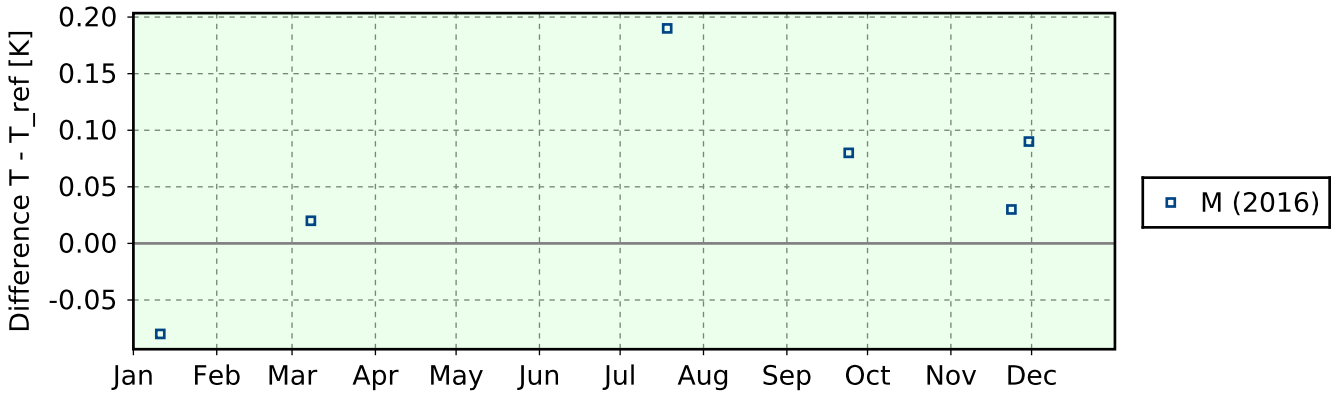


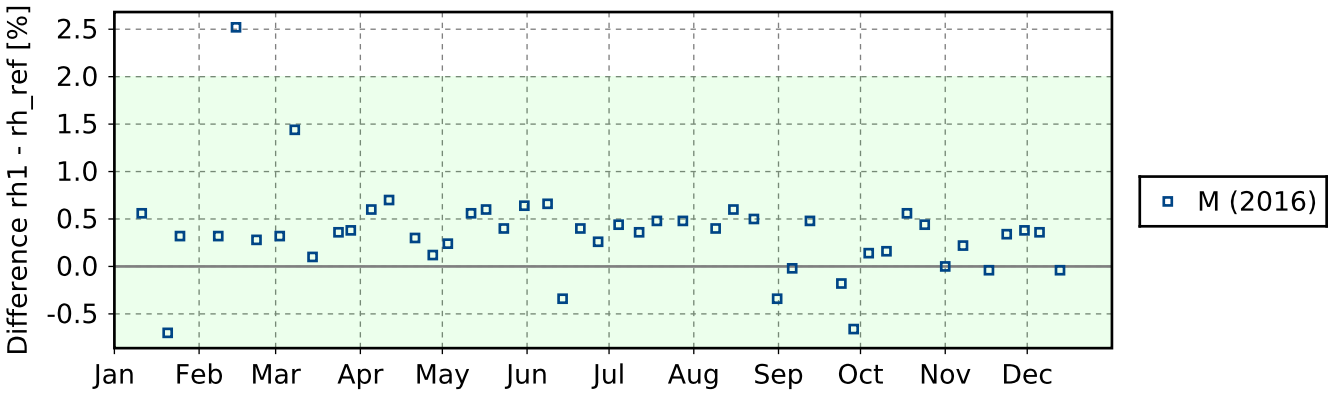


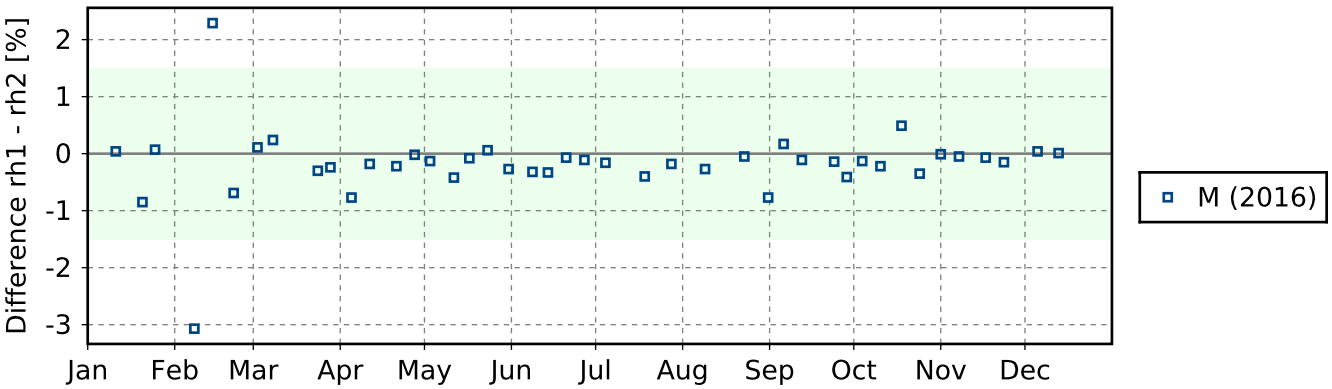




(2) GroundCheck: GC-SHC

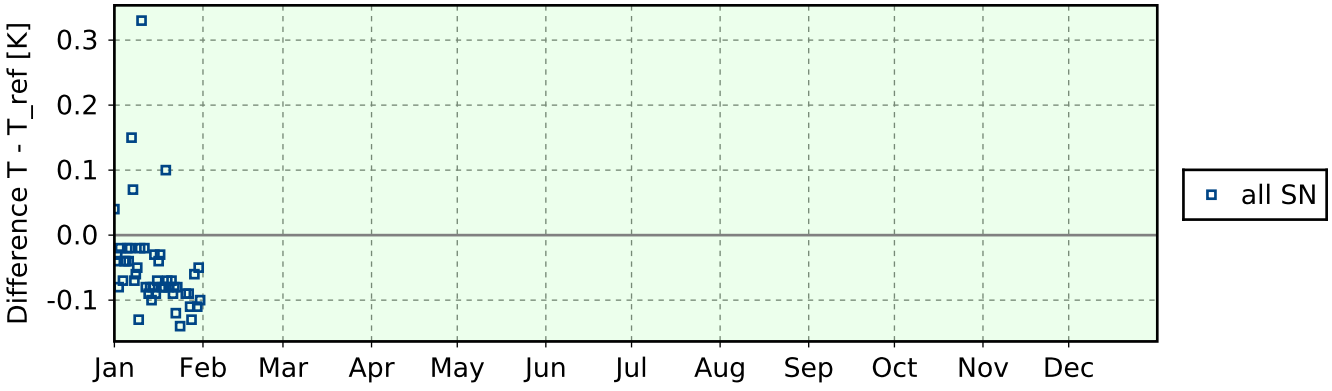


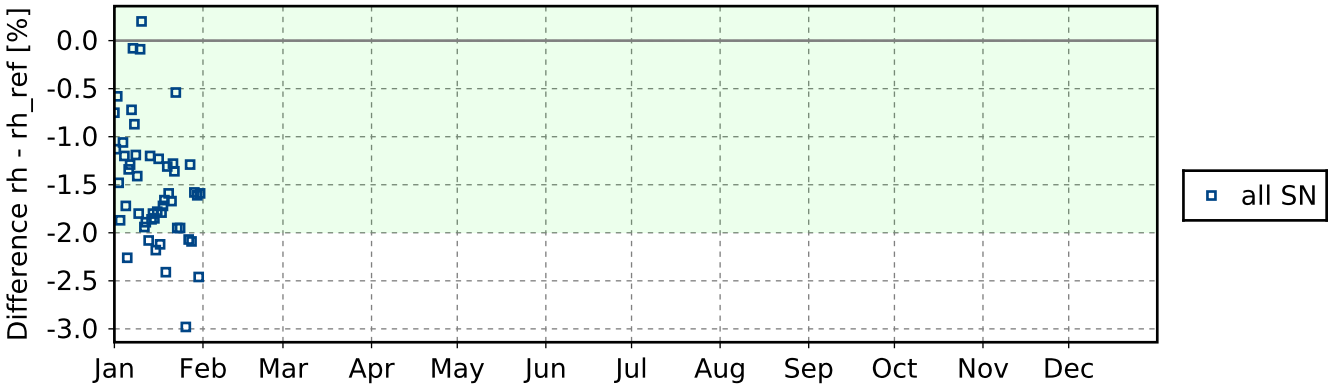




4.6.3 Stream: SRS-C34

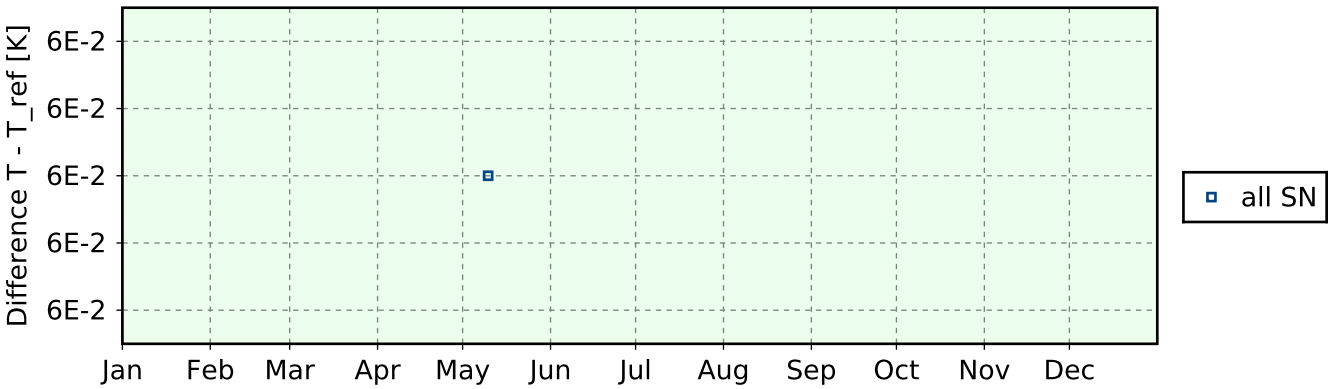
(1) GroundCheck: GC-TU

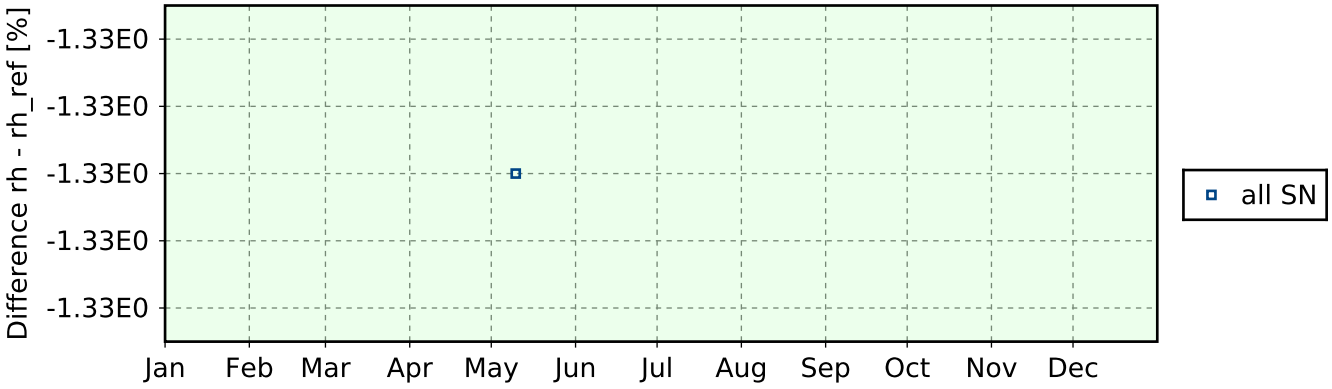




4.6.4 Stream: SRS-C50

(1) GroundCheck: GC-TU





4.7 Measurement events