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GLOBAL CLIMATE OBSERVING
SYSTEM (GCOS)

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**7th GRUAN Implementation-
Coordination Meeting (ICM-7)**
Matera, Italy
23 February – 27 February 2015

Session 8

GRUAN Station Report for Boulder

(Submitted by Dale Hurst)

Summary and Purpose of Document

Report from the GRUAN station Boulder for the period Feb 2014 to Feb 2015.



GRUAN Station Report for Boulder

Reporting for the period Feb 2014 to Feb 2015

Date: 17-Feb-2015

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Overview

Currently only the weekly RS92 sounding data from Boulder are being processed into a GRUAN data product. We also regularly submit sounding data from ozonesondes (ECC) and the NOAA frost point hygrometers (FPH) when these instruments are part of the RS92 payload. It is envisioned that both the ECC and FPH data from Boulder will become GRUAN data streams in the near future. Other data streams available include GNSS-IPW from the Marshall Field Site near Boulder (and potentially the NCAR Foothills Lab in Boulder), Dobson and FTIR measurements of column ozone, and FTIR measurements of column water vapor, CO₂ and methane. For more details of potential data streams see the “New Data Streams Survey” for Boulder that was submitted to the Lead Center in December 2013.

Change and change management

The Boulder site now almost exclusively uses Internet radiosondes to transmit ECC and FPH data to the ground. An occasional RS80 radiosonde is launched when we perform a water vapor sounding with an older model CFH. An RS92 radiosonde is now part of every payload launched at Boulder. Prior to launch the RS92 sonde continues to be ground-checked with the GC-25, but is now also checked in the 100% RH chamber since mid-September 2014.

Resourcing

The Global Monitoring Division within the Earth System Research Laboratory of NOAA continues to support its many long-term monitoring programs in the face of reduced or flat federal funding while equipment and personnel costs rise. We depend on federal funds from GMD to continue our weekly RS92 + ECC soundings and monthly RS92 + FPH + ECC soundings at Boulder and Hilo, Hawaii and to support the monthly RS92 + FPH + ECC soundings at Lauder, New Zealand. Financial assistance from GCOS continues to greatly improve our program’s ability to continue at Lauder. Our capability to continue GRUAN-related activities at Boulder depends largely on the future of GMD’s federal funding.

Site assessment and certification

The Boulder site was officially certified on September 9, 2014, by the GRUAN Lead Center and Working Group for its Vasisla RS92 radiosonde soundings.

GRUAN related research

The NOAA FPH was part of the AquaVIT-2 water vapor measurement intercomparison campaign conducted in April 2013 at the AIDA environmental chamber in Karlsruhe, Germany. There were ~20 different instruments measuring chamber-controlled water vapor mixing ratios from less than 1 ppm to several thousand ppm over a wide range of chamber pressures. Preliminary results of this intercomparison have been released by the referees and the NOAA FPH appears to have performed very well in terms of absolute calibration and stability.

A paper was published in 2014 that compares stratospheric water vapor data retrievals from the Aura Microwave Limb Sounder (MLS) with in situ water vapor measurements by the NOAA FPH at Boulder, Hilo and Lauder. The reference is:

Hurst, D. F., A. Lambert, W. G. Read, S. M. Davis, K. H. Rosenlof, E. G. Hall, A. F. Jordan, and S. J. Oltmans, Validation of Aura Microwave Limb Sounder stratospheric water vapor measurements by the NOAA frost point hygrometer, *J. Geophys. Res. Atmos.*, 119, doi:10.1002/2013JD020757, 2014.

Dale Hurst (NOAA/CIRES) continues to serve as a member of the GRUAN working group, co-chair of the task team of site representatives and manager of the Boulder GRUAN site.

John Braun (NCAR) continues to serve as a member of the task team of GNSS-IPW measurements. Two previous members of this task team, June Wang (NCAR) and Seth Gutman (NOAA), have departed Boulder and are no longer associated with the Boulder GRUAN site.

James Hannigan (NCAR) is a member of the task team of ancillary measurements for his expertise in solar FTIR measurements of water vapor and trace gases.

Holger Voemel, now at NCAR, will serve on the task team for radiosondes.

WG-GRUAN interface

We appreciate the continued support of the Boulder GRUAN site through presentations and papers that include data from Boulder, especially those in easy view of ESRL management and NOAA administrators.

Items for ICM-7 plenary discussions

The Boulder GRUAN site manager has requested rapid feedback on the quality of each and every RS92 sounding performed at the site, so that deviations from standard operating procedures can be promptly detected and avoided. This idea was put forth to the GRUAN Lead Center last year, and in late 2014 the GRUAN site representatives were polled for their suggestion. It is hoped this topic can be specifically discussed at ICM-7 and a new RS92 data product (version 3) will include the capability to issue such rapid feedback.

Future plans

The Boulder site is attempting to continue all its GRUAN measurement programs after another year of flat federal funding.



GRUAN Station Report for Boulder (BOU), 2014

Reported time range is Nov 2013 to Oct 2014

Created by the Lead Centre

Version from 2015-02-11

1 General GRUAN station information

Info	Value
Station name	Boulder
Unique GRUAN ID	BOU
Geographical position	39.9500 °N, -105.2000 °W, 1743.0 m
Operated by	GMD Global Monitoring Division, part of: ESRL Earth System Research Laboratory, part of: NOAA National Oceanic and Atmospheric Administration
Main contact	Hurst, Dale F.
WMO no./name	-
Operators	current 5, change +0 / -0
Sounding Site	1
GNSS	1

1.1 General information about GRUAN measurement systems

System	Type	Setups	Measurements	As scheduled
BOU-GN-01	GNSS	0	0	not scheduled
BOU-RS-01	Sounding Site	4	38	not scheduled

1.2 General comments from Lead Centre

1.2.1 General

The site is requested to establish a GRUAN data product for the frostpoint hygrometer

2 System: GNSS Site P041 (BOU-GN-01)

Info	Value
System name	GNSS Site P041
Unique GRUAN ID	BOU-GN-01
System type	GNSS (GN - GNSS)
Geographical position	39.9495 °N, -105.1943 °W, 1728.8 m
Operated by	GMD Global Monitoring Division, part of: ESRL Earth System Research Laboratory, part of: NOAA National Oceanic and Atmospheric Administration
Instrument contact	Hurst, Dale F.
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: Radiosonde Launch Site (Marshall) (BOU-RS-01)

Info	Value
System name	Radiosonde Launch Site (Marshall)
Unique GRUAN ID	BOU-RS-01
System type	Sounding Site (RS - Radiosonde)
Geographical position	39.9500 °N, -105.2000 °W, 1743.0 m
Operated by	GMD Global Monitoring Division, part of: ESRL Earth System Research Laboratory, part of: NOAA National Oceanic and Atmospheric Administration
Instrument contact	Hurst, Dale F.
Started at	-
Defined setups	4 (RESEARCH, OZONE, FPH-OZONE, FPH)
Possible streams	FPH, IMET1, RS80, RS92

3.1 Lead Centre comments

3.1.1 Dataflow

Data to the GRUAN LC are flowing since April 2012. This dataflow includes data from the Vaisala RS92-SGP, ECC ozone sonde, FPH water vapour, Intermet IMET-1, and Vaisala RS80. All soundings are submitted using RsLaunchClient within a month after the launch.

No GRUAN data product has yet been established for the frostpoint hygrometer.

3.1.2 Data quality

Very few data processing issues (corrupt files or unknown issues).

One third of measurements pass GRUAN Quality Control routines with a 'checked' label, largely due to uncertainty inconsistencies in humidity.

GC25 ground check corrections are within expected limits.

An additional ground check with a SHC (Standard Humidity Chamber) is performed since September 2014.

3.2 GRUAN data products

Product	Version	Soundings received	Available at LC	Distributed by NCDC
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3.2.1 Stream: ECC

ECC		32	32	
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3.2.2 Stream: FPH

FPH		10	10	
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3.2.3 Stream: IMET1

IMET1		29	29	
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3.2.4 Stream: RS80

RS80		4	4	
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Product	Version	Soundings received	Available at LC	Distributed by NCDC
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3.2.5 Stream: RS92

RS92		38	38	
RS92-RAW	001		38	
RS92-GDP	001		3	
RS92-GDP	002		34	21

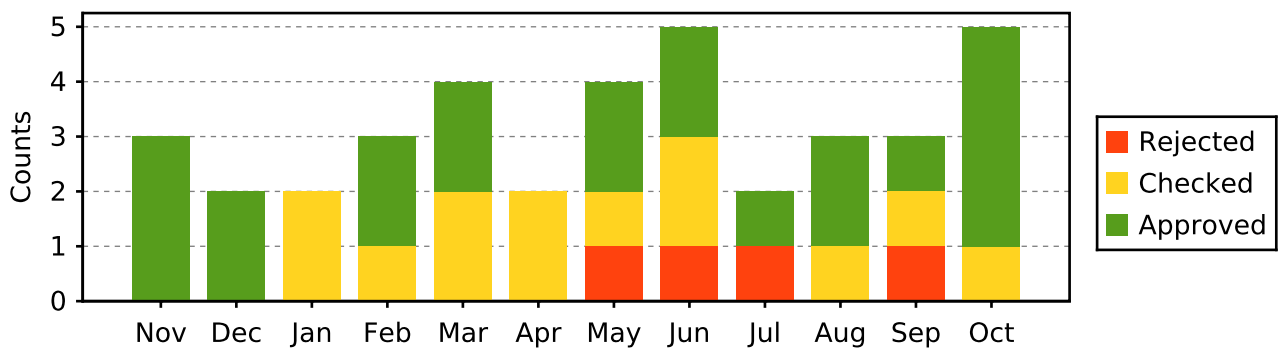
3.3 Data quality of current GRUAN data products

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

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

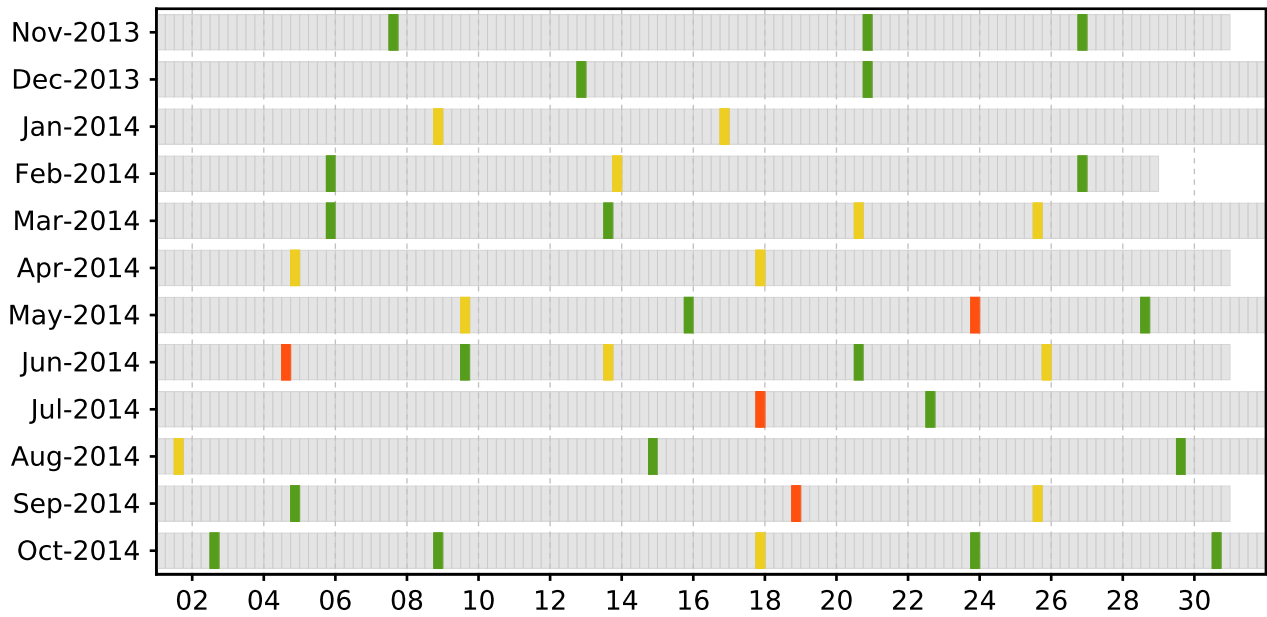
Nov 13	3	3							
Dec 13	2	2							
Jan 14	2		2				1		2
Feb 14	3	2	1						1
Mar 14	4	2	2						2
Apr 14	2		2						2
May 14	4	2	1	1				1	
Jun 14	5	2	2	1	1				2
Jul 14	2	1		1					
Aug 14	3	2	1						1
Sep 14	3	1	1	1			1		1
Oct 14	5	4	1					1	2
	38	21	13	4	1		2	2	13

Data quality statistic of stream RS92



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

Schedule data quality of stream RS92



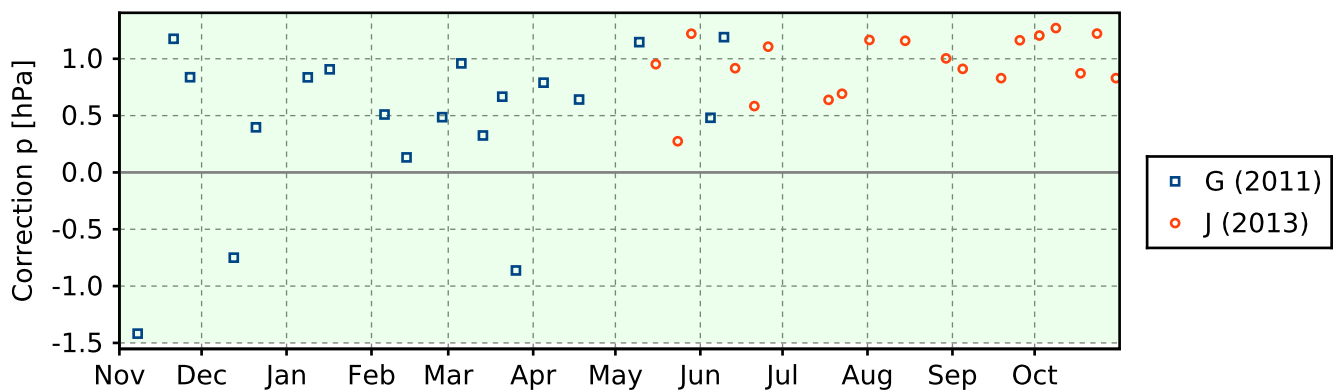
3.4 Instrument combinations of BOU-RS-01

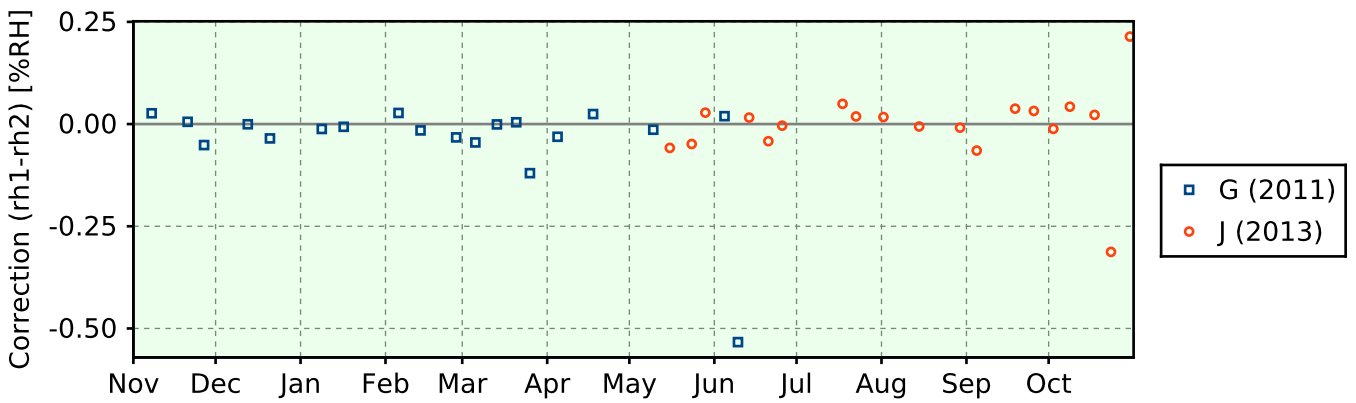
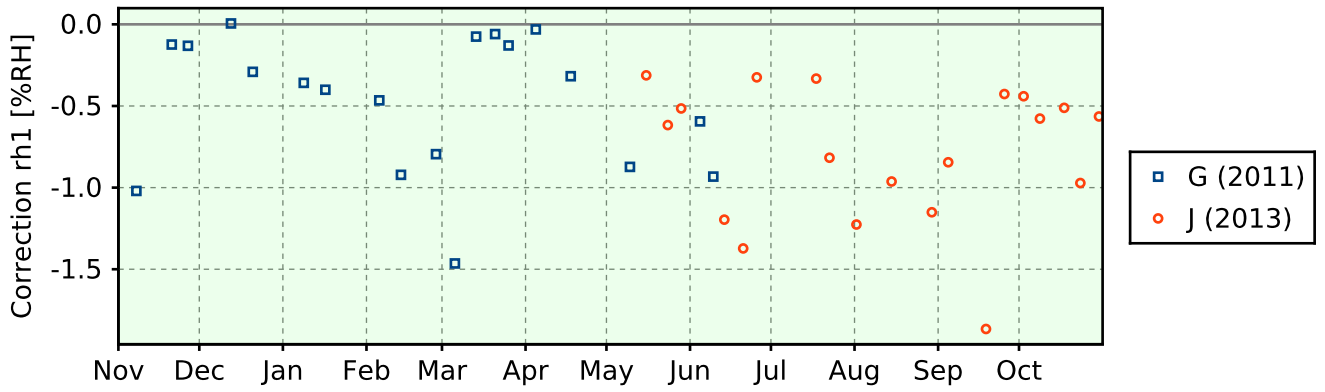
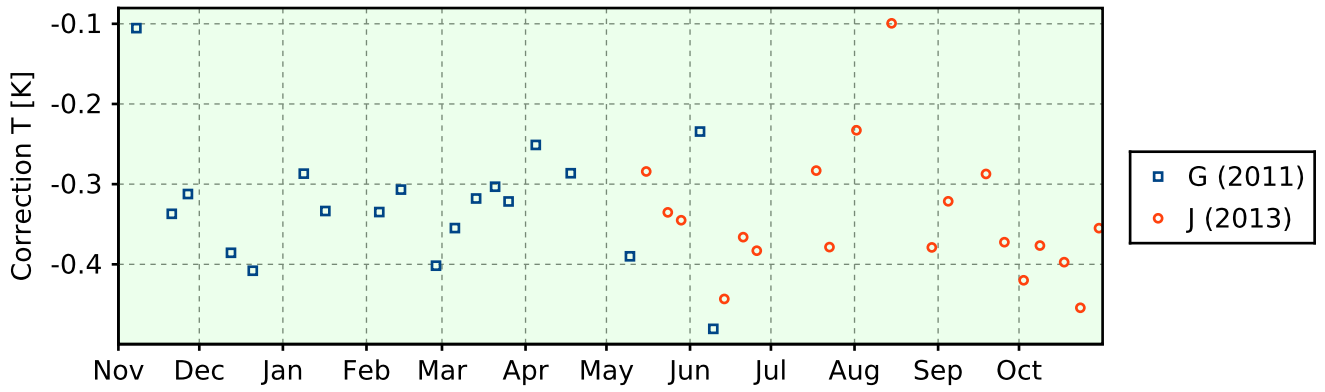
Count	Instrument combination
6	ECC, FPH, IMET1, RS92
3	ECC, FPH, RS80, RS92
22	ECC, IMET1, RS92
1	ECC, RS92
1	FPH, IMET1, RS92
1	RS80, RS92
4	RS92

3.5 Instrument ground check

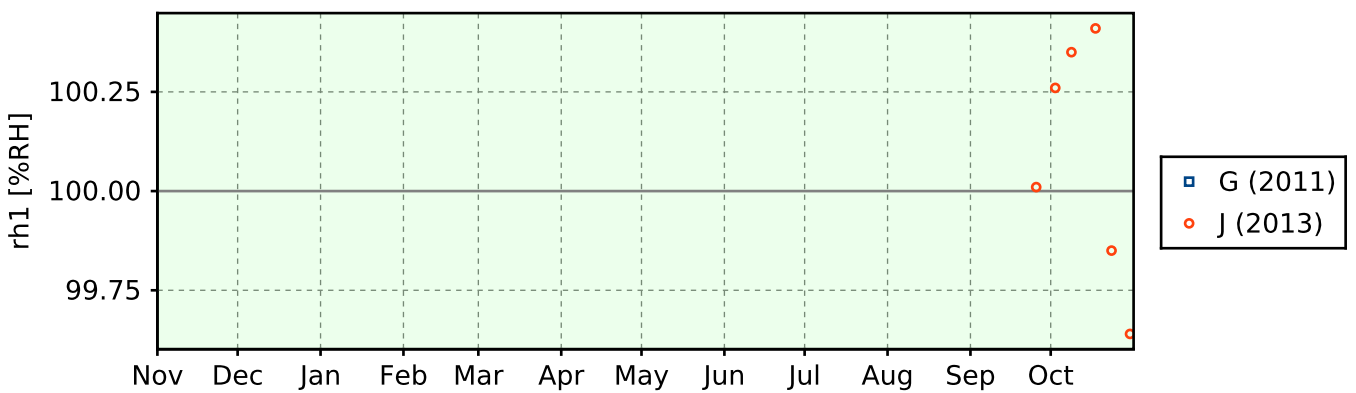
3.5.1 Stream: RS92

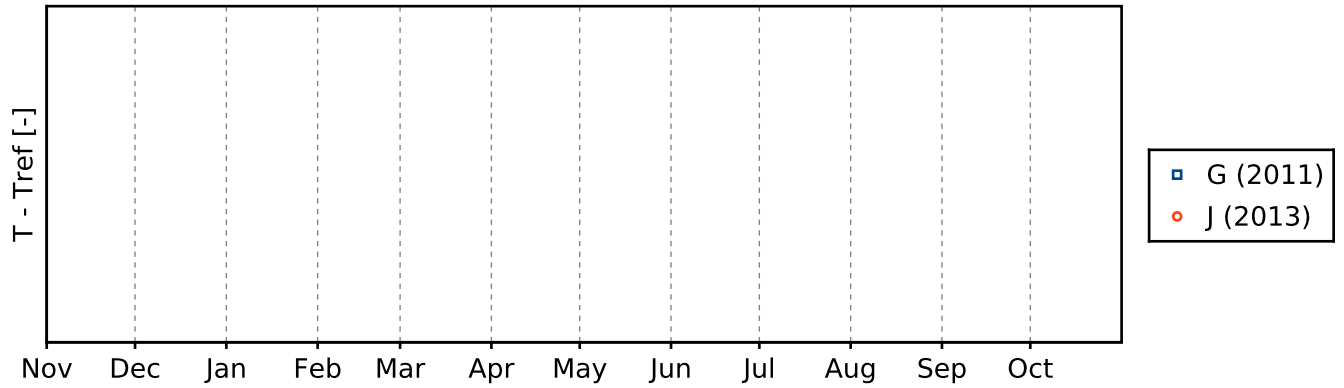
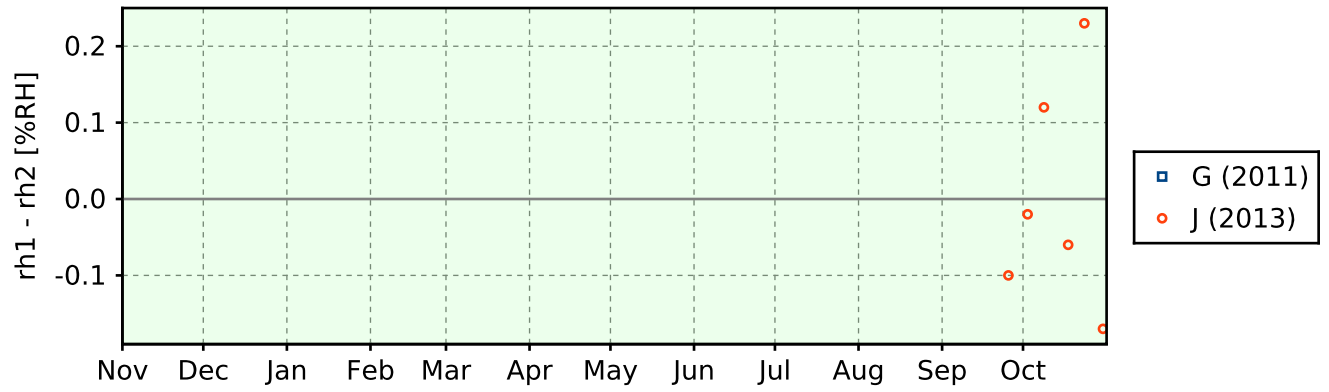
3.5.1.1 GroundCheck: GC25





3.5.1.2 GroundCheck: SHC





3.6 Measurement events

3.6.1 Stream: RS92

