



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

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**8th GRUAN Implementation-
Coordination Meeting (ICM-8)**

Session 7

Boulder, USA
25 April – 29 April 2016

GRUAN Station Report for Boulder

(Submitted by Dale Hurst)

Summary and Purpose of Document

Report from the GRUAN station Boulder for the period March 2015 to March 2016.



GRUAN Station Report for Boulder (BOU)

Reporting for the period Mar 2015 to Mar 2016

Date: 12-Apr-2016

Primary author: Dale Hurst
(dale.hurst@noaa.gov)

Overview

Currently the Boulder GRUAN site is contributing data files from weekly soundings by RS92 radiosondes and ECC ozonesondes, and monthly soundings by NOAA FPH sondes. In the foreseeable future the Boulder site will also contribute data from the GNSS-IPW measurement system at Marshall Field Site (site P041). Ultimately the Boulder site may provide vertical profile and column data for ozone, water vapor and several other trace gases from the FTIR spectrometer located at the NCAR Foothills Laboratory, and column ozone data from a Dobson spectrophotometer located at the NOAA ESRL Building. To our knowledge none of the current measurement programs deviate from GRUAN operating procedures.

Change and change management

To our knowledge there were no deviations in operating procedures at the Boulder GRUAN site during the reporting period.

Resourcing

NOAA ESRL's Global Monitoring Division, host of the Boulder GRUAN site, provides salary money for the efforts of the personnel who perform and submit the current GRUAN measurements, but does not provide funding for purchasing the hardware required by GRUAN. The hardware costs at the Boulder site are partially covered by GCOS. Work is ongoing to engage NOAA at a high level for funding to support all of NOAA's GRUAN hardware and efforts, but success in this area may take several years and is not guaranteed. The Boulder site manager continues to look for resources to help the site maintain GRUAN measurements well into the future.

Site assessment and certification

The Boulder GRUAN site is certified.

GRUAN-related research

The Boulder GRUAN site have contributed to an intercomparison of frost point hygrometers at the GRUAN Lead Center by providing a NOAA FPH for their use.

Two papers co-authored by members of the Boulder GRUAN team were published during the reporting period:

Kräuchi, A., R. Philipona, G. Romanens, D.F. Hurst, E.G. Hall, and A.F. Jordan, Controlled weather balloon ascents and descents for atmospheric research and climate monitoring, *Atmos. Meas. Tech.*, 9, 929–938, doi:[10.5194/amt-9-929-2016](https://doi.org/10.5194/amt-9-929-2016), 2016.

Bodeker, G., S. Bojinski, D. Cimini, R. Dirksen, M. Haeffelin, J. Hannigan, D. Hurst, T. Leblanc, F. Madonna, M. Maturilli, A. Mikalsen, R. Philipona, T. Reale, D. Seidel, D. Tan, P. Thorne, H. Vömel, and J. Wang, Reference upper-air observations for climate: From concept to reality, *Bull. Amer. Meteor. Soc.*, 97, 123-135, doi:[10.1175/BAMS-D-14-00072.1](https://doi.org/10.1175/BAMS-D-14-00072.1), 2016.

WG-GRUAN interface

At this point in time NOAA is well aware of the efforts of the Boulder GRUAN site and the costs associated with the site maintaining the GRUAN-based measurements. When the time comes for additional data streams to be added to the Boulder site it would be helpful to have official letters of request sent to the person responsible for those measurements since the Boulder GRUAN site is a collaboration between NOAA and NCAR.

Items for ICM-8 plenary discussions

Continued discussion of the version 3 data processing of RS92 soundings.

Future plans

We are currently in the process of procuring an update of our MW31 receiving station to enable the reception of data from RS41 sondes. We plan to make transition from RS92 to RS41 soundings later in 2016.



GRUAN Station Report for Boulder (BOU), 2015

Reported time range is Nov 2014 to Feb 2016

Created by the Lead Centre

Version from 2016-04-18

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	60	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, IMET-1, RS80, RS92

3.1 Lead Centre comments

3.1.1 Dataflow

A GRUAN data product for the frostpoint hygrometer is not yet available.

This dataflow includes data from the Vaisala RS92-SGP, ECC ozone sonde, FPH water vapour, Internet IMET-1, and Vaisala RS80. All soundings are submitted using the RsLaunchClient within a month after the launch.

3.1.2 Data quality

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

One fourth of measurements passed the 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		59	59	
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3.2.2 Stream: FPH

FPH		12	12	
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3.2.3 Stream: IMET-1

IMET-1		59	59	
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3.2.4 Stream: RS80

RS80		1	1	
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Product	Version	Soundings received	Available at LC	Distributed by NCDC
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3.2.5 Stream: RS92

RS92		60	60	
RS92-RAW	001		60	
RS92-RAW	002		1	
RS92-GDP	002		59	45

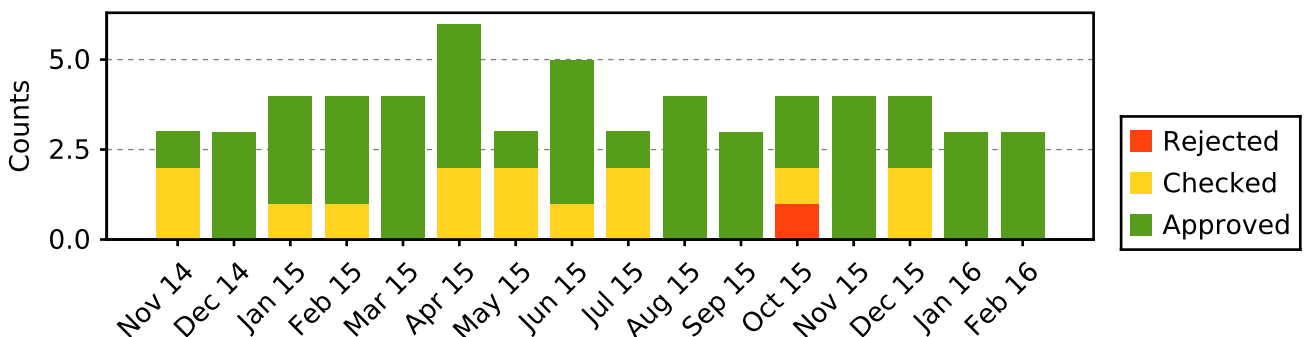
3.3 Data quality of current GRUAN data products

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

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

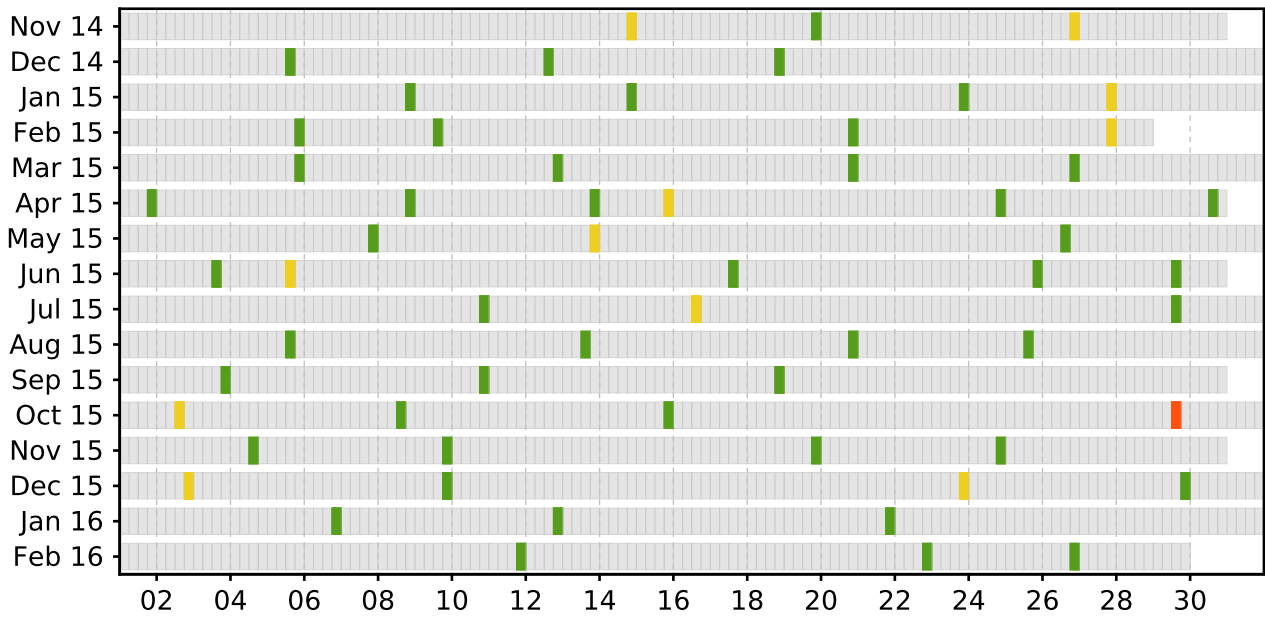
Nov 14	3	1	2				1	1	
Dec 14	3	3							2
Jan 15	4	3	1				1		2
Feb 15	4	3	1				1		1
Mar 15	4	4							1
Apr 15	6	4	2				1	1	2
May 15	3	1	2				1	1	
Jun 15	5	4	1				1		
Jul 15	3	1	2				1	2	1
Aug 15	4	4							
Sep 15	3	3							
Oct 15	4	2	1	1			1		1
Nov 15	4	4							
Dec 15	4	2	2				2		1
Jan 16	3	3							1
Feb 16	3	3							1
	60	45	14	1			10	5	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



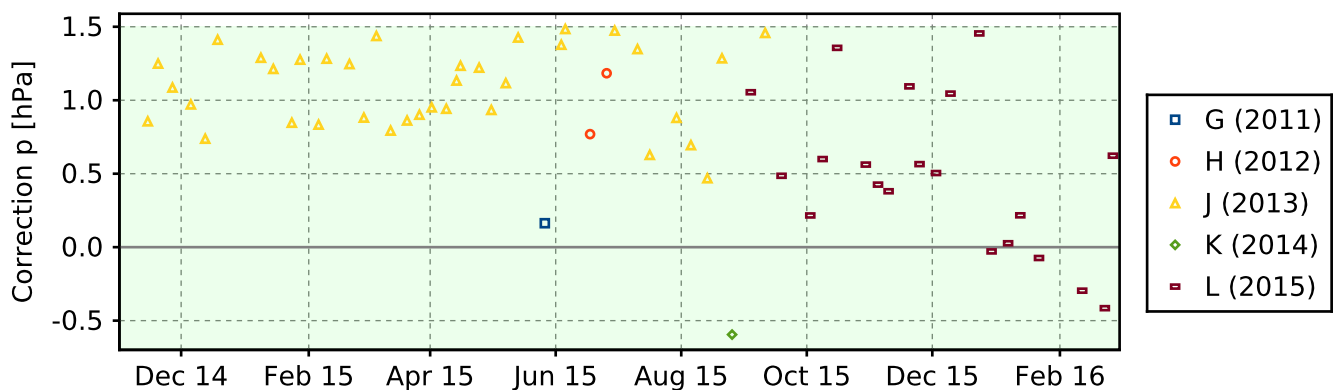
3.4 Instrument combinations of BOU-RS-01

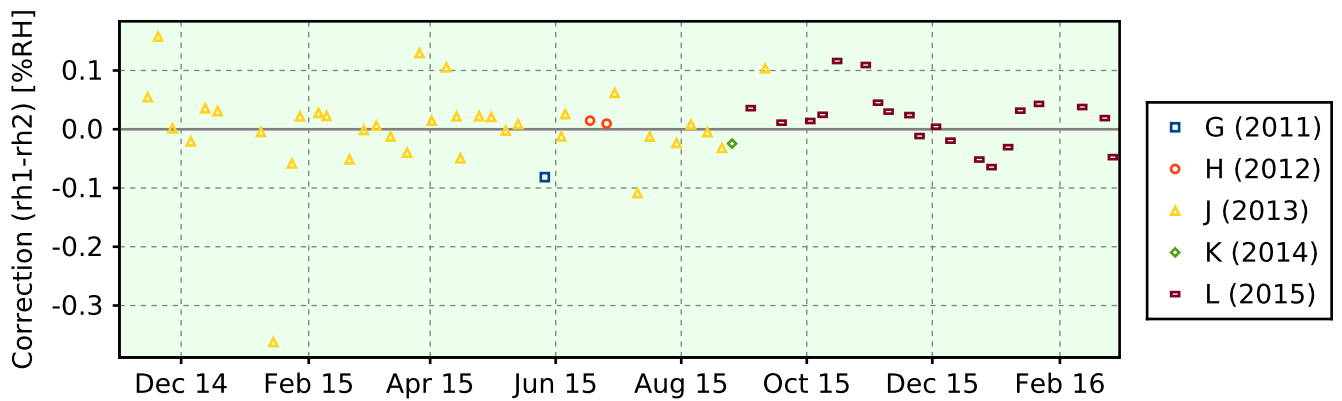
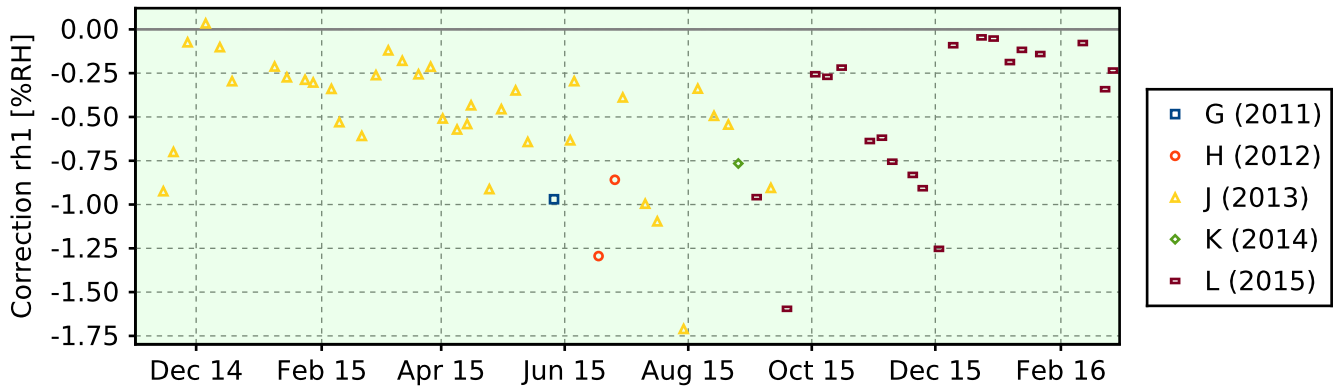
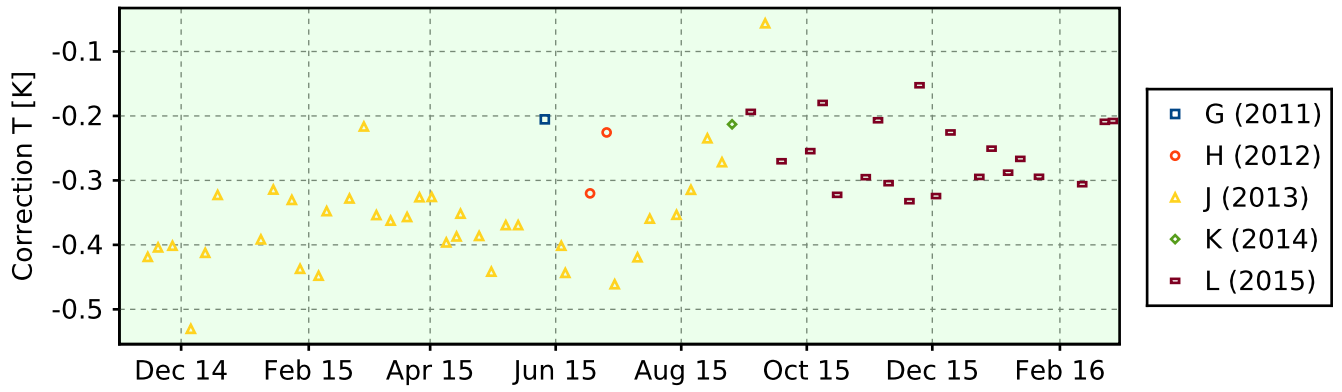
Count	Instrument combination
10	ECC, FPH, IMET-1, RS92
1	ECC, FPH, RS80, RS92
48	ECC, IMET-1, RS92
1	FPH, IMET-1, RS92

3.5 Instrument ground check

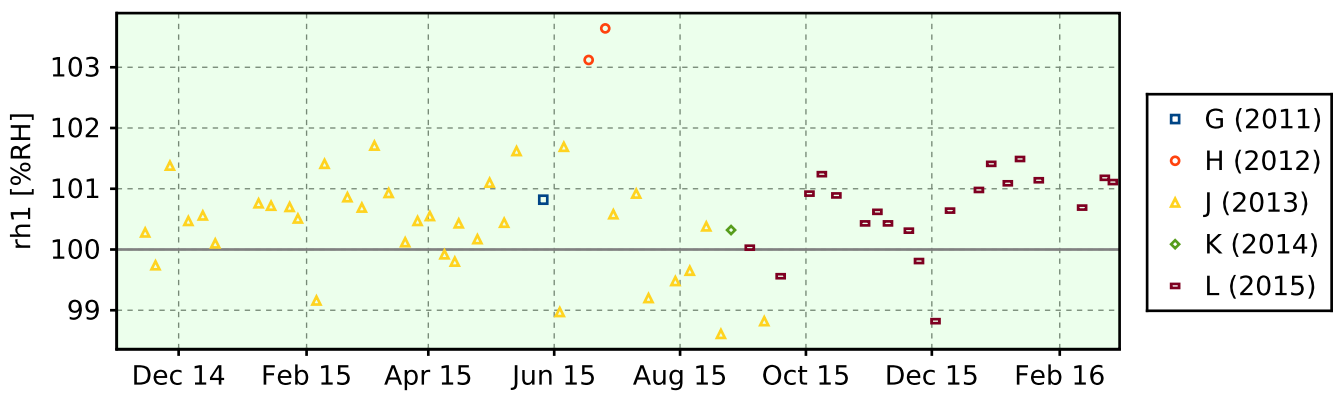
3.5.1 Stream: RS92

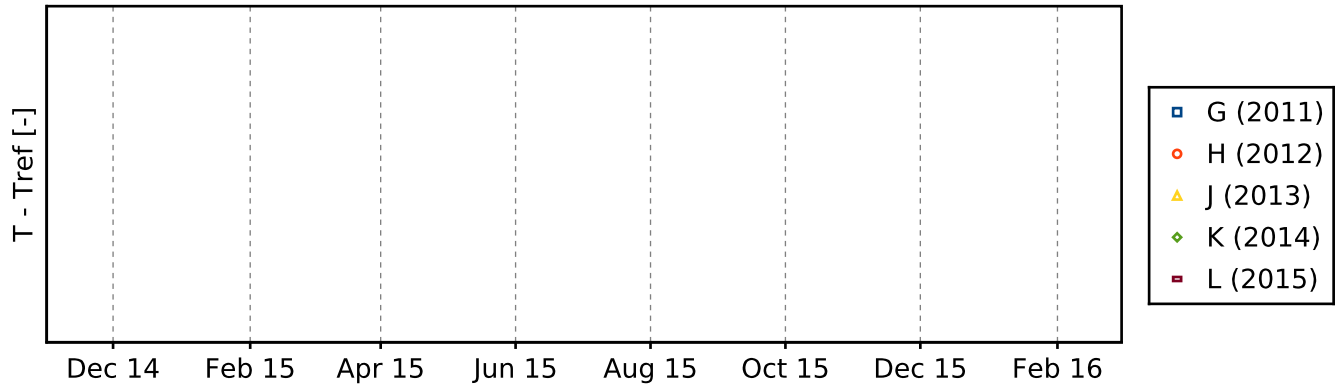
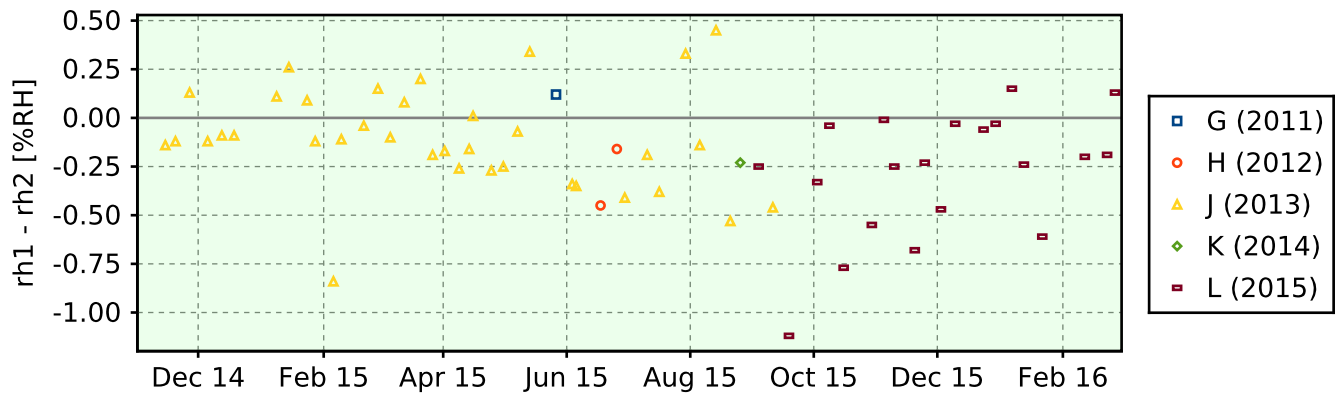
3.5.1.1 GroundCheck: GC25





3.5.1.2 GroundCheck: SHC





3.6 Measurement events

3.6.1 Stream: RS92

