

# Update on GRUAN website



**Michael Sommer**

*GRUAN Lead Centre, DWD*

13<sup>th</sup> GRUAN Implementation and Coordination Meeting (ICM-13)

Virtual, Session 4, 18 November 2021



5th anniversary of  
this GRUAN website  
<https://www.gruan.org>



## GCOS Reference Upper-Air Network

The climate reference network




The Global Climate Observing System ([GCOS](#)) Reference Upper-Air Network ([GRUAN](#)) is an international reference observing [network](#) of sites measuring essential climate variables above Earth's surface, designed to fill an important gap in the current global observing system. GRUAN measurements are providing long-term, high-quality [climate data records](#) from the surface, through the troposphere, and into the stratosphere. These are being used to determine trends, constrain and calibrate data from more spatially-comprehensive observing systems (including satellites and current radiosonde networks), and provide appropriate data for studying atmospheric processes. GRUAN is envisaged as a global network of eventually 30-40 [sites](#) that, to the extent possible, builds on existing observational networks and capabilities.

### GRUAN promotional video



This video provides an excellent overview of the goals and principles of GRUAN and its relation to the current challenges in climate research. You can find this and other public outreach material [here](#).

### Latest news

	<p>Article   2021-10-25</p> <p><b>AMT paper Rosoldi et al. 2021 in review</b></p> <p>"Intercomparison of Vaisala RS92 and RS41 radiosonde temperature sensors under controlled laboratory conditions" by Rosoldi et al. The paper is open...</p>
	<p>Article   2021-09-29</p> <p><b>AMT paper Lee et al. 2021 in review</b></p> <p>"Radiation correction and uncertainty evaluation of RS41 temperature sensors by using an upper-air simulator" by Lee et al. The paper is open for...</p>
	<p>Article Data product   2021-07-20</p> <p><b>AMT paper von Rohden et al. 2021 in review</b></p> <p>"Laboratory characterisation of the radiation temperature error of radiosondes and its application to the GRUAN data</p>

## ➤ Network

- About GRUAN, Working Group, Lead Centre, Task Teams, [sites](#)

## ➤ Data

- [Measurements](#), [data products](#), [file archive](#), [software](#), data policy

## ➤ Instruments

- [Radiosondes](#), other in-situ sensors, other instruments

## ➤ Documentation

- WMO/GCOS documents, [GRUAN documents](#) (TD, TN, RP), public outreach, [peer-reviewed articles](#), FAQ, conference contributions, other publications

## ➤ Community

- [News](#), [meetings](#), campaigns, awards

### Network

Information about organisation and parts of network

### Data

Information about data, data handling and data products

### Instruments

Information about instruments used at GRUAN stations

### Documentation

Archive of and information about GRUAN-related documents

### Community

Collection of all community tools



## Lauder (LAU) New Zealand



### GRUAN Status

since 2014 active  
since 2015 certified

### Site Name

GRUAN (code, name) LAU Lauder  
-short Lauder  
-long, international Lauder Atmospheric Research Station  
-long, national Lauder Atmospheric Research Station  
WMO (code, name) 93817, Lauder

### Location

Country New Zealand  
Altitude 1.5 to 370 m

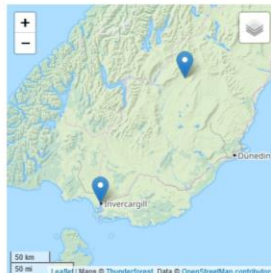
### Site maps

Position and region map

### Position map



### Local map



### Site Contact for purposes of GRUAN activities

Name Richard Querrel  
Affiliation NIWA  
Address Lauder, State Highway 85, Central Otago, Priv  
E-Mail [Richard.querrel@niwa.co.nz](mailto:Richard.querrel@niwa.co.nz)  
Phone +64 3 440 0400  
Fax +64 4 386 0574

The GRUAN site "Lauder" is a cooperation from two national organizations

### Site Locations

Lauder Invercargill



### Position

Country New Zealand  
Federal state Southland  
Latitude 46.42 °S  
Longitude 168.3 °E  
Altitude 1.5 m

### Institution / Operator

Name MetService  
-long, international Meteorological Service of New Zealand Ltd  
-long, national Meteorological Service of New Zealand Ltd  
Website [www.metservice.com](http://www.metservice.com)  
Description National Meteorological Service

### Contact

Name Kevin Alder  
Affiliation MetService  
Address 30 Salamanca Road, Kelburn, Wellington 6012, New Zealand  
E-Mail [kevin.alder@metservice.com](mailto:kevin.alder@metservice.com)  
Phone  
Fax

Site  
contact

General  
facts

Site  
locations

### Description of Location

Foundation 1939-09-01  
Description The observation site lies 500m southeast of Invercargill Airport and 1.5 km to the west of the Invercargill city centre (pop. 50,000), in an open farmland setting at the head of the New River Estuary.  
General type rural  
Topography coastal plain  
Land use (within 10 km) Grassland / cropland 60 %, open water 10 %, settlements 30 %  
Climate moderate maritime mid-latitude  
Website [www.metservice.com](http://www.metservice.com)

### Membership In Other Networks

GSN since 1997  
GUAN since 1997

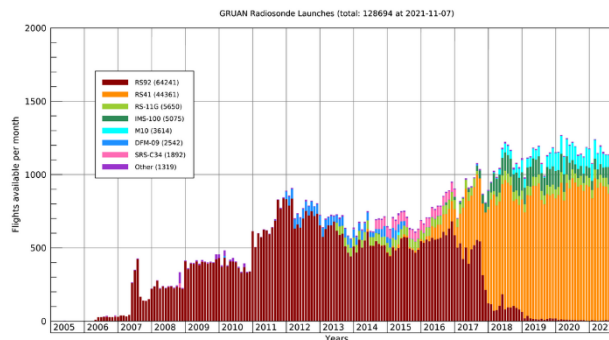
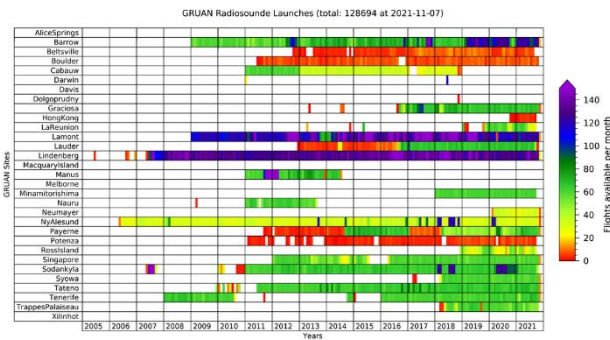
### Relevant Documents

- ICM-12 (2020) [GRUAN Site Report for Lauder - Richard Querrel](#)
- ICM-11 (2019) [GRUAN Site Report for Lauder - Richard Querrel](#)
- ICM-10 (2018) [GRUAN Site Report for Lauder - Richard Querrel](#)  
[A Site Atmospheric State Best Estimate of Temperature for Lauder, New Zealand - Jordis Tradowsky](#)
- ICM-9 (2017) [GRUAN Site Report for Lauder - Richard Querrel](#)  
[Update from Lauder - Richard Querrel](#)  
[Partnering with operational meteorology: Lauder's new Invercargill-based data stream - Richard Querrel](#)
- ICM-8 (2016) [GRUAN Station Report for Lauder - Richard Querrel](#)
- ICM-7 (2016) [GRUAN Station Report for Lauder - Richard Querrel](#)  
[Update on Lauder activities - Richard Querrel](#)
- ICM-6 (2014) [GRUAN Station Report for Lauder - Richard Querrel](#)  
[Lauder Update - Richard Querrel](#)
- ICM-5 (2013) [NIWA's Contribution to GRUAN - Olaf Bock](#)
- ICM-4 (2012) [Lauder Report for ICM-4 Meeting, Tokyo, 5 - 9 March 2012 - Paul Johnston](#)  
[New Zealand - Lauder Site Report - Paul Johnston and Karen Johnston](#)
- ICM-3 (2011) [Site Report: Lauder, New Zealand - Paul Johnston](#)  
[New Zealand - Lauder Site Report - Paul Johnston](#)
- ICM-2 (2010) [Site report: Lauder, New Zealand - Paul Johnston](#)  
[New Zealand - Lauder Site Report - Paul Johnston](#)
- ICM-1 (2009) [Site report: New Zealand Lauder - Paul Johnston](#)  
[New Zealand - Lauder - Paul Johnston](#)
- Lindenberg (2008) [Lauder, New Zealand within Network for Detection of Atmospheric Composition Change \(NDACC\) - Paul Johnston](#)

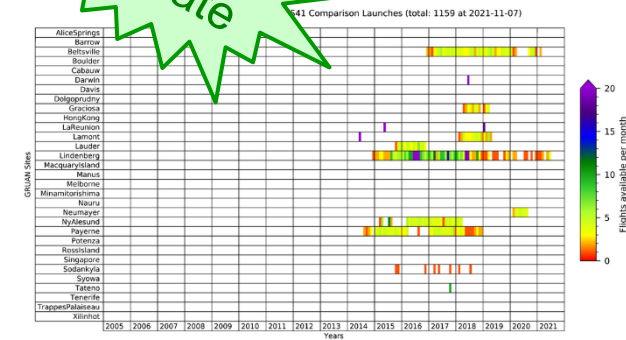
Related  
documents

→ Please check yearly & contact LC

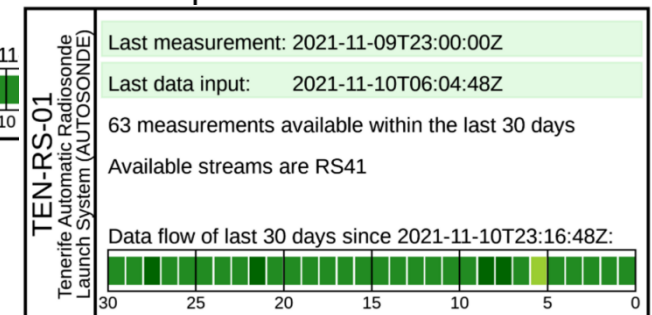
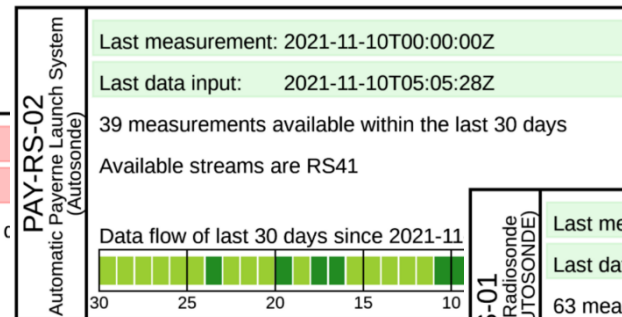
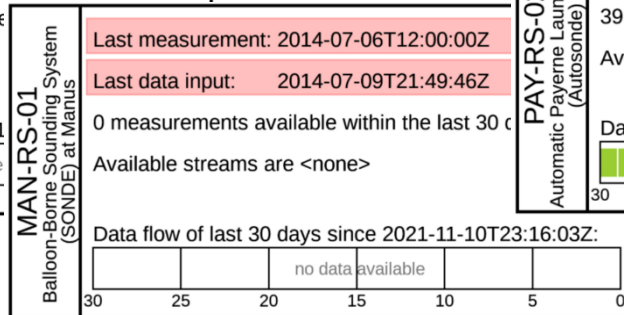
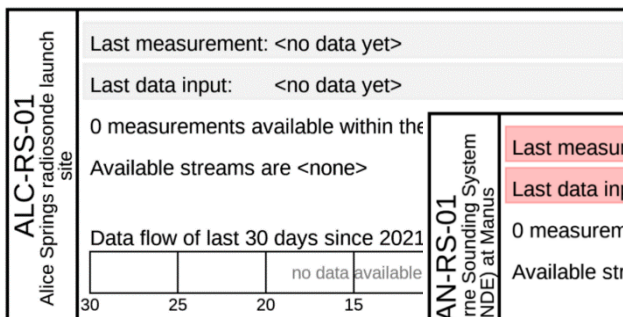
## ➤ Sonde launches & comparisons (plots & lists)



weekly update



## ➤ Status of current data flow (plots) → daily update



daily update

# Data section – Data products

Deutscher Wetterdienst  
Wetter und Klima aus einer Hand

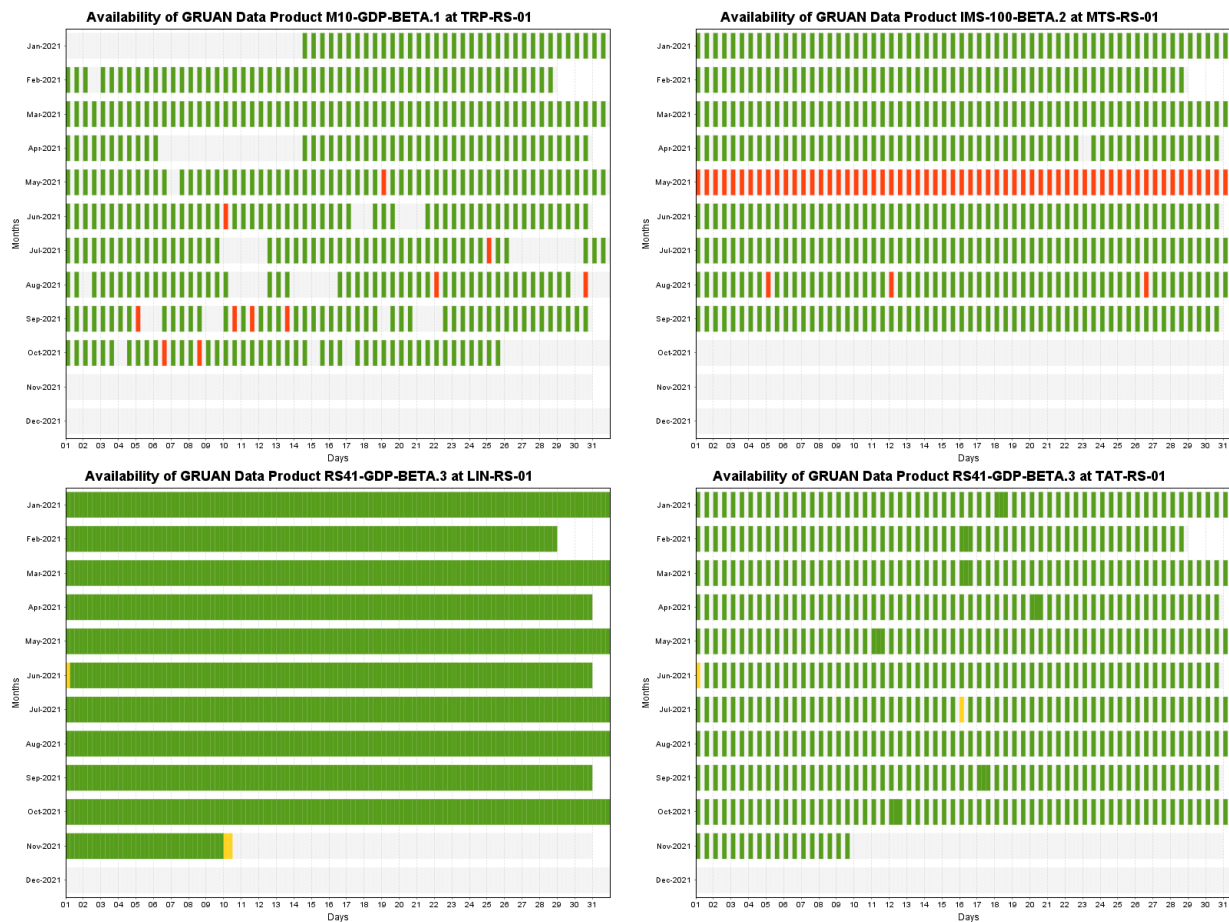


- Availability of data products  
→ monthly update

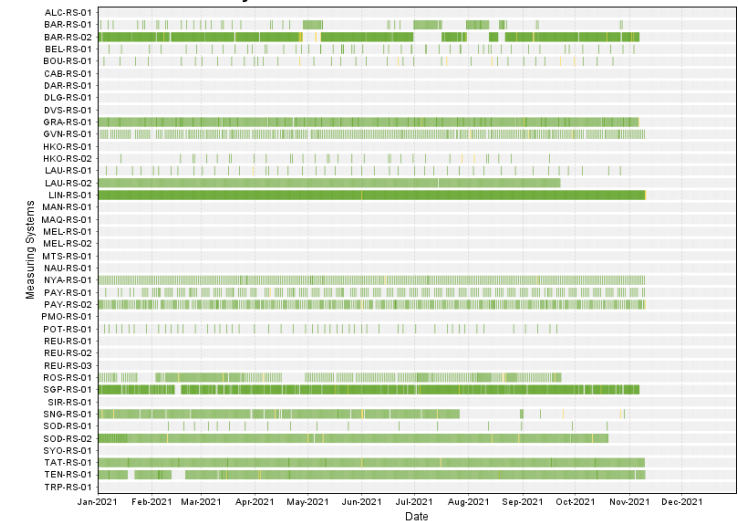
Site:  Product:  Year:

## Available Data

All sites	RS41 GRUAN Data Product BETA 3	2021
All sites	RS92 Vaisala Data Product Version 1	2005
All sites	RS92 Vaisala Data Product Version 1	2006
All sites	RS92 Vaisala Data Product Version 1	2007
All sites	RS92 Vaisala Data Product Version 1	2008
All sites	RS92 Vaisala Data Product Version 1	2009
All sites	RS92 Vaisala Data Product Version 1	2010
All sites	RS92 Vaisala Data Product Version 1	2011
All sites	RS92 Vaisala Data Product Version 1	2012
All sites	RS92 Vaisala Data Product Version 1	2013



## Availability of GRUAN Data Product RS41-GDP-BETA.3



## Legend

The data availability status refers to different data products. Currently we have three availability levels and all data we have received are ranked within these three categories:

**Available (green):** All steps of processing have been successfully completed. The data file is available at NCDC (GDP only) and at GRUAN Lead Centre (all other products).

**Unprocessed (yellow):** The raw data file has been successfully converted to a GRUAN standardized raw data file format (NetCDF). The processing itself is not done yet, or could not be completed. Reason may be missing raw data, or bugs in the processing software.





# Data section – File archive

Deutscher Wetterdienst  
Wetter und Klima aus einer Hand



## File archive

Direct access to all published files

### National Centers for Environmental Information (NCEI)

FTP access to all certified and published GRUAN data

- [RS92-GDP.2](#) <ftp://ftp.ncsl.noaa.gov/pub/data/gruan/processing/level2/RS92-GDP/version-002> (anonymous ftp)
- [RS-11G-GDP.1](#) <ftp://ftp.ncsl.noaa.gov/pub/data/gruan/processing/level2/RS-11G-GDP/version-001> (anonymous ftp)

Anonymous  
access (NCEI)

### GRUAN Lead Centre (at DWD)

Please contact the GRUAN Lead Centre ([gruan.lc@dwd.de](mailto:gruan.lc@dwd.de), [formular](#)) to get access to GRUAN data files in following cases. You need access to:

1. Uncertified GRUAN data products (currently in certification process, or certification process is not started yet)
2. Beta or development versions of upcoming GRUAN data products
3. Converted raw data files
4. Original raw data files
5. RS92 vs. RS41 comparison data set (see also page [comparison](#))

Following information is recommended to send to the GRUAN Lead Centre in case of a request:

- Who are you? (person and institute)
- What is the reason? (study, campaign, comparison, ...)
- Which are the relevant time range and sites?
- Which data products are you interested in?
- All other facts which help us to understand your request.

## Data access

Virtual central access point to all available GRUAN data

Please try this version of our virtual file archive. If you find any issue, please contact the GRUAN Lead Centre. If someone needs access to other files, please contact the GRUAN Lead Centre.

- [RS92-GDP.2](#) [Access to GRUAN data product RS92-GDP.2 \(hosted by LC\)](#)
- [RS-11G-GDP.1](#) [Access to GRUAN data product RS-11G-GDP.1 \(hosted by LC\)](#)
- [RS92-EDT.1](#) [Access to Vaisala data product RS92-EDT.1 \(hosted by LC\)](#)
- [RS41-EDT.1](#) [Access to Vaisala data product RS41-EDT.1 \(hosted by LC\)](#)
- [Compare RS41-RS92](#) [Access to GRUAN and Vaisala comparison data set \(hosted by LC\)](#)

Access for all  
registered user

### Beta versions

- [RS41-GDP-BETA.3](#) [Access to BETA version 3 of RS41 GRUAN data product \(hosted by LC\)](#)
- [RS-11G-BETA.2](#) [Access to BETA version 2 of RS-11G GRUAN data product \(hosted by LC\)](#)
- [IMS-100-BETA.2](#) [Access to BETA version 2 of IMS-100 GRUAN data product \(hosted by LC\)](#)
- [IMS-100-BETA.1](#) [Access to BETA version 1 of IMS-100 GRUAN data product \(hosted by LC\)](#)
- [M10-GDP-BETA.1](#) [Access to BETA version 1 of M10 GRUAN data product \(hosted by LC\)](#)

Access for  
special user only  
(BETA tester)

## Access to the comparison dataset RS41 - RS92

Hosted by LC

This comparison dataset includes several data products:

- [RS92-GDP.2](#) (GRUAN): Please find a description about data product on page [RS92-GDP.2](#).
- [RS92-EDT.1](#) (Vaisala): Please find a description about data product on page [RS92-EDT.1](#).
- [RS41-EDT.1](#) (Vaisala): Please find a description about this data product on page [RS41-EDT.1](#).

Link to  
description

Filter &  
navigate

Download  
full folder  
(if not too large)

Download  
single files

search		
1 2		
Index of: <a href="#">Comparison-DS RS41-RS92 (GRUAN &amp; Vaisala)</a> / <a href="#">RS41-GDP.1</a> / <a href="#">GVN</a> / 2020		
<a href="#">Switch to the parent folder</a>		
Name	Info	Modified
<a href="#">GVN-RS-01_2_RS41-GDP_001_20200222T120000_1-000-001.nc</a>	4113 KB	2021-11-11
<a href="#">GVN-RS-01_2_RS41-GDP_001_20200229T120000_1-000-001.nc</a>	4134 KB	2021-11-11
<a href="#">GVN-RS-01_2_RS41-GDP_001_20200307T120000_1-000-001.nc</a>	4224 KB	2021-11-11
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<a href="#">GVN-RS-01_2_RS41-GDP_001_20200321T120000_1-000-001.nc</a>	4285 KB	2021-11-11
<a href="#">GVN-RS-01_2_RS41-GDP_001_20200328T120000_1-000-001.nc</a>	3250 KB	2021-11-11
<a href="#">GVN-RS-01_2_RS41-GDP_001_20200403T120000_1-000-001.nc</a>	4050 KB	2021-11-11
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<a href="#">GVN-RS-01_2_RS41-GDP_001_20200622T120000_1-000-001.nc</a>	3476 KB	2021-11-11
<a href="#">GVN-RS-01_2_RS41-GDP_001_20200627T120000_1-000-001.nc</a>	3245 KB	2021-11-11
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<a href="#">GVN-RS-01_2_RS41-GDP_001_20200728T120000_1-000-001.nc</a>	2855 KB	2021-11-11
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<a href="#">GVN-RS-01_2_RS41-GDP_001_20200816T120000_1-000-001.nc</a>	3349 KB	2021-11-11
1 2		



- RsLaunchClient
  - Raw data and meta-data collecting tool for radiosounding
- gtRsl – GRUAN Tool RsLaunch
  - Command line tool to prepare simple radiosonde launches for upload to GRUAN
- gt92 – GRUAN radiosonde file converting tool
  - Command line tool for handling radiosonde data files
- gm41 – GRUAN monitor MW41
  - Tool for Vaisala MW41 online Xdata decoding and web visualization

## GruanToolRS92 (gt92)

Command line tool for handling radiosonde data files

### Details

ID gt92

Title GruanToolRs92

Author Michael Sommer (GRUAN Lead Centre)

**Brief description** Command line tool which can be used to handle a couple of radiosounding-specific file formats. Files can be tested, converted, extracted and more.

Version **0.5.2** (2021-02-18)

Status **Stable**

General  
information

### Download

Full installation [GruanToolRs92-v0.5.2.zip](#) (zip)

Program file only [GruanToolRs92.jar](#) (jar)

Download  
(login)

### Description

• [GRUAN-TN-11: M. Sommer: Brief Description of GruanToolRs92 \(gt92\)](#) (2020-10-01). [PDF](#)

Documents

### History

Version 0.5.2 (2021-02-18 to now)

Version 0.5.1 (2020-08-04 to 2020-10-30)

Version 0.5.0 (2019-11-06 to 2020-04-29)

Version 0.4.11 (2019-03-28 to 2019-10-23)

Version 0.4.10 (2018-05-19 to 2019-03-19)

Version 0.4.9 (2018-02-28 to 2018-04-16)

Version 0.4.8 (2017-10-23 to 2018-01-05)

Version 0.4.7 (2016-11-23 to 2017-03-17)

Version 0.4.6 (2016-08-01 to 2016-11-23)

Version 0.4.5 (2016-02-18 to 2016-07-29)

Version 0.4.4 (2016-01-13 to 2016-02-16)

Version 0.4.3 (2016-01-06)

Version 0.4.2 (2015-12-16)

Version 0.4.1 (2015-12-14 to 2015-12-15)

Version 0.4.0 (2015-12-11)

Full history  
with details



- Radiosondes
  - Different sonde models
  - Descriptions & flight statistics

somewhat  
limited

- Other sensors
  - Ozone, water vapour, temperature, aerosol
  - Flight statistics only

rudimentary

- Other instruments
  - GNSS, LIDAR, MWR, ...

missing

Who can write something? → task team members?

## Meisei IMS-100

### Details

General information

Model IMS-100

Manufacturer Meisei ([www.meisei.co.jp/english/](http://www.meisei.co.jp/english/))

Weight 38 g

Size 55 x 53 x 131 mm

Sensors Pressure: derived from GPS  
Temperature: thermistor  
Humidity: electrostatic capacitance humidity sensor  
Position: GPS

Measurement cycle 1 s

Available since 2014

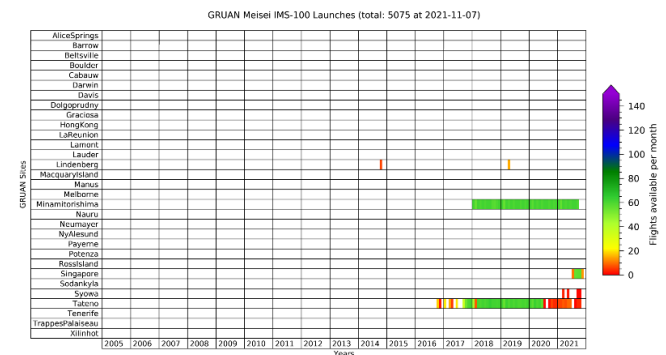
Ground system Ground receiver RD-08AC with MGPS-R sounding software

Ground check Meisei ground check tool which is part of the Meisei RD-08 Sounding System



Meisei IMS-100

### Archived soundings by GRUAN



### Data products

- IMS-100-BETA.2 -- development version of [IMS-100-GDP.2](#)

### Related documents

#### GRUAN

- [GRUAN-TD-5](#): Kizu et al. (2018): Technical characteristics and GRUAN data processing for the Meisei RS-11G and IMS-100 radiosondes

#### Meisei

- [IMS-100 on the Meisei website](#)
- [IMS-100 datasheet \(pdf\)](#)

## ➤ Technical Documents (TD)

- with official review process
- 5 published
- > 6 in preparation

## ➤ Technical Notes (TN)

- without official review process
- 10 published
- > 6 in preparation

## ➤ Reports (RP)

- 4 published

Should information be available on documents in progress?

## Global Navigation Satellite System (GNSS) - Precipitable Water (PW) Omnibus

GRUAN-TD-6

### Details

ID GRUAN-TD-6

Title Global Navigation Satellite System (GNSS) - Precipitable Water (PW) Omnibus

Authors Junhong Wang, Kalev Rannat, Jonathan Jones, Michael Sommer, Galina Dick, and Matthew Hanson

Last version **v2.0** (2019-08-21)

Status **Published**

Download [PDF](#)



Publisher  
DWD (German Weather Service)

Number & Version  
GRUAN-TD-6, v2.0 (2019-08-21)

### Abstract

This omnibus provides detailed guidelines on the GRUAN GNSS-PW measurement program, including instrumentation, operation procedures and all aspects of data management. It also addresses specific GRUAN requirements, such as reference measurements, measurement uncertainty and managing changes.

### History

**v2.0 (2019-08-21)** Wang et al., Global Navigation Satellite System (GNSS) - Precipitable Water (PW) Omnibus, GRUAN-TD-6, [v2.0 \(2019-08-21\)](#).

**v1.0 (2012-05-23)** Shoji et al., GRUAN Ground-based GNSS Site Guidelines, GRUAN-TD-6, [v1.0 \(2012-05-23\)](#).



- Current news topics are
  - New articles, documents
  - Changes related to sites
  - Meetings
  - Data products
  - Other
- More would be possible
  - Campaigns, experiments
  - Other events, e.g. conferences

→ Please inform the Lead Centre about news

## News

Meetings ▾

Campaigns ▾

Awards ▾

✉ Contact

## Month filter

- 2021
  - November 2021 (1 entry)
  - October 2021 (1 entry)
  - September 2021 (1 entry)
  - July 2021 (3 entries)
  - May 2021 (2 entries)
  - February 2021 (2 entries)
- 2020
  - December 2020 (3 entries)
  - November 2020 (1 entry)
  - October 2020 (1 entry)
  - September 2020 (3 entries)
  - August 2020 (5 entries)
  - July 2020 (2 entries)
  - June 2020 (3 entries)
  - May 2020 (1 entry)
  - February 2020 (2 entries)
  - January 2020 (1 entry)
- 2019
  - October 2019 (1 entry)
  - September 2019 (3 entries)
  - August 2019 (5 entries)
  - June 2019 (1 entry)
  - May 2019 (5 entries)
  - April 2019 (1 entry)
  - February 2019 (3 entries)
  - January 2019 (2 entries)
- 2018
  - December 2018 (1 entry)
  - October 2018 (1 entry)
  - August 2018 (1 entry)
  - June 2018 (1 entry)
  - April 2018 (3 entries)
  - March 2018 (1 entry)
- 2016
  - September 2017 (1 entry)
  - August 2017 (1 entry)
  - June 2017 (2 entries)
  - May 2017 (1 entry)
  - April 2017 (1 entry)
  - March 2017 (1 entry)

## GRUAN News

News of network, community and related science

1 2 3 ... 7 »



### ICM-13: agenda available

Due to the global Covid-19 situation, this year's meeting will be organized as a condensed, virtual meeting in the week of 15-19 November 2021.

Meeting | 2021-11-09



### AMT paper Rosoldi et al. 2021 in review

"Intercomparison of Vaisala RS92 and RS41 radiosonde temperature sensors under controlled laboratory conditions" by Rosoldi et al. The paper is open...

Article | 2021-10-25



### AMT paper Lee et al. 2021 in review

"Radiation correction and uncertainty evaluation of RS41 temperature sensors by using an upper-air simulator" by Lee et al. The paper is open for...

Article | 2021-09-29



### AMT paper von Rohden et al. 2021 in review

"Laboratory characterisation of the radiation temperature error of radiosondes and its application to the GRUAN data processing for the Vaisala RS41"...

Article Data product | 2021-07-20



### Paramaribo (Suriname) first GRUAN site in South America

With the establishment of a new site in Paramaribo we have reached the landmark of the first GRUAN site on the South American continent. This is...

Station | 2021-07-20



### AMT paper Ingleby et al. 2021 in review

The following GRUAN-relevant paper was published at AMT: "On the quality of RS41 radiosonde descent data" by Ingleby et al. The paper is open for...

Article Measurement | 2021-07-13



### ICM-13: virtual meeting 15-19 November 2021

In view of the ongoing Covid-19 situation, ICM-13 will again be organized as a virtual meeting.

Conference | 2021-05-20



### Lauder 60th

The GRUAN site Lauder (NZ) was founded 60 years ago.

Event Station | 2021-05-10



### AMT paper Graf et al. 2021

The following GRUAN-relevant paper was published at AMT: "Compact and lightweight mid-infrared laser spectrometer for balloon-borne water vapor..."

Article | 2021-02-23



- All GRUAN meetings since beginning
  - Presentations, documents, reports
  - Additional material, e.g. group photos



## Meetings

Community meetings, workshops and relevant conferences

### GRUAN Implementation-Coordination Meetings (ICM)

- 🔗 **ICM-13 (Virtual 2021)** 13th GRUAN Implementation-Coordination Meeting (ICM-13), Virtual, 15 November to 19 November 2021.
- 🔗 **ICM-12 (Virtual 2020)** 12th GRUAN Implementation-Coordination Meeting (ICM-12), Virtual, 16 November to 20 November 2020, [Report \(pdf\)](#).
- 🔗 **ICM-11 (Singapore 2019)** 11th GRUAN Implementation-Coordination Meeting (ICM-11), Singapore / SG, 20 May to 24 May 2019, [Report \(pdf\)](#).
- 🔗 **ICM-10 (Potsdam 2018)** 10th GRUAN Implementation-Coordination Meeting (ICM-10), Potsdam / DE, 23 April to 27 April 2018, [Report \(pdf\)](#).
- 🔗 **ICM-9 (Helsinki 2017)** 9th GRUAN Implementation-Coordination Meeting (ICM-9), Helsinki / FI, 12 June to 16 June 2017, [Report \(pdf\)](#).
- 🔗 **ICM-8 (Boulder 2016)** 8th GRUAN Implementation-Coordination Meeting (ICM-8), Boulder / US, 25 April to 29 April 2016.
- 🔗 **ICM-7 (Matera 2015)** 7th GRUAN Implementation-Coordination Meeting (ICM-7), Matera / IT, 23 February to 27 February 2015, [Report \(pdf\)](#).
- 🔗 **ICM-6 (Greenbelt 2014)** 6th GRUAN Implementation-Coordination Meeting (ICM-6), Greenbelt / US, 10 March to 14 March 2014, [Report \(pdf\)](#).
- 🔗 **ICM-5 (De Bilt 2013)** 5th GRUAN Implementation-Coordination Meeting (ICM-5), De Bilt / NL, 25 February to 01 March 2013, [Report \(pdf\)](#).
- 🔗 **ICM-4 (Tokyo 2012)** 4th GRUAN Implementation-Coordination Meeting (ICM-4), Tokyo / JP, 05 March to 09 March 2012, [Report \(pdf\)](#).
- 🔗 **ICM-3 (Queenstown 2011)** 3rd GRUAN Implementation-Coordination Meeting (ICM-3), Queenstown / NZ, 28 February to 4 March 2011, [Report \(pdf\)](#).
- 🔗 **ICM-2 (Payerne 2010)** 2nd GRUAN Implementation-Coordination Meeting (ICM-2), Payerne / CH, 2 to 4 March 2010, [Report \(pdf\)](#).
- 🔗 **ICM-1 (Norman 2009)** 1st GRUAN Implementation-Coordination Meeting (ICM-1), Norman / US, 2 to 4 March 2009, [Report \(pdf\)](#).
- 🔗 **IM (Lindenberg 2008)** Implementation Meeting of GCOS Reference Upper Air Network, Lindenberg / DE, 26 to 28 February 2008, [Report \(pdf\)](#).
- 🔗 **UAWS-2 (Seattle 2006)** GCOS/NOAA Upper-Air Workshop II, Seattle / US, 22 to 24 May 2006.
- 🔗 **UAWS-1 (Boulder 2005)** NOAA/GCOS Workshop to Define Climate Requirements for Upper-Air Observations, Boulder / US, 8 to 11 February 2005.

### Workshops

- NEW (Fürstenwalde 2012) The GRUAN Workshop to Develop Network Design and Expansion Criteria, Fürstenwalde / DE, 13-15 June 2012, [Report \(GRUAN-RP-4\)](#).

- Available since 5 years → <https://www.gruan.org>
- Comprehensive information → Data, documents, papers, news, meetings
- More content needed → e.g. section instruments
- Website of whole GRUAN community  
→ Contributions are very welcome

Please give feedback and contribute!  
[gruan.lc@dwd.de](mailto:gruan.lc@dwd.de)