

## **GRUAN Lead Centre progress report 01/2017**

covering the period 04/2016 to 05/2017

### **Author**

Ruud Dirksen  
GRUAN Lead Centre  
Lindenberg Meteorological Observatory – Richard Aßmann Observatory  
Deutscher Wetterdienst

### **Summary**

Beltsville is official GRUAN certified site. Lamont (SGP) and Tateno are currently going through the process of certification.

Several candidate sites joined GRUAN

WMO Vaisala award for paper describing RS92 GRUAN Data product

The GRUAN Lead Centre has participated in several conferences and workshops.

The GRUAN Lead Centre participated in StratoClim campaign in India.

Preparation of ICM-9.

Development of GRUAN data processing for RS92 v3.

Development of new GRUAN website

Coordination of RS92-RS41 transition

### **Health of network**

Several candidate sites have joined GRUAN:

- Tenerife
- Gracioso (Azores)
- Syowa
- Minamitorishima

Making a grand total of 26

Certification process for various sites initiated and/or concluded (Beltsville, Tateno, Lamont (SGP))

In total 9 sites have been certified

### **Lead Centre operations**

- The Lead Centre participated in the preparation of ICM-9.
- Setting up dataflow from Tateno (RS11-G) & Payerne (SRS-C34 & SRS-C50)
- Testing and characterization of Vaisala RS41.

- Ongoing development of RsLaunchClient.
- Coordination RS92-RS41 transition
- Configuring data flow for sites switching to RS41
- Ongoing development GRUAN data processor

#### **Visitors to LC**

- NWS-Sterling August 2016
- Masatomo Fujiwara Sept 2016
- Fabien Carminati (GAIA-CLIM) Oct 2016
- Sasha Kats (visiting scientist) & Alexey Lykov (FLASH-B) Dec 2016
- Vaisala March 2017
- Andrea Merlone April 2017

#### **Instrument research**

The following activities were undertaken in testing and/or characterizing research instruments and radiosondes

- FLASH-B (water vapor in stratosphere)
- Particle replicator (imaging of cloud particles)
- Aircore (trace gas composition)
- RS41 (lab & intercomparison)

#### **Site Visits**

The Lead Centre visited the following sites:

- Dolgoprudny; discussion about continuation of GRUAN after reforms at CAO
- La Reunion; measurement campaign (UTLS composition using CFH and COBALD) & discussion on setting up data flow from Sirta and Reunion sites.

#### **Conferences**

- SPARC meeting, Geneva, May 2016
- CIMO-TECO, Madrid, Sept 2016
- NDACC steering committee, Bremen, Nov 2016

#### **GRUAN-related publications**

The following GRUAN-related publications appeared in peer-reviewed literature:

- Calbet, X., et al., Consistency between GRUAN sondes, LBLRTM and IASI, AMTD, 2016, 1–18, [doi:10.5194/amt-2016-344](https://doi.org/10.5194/amt-2016-344), 2016.
- Hall, E. G., et al., Advancements, measurement uncertainties, and recent comparisons of the NOAA frost point hygrometer, AMT, 9(9), 4295–4310, [doi:10.5194/amt-9-4295-2016](https://doi.org/10.5194/amt-9-4295-2016), 2016.
- Hurst, D. F., et al., Recent divergences in stratospheric water vapor measurements by frost point hygrometers and the Aura Microwave Limb Sounder, AMT, 9(9), 4447–4457, [doi:10.5194/amt-9-4447-2016](https://doi.org/10.5194/amt-9-4447-2016), 2016.
- Jensen, M. P., et al., Comparison of Vaisala radiosondes RS41 and RS92 at the

ARM Southern Great Plains site, AMT, 9(7), 3115–3129, [doi:10.5194/amt-9-3115-2016](https://doi.org/10.5194/amt-9-3115-2016), 2016.

- Kräuchi, A. et al., Return glider radiosonde for in situ upper-air research measurements, AMT, 9(6), 2535–2544, [doi:10.5194/amt-9-2535-2016](https://doi.org/10.5194/amt-9-2535-2016), 2016.
- Kräuchi, A., et al., Controlled weather balloon ascents and descents for atmospheric research and climate monitoring, AMT, 9(3), 929–938, [doi:10.5194/amt-9-929-2016](https://doi.org/10.5194/amt-9-929-2016), 2016.
- Leblanc, T., et al., Proposed standardized definitions for vertical resolution and uncertainty in the NDACC lidar ozone and temperature algorithms – Part 1: Vertical resolution, AMT, 9(8), 4029–4049, [doi: 10.5194/amt-9-4029-2016](https://doi.org/10.5194/amt-9-4029-2016), 2016a.
- Leblanc, T., et al., Proposed standardized definitions for vertical resolution and uncertainty in the NDACC lidar ozone and temperature algorithms – Part 2: Ozone DIAL uncertainty budget, AMT, 9(8), 4051– 4078, [doi:10.5194/amt-9-4051-2016](https://doi.org/10.5194/amt-9-4051-2016), 2016b.
- Leblanc, T., et al., Proposed standardized definitions for vertical resolution and uncertainty in the NDACC lidar ozone and temperature algorithms – Part 3: Temperature uncertainty budget, AMT, 9(8), 4079– 4101, [doi:10.5194/amt-9-4079-2016](https://doi.org/10.5194/amt-9-4079-2016), 2016c.
- Maturilli, M. et al., Surface radiation during the total solar eclipse over Ny-Ålesund, Svalbard, on 20 March 2015, Earth System Science Data, 8(1), 159–164, [doi:10.5194/essd-8-159-2016](https://doi.org/10.5194/essd-8-159-2016), 2016.
- Maturilli, M. et al., Arctic warming, moisture increase and circulation changes observed in the Ny-Ålesund homogenized radiosonde record, Theoretical and Applied Climatology, pp. 1–17, [doi:10.1007/s00704-016-1864-0](https://doi.org/10.1007/s00704-016-1864-0), 2016, ISSN 1434-4483.
- Tradowsky, G. et al., GRUAN in the service of GSICS: Using reference ground-based profile measurements to provide traceable radiance calibration for space-based radiometers, GSICS Quarterly Newsletter, 10(2), [doi:10.7289/V5GT5K7S](https://doi.org/10.7289/V5GT5K7S), 2016.
- Trickl, T., et al., How stratospheric are deep stratospheric intrusions? LUAMI 2008, ACP, 16(14), 8791–8815, [doi:10.5194/acp-16-8791-2016](https://doi.org/10.5194/acp-16-8791-2016), 2016.
- Vèrèmes, H., et al., A raman Lidar at Maïdo observatory (Reunion island) to measure water vapor in the troposphere and lower stratosphere: calibration and validation, AMTD, 2017, 1–38, [doi:10.5194/amt-2017-32](https://doi.org/10.5194/amt-2017-32), 2017.
- Vömel, H., et al., An update on the uncertainties of water vapor measurements using cryogenic frost point hygrometers, AMT, 9(8), 3755–3768, [doi:10.5194/amt-9-3755-2016](https://doi.org/10.5194/amt-9-3755-2016), 2016.

**Progress against stated objectives**

| Nr | Action   | Summary of progress   |
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| 3  | Develop first draft of GRUAN radiosonde generic technical document omnibus | In progress. Delayed by preceding priority of analysis of radiation tests. Also awaiting contributions from co- |

|    |  | authors.   |
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| 4  | Revise the RS92 data stream - revised version 3 release including qc flags + data in different vectors (good, questionable, missing), including implementation of performance feedback to the sites. Validate new radiation correction using ancillary measures to build confidence incl. GAIA-CLIM NWP feedback. Document v3 appropriately in peer-reviewed literature. | In progress. Nearly finished, save for implementation of radiation temperature correction for RS92.                        |
| 7  | Lead Centre to ascertain consistency or otherwise of payload configurations being undertaken by sites performing a dual sounding program and make a recommendation as to how to set the rigs to assure comparability to extent possible.   | Document (TN) has been prepared and published.   |
| 8  | Lead Centre to work with BoM to instigate an intercomparison campaign for RS92-RS41 transition at the tropical Darwin site   | In progress, pending reorganisation of BoM's upper air sounding program.   |
| 10 | Lead Centre to instigate and populate a database of parallel soundings of RS92-RS41, including where possible satellite co-locations, raw and black-box processed raobs profiles. Served through LC and available to GRUAN community for analysis.   | Completed. Parallel soundings of RS92-RS41 at GRUAN sites have been made available at GRUAN ftp-server.                    |
| 11 | Paper describing the GRUAN change management replacement strategy submitted to peer-reviewed journal (GI) to increase visibility of effort and broad community buy-in.   | In progress (nearly completed)   |
| 12 | Lead Centre and Sterling facility to undertake coordinated lab characterisation of the RS92 and RS41. Formal report at ICM-9.  | Ongoing. A Sterling delegation visited LC in August 2016. Discussion and agreement about coordinated lab characterisation. |
| 13 | Interim analysis of the radiosonde overlap observations completed and reported at ICM-9  | In progress, analysis is led by A. Fasso   |
| 14 | Interim analysis of the insights that can be bought by the use of satellite data to the characterisation of the change between RS92 and RS41 based upon the paired launches.   | Pending  |

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| 15 | All sites with capability to report BUFR over GTS in NRT. Advice and tech. support to be provided by LC / WMO / GCOS on a site by site basis to all certified and candidate sites not currently reporting BUFR to attempt to enable. | Pending  |
| 20 | Technical Note on the appropriate techniques for manufacturer independent ground checks using the SHC. Paper submitted to peer review documenting scientific rationale   | Pending  |
| 28 | Version 3 release of RS92 to include correlated uncertainty information and subsequent work to consider an emulator that can create N profiles consistent with the uncertainty information   | In progress  |
| 33 | LC and processing centres to evaluate options with regard to failsafe back-up to ensure data archival and processing software redundancy. Technical Note produced.   | In progress. Potenza (F. Madonna) will offer back up facilities in framework of Copernicus' C3S project BARON. |

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| <p><b>Achievements</b></p> <ul style="list-style-type: none"> <li>• Beltsville has become GRUAN-certified site.</li> <li>• New GRUAN website (<a href="http://www.gruan.org">www.gruan.org</a>)</li> <li>• Vaisala Award for paper on RS92 GRUAN data product (Dirksen AMT2014)</li> <li>• Contribution to ARM proposal RIVAL (RS92-RS41 comparison)</li> <li>• New sites added to network</li> </ul> <p>Technical documentation published:</p> <ul style="list-style-type: none"> <li>• TN-4 Guidelines on requirements for the initial development of a GRUAN data product, Thorne, 2016-04-21</li> <li>• TN-5 Procedures for (re)certifying a GRUAN measurement programme at an existing GRUAN-certified site, Bodeker, 2016-04-21</li> <li>• TN-7 Rigging recommendations for dual radiosonde soundings, von Rohden et al, 2016-08-12</li> <li>• TN-8 GRUAN Monitor MW41 and the Vaisala RS41 additional sensor interface, Oelsner &amp; Tietz, 2017-03-10</li> </ul> <p><b>Training by Lead Centre</b></p> |
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- Training of AWI staff going to Ny Alesund
- Training of Geomar staff going on cruise in the Arctic
- Training and assisting staff in Nainital (India) in preparation and launch of CFH during StratoClim campaign.

### **Issues**

- Staffing: despite staffing being at nominal level, the LC is understaffed to perform and/or support all tasks, research activities and campaigns that need to be done.

### **Work plan for next 12 months**

- Participate in StratoClim2017 campaign
- Completion of Tateno and Lamont site certification application.
- Recertify sites (Lindenberg and Ny Alesund)
- Complete the GRUAN radiosonde omnibus.
- Further develop the GRUAN website
- Complete the development of a new GRUAN data processor, and version 3 of the RS92-GDP.
- Further coordinate RS92-RS41 transition within GRUAN
- Continue testing and characterization of the RS41
- Develop GRUAN data product for RS41
- Operationalize processing of CFH data
- Prepare WMO-CIMO Radiosonde intercomparison campaign
- Develop GRUAN data processor for GNSS-WV (cooperation with GFZ)