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Wetter und Klima aus einer Hand

Lead Centre report for 2018-2019

Ruud Dirksen
GRUAN Lead Centre, DWD

11th GRUAN Implementation and Coordination Meeting (ICM-11)
Singapore
May 2019

LC - staff

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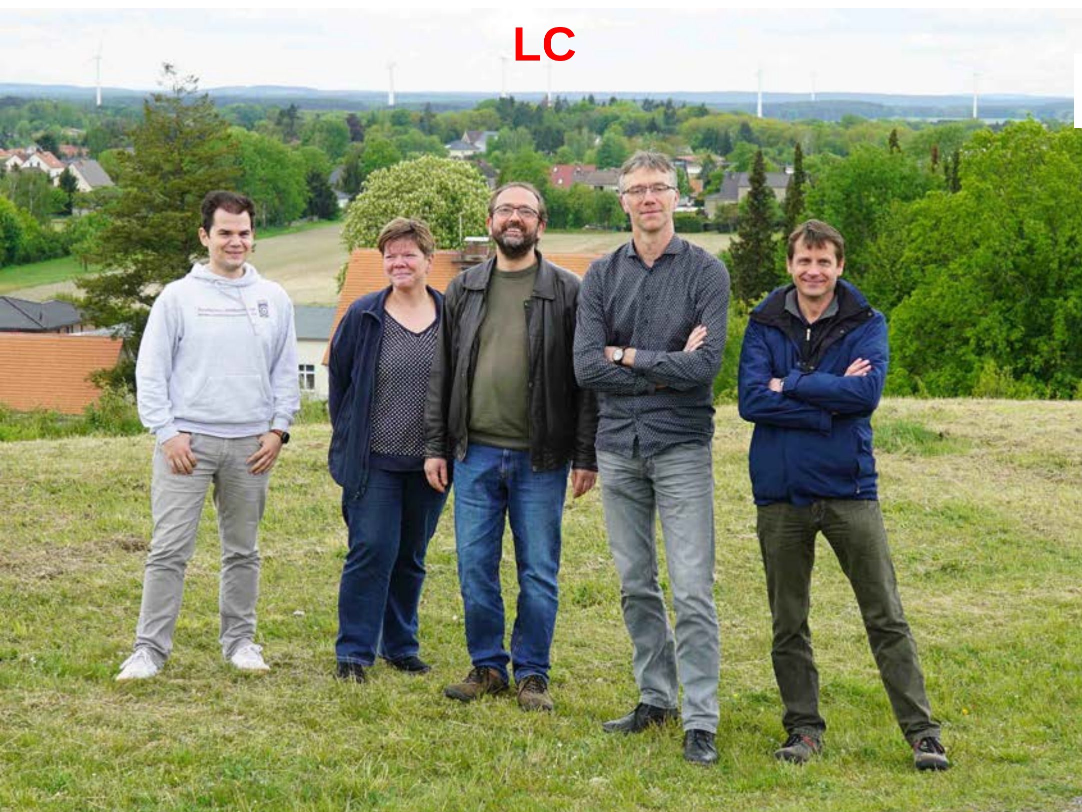
- New hire: Tzvetan Simeonov (1 April)
  - o RS41 data product

LC



In-situ sounding group

Network status

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- Neumayer & Arrival heights invited to become candidate sites
- Singapore (SNG) & Lamont (SGP) certified
- Several sites recertified
  - Boulder, Lindenberg, Lauder, Ny Alesund, Sodankyla
- Under review:
  - Tenerife (Payerne, recertification)
- In total
  - 26 sites
  - 12 GRUAN-certified sites

GCOS Reference Upper-Air Network

Lead Centre cooperation

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- CONCIRTO Campaign La Reunion (RS92-RS41-M10-CFH)
- Visitors
  - Graw, discussion/coordination, May 2018.
  - ETH-Zürich, tests with PCFH, July & December 2018.
  - Alexey Lykov (CAO - Dolgoprudny), test of FLASH-B November 2018.
  - Meisei, test of Skydew instrument, April 2019.
  - David Smyth, GRUAN coordination, May 2019.
- Site Visits
  - Korea Research Institute of Standards and Science (KRISS), December 2018

Lead Centre operations

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- GRUAN data archive
  - Operationally running GRUAN data management server - GDMS (24/7)
  - Operationally running GRUAN meta-data data base - GMDB (24/7)
  - Operationally working GRUAN file archive - GFA (24/7)
- Ongoing development and optimization of all GRUAN server software components, GDMS, GMDB, GFA
- Ongoing development on GRUAN software tools for use at sites
  - RsLaunchClient, LidarRunClient, gt92, gtRsl, gm41
- Regularly update of data flow statistic plots (available at website)
- Configuring radiosonde data flow
  - BoM sites
  - RS92-RS41: RIVAL & UKMO

RS92-RS41 transition

- Laboratory experiments (radiation, calibration)
- All RS92 sites have switched to RS41
- Dual soundings with RS41/RS92 (and CFH) ~800 GRUAN-wide
  - Radiosounding database complete (CFH, M10, FPH, O3, COBALD, Skydew, RS11-G, iMS100 etc)
  - Transfer of ancillary data still to be initiated
- Several RS92-RS41 intercomparison programs ongoing (Lindenberg, RIVAL, Payerne)
- Strategy paper nearly finished

Instrument research

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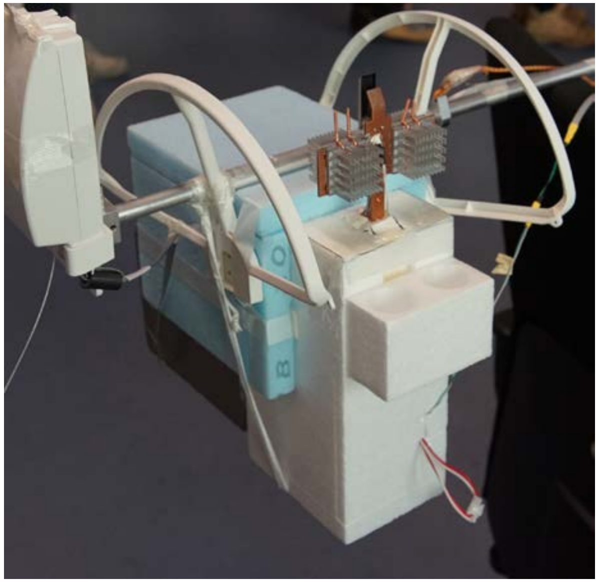

- Stratospheric hygrometers
  - FLASH-B
  - Meisei Skydew (presentation 8-3)
  - PCFH (presentation 8-1)
- Research contract TU Dresden to investigate alternatives for R23.
  - Presentation 8-2
- RS41, RS92, DFM-09 (laboratory & intercomparison).

Achievements

- GRUAN-TD-7 published - *Review of Multiple-payload Radiosonde Sounding Configurations for Determining Best-Practice Guidance for GRUAN Sites*
- GRUAN TD-6 *Global Navigation Satellite System (GNSS) - Precipitable Water (PW) Omnibus*. Reviewed & accepted. Under preparation for publication
- RS41 GDP Alpha version
- Meisei RS-11G GRUAN data product certified
- Various GRUAN-related papers (~25) and presentations
- Expansion satellite overpass prediction service

GRUAN Data flow

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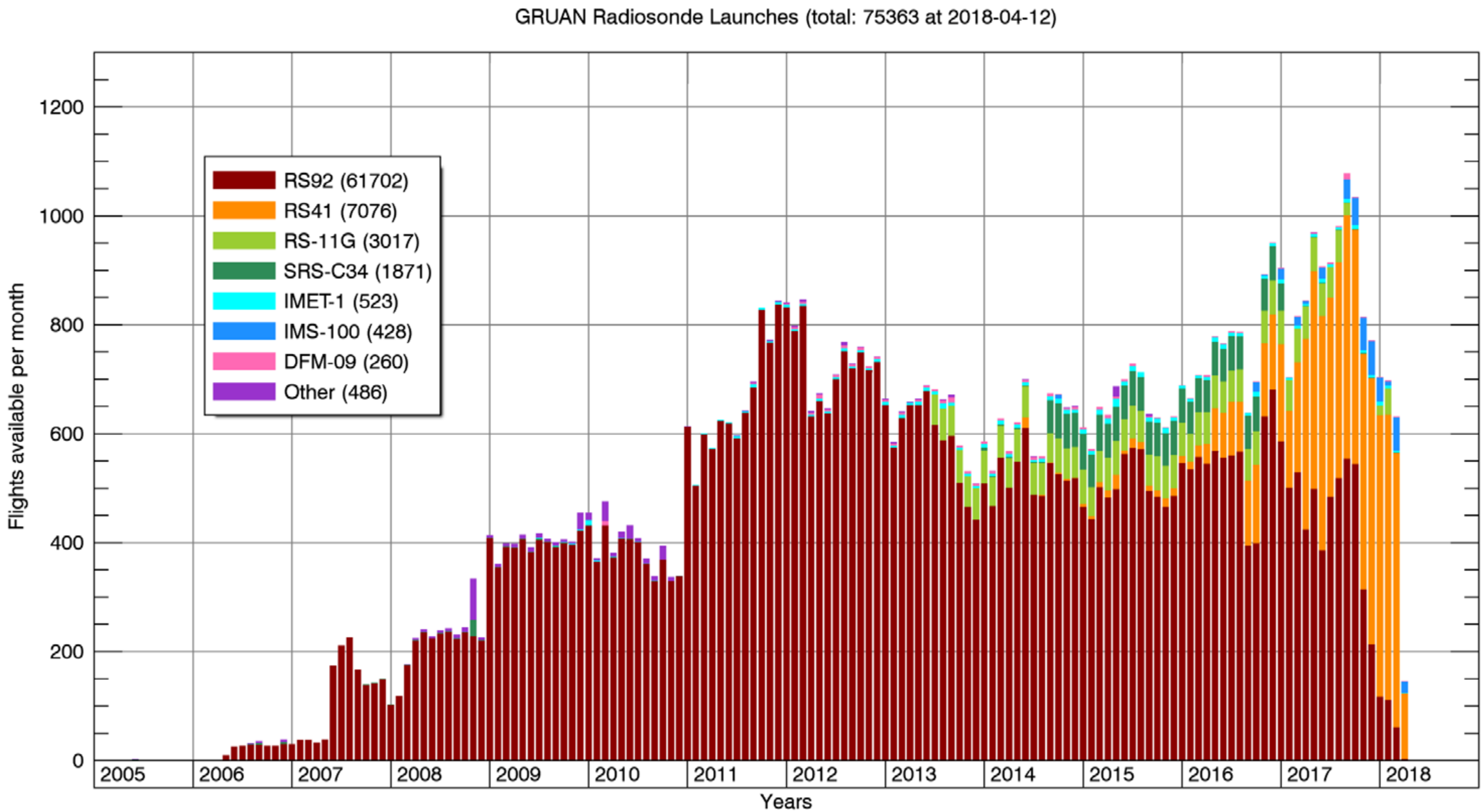

Presentation Wednesday morning

Work on new data products

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- Vaisala radiosondes (Lead Centre)
  - Presentation 4-2, 4-10
- Modem Radiosonde (J-C du Pont, Damien Vignelles)
  - Presentation 4-18
- Lidar (Thierry Leblanc)
  - Presentation 4-12
- MWR (Nico Cimini)
  - Presentation 4-14
- GNSS (GFZ & TT)
  - Presentation 4-8

GRUAN Website

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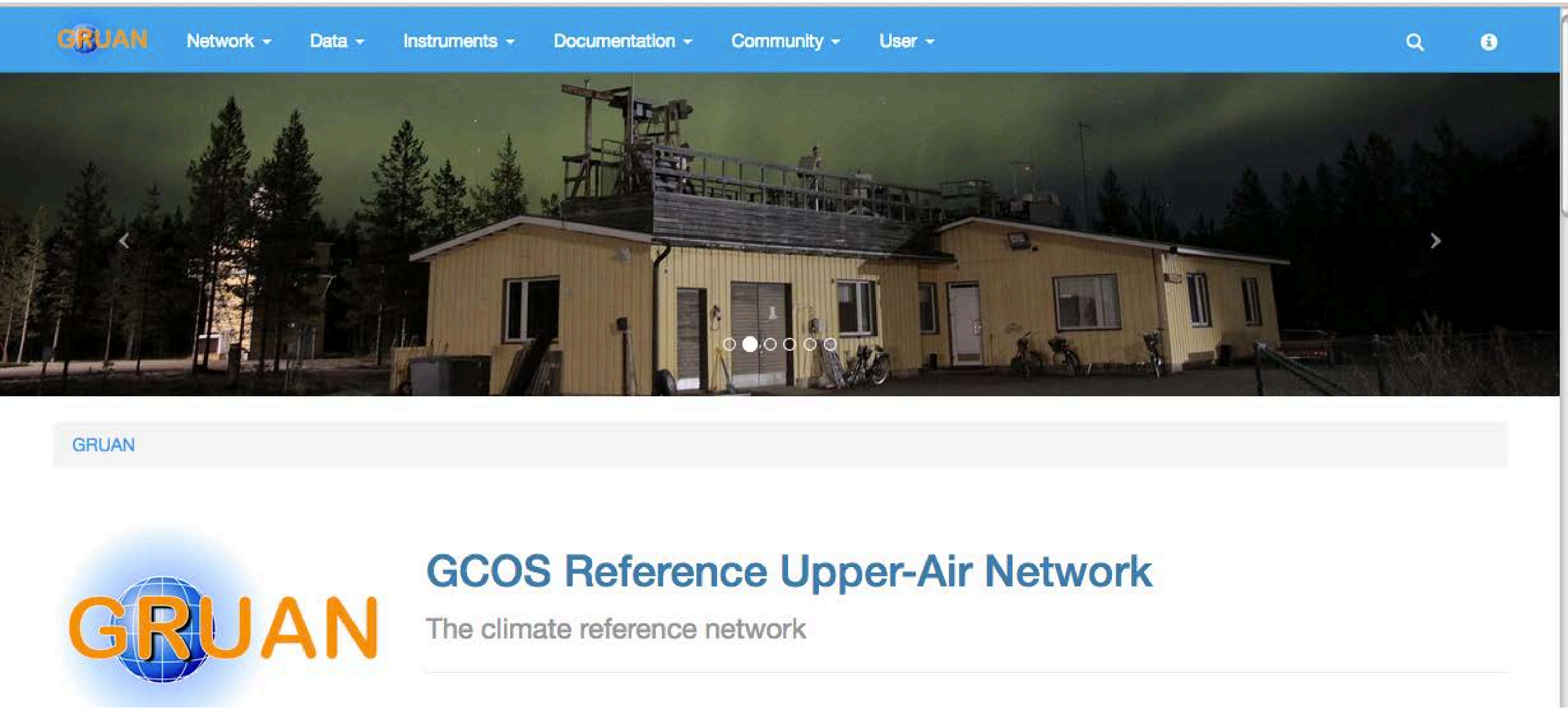

- Steady development
  - Addition of functionality
  - Regularly updated data flow statistic plots
  - Content: input needed from community (e.g. instrument experts)

Work plan

- Complete the development of a new GRUAN data processor.
- Finish development of GRUAN data product for RS41 (RS41-GDP.1).
- Develop GRUAN new version of data product for RS92 (RS92-GDP.3).
- Complete the GRUAN radiosonde omnibus.
- Prepare WMO-CIMO Radiosonde intercomparison campaign.
- Continue development of alternative, non-R23 based, cooling mechanisms for frostpoint hygrometers.
- Further coordinate RS92-RS41 transition within GRUAN.

Work plan

- (Re)certify sites.
- Further development of the GRUAN website.
- Operationalize processing of CFH data.

GRUAN-related papers in 2018/2019

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- Bobryshev, O., et al., Is There Really a Closure Gap Between 183.31-GHz Satellite Passive Microwave and In Situ Radiosonde Water Vapor Measurements?, IEEE Transactions on Geoscience and Remote Sensing, 56(5), 2904-2910, doi:10.1109/TGRS.2017.2786548, 2018, ISSN 0196-2892.
- Borger, C., et al., Evaluation of MUSICA MetOp/IASI tropospheric water vapour profiles by theoretical error assessments and comparisons to GRUAN Vaisala RS92 measurements, Atmos. Meas. Tech., 11(9), 4981-5006, doi:10.5194/amt-11-4981-2018, 2018, URL https://www.atmos-meas-tech.net/11/4981/2018/.
- Brunamonti, S., et al.,Balloon-borne measurements of temperature, water vapor, ozone and aerosol backscatter at the southern slopes of the Himalayas during StratoClim 2016-2017, Atmos. Chem. Phys., 18(21), 15,937–15,957, doi:10.5194/acp-18-15937-2018, 2018, URL https://www.atmos-chem-phys.net/18/ 15937/2018/.
- Calbet, X., et al., Can turbulence within the field of view cause significant biases in radiative transfer modeling at the 183 Ghz band?, Atmos. Meas. Tech., 11(12), 6409-6417, doi:10.5194/amt-11-6409-2018, 2018, URL https: //www.atmos-meas-tech.net/11/6409/2018/.
- Carminati, F., et al., Using reference radiosondes to characterise NWP model uncertainty for improved satellite calibration and validation, Atmos. Meas. Tech., 12(1), 83-106, doi:10.5194/amt-12-83-2019, 2019, URL https://www.atmos-meas-tech.net/12/ 83/2019/.

GRUAN-related papers in 2018/2019

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- Finazzi, F., et al., Statistical harmonization and uncertainty assessment in the comparison of satellite and radiosonde climate variables, Environmetrics, pp. 1-17, doi:10.1002/env.2528, 2018.
- Gierens, K., et al., Intercalibration between HIRS/2 and HIRS/3 channel 12 based on physical considerations, Atmos. Meas. Tech., 11(2), 939-948, doi:10.5194/amt-11-939-2018, 2018, URL https://www.atmos-meas-tech.net/11/939/2018/.
- Gilpin, S., et al., Reducing representativeness and sampling errors in radio occultation-radiosonde comparisons, Atmos. Meas. Tech., 11(5), 2567-2582, doi:10.5194/amt-11-2567-2018, 2018, URL https://www.atmos-meas-tech.net/11/2567/2018/.
- Göpfert, T., et al., Alternativen zu R23 zur Temperierung von Messsensoren in der Stratosphäre (Deutscher Kälte- und Klimatechnischer Verein (DKV), 2018).
- Hicks-Jalali, S., et al., Calibration of a water vapour lidar using a radiosonde trajectory method, Atmos. Meas. Tech. Discuss., 2018, 1-27, doi:10.5194/amt-2018-246, 2018, URL https://www.atmos-meas-tech-discuss.net/amt-2018-246/.
- Kobayashi, E., et al., Comparison of the GRUAN data products for Meisei RS-11G and Vaisala RS92-SGP radiosondes at Tateno (36.06◦ N, 140.13◦ E), Japan, Atmos. Meas. Tech. Discuss., 2019, 1-34, doi:10.5194/amt-2018-416, 2019, URL https://www. atmos-meas-tech-discuss.net/amt-2018-416/.

GRUAN-related papers in 2018/2019

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- Kremser, S., et al., Is it feasible to estimate radiosonde biases from interlaced measurements?, Atmos. Meas. Tech., 11(5), 3021-3029, doi:10.5194/amt-11-3021-2018, 2018, URL https://www.atmos-meas-tech.net/11/3021/2018/.

- Merlone, A., et al., The MeteoMet2 project - Highlights and results, Meas. Sci. Technol., 29, doi:10.1088/1361-6501/aa99fc, 2018, URL https://doi.org/10.1088/1361-6501/aa99fc.

- Nalli, N. R., et al., Validation of Atmospheric Profile Retrievals From the SNPP NOAA-Unique Combined Atmospheric Processing System. Part 1: Temperature and Moisture, IEEE Transactions on Geoscience and Remote Sensing, 56(1), 180-190, doi:10.1109/TGRS.2017.2744558, 2018, ISSN 0196-2892.

- Philipona, R., et al., Radiosondes show that after decades of cooling, the lower stratosphere is now warming, Journal of Geophysical Research: Atmospheres, 123(22), 12,509-12,522, doi:10.1029/2018JD028901, 2018, URL https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2018JD028901.

- Pisoft, P., et al., Revisiting internal gravity waves analysis using GPS RO density profiles: comparison with temperature profiles and application for wave field stability study, Atmos. Meas. Tech., 11(1), 515-527, doi:10.5194/amt-11-515-2018, 2018, URL https: //www.atmos-meas-tech.net/11/515/2018/.

GRUAN-related papers in 2018/2019

- de Podesta, M., et al., Air temperature measurement challenges in precision metrology, Journal of Physics: Conference Series, 1065, 122,027, doi:10.1088/1742-6596/1065/12/122027, 2018, URL https://doi.org/10.1088%2F1742-6596%2F1065%2F12%2F122027.

- de Podesta, M., et al., Air temperature sensors: dependence of radiative errors on sensor diameter in precision metrology and meteorology, Metrologia, 55(2), 229, doi:10.1088/1681-7575/aaaa52, 2018, URL http://stacks.iop.org/0026-1394/55/i=2/a=229.

- Rieckh, T., et al., Evaluating tropospheric humidity from GPS radio occultation, radiosonde, and AIRS from high-resolution time series, Atmos. Meas. Tech., 11(5), 3091-3109, doi:10.5194/amt-11-3091-2018, 2018, URL https://www.atmos-meas-tech.net/11/3091/2018/.

- Schröder, M., et al., The gewex water vapor assessment: Overview and introduction to results and recommendations, Remote Sensing, 11(3), doi:10.3390/rs11030251, 2019, ISSN 2072-4292, URL http://www.mdpi.com/2072-4292/11/3/251.

- Sun, B., et al., On the Accuracy of Vaisala RS41 versus RS92 Upper-Air Temperature Observations, J. Atmos. Ocean. Technol., 36(4), 635-653, doi:10.1175/JTECH-D-18-0081.1, 2019, URL https://doi.org/10.1175/JTECH-D-18-0081.1.

GRUAN-related papers in 2018/2019

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- Tradowsky, J. S., et al., Combining Data from the Distributed GRUAN Site Lauder-Invercargill, New Zealand, to Provide a Site Atmospheric State Best Estimate of Temperature, Earth System Science Data, 10(4), 2195–2211, doi:10.5194/essd-10-2195-2018, 2018, URL https://www.earth-syst-sci-data.net/10/2195/2018/.

- Trent, T., et al., Gewex water vapor assessment: Validation of airs tropospheric humidity profiles with characterized radiosonde soundings, Journal of Geophysical Research: Atmospheres, 124(2), 886-906, doi:10.1029/2018JD028930, 2019, URL https://agupubs.onlinelibrary.wiley.com/doi/abs/ 10.1029/2018JD028930.

- Vaquero-Martínez, J., et al., Comparison of integrated water vapor from GNSS and radiosounding at four GRUAN stations, Science of the Total Environment, 648, 16391648, doi:10.1016/j.scitotenv.2018.08.192, 2018, URL http://doi.org/10.1016/j. scitotenv.2018.08.192.

- Weaver, D., et al., Comparison of ground-based and satellite measurements of water vapour vertical profiles over Ellesmere island, Nunavut, Atmos. Meas. Tech. Discuss., 2018, 1-45, doi:10.5194/amt-2018-267, 2018, URL https://www.atmos-meas-tech-discuss. net/amt-2018-267/.

Questions

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