Status WMO radiosonde intercomparison campaign – UAII2022

Ruud Dirksen GRUAN Lead Centre, DWD
13th GRUAN Implementation and Coordination Meeting (ICM-13)
November 2021

Objectives of WMO Radiosonde campaigns

➢ To get overview of performance of various operational radiosounding systems

➢ Provide information for NMHs, basis for decision-making

➢ Provides incentive to manufacturers to improve the quality and cost-effectiveness of radiosounding systems

Legacy

- ➢ 1984 Bracknell

- ➢ 1985 Wallops

- ➢ 1989 Dzhambul

- ➢ 1993 Tsukuba

- ➢ 1995-1997 Moscow & Wallops

- ➢ 2001 Alcantara

- ➢ 2005 Mauritius

- ➢ 2010 Yangjiang

UAII2022 Campaign goals

➢ To bring all the major radiosonde manufacturers of all the different regions of the world together.

➢ To characterize the individual radiosondes with respect to their Reproducibility and to determine the Uncertainty of the different measured parameters. [GRUAN synergy]

➢ To compare the different radiosonde systems to a "Radiosonde Reference" (mean of three chosen Traveling Standard Systems).

➢ To include remote sensing instruments for the benefit of upper air measurements as a whole.

	Working standards	Reference Sonde	Uncertainty/ traceability	parameters
Basic requirements	Goal: 3 GDP	scientific sondes	GRUAN expertise	P, T, q, u, gph

Campaign set-up

➢ GRUAN-philosophy

- o Laboratory characterisation, SHC ground check, reference instruments

➢ Laboratory campaign

- o Auxiliary, help interpret results of radiosounding intercomparison
- o Mutual benefit manufacturers & GRUAN
- o Results NOT used in final assessment of the systems

➢ Traveling reference based on 3 GRUAN data products

- o Additional reference instrument: CFH (RH)

➢ Independent operators

- o Capacity building, evaluate user-friendliness of the radiosounding system
- o Independent comparison of radiosounding systems

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

- ➢ Laboratory campaign Dec 2021 – June 2022
  - o Optimized measurement program to get overview of sensor performance and identify relevant issues.
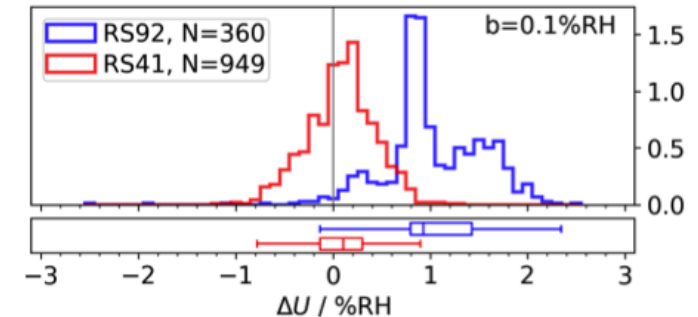
- ➢ Radiosounding campaign August – September 2022

- ➢ 12 participants
  - o Selected based on criteria such as product maturity, market share, BUFR capacity, compatibility
  - o Finland, France, Germany, Japan, South Africa
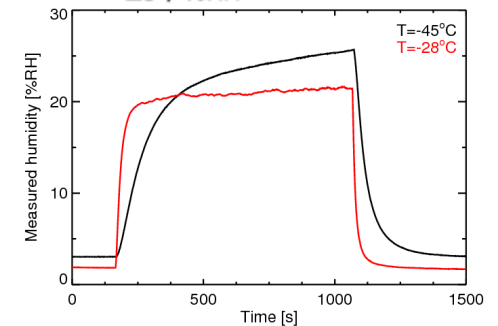 - o Russia, China (3), India (2), South Korea

Deutscher Wetterdienst
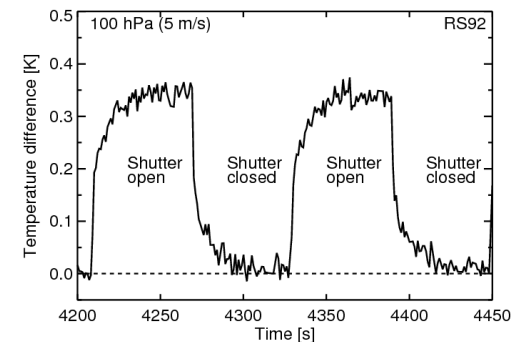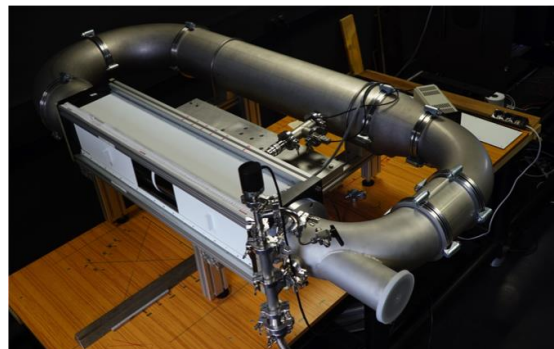**Wetter und Klima aus einer Hand**

Aug					Sep				Okt					
31	32		33	34	35	36	37	38	39	40	41	42	43	44
1.8	8.8		15.8	22.8	29.8	5.9	12.9	19.9	26.9	3.10	10.10	17.10	24.10	31.10
Preparation	**Manufacturer** Installation Testflights Training		~80 Balloon ascents (Regular; Duplicate Reference - CFH)											

2 weeks, 6 measurement days

PTU

Climate chamber

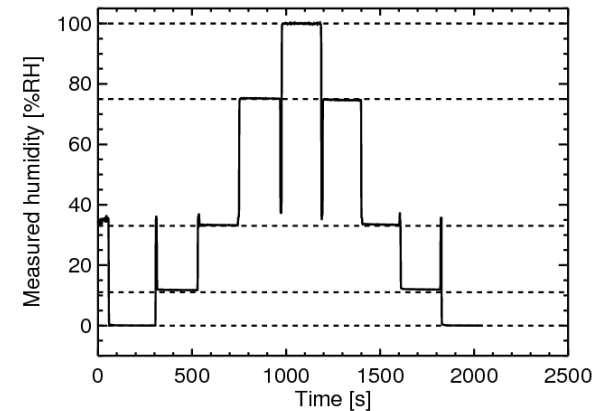

Radiation

Deutscher Wetterdienst
**Wetter und Klima aus einer Hand**

➢ Parameters: T, RH

➢ 0-100-0 %RH, via plateaus.

➢ Stabilize for max. 10 min.

    o Determined by specific radiosonde configuration

    o #sensors, sensor cover, sensor heating

➢ Test 10 radiosondes per type (statistical validity)

➢ 1 radiosonde: iterate test 5 times (repeatability)

➢ Operate 2 radiosondes simultaneously

➢ Time allocated per radiosonde type: 2 days

➢ Rotation of radiosonde around longitudinal axis.

➢ Fixed irradiance (~1300 W/m2)

➢ Fixed azimuth angle (45°)

➢ Variation of pressure & ventilation speed

 o Mandatory: 5, 20 , 100, 950 hPa

 o 1, 3, 5 m/s

 o Additional settings TBD

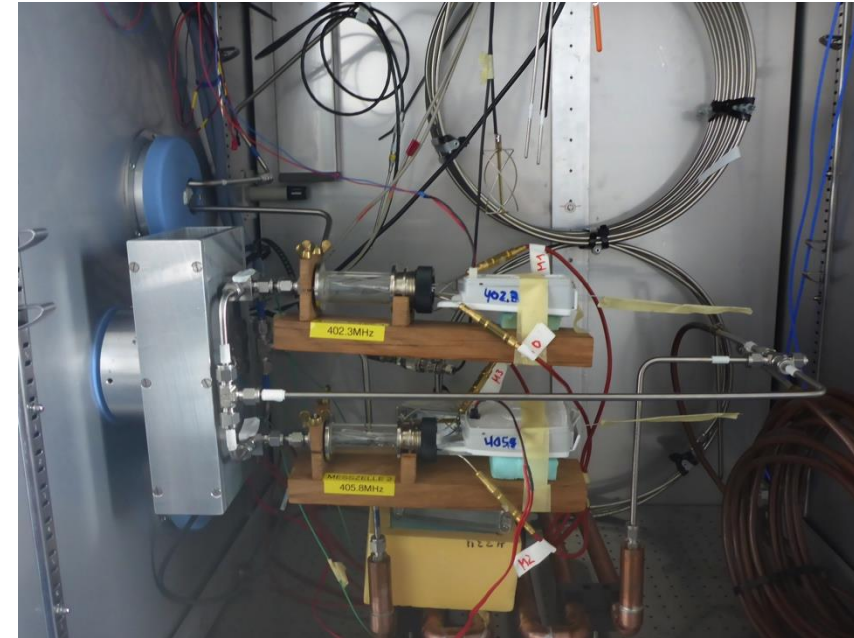➢ Time allocated per radiosonde type: 2 days

Climate chamber
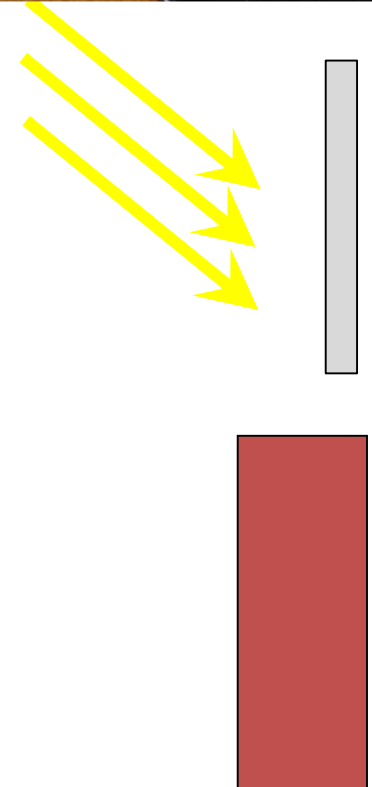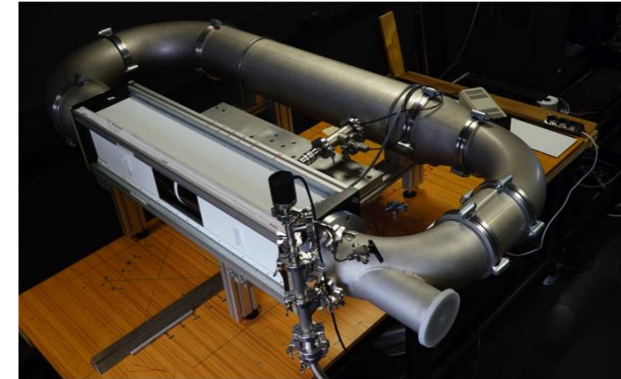
- ➢ Parameter: Timelag of RH sensor

- ➢ Temperature plateaus
  - ○ Mandatory -70, -50, -30, -10°C
  - ○ Additional temperatures TBD

- ➢ Test 2 radiosondes simultaneously

- ➢ Time allocated per radiosonde type: 2 days
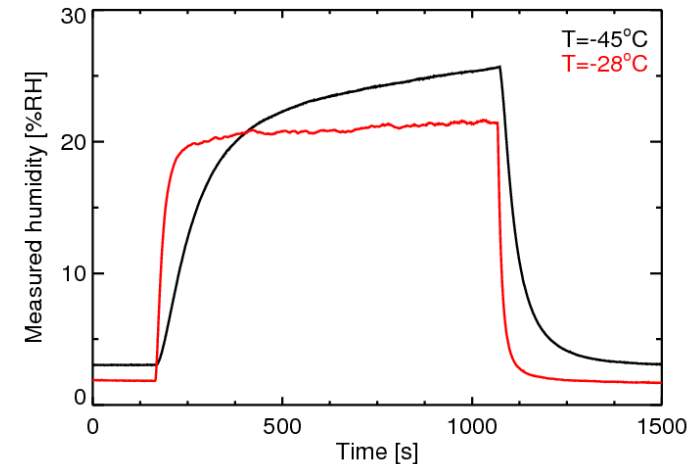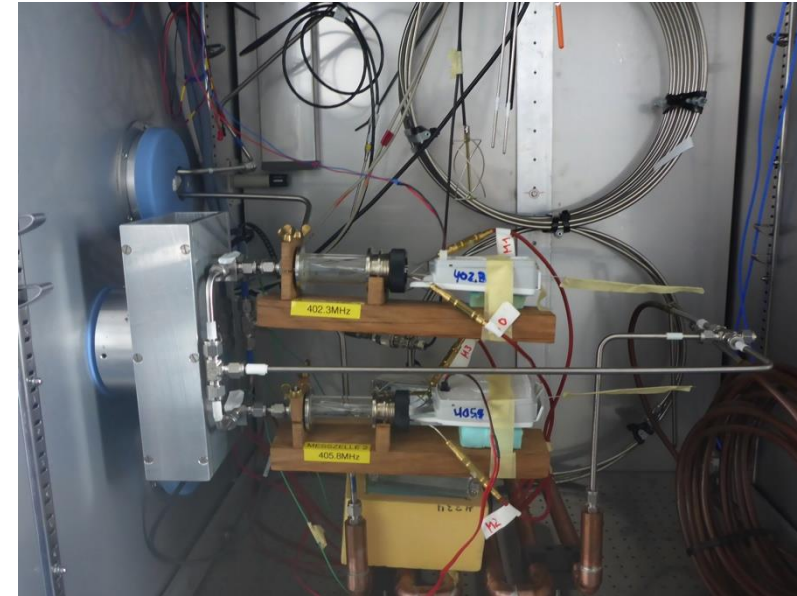
➢ Parameter: T

    o Calibration verification at low temperatures

➢ Temperature range [-75 , -10°C]

➢ Nighttime measurement

Radiosoundings

➢ Extended rig, capacity 10 radiosondes

➢ Working standard, composed of 3 GRUAN Data Products
  - Separate radiosondes

➢ weekly CFH sounding with working standard

➢ ~80 launches (4 per day)

Radiosoundings - preparations
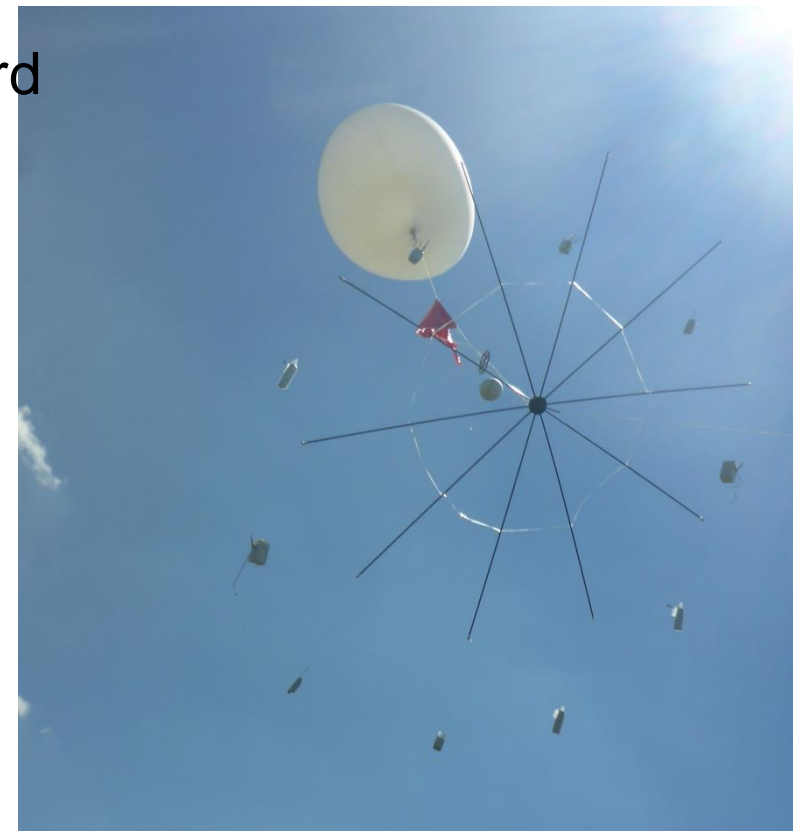
➤ Design and manufacturing of rig, capacity 10 radiosondes

➤ Training in rig handling and launch

➤ Test flights to verify sondes' behaviour

➤ Data submission to test analysis software

Radiosounding campaign

August – September 2022

➢ Set up systems by manufacturers

➢ Train operators & perform test soundings

➢ Perform radiosoundings (by operators)

    o   Background support available from manufacturers

➢ 30 radiosoundings per type (day/night)

➢ Selected soundings with 2 identical radiosondes to check reproducibility

➢ Weekly CFH sounding with traveling standard

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

- ➢ Preparations laboratory campaign completed
  - o Dry-run October with RS92

- ➢ Reference GDPs for traveling standard:
  - o 3 certified GDPs needed
  - o Candidates: RS41 iMS100 M10

- ➢ Radiosounding campaign
  - o Rig & sounding plan defined
  - o Practical/logistical preparations ongoing

- ➢ Covid-19
  - o Precautions & restrictions