Status of the RS41 data processing

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10th GRUAN Implementation and Coordination Meeting (ICM-10)
Potsdam, Germany
April 2018

Current status of RS41 processing

- RS41 data processor – in principle working
  - Overall processing system (environment for dynamic modules) → operational
  - Majority of the processing modules → technically functioning
  - Preliminary processing is possible (individual soundings for functional testing)

- Still to be done (ongoing work)
  - Step-by-step evaluation of existing modules (code review) of content and uncertainty estimates → very important
  - Laboratory tests & module definition for radiation correction for temperature
  - Documenting the processing steps

Processing system

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Pre-processing	Data import & mapping	Processing & quality control	Quality assessment	Data export
• Create a standardised raw data file • Create a standardised meta-data file • Initialise the data processor use of a configuration	• Import raw data files • Import meta-data file • Map data variables • Combine & grid data variables	• Modular processing • Store intermediary results • Store final results • Store quality flags	• Assess all available quality information, like - ranges & dis-tribution of data - uncertainties - quality & processing flags	• Create a standardised data product file • Create a quality control & quality assessment report • Create a processing log
Completed	**Completed**	**In evaluation**	**Draft**	**In development**

Processing modules

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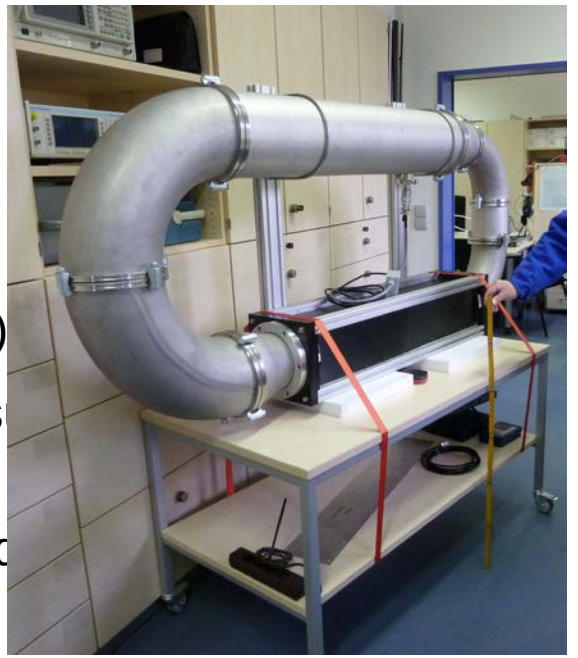
General & ground check	Pressure & altitude	Ventilation & wind	Temperature	Humidity
Make time axis steady	Calculate position (XYZ → LLA)	Pendulum analysis	Estimate radiation	Quality control of raw humidity
Combine & grid data sources	Pressure calibration	Calculate ventilation	Radiation correction	Re-calculate raw humidity
Detect launch points	Comp. pressure & altitude (p + GPS)	Calculate wind speed & direction	Remove spikes ?	? Radiation correction ?
Detect & analyse SHC / shelter	Smoothing	Smoothing	Smoothing	Time-lag correction
Quality control of all GC	Quality control of pressure & alt.	Quality control of wind	Quality control of temperature	Quality control of humidity

Module development for RS41

- Module which requires most effort:
  Radiation correction for T-measurements
  - Design and construction of a new setup for measurements T-error by radiation (testing phase)
  - Collection of experimental data (start spring/summer 2018)
  - Parameterization of measured T-error with radiation, press (modification of existing approach)
  - Model to relate experimental results to effects during sound



- Is removing of temperature spikes necessary? – depending on string length

- To be evaluated: Is a radiation correction (dry bias) for humidity sensor of RS41 required?
  - U-sensor equipped with additional T-sensor for correct temperature of U-sensor
  - correct U-estimate of ambient air depends on correct measurement (radiation correction) of “normal” T-sensor

Contents of GDP files

- Processing outputs that are to be included in GDP (generic for all radiosonde products)
  - Calculated product variables with associated uncertainties
  - Add → Raw data, corrections
  - Add → Intermediate elements of uncertainty budget and correction steps
  - Add → Additional metadata, e.g. information on ground check, setup, …
  - Add → Extracts from QC/QA, e.g. flags, assessments, diagnostic (next slide)
- Find compromise between scope and benefit
- Input from GRUAN community needed!

Quality assessment

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	Pressure / Alt.	Wind	Temperature	Humidity
Ground check	Large GC correction	OK	OK	OK
	OK	OK	OK	Large difference in SHC
Troposphere	OK	GPS failure for 2 kilometers	Contamination detected (2 – 4 km)	OK
	OK	OK	OK	Large uncertainties in TP region
Stratosphere	OK	OK	OK	Values not in range (< 0.0 %)
	Large uncertainties above 27 km	OK	Large uncertainties above 33.5 km	More than 100 % relative uncertainty
Assessment summary	**?**	**?**	**?**	**?**
	GRUAN stamp?			

Quality assessment

- Generic definition for all radiosondes
  - Postprocessing @LC for data products which are processed externally
- Definition of quality assessment components
  - separate task / action item to be assigned to a selected group of persons (from LC, TT-RS, external, …)
- Part of radiosonde technical document (GRUAN-TD-2)

Product documentation

- Documentation at several levels
  - Processing system → how it works and how it can be configured
  - Processing modules → what is calculated
  - At general level → structure of processing, physical background, …
- GDP publications
  - Peer-reviewed paper (?)
  - RS41 specific technical document (appendix to radiosonde omnibus document)

Time schedule

- How much time should/can the Lead Centre use to develop and document the RS41-GDP.1 ?
  - Consequence → Other tasks can not be done and are delayed
- Required steps/tasks:
  - Laboratory experiments to establish radiation effect of temperature sensor → usage of new radiation chamber/tunnel
  - Optimize radiation correction module (transfer function: lab → atmosphere)
  - Evaluate all processing modules
  - Extend and optimize GDP file content
- Time schedule/work load
  - First operational BETA version → ~6 month of work
  - First operational RELEASE version → ~6 month of work in addition
  - Full documentation → >12 month of work in addition (TD and paper)