

New GRUAN data processor for radiosonde measurements

*Status of RS92 (v3) and
RS41 (alpha) data products*



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→ Why do we need a new GRUAN data processor?

→ *Limitations of old system*

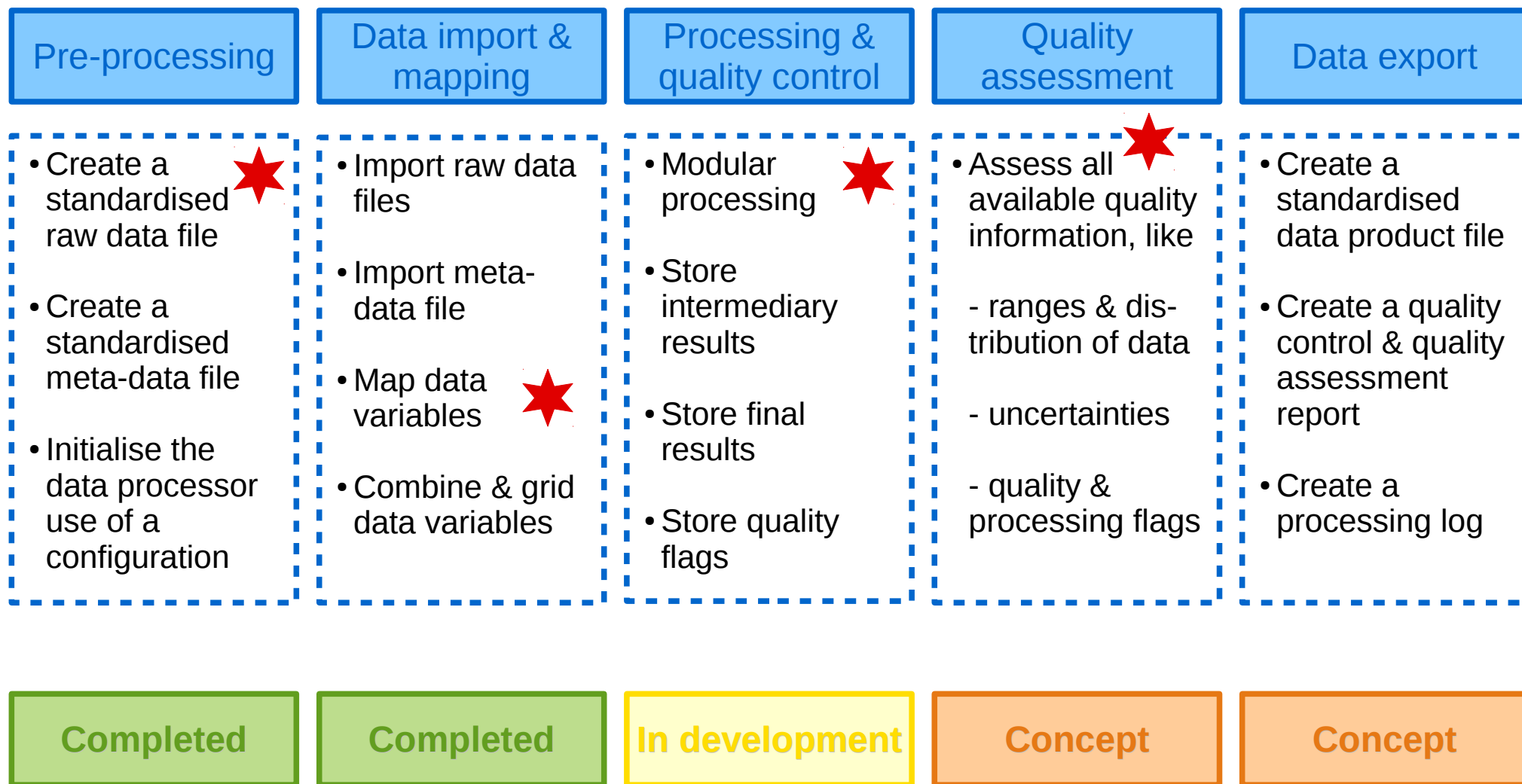
- Dependent on file format (DC3DB)
- Not modular
- Very strict quality assessment

→ Desired new features

- Modular system
- Easy handling of several different versions
- One system for different sondes
- Independent from original file formats of raw data
- New quality assessment

Scheme of GRUAN data processor

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→ Raw data is our starting point

- Different manufacturers → different file formats

→ Is one file format possible for all?

- Yes & No

→ Features (yes)

- All data & meta-data → unmodified
- Additional information → description, units, ...
- Additional decoding → XDATA, ...
- Additional gridding → grid irregularly data
- Including original file possible

→ Missing (no)

- No naming convention → e.g. variable *temperature* is **T** or **temp** or ...

GRUAN Radiosonde Raw File Format

NetCDF v4,
free libraries available

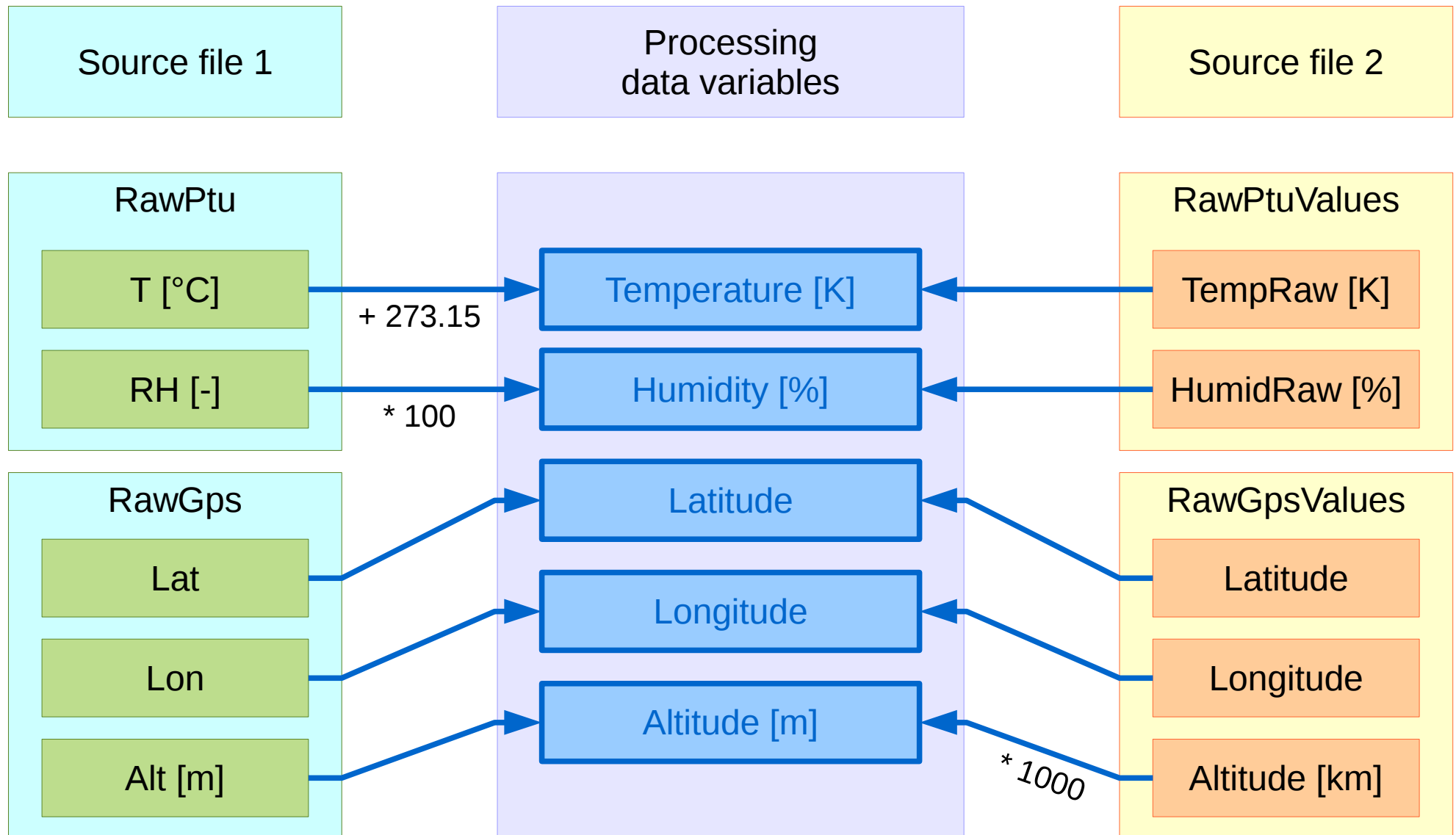
Tables, meta-data tree,
self-describing, ...

Packed (smaller size),
original file can be included

GRUAN tool &
libs are coming soon

Mapping of data variables

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Quality assessment – a concept

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	Pressure / Alt.	Wind	Temperature	Humidity
Ground check	Large GC correction	OK	OK	OK
	OK	OK	OK	Large difference between U1 & U2
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?				



Status of RS92-GDP version 3

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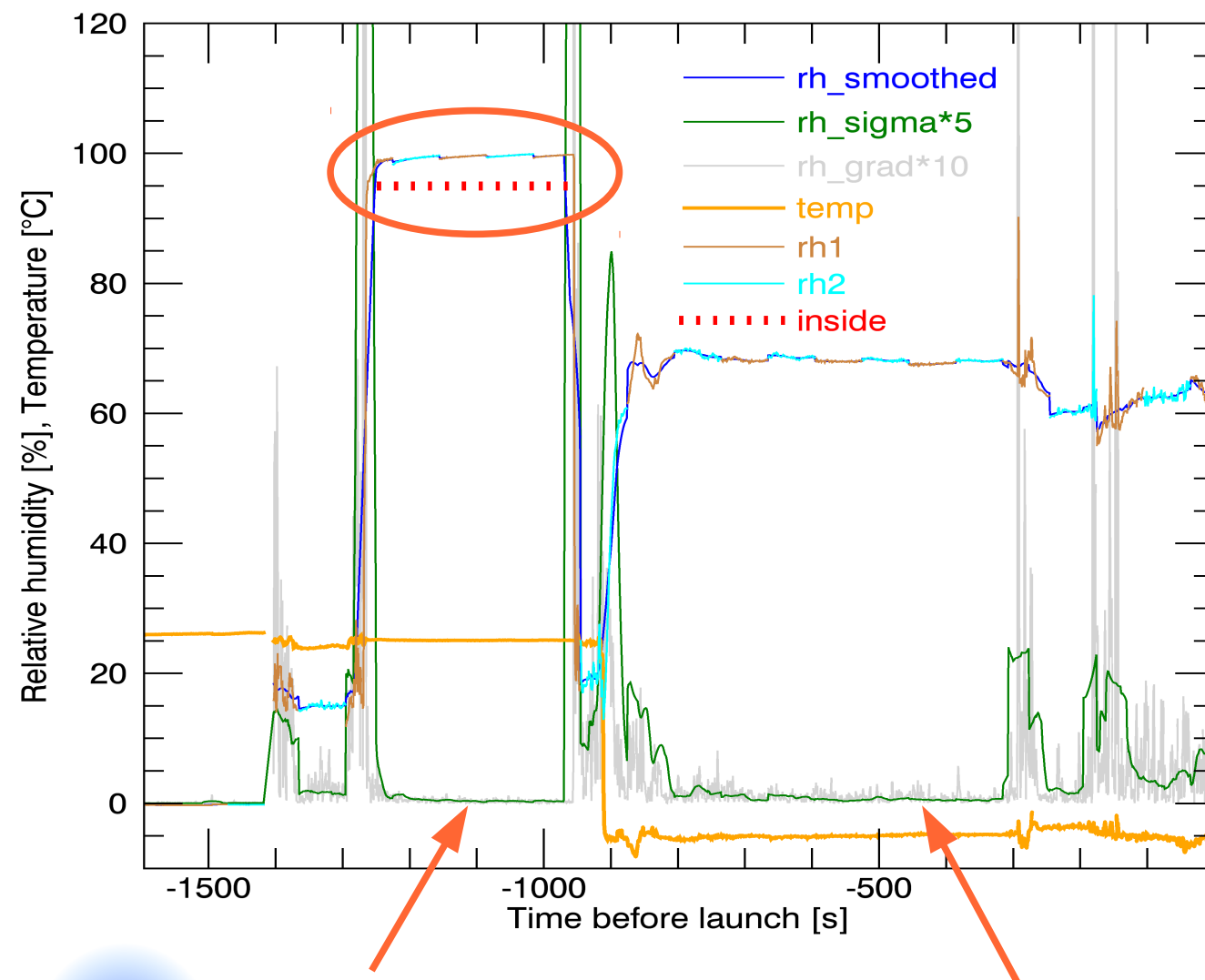


General & ground check	Pressure & altitude	Ventilation & wind	Temperature	Humidity
Make time axis steady	Calculate position (XYZ → LLA)	Pendulum analyse	Estimate radiation	Remove GC25 recalibration
Combine & grid data sources	Pressure calibration	Calculate ventilation	Radiation correction	Merge U1 + U2
Detect launch points	Merge 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



Example: SHC analysis

Detection of SHC period



Features

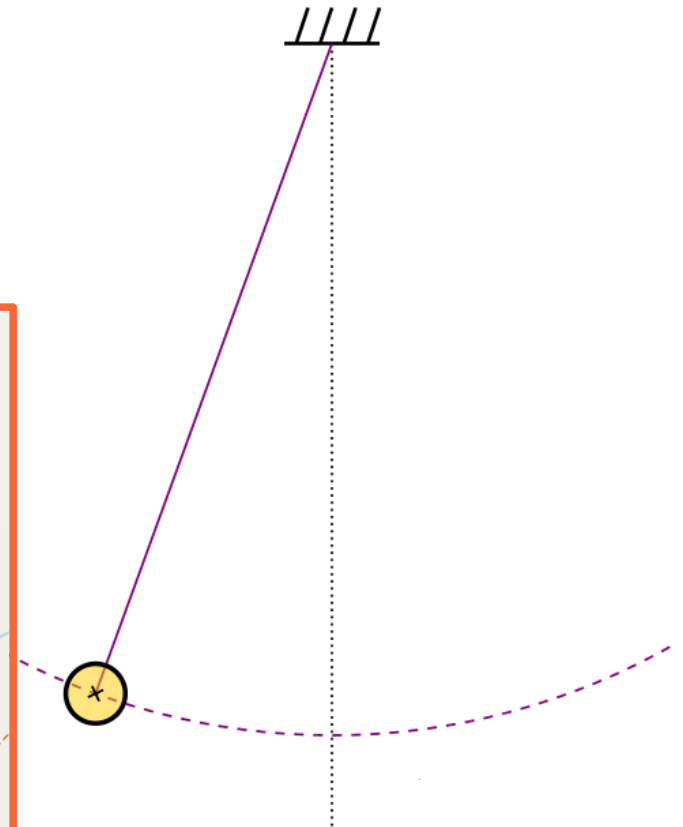
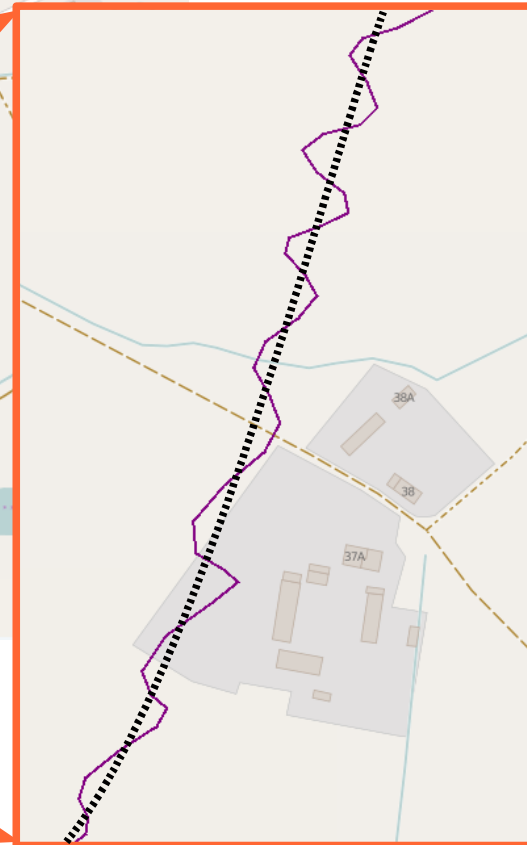
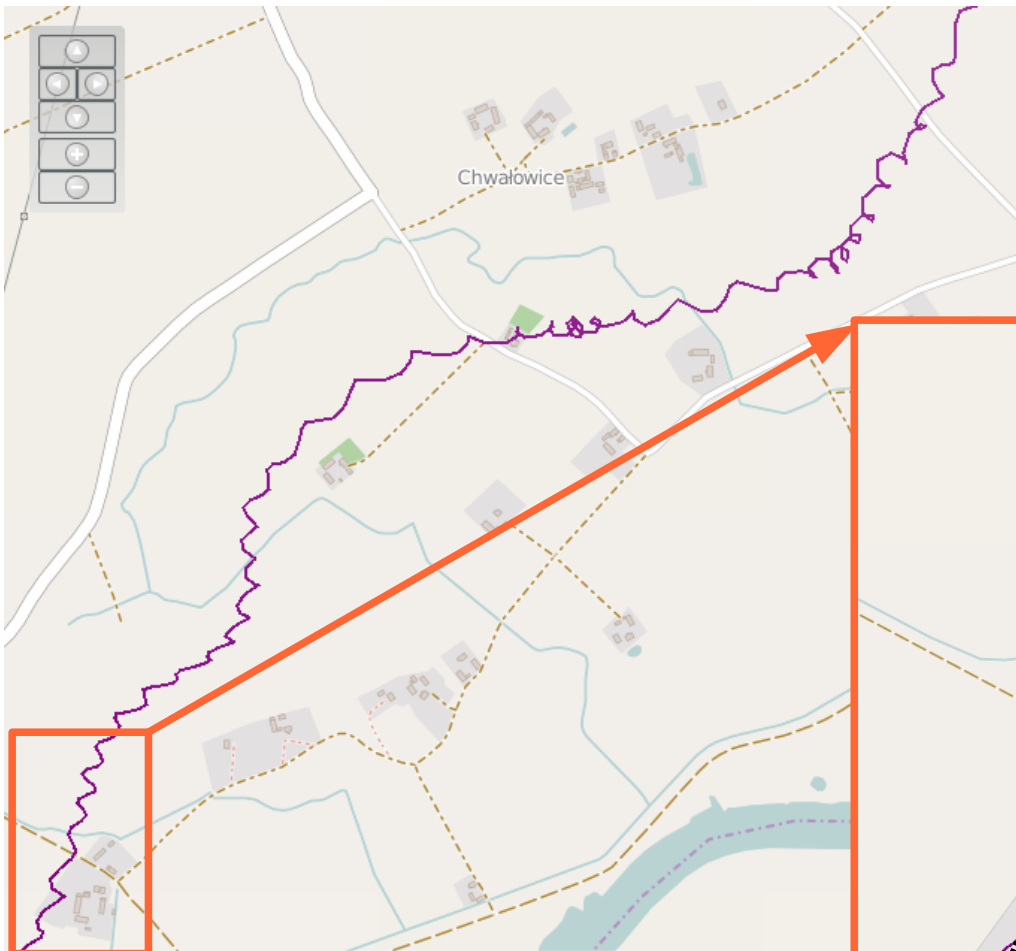
- Automatically detection of stable ambience
- Use of pre-flight raw data
- One or two humidity sensors (e.g. RS41, RS92)
- External reference data can be used (p, T, RH)

Results

- Difference to reference
- Variables RH, T, p

Example: Ventilation – 1

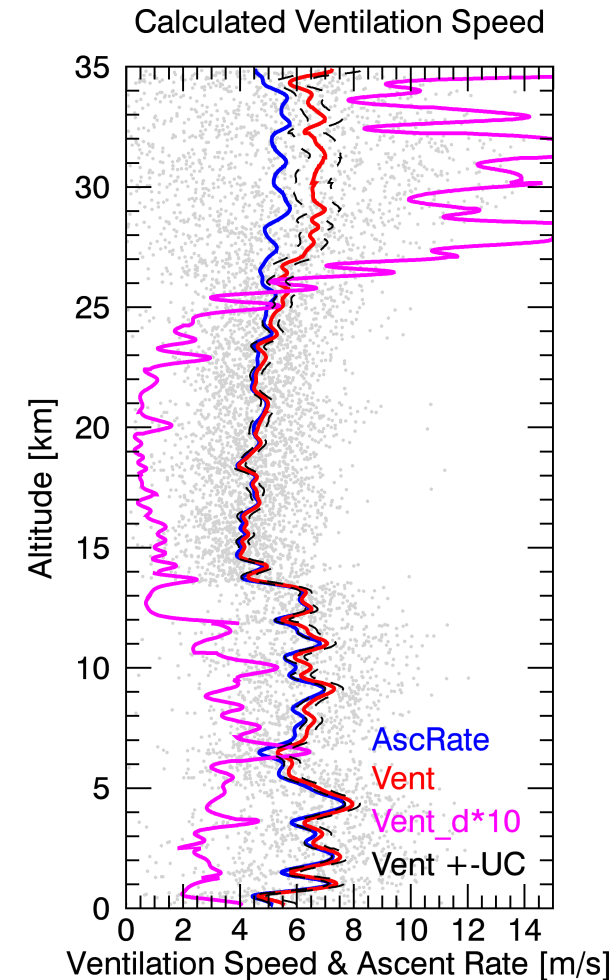
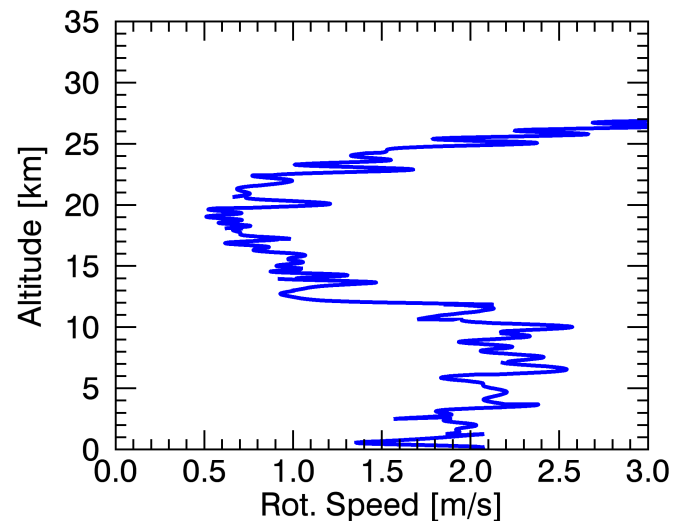
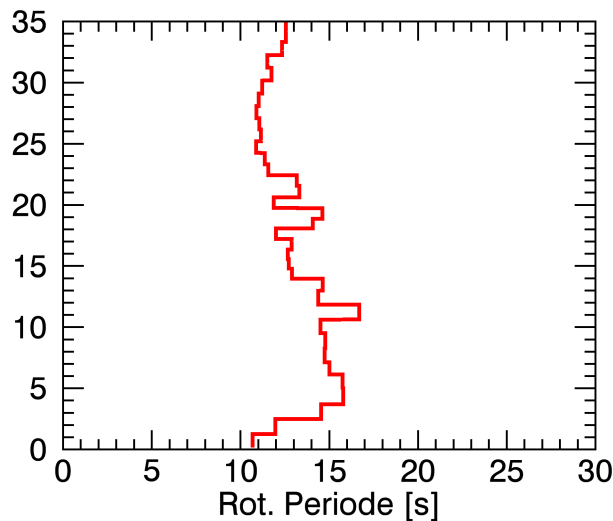
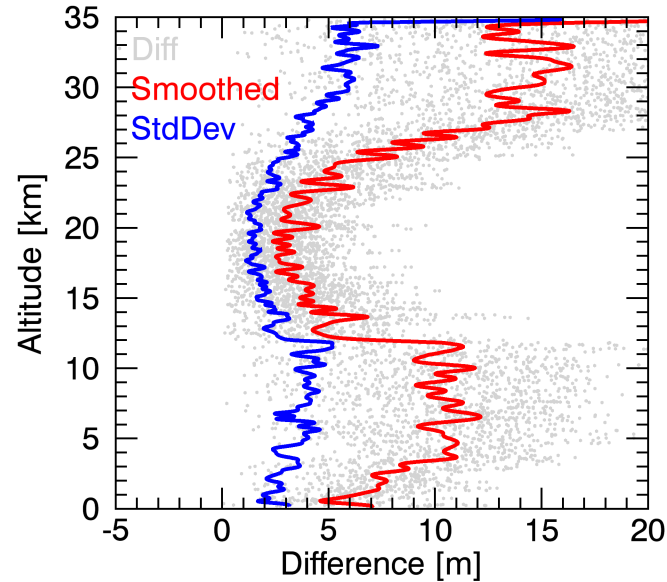
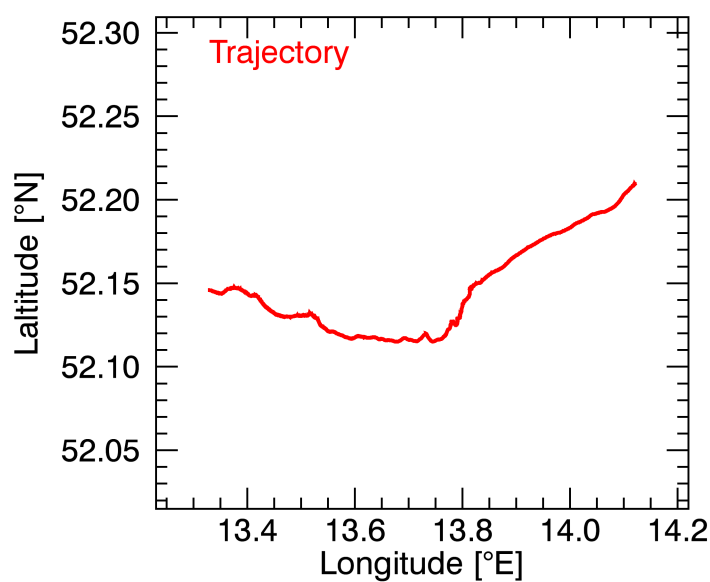
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- Period of oscillation
- Amplitude
- Speed



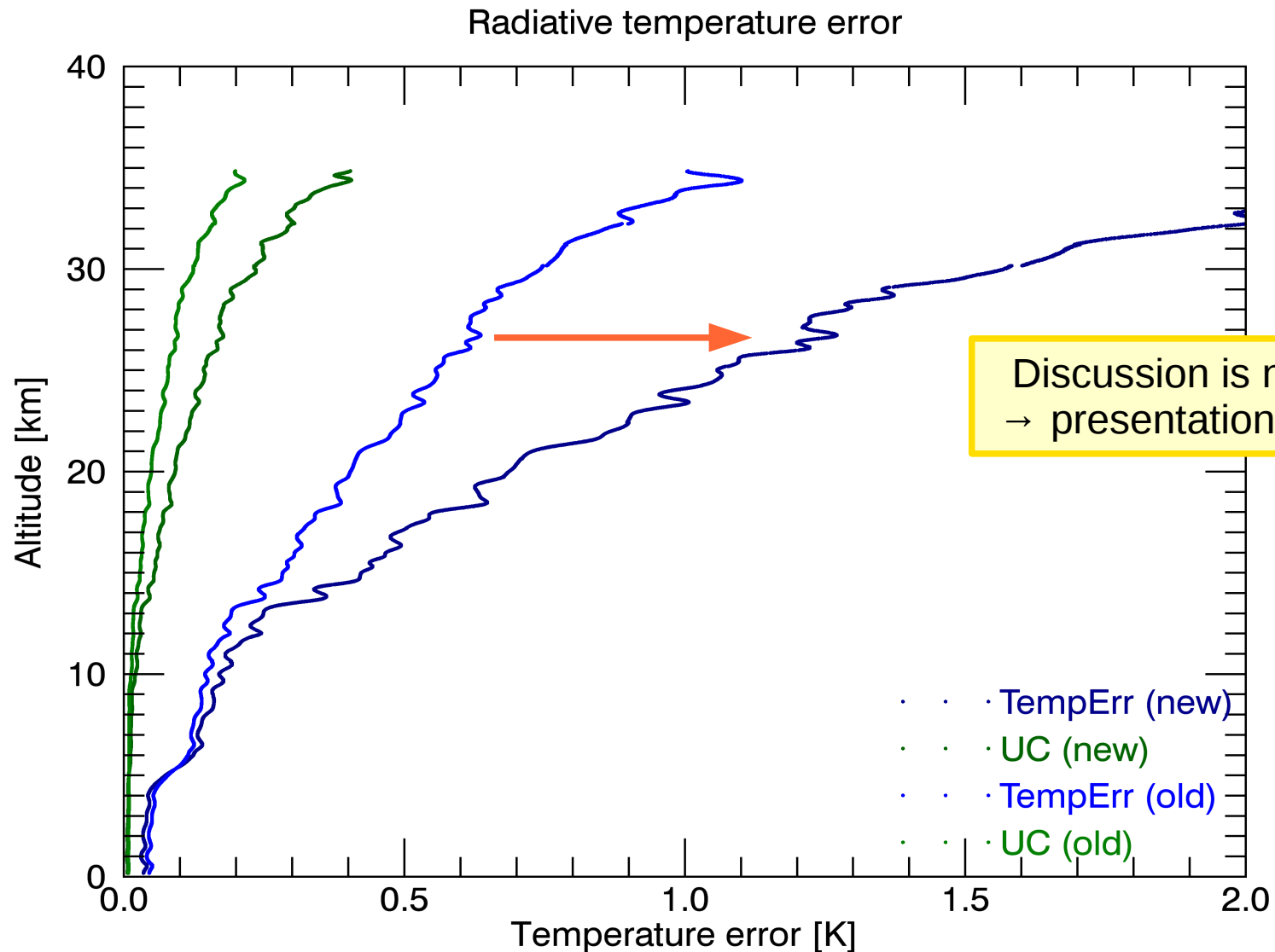
Example: Ventilation – 2



Often: ~ 0.2 to 0.5 m/s

Example: Radiation correction of T

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→ If possible → use of same modules as for RS92

- But different parametrisation & configuration of these modules
- Example: different time-lag constants

→ Exceptions

- Different humidity sensor → only one with internal temperature measurement
- With & without pressure sensor
- Measurable time-lag of temperature sensor

→ Conclusion

- If we have the version 3 for RS92
→ 75% of **software** development for RS41 is done

- Completely new written GRUAN data processor for radiosonds
 - Modern design, modular, ...
 - Standardised file format for radiosonde raw data
- RS92-GDP version 3
 - Not completed yet
 - Apparently large change of stratospheric temperature correction
→ discussion is necessary
- RS41-GDP alpha version
 - Directly coupled to development on RS92-GDP

Thank you for your
attention.