

RS41 GRUAN Data Product (RS41-GDP) – Version 1 –



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Session 5, 20 November 2020

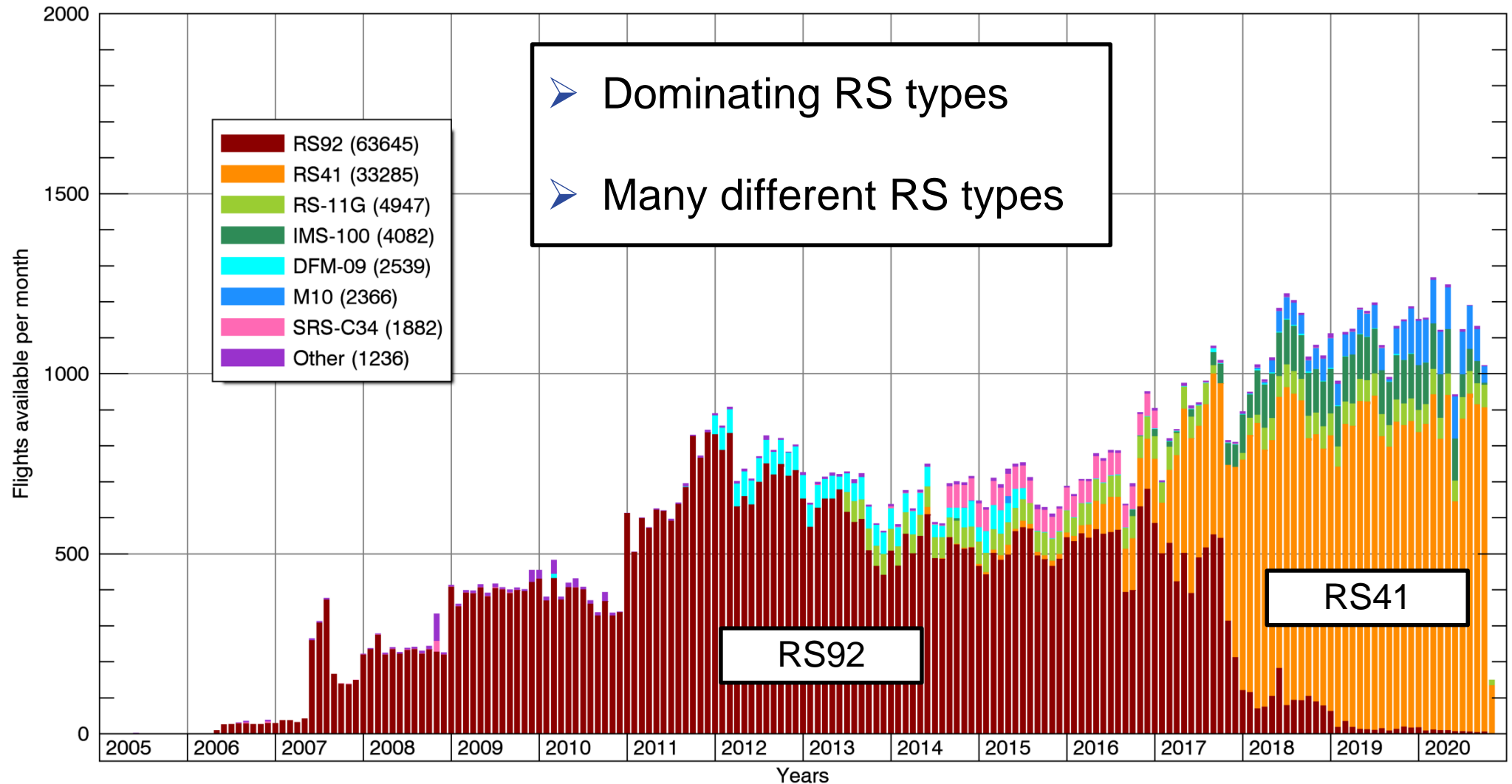
- Motivation
- Processing system (GDPS)
- Data product RS41-GDP → BETA.1 and changes afterwards
- Schedule and summary

Sounding data in GRUAN – RS types

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



GRUAN Radiosonde Launches (total: 113982 at 2020-11-08)



➤ GDPS

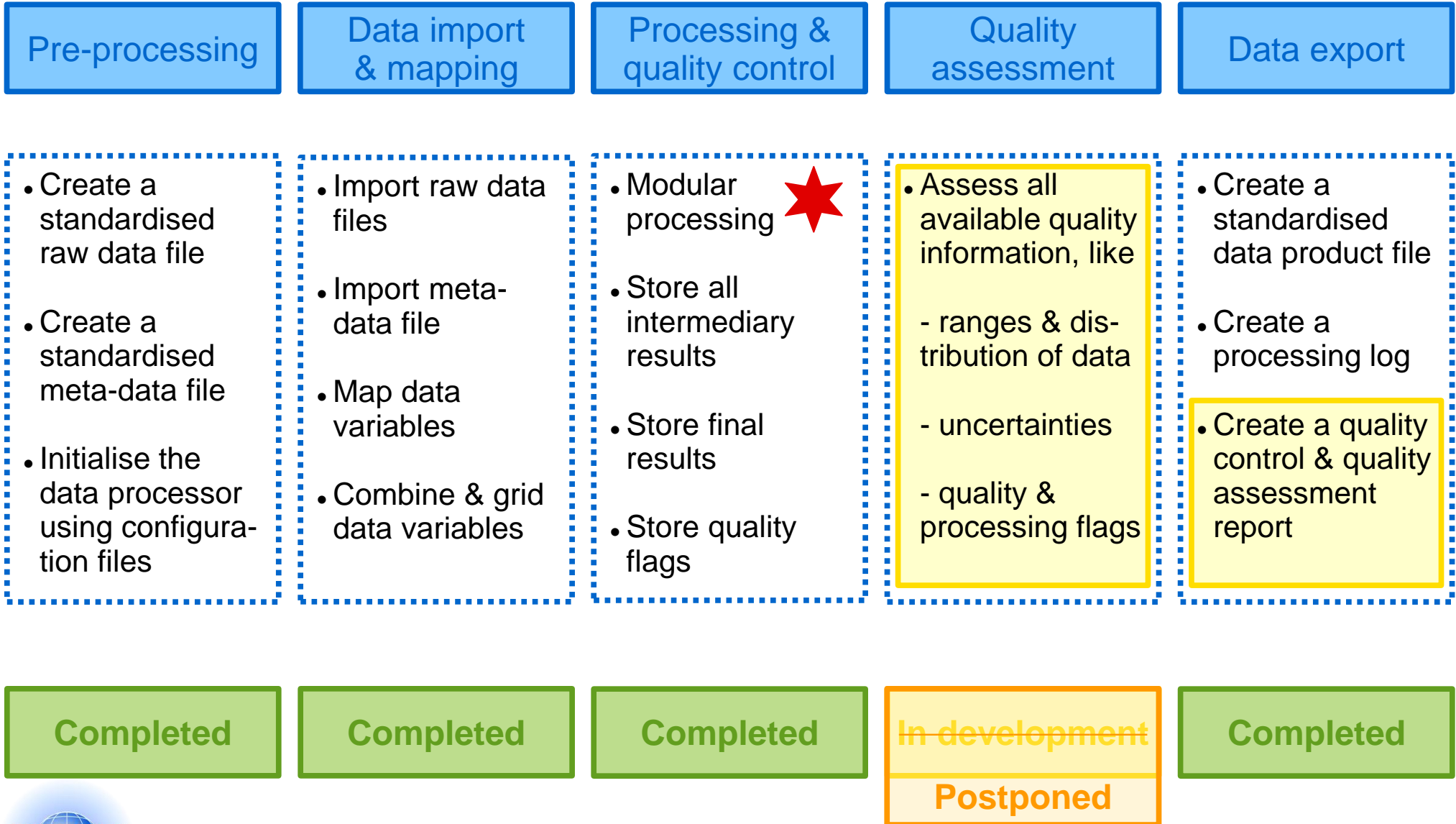
- Alias name of → “GRUAN Data Processing System for Radiosounding”
- General modular processing system for radiosonde data
- Open system which could be adopted for any radiosonde types/models
- Output files will be created as NetCDF
- Creation of any number of analysis plots

➤ Current adaptations/configurations

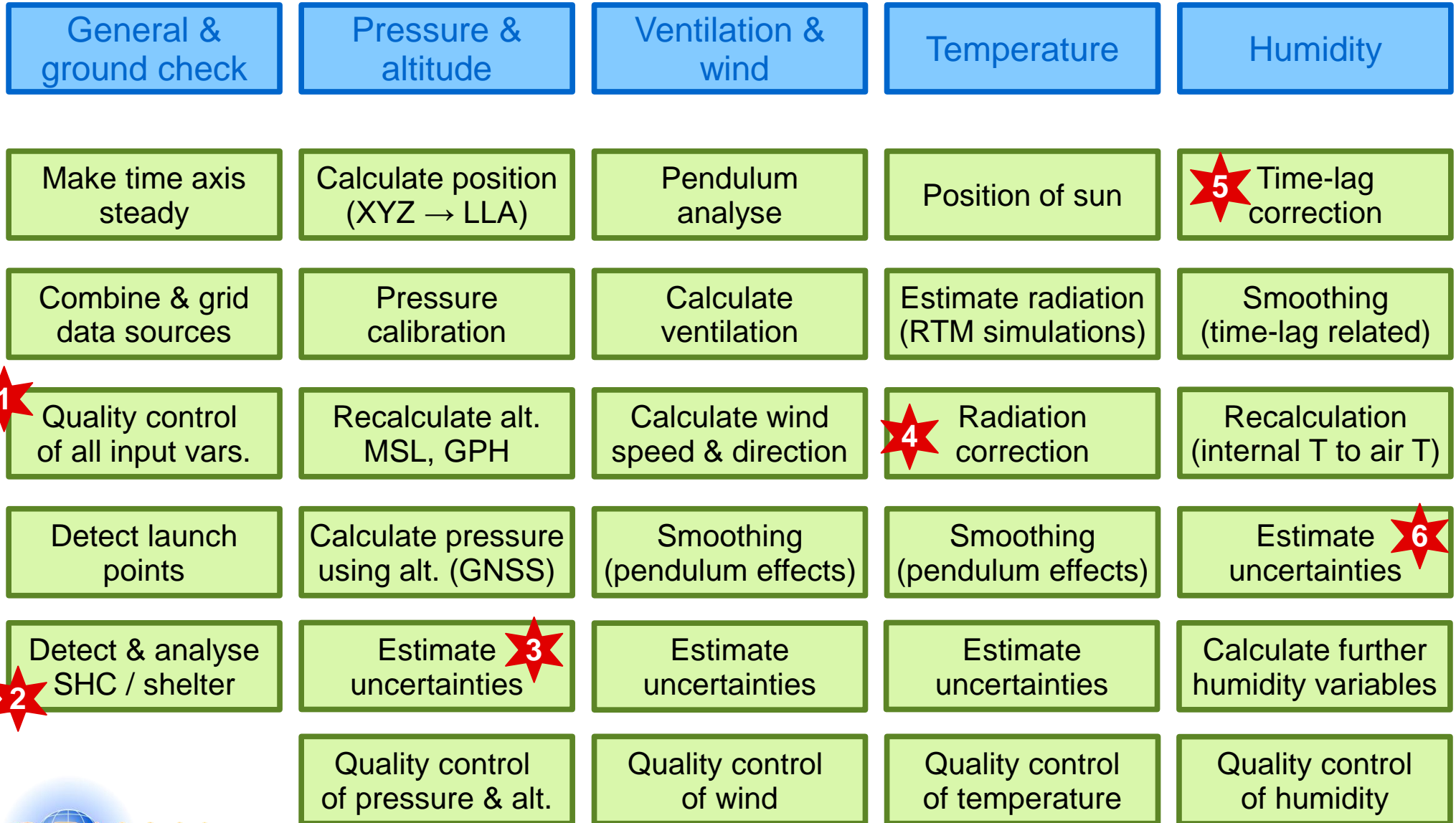
- Analysis of Ground Checks only (GCA) → RS92-GCA.1, RS41-GCA.1
- Converted data products of manufacturer (EDT) → RS92-EDT.1, RS41-EDT.1
- **GRUAN Data Products (GDP) → RS41-GDP.1, RS92-GDP.3, DFM-09-GDP.1**

➤ Possible future adaptations

- ECC Ozone, CFH, ...



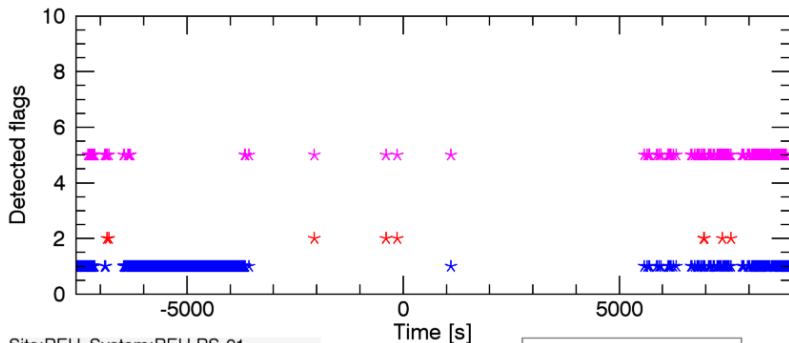
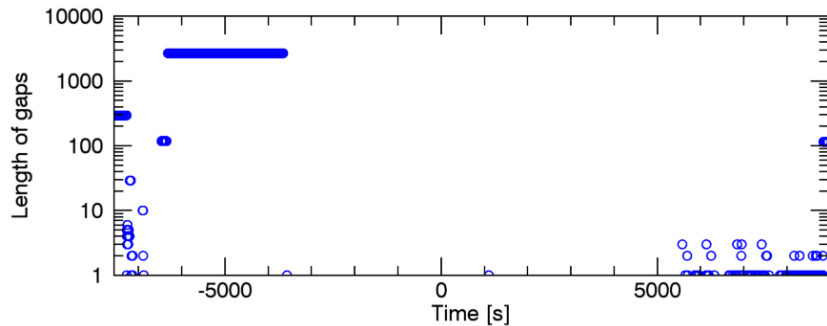
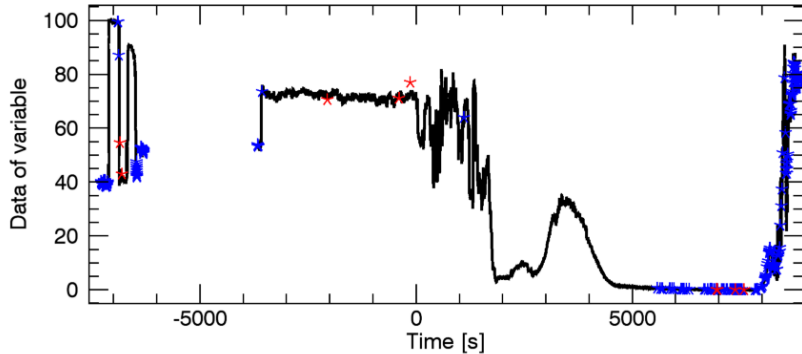
Processing Scheme of RS41-GDP.1



(1) Quality control of input variables



Check Outliers & NaN of RelativeHumidity



Site:REU, System:REU-RS-01
Date:2019-01-11T17:56:00
B-No:2, DPS-No:0
Sonde:RS41-SGP-REV1, SN:N4120581
Step:15 (PreCheckRelativeHumidity)

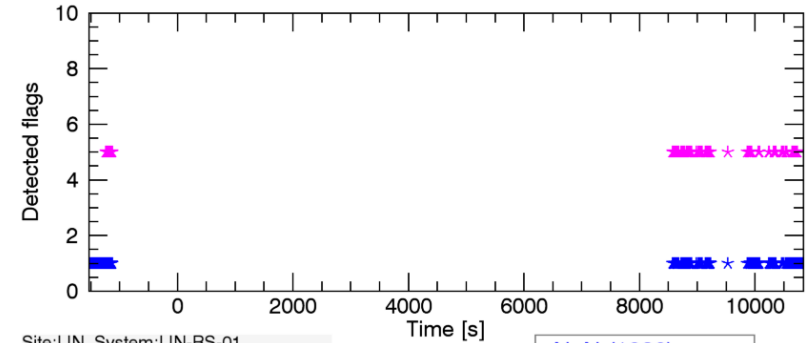
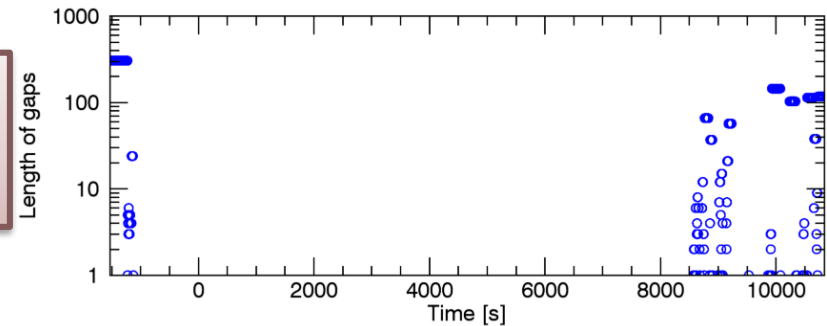
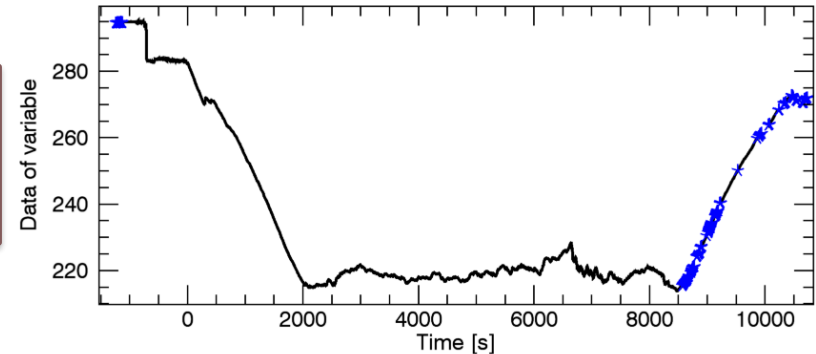
★NaN (3461)
★Outlier (9)
★Interpolated (364)

Detect outlier & missing values

Analyse gaps

Interpolate small gaps & store flags

Check Outliers & NaN of Temperature



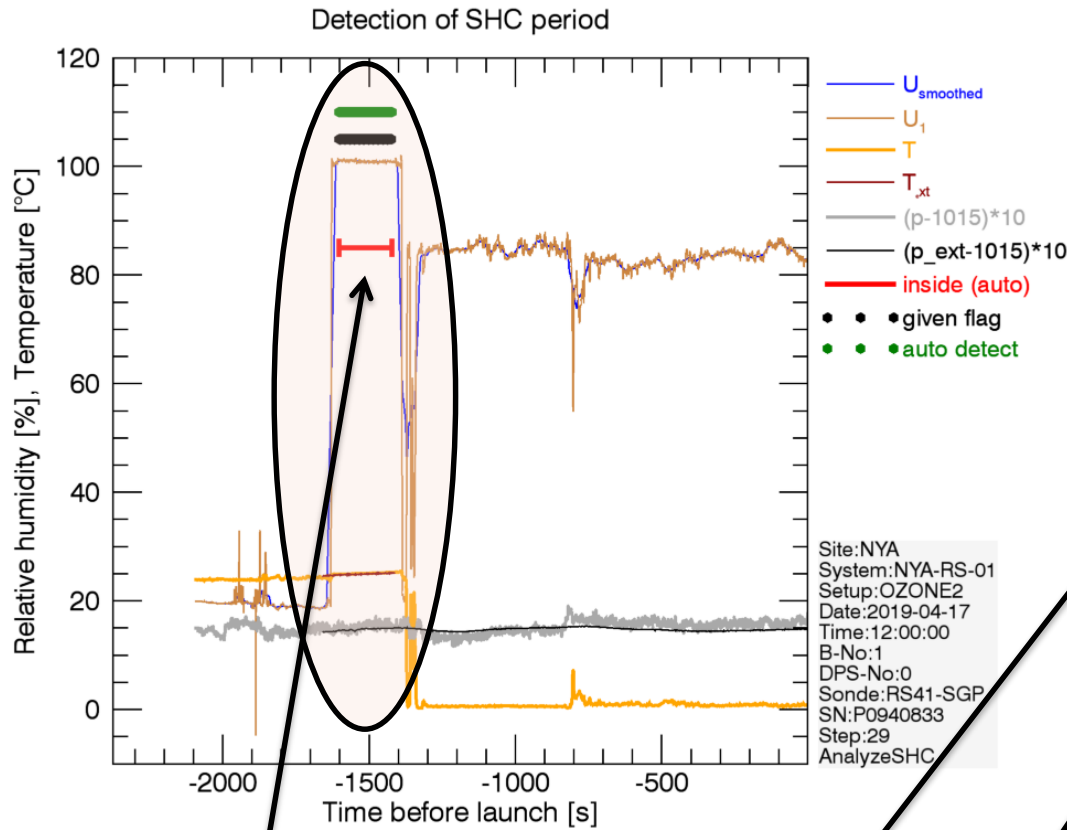
Site:LIN, System:LIN-RS-01
Date:2019-04-01T18:00:00
B-No:1, DPS-No:0
Sonde:RS41-SGP-REV2, SN:P3410084
Step:16 (PreCheckTemperature)

★NaN (1280)
★Interpolated (538)

★ see presentation of Alessandro Fassò

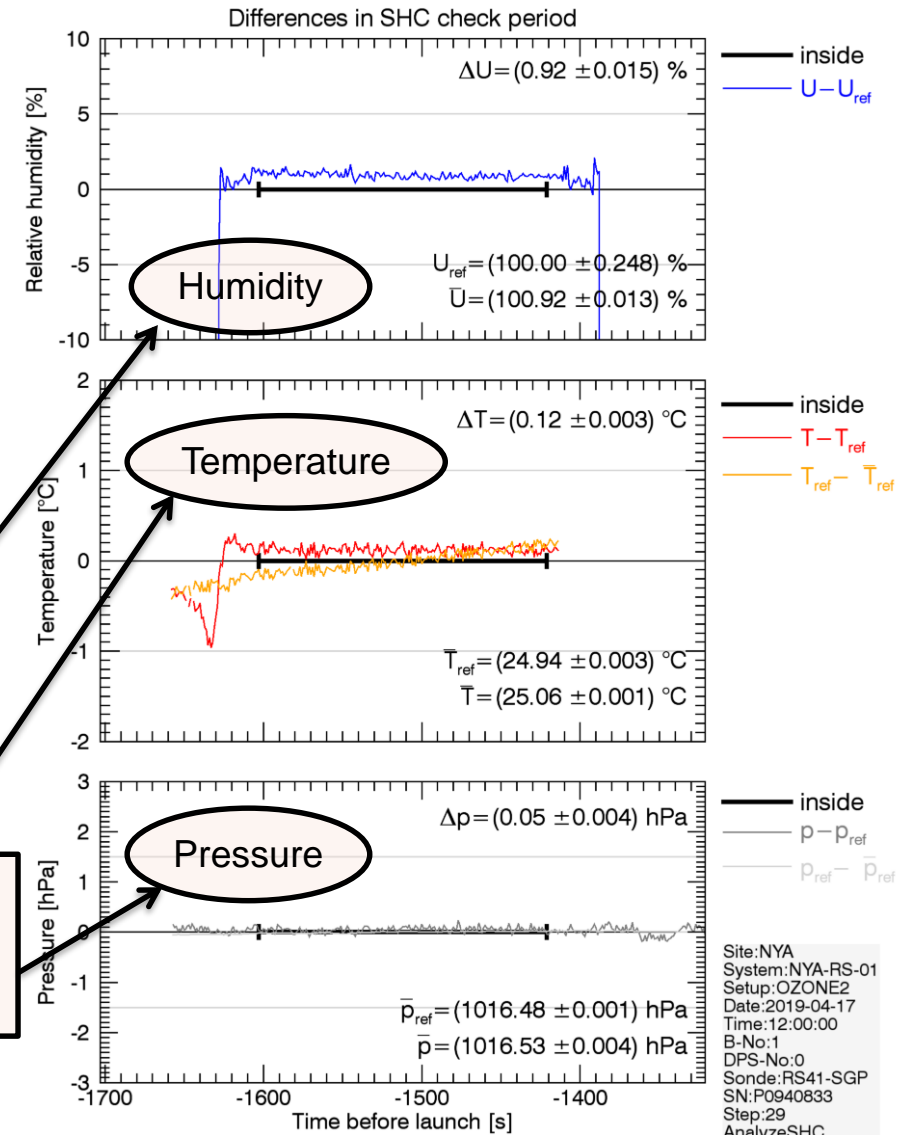


(2) Detect and analyse SHC check

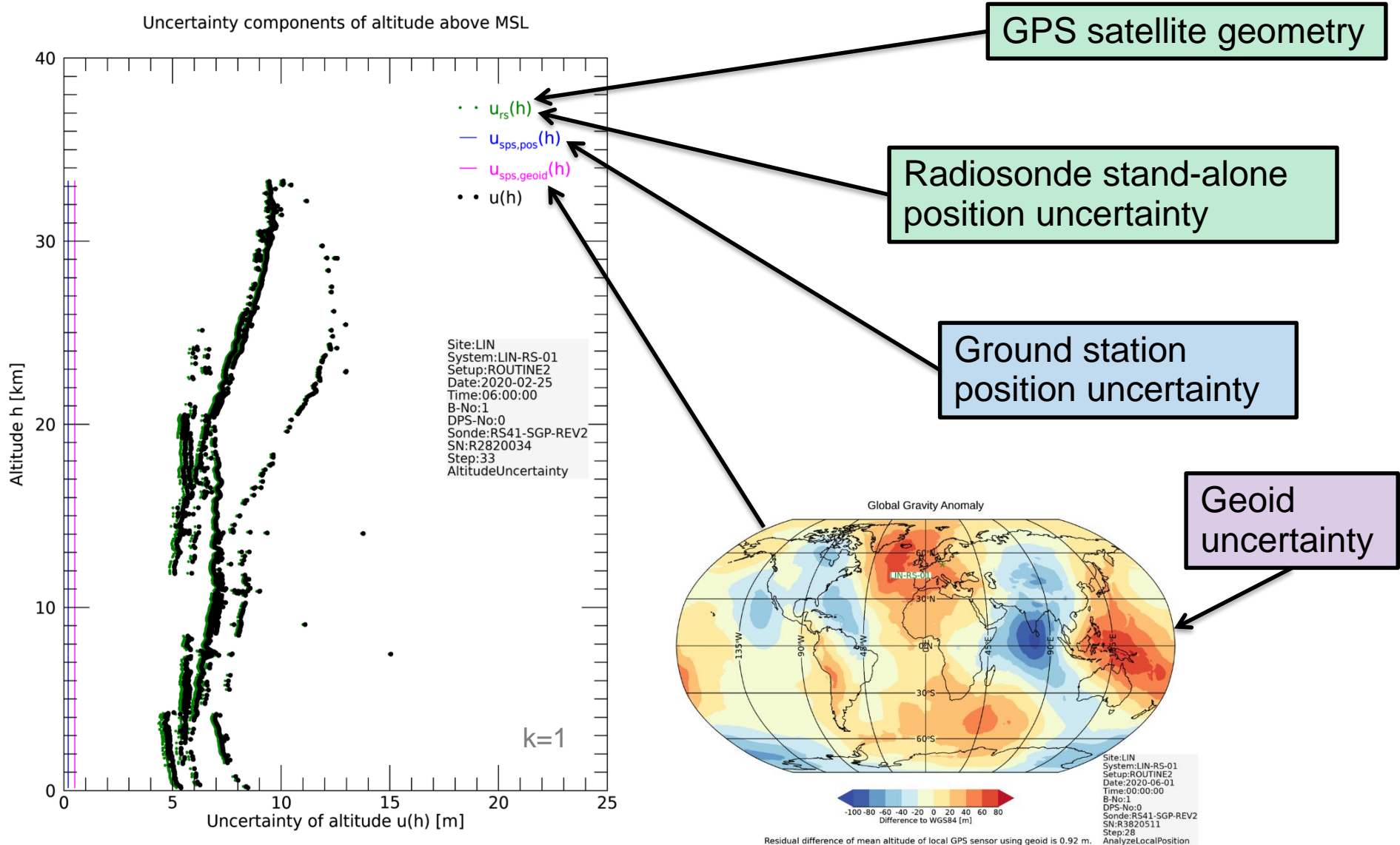


Automatic detection of SHC period using stability of temperature and humidity level

Analyse in comparison with assumptions or references



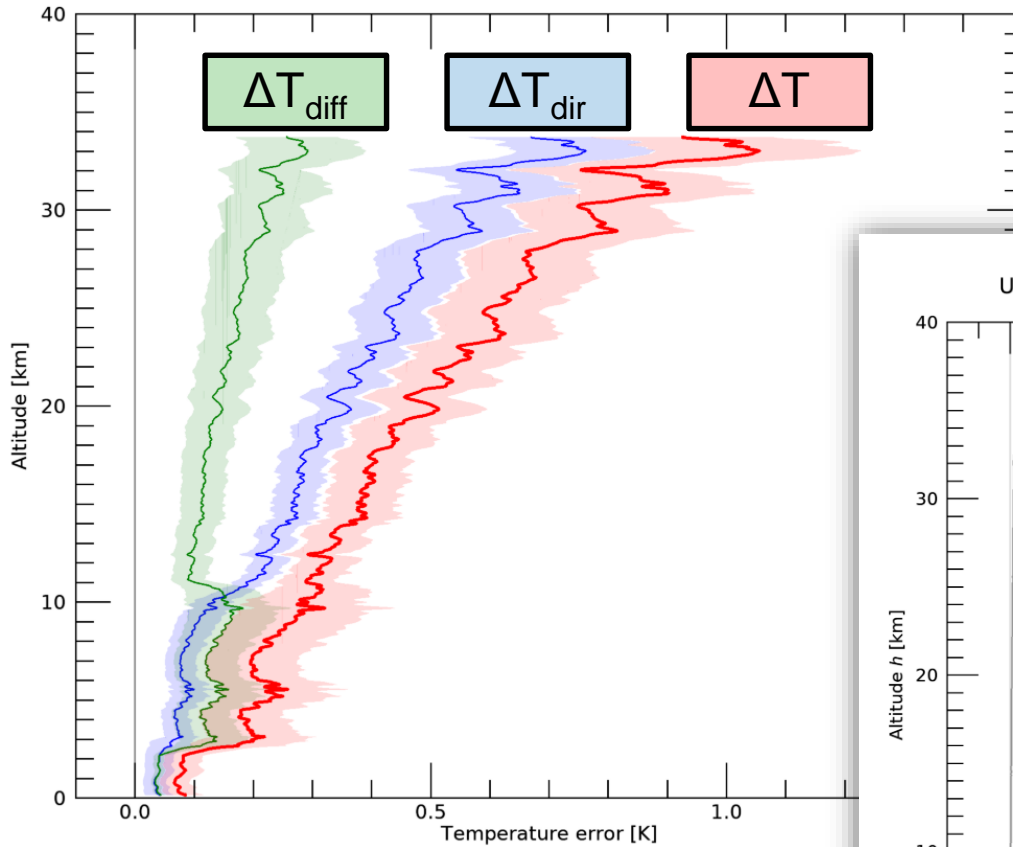
(3) Estimate uncertainty of altitude



(4) Radiation correction of temperature sensor

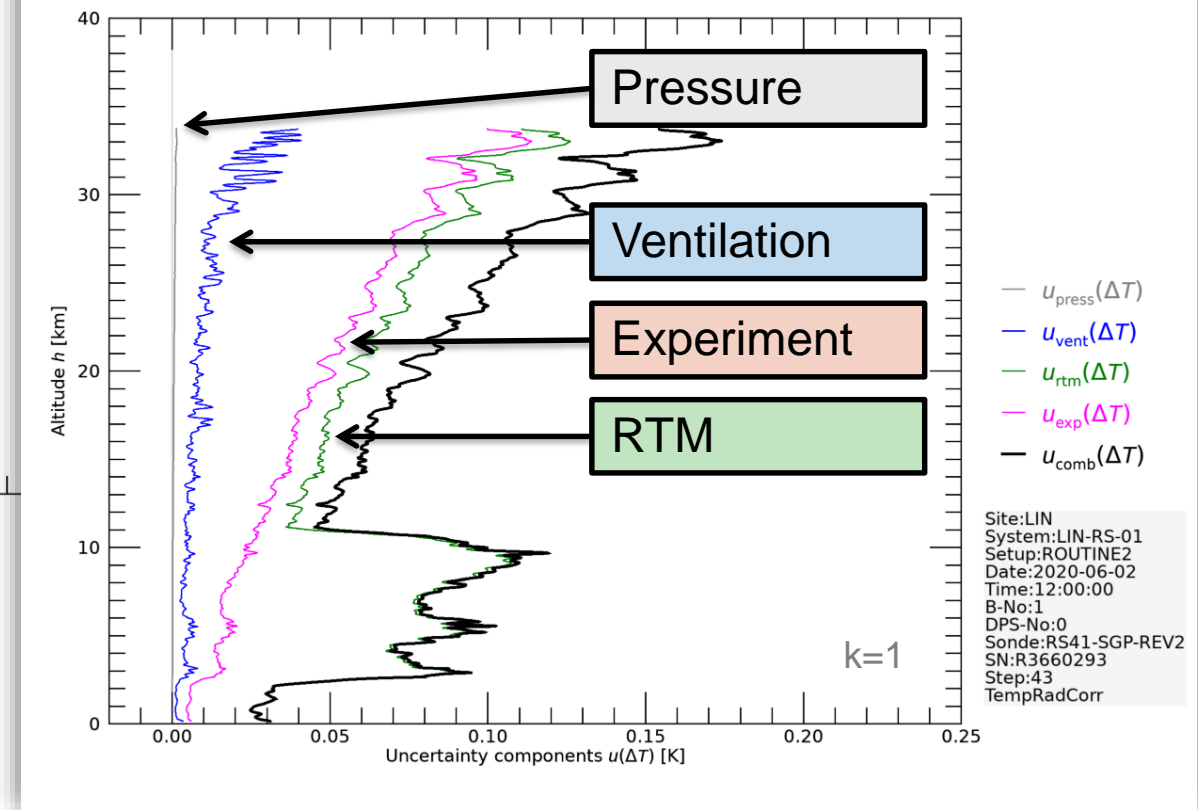


Solar radiation correction of temperature

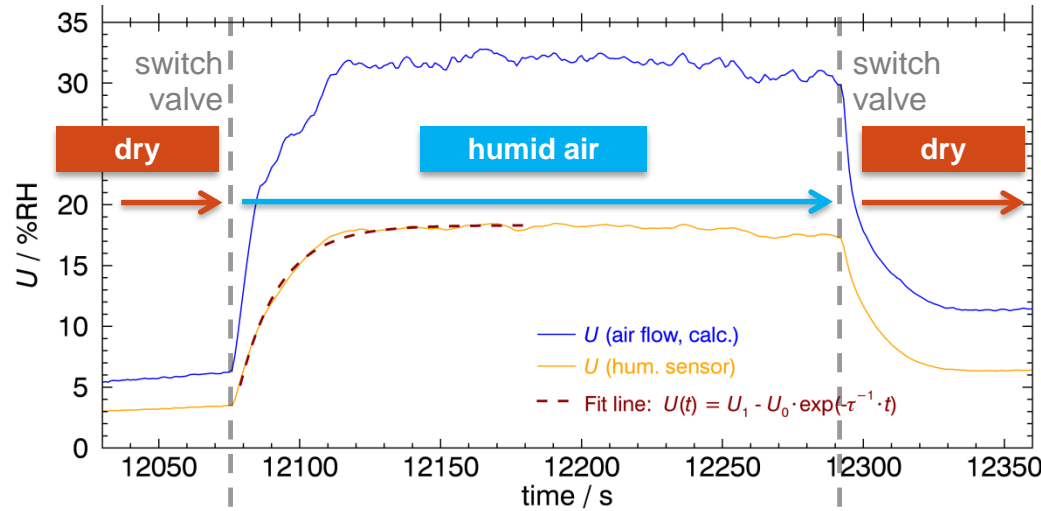


★ see presentation of Christoph von Rohden

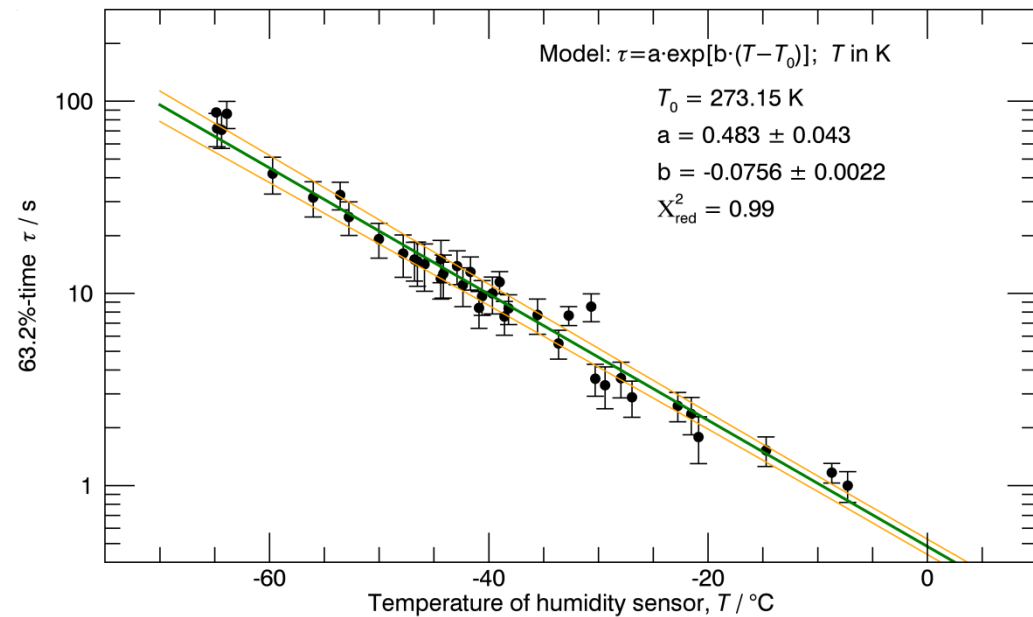
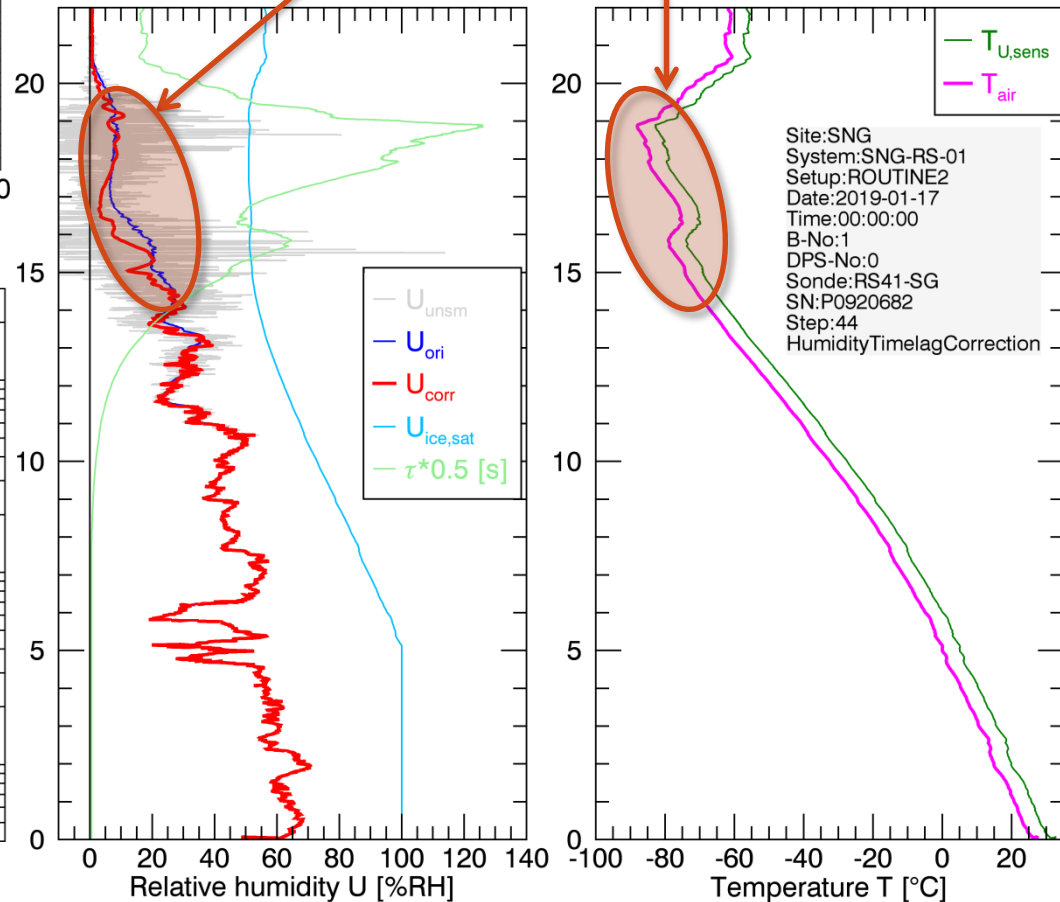
Uncertainty components for solar radiation correction of temperature



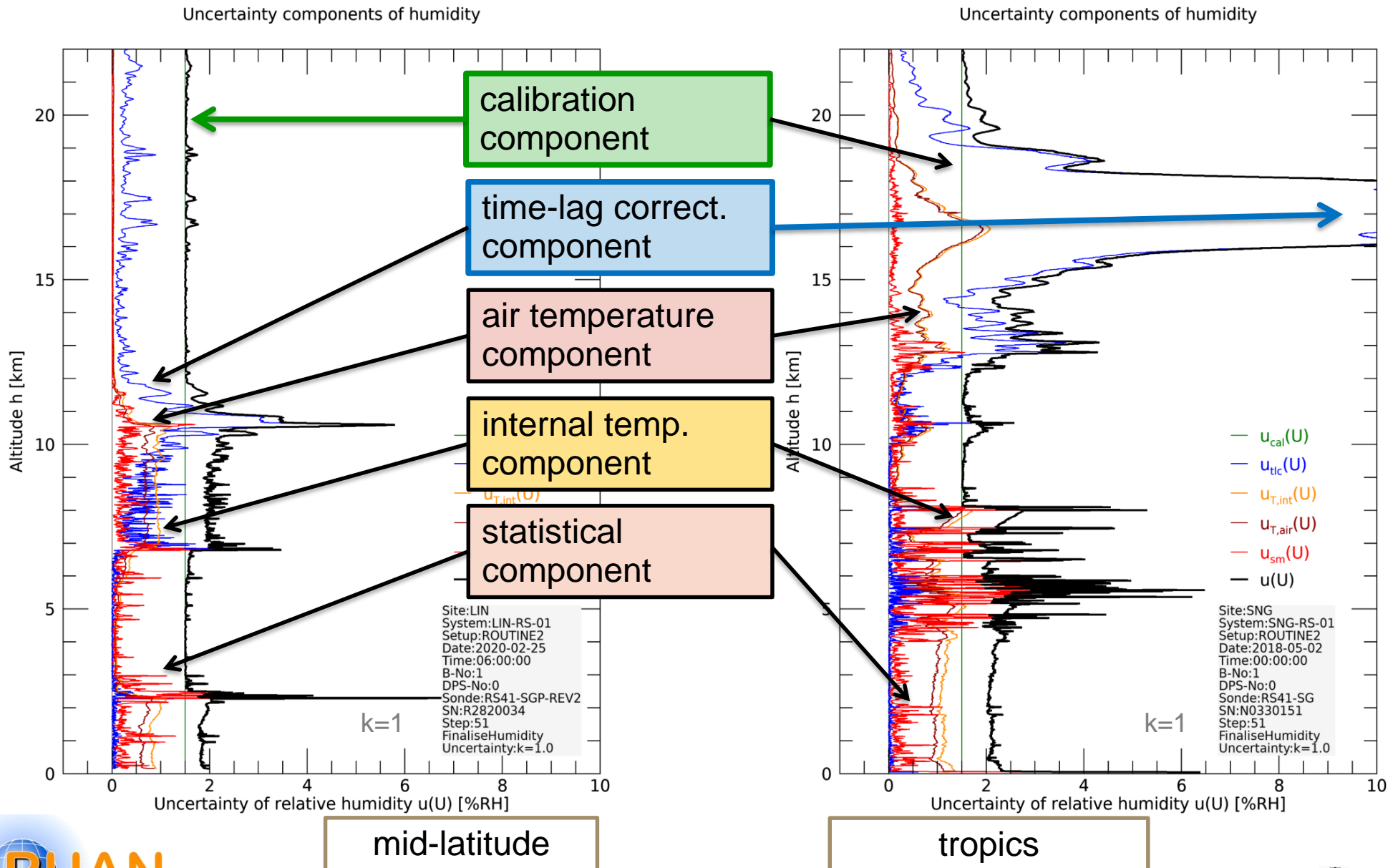
(5) Time-lag correction of humidity



Strong correction in range of the tropical tropopause
> 20 %RH at -70 to -90°C

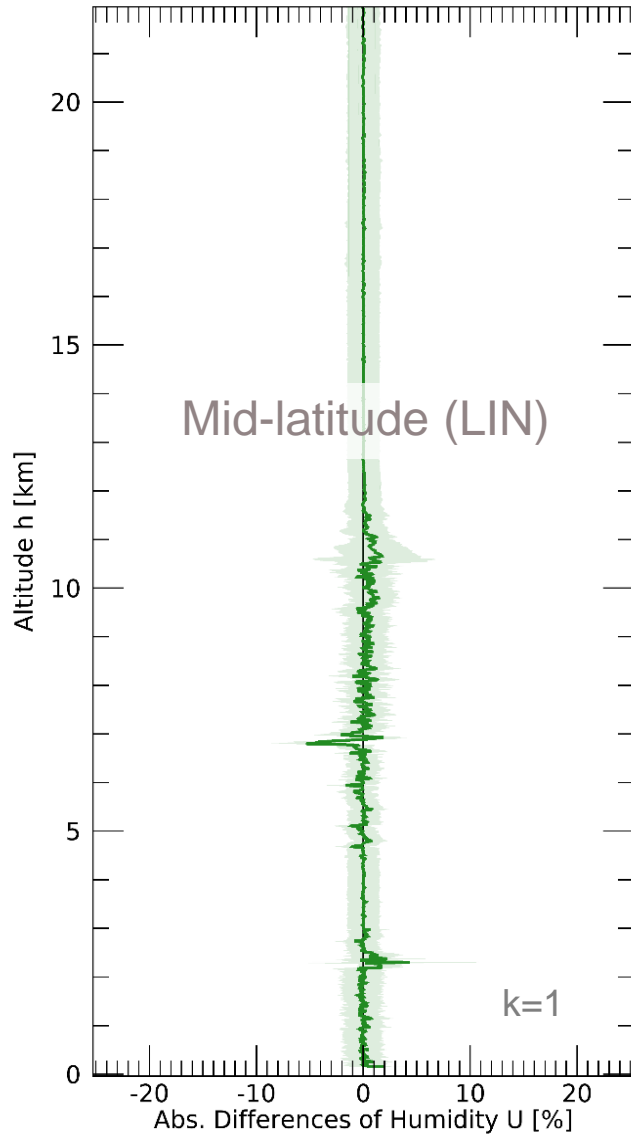


(6) Uncertainty components of relative humidity (RH)

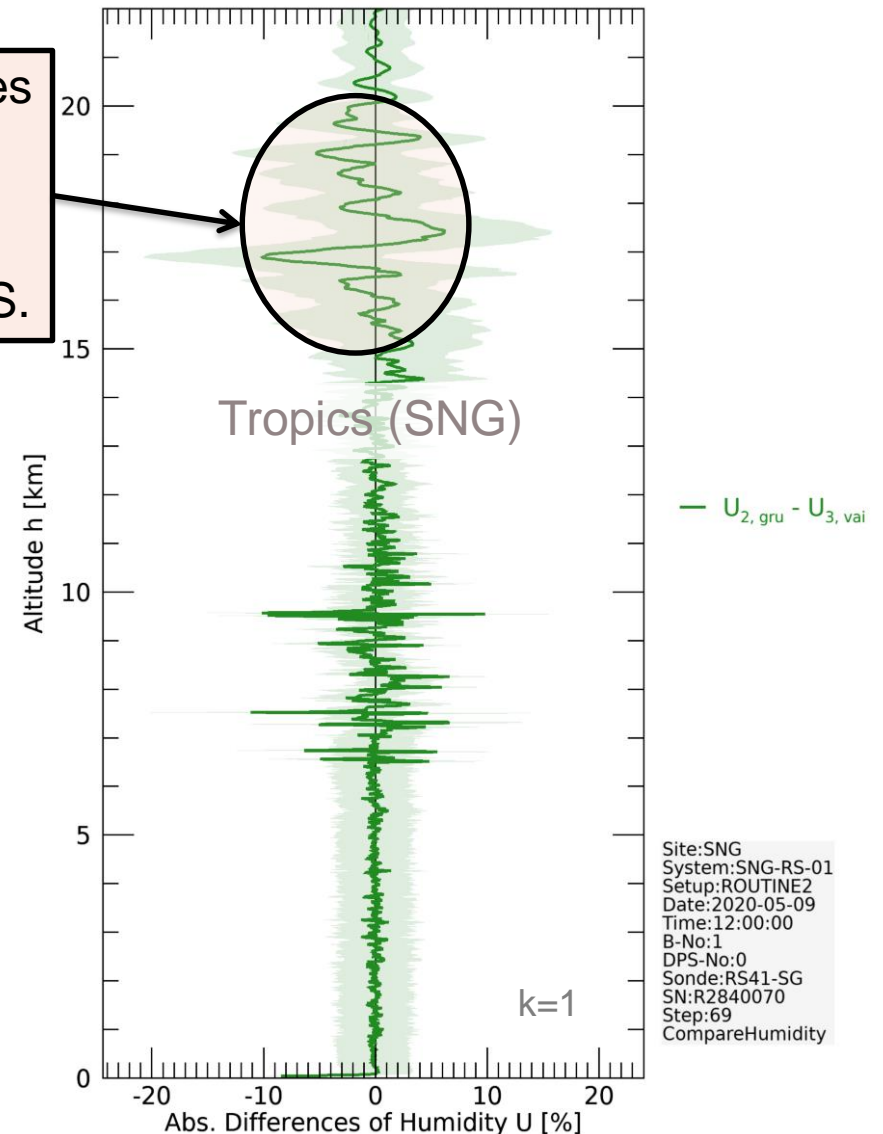


Comparison example – Humidity

→ GDP vs. Vaisala



Do differences exist?
→ Yes, in tropical UTLS.



- Uncertainty estimation of all GPS-based variables
 - altitude, longitude, latitude, wind speed, wind direction, ventilation, pressure
- Updated calculation of ventilation (relevant for radiation correction)
- Improved calculation of IWV and $u(\text{IWV})$
- Fix of several bugs to prevent crashes and to decrease the number of aborted processes
- Optimised NetCDF files
 - uses CHAR instead of STRING
 - k-level of all stored uncertainties are changed from $k=1$ to $k=2$ now

$k=2$ → Is this fine with everybody?

Title: “GRUAN characterization and data processing of the Vaisala RS41 radiosonde”

Authors: Michael Sommer, Christoph von Rohden, Tzvetan Simeonov, Peter Oelsner, Tatjana Naebert, Ruud Dirksen, Hannu Jauhiainen, Petteri Survo, ...

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Status at: 2020-11-09
Pages: 118
Completeness: ~75 %

1. **Release of BETA.2** → planned at 2020-12-08
 - To be processed:
 - all RS41 launches of full network for June and December 2020 (~1800)
 - all RS41+RS92 comparison flights 2014 – 2020 (~1100)
2. Technical document (GRUAN-TD) → final for review in Feb 2021
3. AMT paper (focus radiation correction) → final submission in Q1/2021
4. Certification process → Q2/2021
 - Based on: current data flow, GDP version BETA.2 data, TD and paper
5. Release of final **RS41-GDP.1** → after certification
 - Reprocessing of all RS41 soundings in GRUAN archive (more than 33,000)

- Processing system → Operational version available
- Very detailed data control, corrections and uncertainty estimation
- BETA.1 available → GRUAN sites 2019-09 to 2020-12
- BETA.2 → start 2020-12-08
- Documentation → ongoing (to be finished by Q1/2021)
- Certification process → Q2/2021

Thank you for your attention.