

The importance and use of uncertainties in GRUAN data

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Why the strong focus on uncertainties?

Answer: Long term data series for climate are most strongly impacted by the insufficient treatment of systematic errors

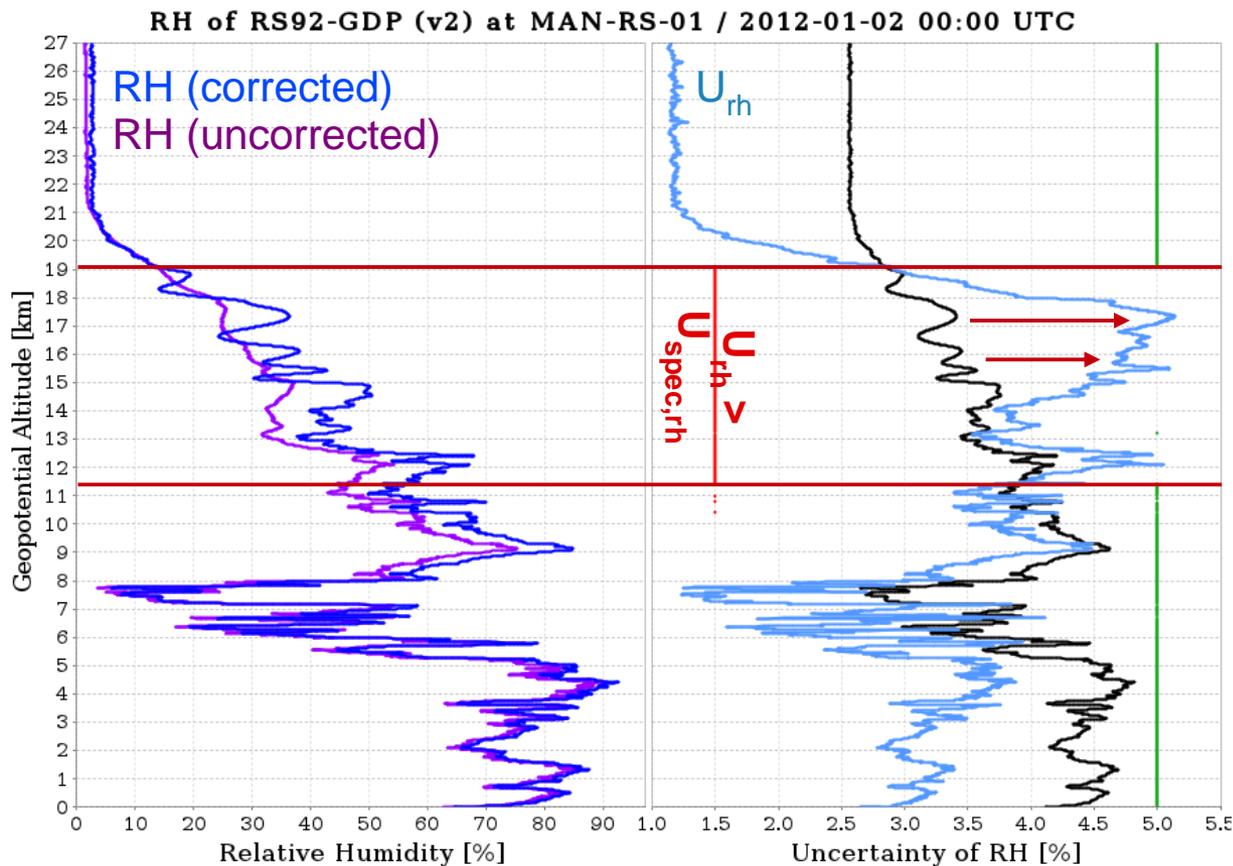
→ Understanding the uncertainties on the measurement level is essential!

Using uncertainties is much more than QC!

Distinguish between

- Systematic error
- Random uncertainties
- Correlated uncertainties
- Uncorrelated uncertainties

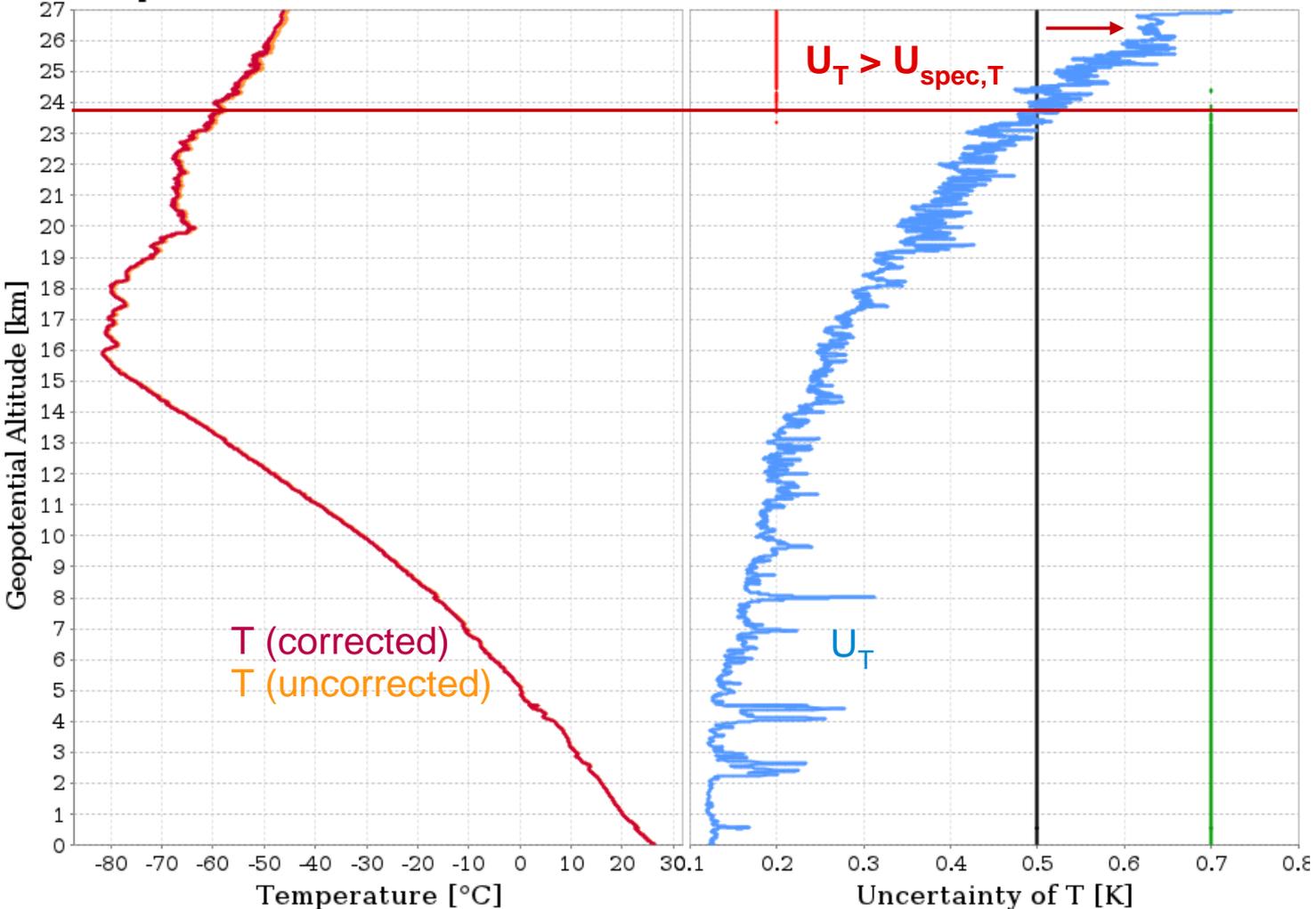
Identification of insufficient understanding of the measurement system:



Limit $U_{abs,rh}$	Limit $U_{rel,rh}$
0.025	0.025

Insufficient understanding

Temperature of RS92-GDP (v2) at MAN-RS-01 / 2012-05-12 00:00 UTC



$U_{spec,T}$
0.5 K

Need to understand details of instrument changes:

Examples:

Changes in RS92 RH sensor geometry or operation

→ Change in time lag!

Changes in RS92 temp sensor geometry

→ Change in radiation correction!

Removing pressure sensor from radiosondes

→ Change in uncertainty characteristic in the lower troposphere!

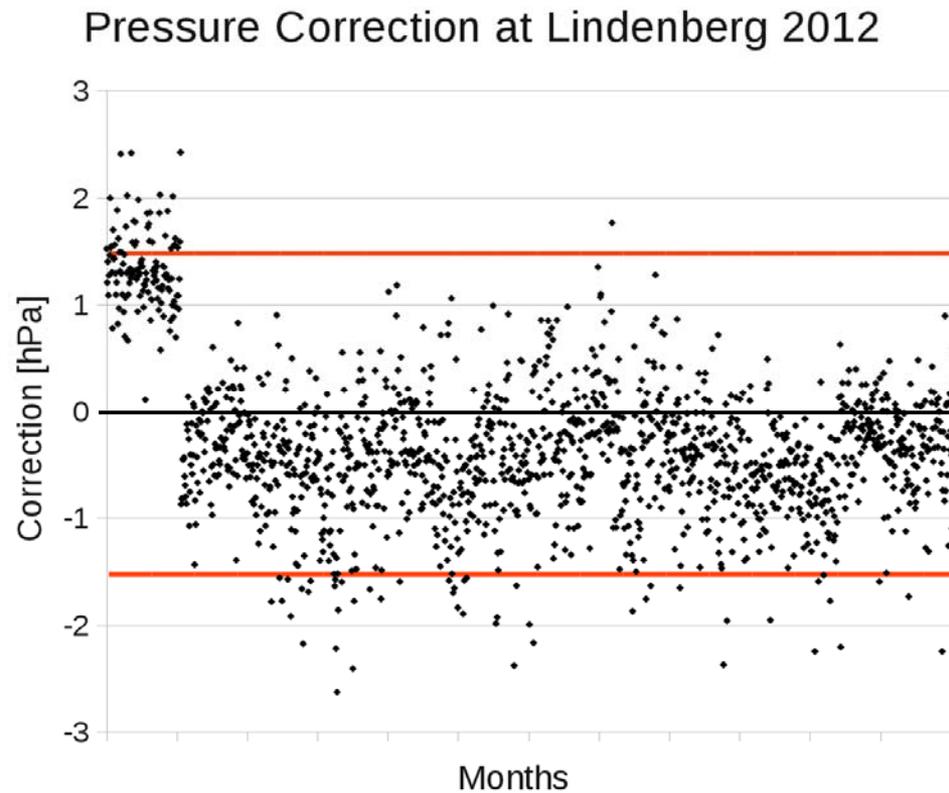
Provide user with information on useability

Satellite validation ↔ in situ cloud physics

Provide information about current understanding of the sensor

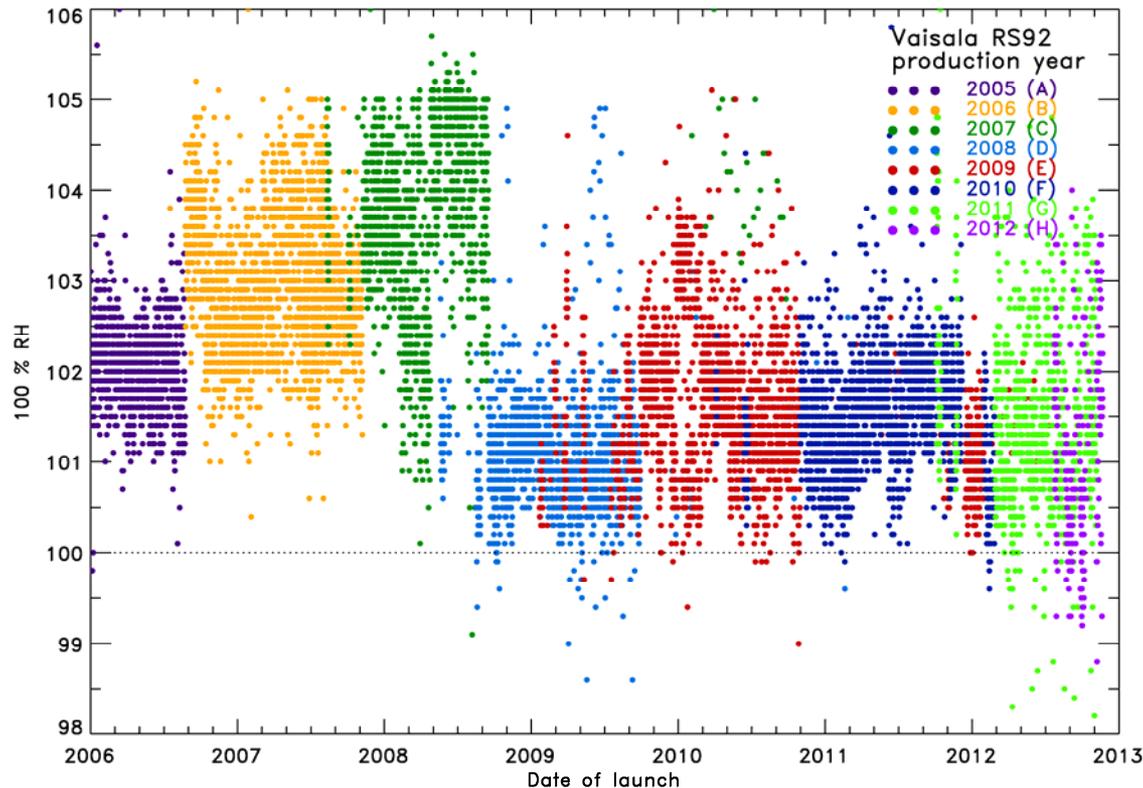
Identify important steps in data collection

Missing ground checks



Identify important steps in data collection

Need for additional ground checks (SHC):



The focus on uncertainties helps the data provider and the data user.

Provider:

- Identify weaknesses in instrumentation
- Identify weaknesses in the operation
- Identify weaknesses in processing

User:

- Provide additional information about the quality of the data
- Understand the strengths and weaknesses of the data
- Avoid using data, where the uncertainty does not match the needs