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Standard humidity chamber (SHC) use in GRUAN

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Overview

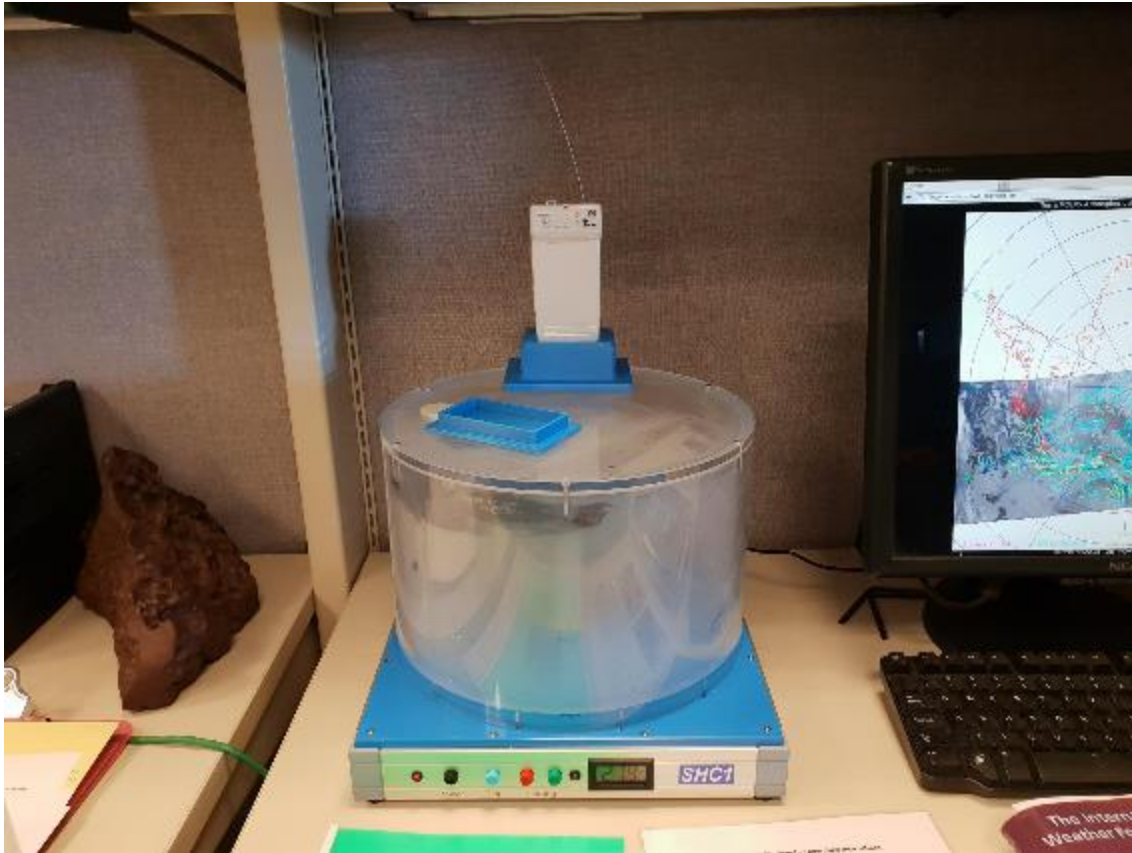
- What is the standard humidity chamber (SHC)?
- Why do we need the SHC?
- Some challenges?
- Where do we go now?

SHC-1 (from Dr Schulz)

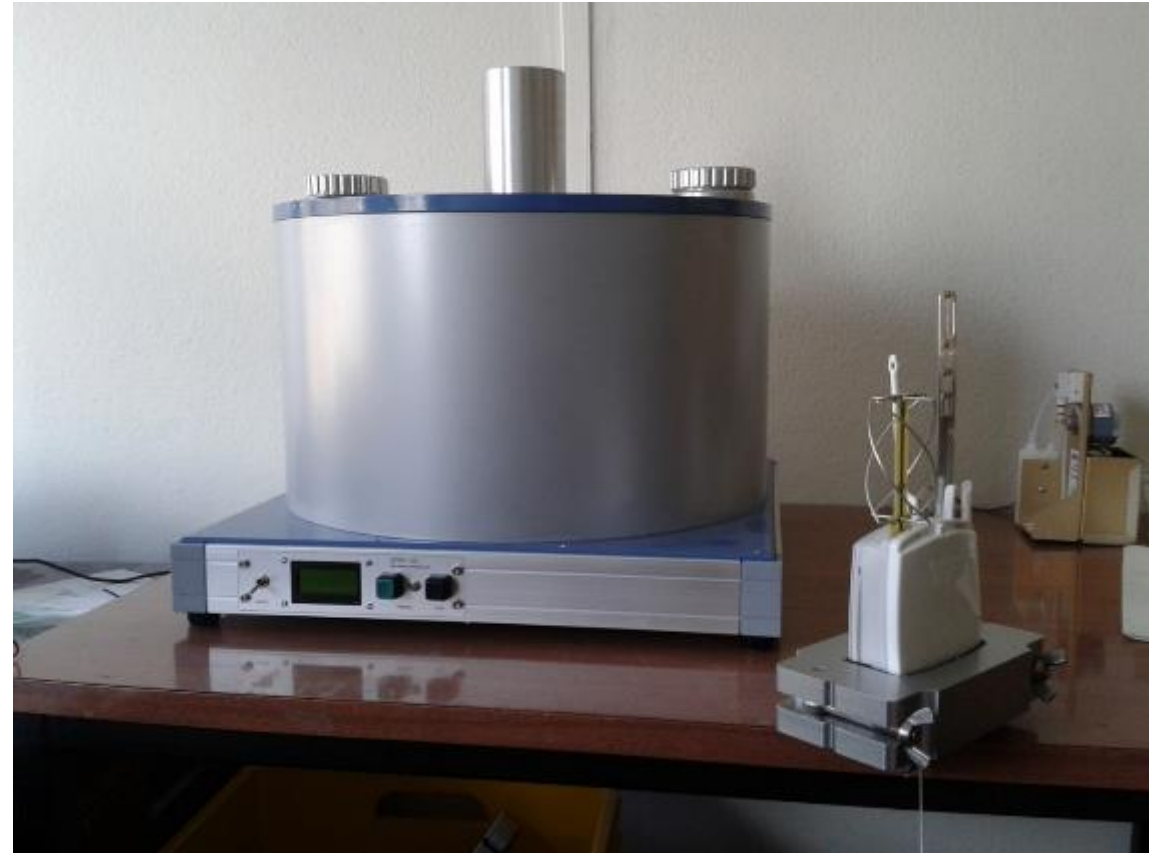
- Simple device
- Uses 0.5 litre distilled water
- Principle: heat water a few degrees above ambient, then as it cools, air saturates at 100% relative humidity
- Fan airflow $\sim 4 - 5 \text{ m/s}$



SHC at McMurdo



SHC at Lauder

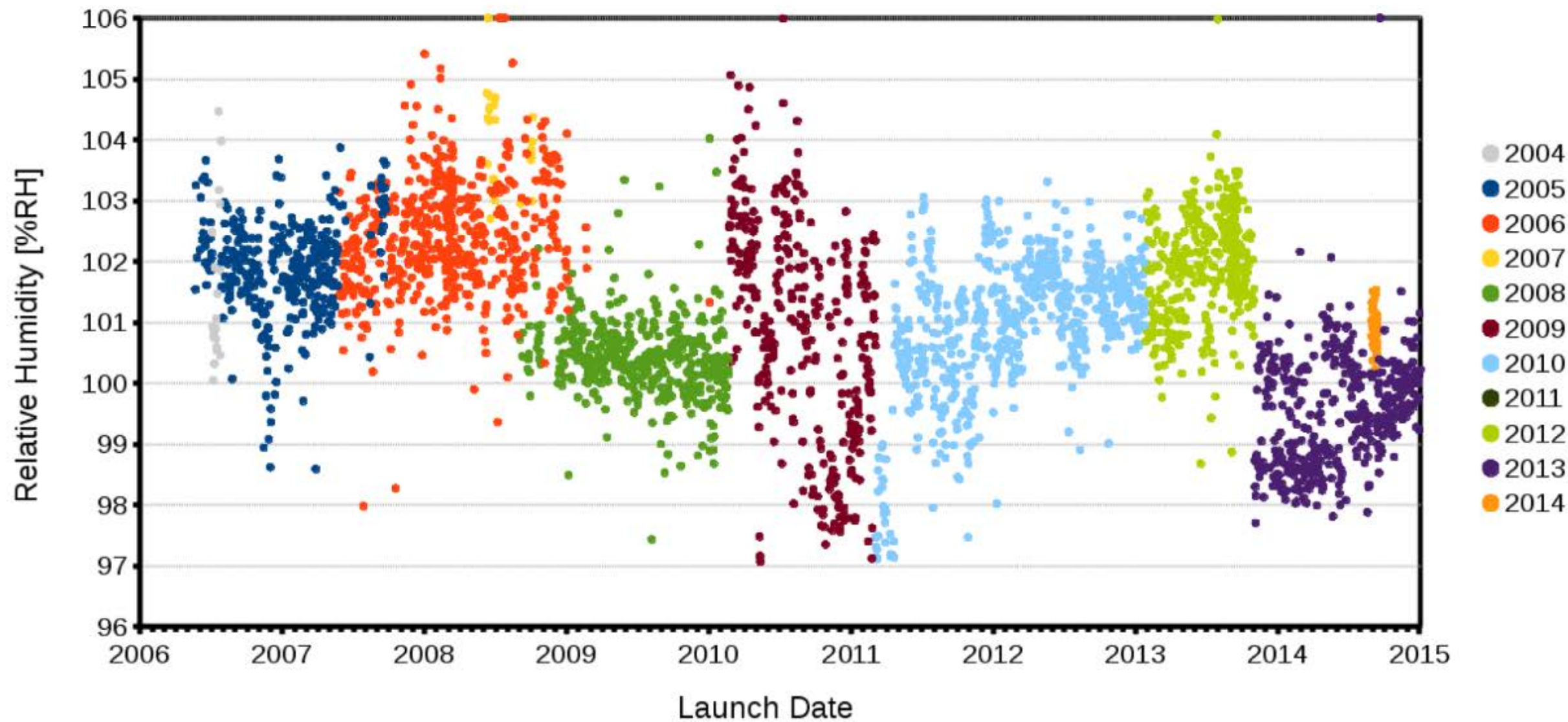


Why use an SHC?

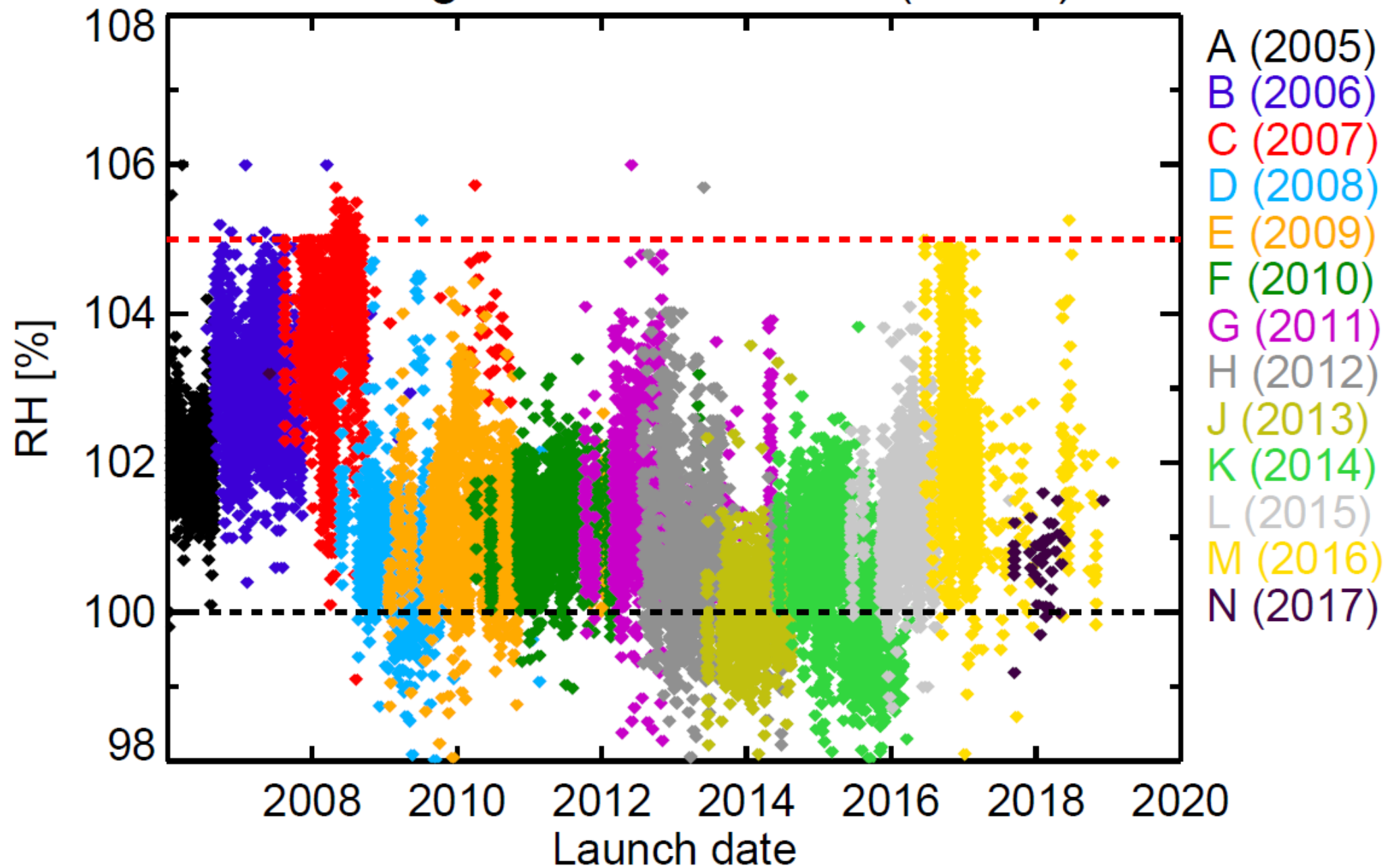
- In GRUAN, ideally there would be a manufacturer independent ground-check for each measured parameter.
- Standard radiosonde preparation usually includes a 0% RH check.
- SHC allows a 100% RH check (or other RH values possible using salts).
- (Eventually) can impact uncertainty of RH measurement

Ny-Ålesund data

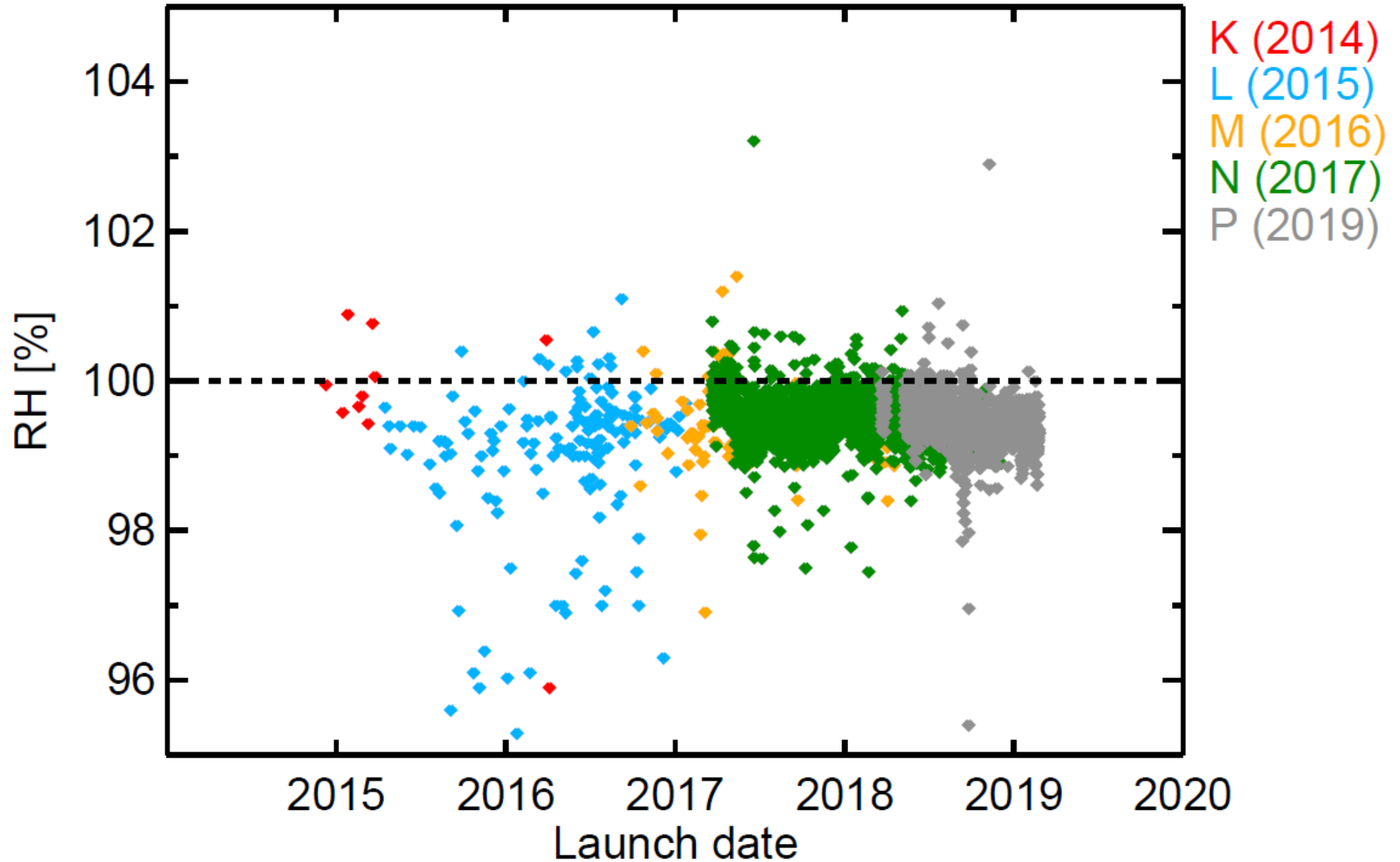
Use of Standard Humidity Chamber at 100% (2006-2014)



RS92 groundcheck SHC (100%)



RS41 groundcheck SHC (100%)



However, some problems....

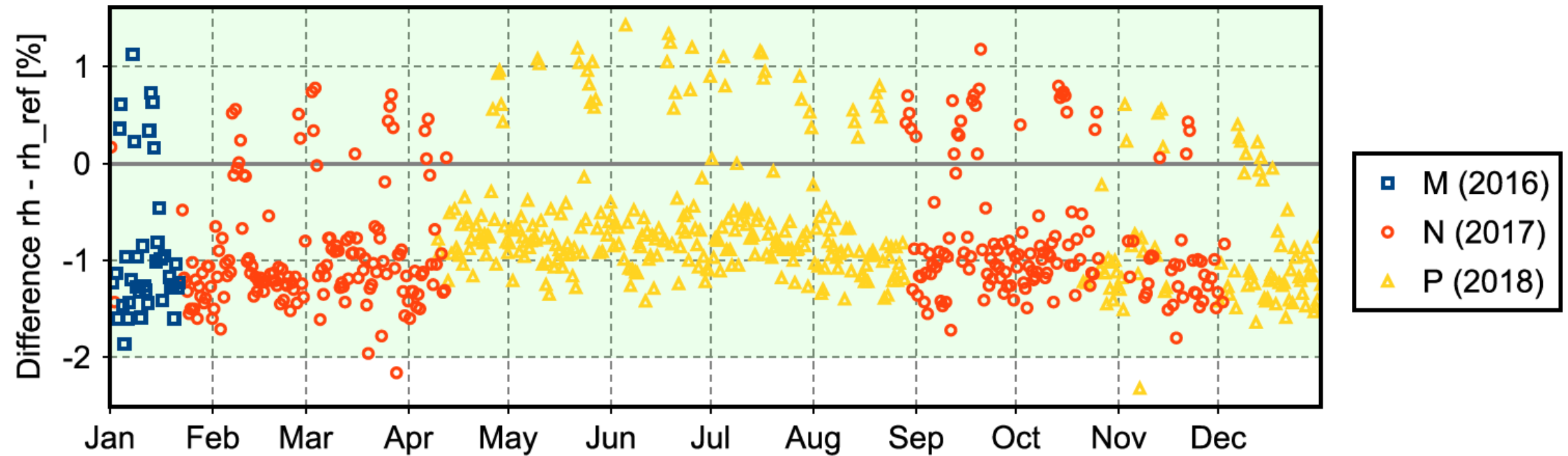
- No GRUAN-wide standard operating procedure (SOP)
- Not all sites use an SHC (yet still have certified products...)
- Autosondes have no SHC (but does it matter?)
- SHC use varies across sites:
 - Water may not be pure, affecting results
 - Time in chamber not consistent per site / operator
 - Potential for sensor probe damage from fan position
 - Orientation of radiosonde sensor also seems to impact results

Orientation - example



Orientation – example at Invercargill

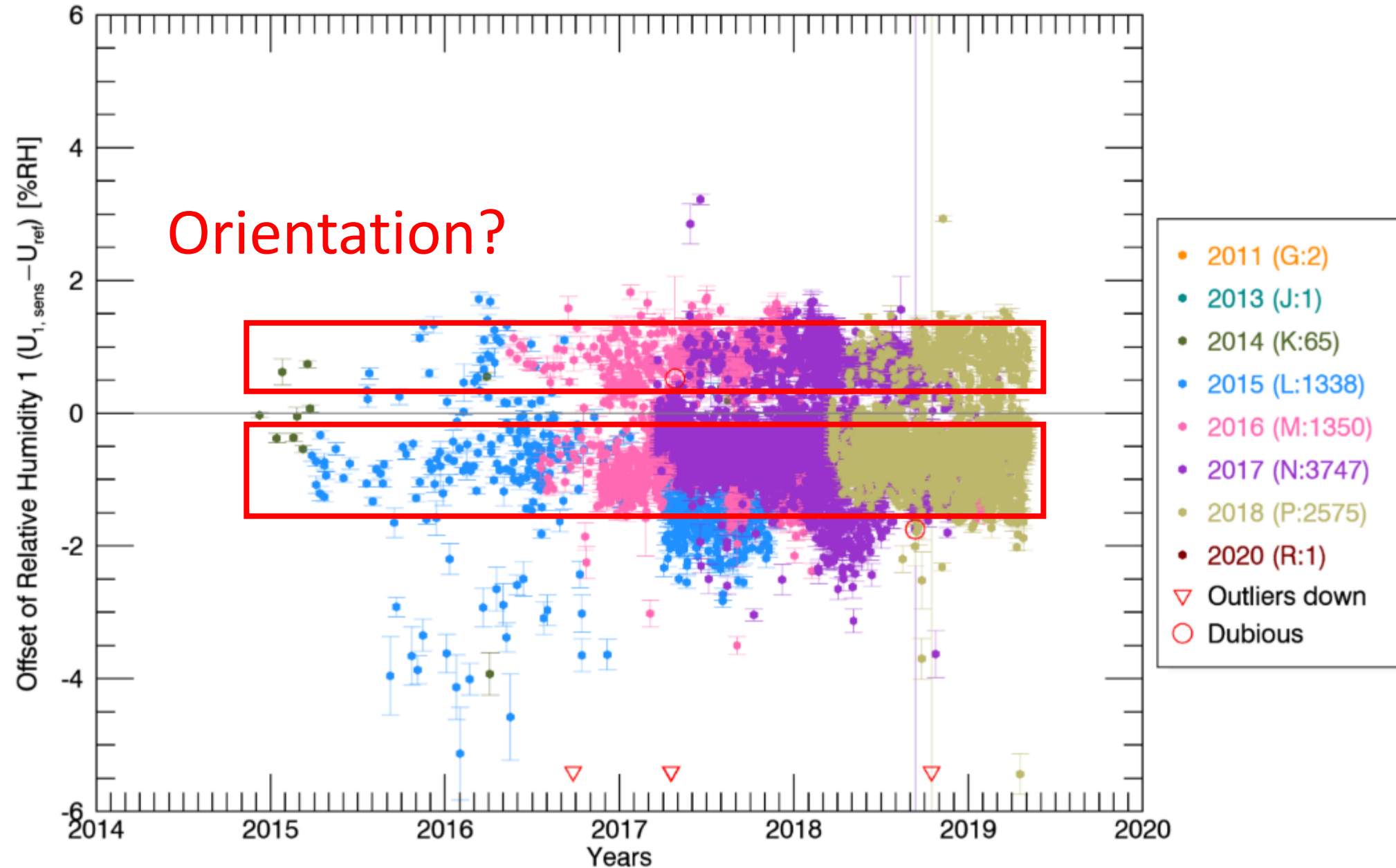
(1) GroundCheck: GC-SHC



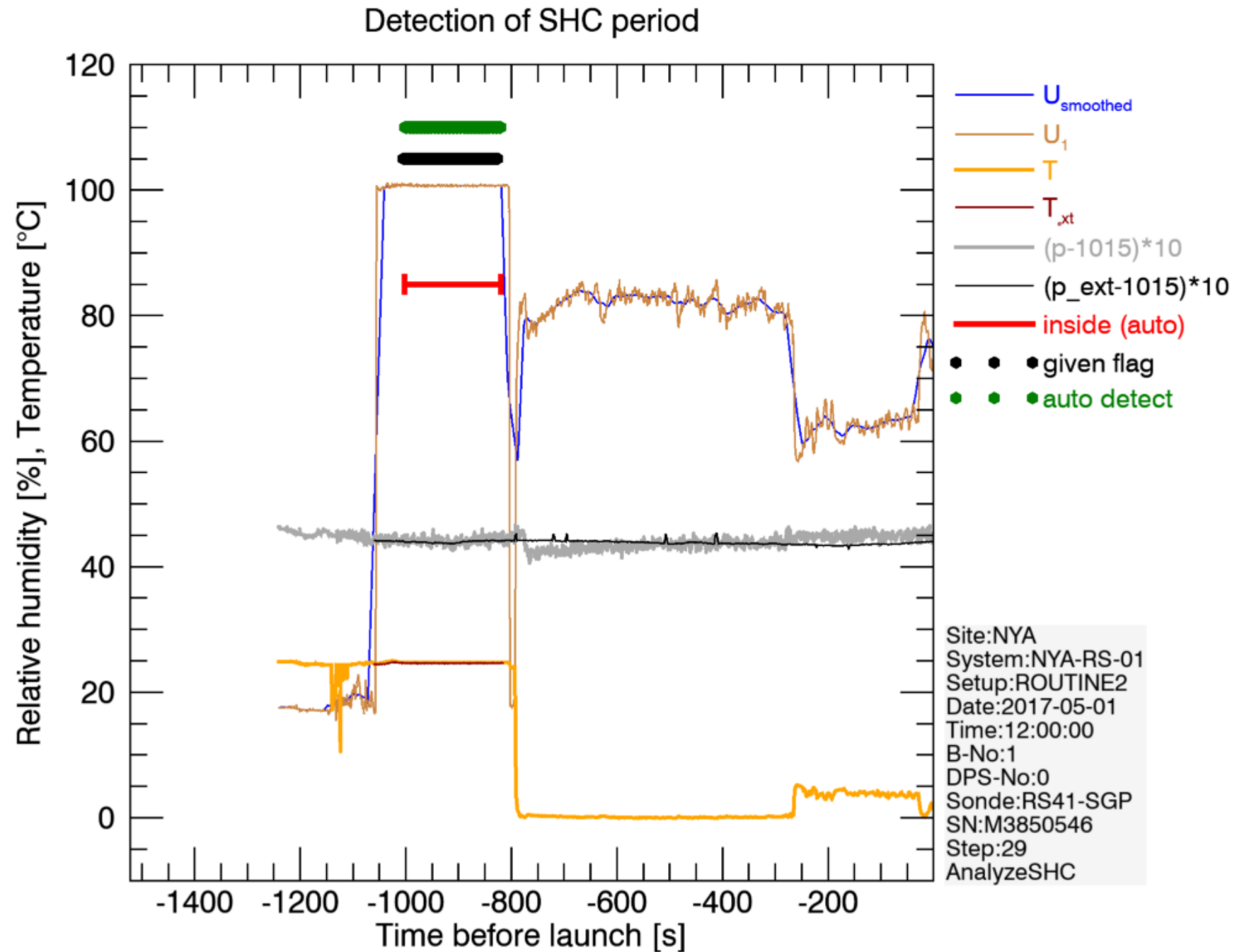
Orientation - example



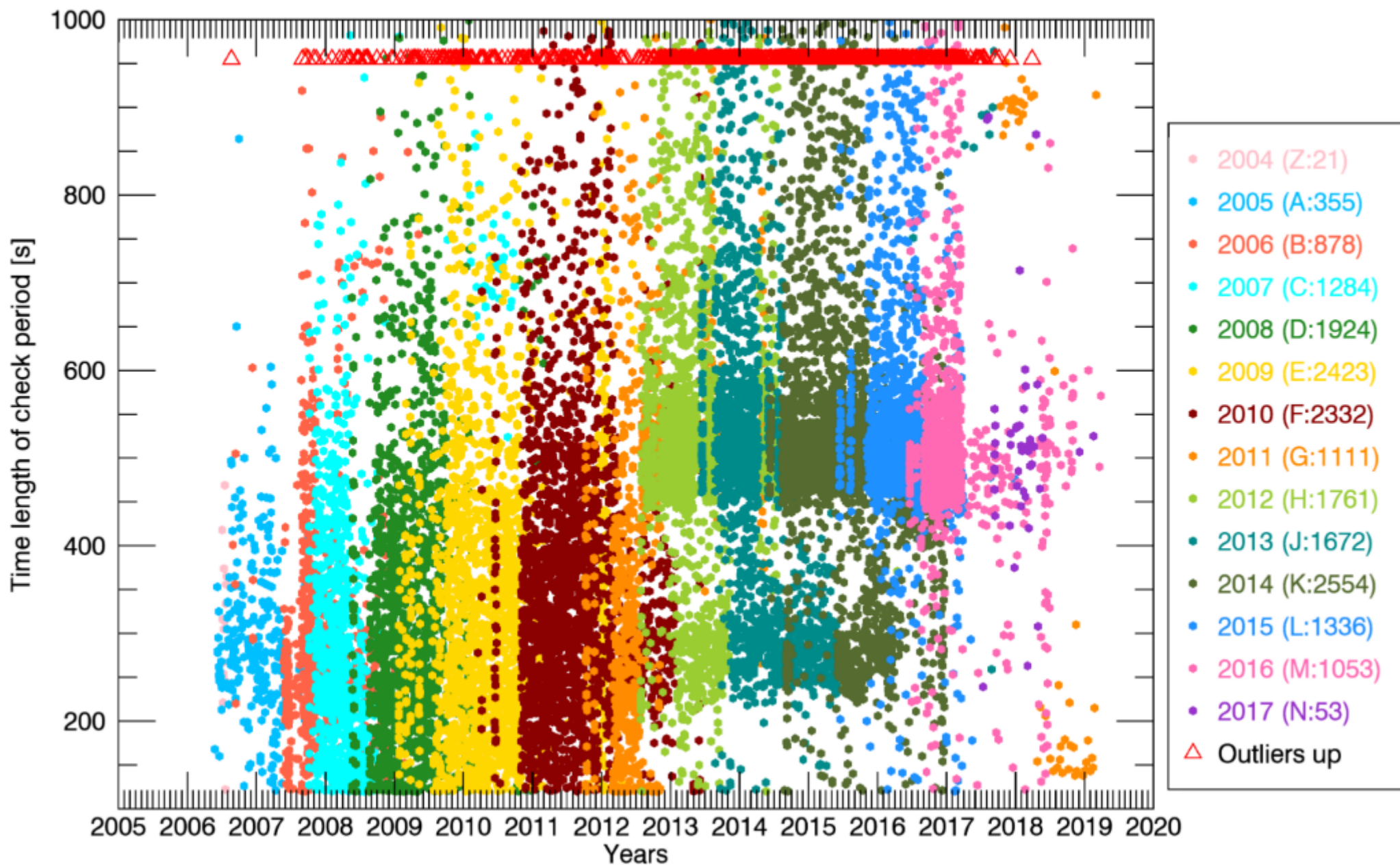
Analysis of 9079 SHC-OffsetRelativeHumidity1 (RS41-GCA.1 at ALL-RS-00)



Time in SHC



Analysis of 18760 SHC-CheckLength (RS92-GCA.1 at ALL-RS-00)



Next steps

- Resolve orientation issue and standardise (keyed adapters?)
- Define GRUAN SHC Standard Operating Procedure (SOP):
 - Orientation of sensor wand (radiosonde specific?)
 - Distilled water versus deionised water?
 - Length of time sensor is in SHC
 - Should T & RH in the SHC be measured as well?
- GRUAN recommends SHC use, but there is no peer-reviewed publication to support this position. Need scientific justification.
- Develop low-cost open source SHC?

Thank you

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