Development of a GRUAN data product for Cryogenic Frostpoint Hygrometers

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From manufacturer:

- Measurement range: **-100°C to +25°C**

- Range for which the sensor was calibrated: **-95°C to +18°C**

- Calibration accuracy : **<0.05 K throughout measurement range**

- Time resolution of the data transmission: **1 s**

- Accuracy, precision, repeatability, or uncertainty: **Systematic errors < 0.5 K**

- Time lag constants: **Not well understood**

- Is a recalibration required as part of the launch preparation? **No**

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

From site:

- Tests of a limited number of sondes in an environmental chamber using reference sensors:

    AquaVIT 1 and 2 (Stratospheric uncertainty < 10% mr)

- Tests of a larger number of sondes at relaxed conditions

    Some lab tests in Lindenberg with about 15 sondes.

- Test of the production variability

    Some lab tests in Lindenberg with about 15 sondes.

- Dual launches with a GRUAN accepted sonde

    Every sonde launched with Vaisala RS92

- Manufacturer independent ground check

    In progress

Random uncertainty:
+ Related to statistical variations in the entire measurement system
+ Can be measured by the scatter of multiple measurements under identical conditions
+ Averages out in the mean of a large number of observations.
+ Often called precision

Systematic error:
+ Deviation from the (unknown) true value due to (unspecified) instrument artifacts
+ Can only be estimated
+ Does _not_ average out in the mean of a large number of observations

CFH uncertainty budget

Thermistor calibration :   <0.05 K   (<1% mixing ratio)
         systematic in profile
         systematic in time series

Manufacturing variability :   < 0.2 K   (< 4% mixing ratio)
         systematic in profile
         random in time series

Controller stability :   0.1 K … 0.5 K   (2% to 10% mixing ratio)
         random in profile   (occasionally larger)
         random in time series

PID drift : 0 K
         systematic in profile
         random in time series

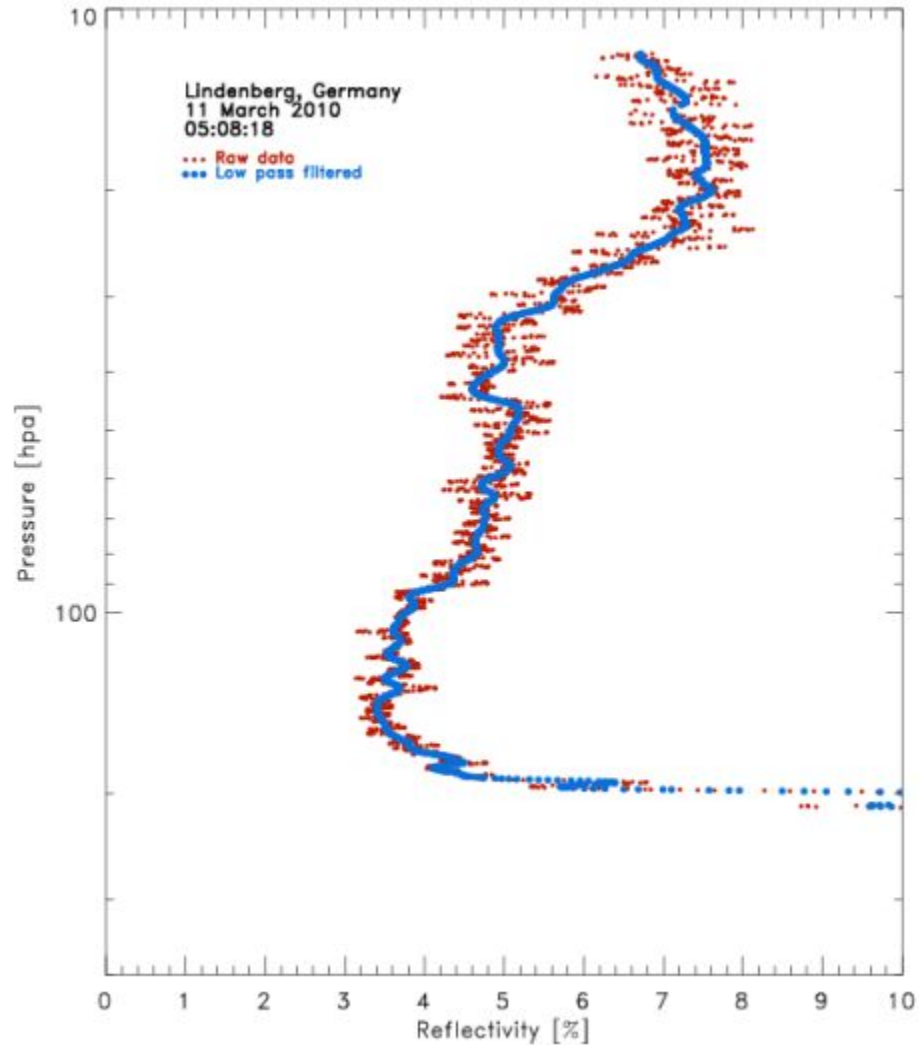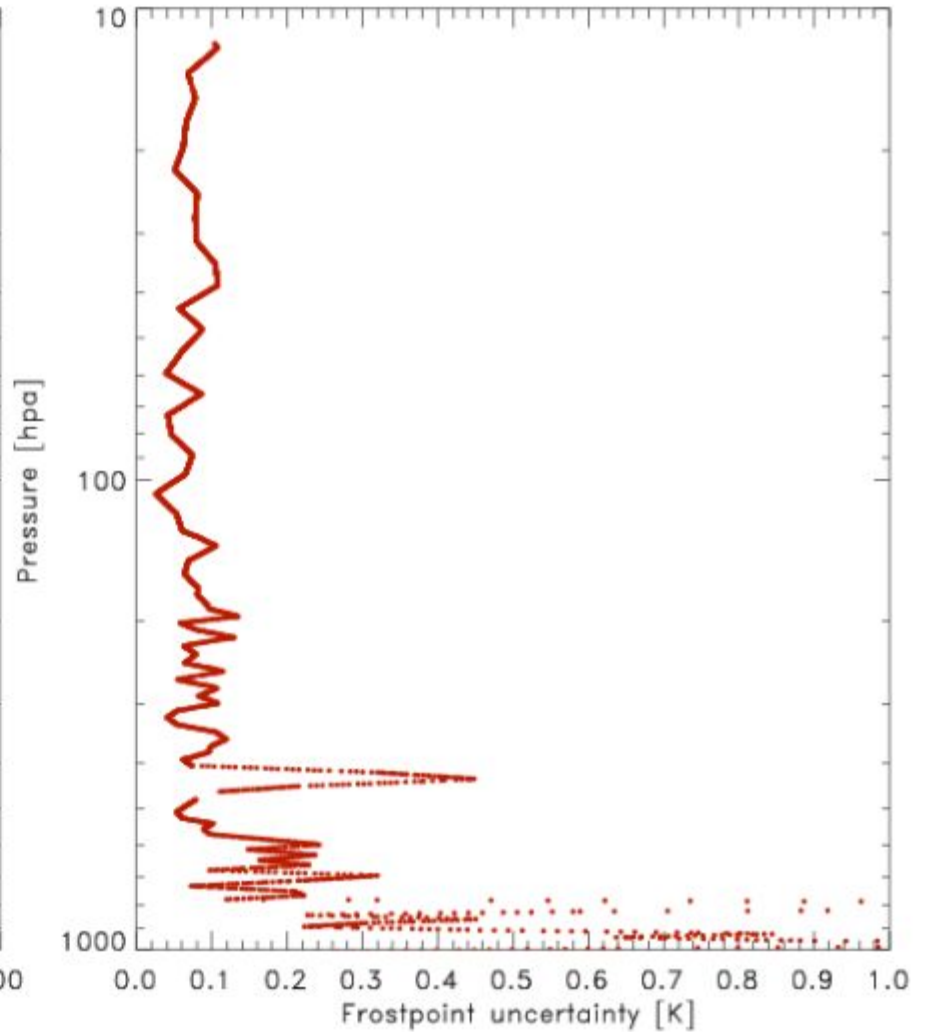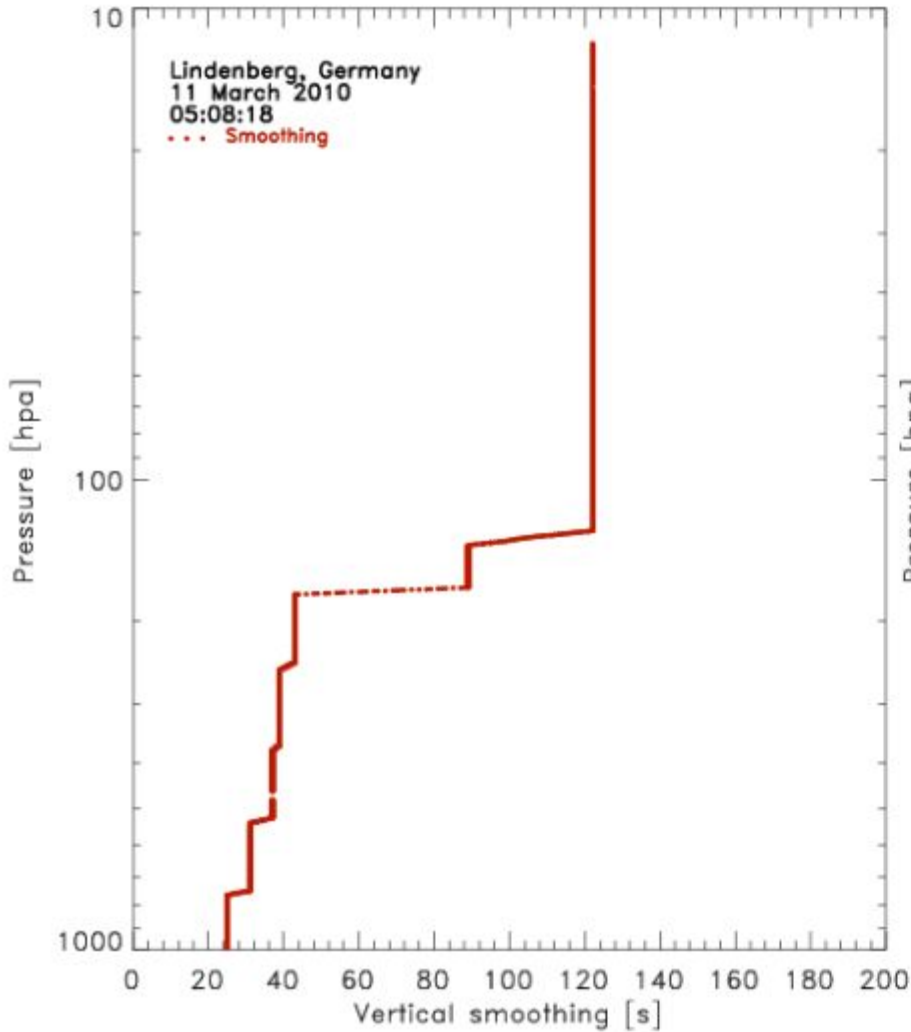Contamination : Can be large. Is flagged out in processing

CFH Repeatability
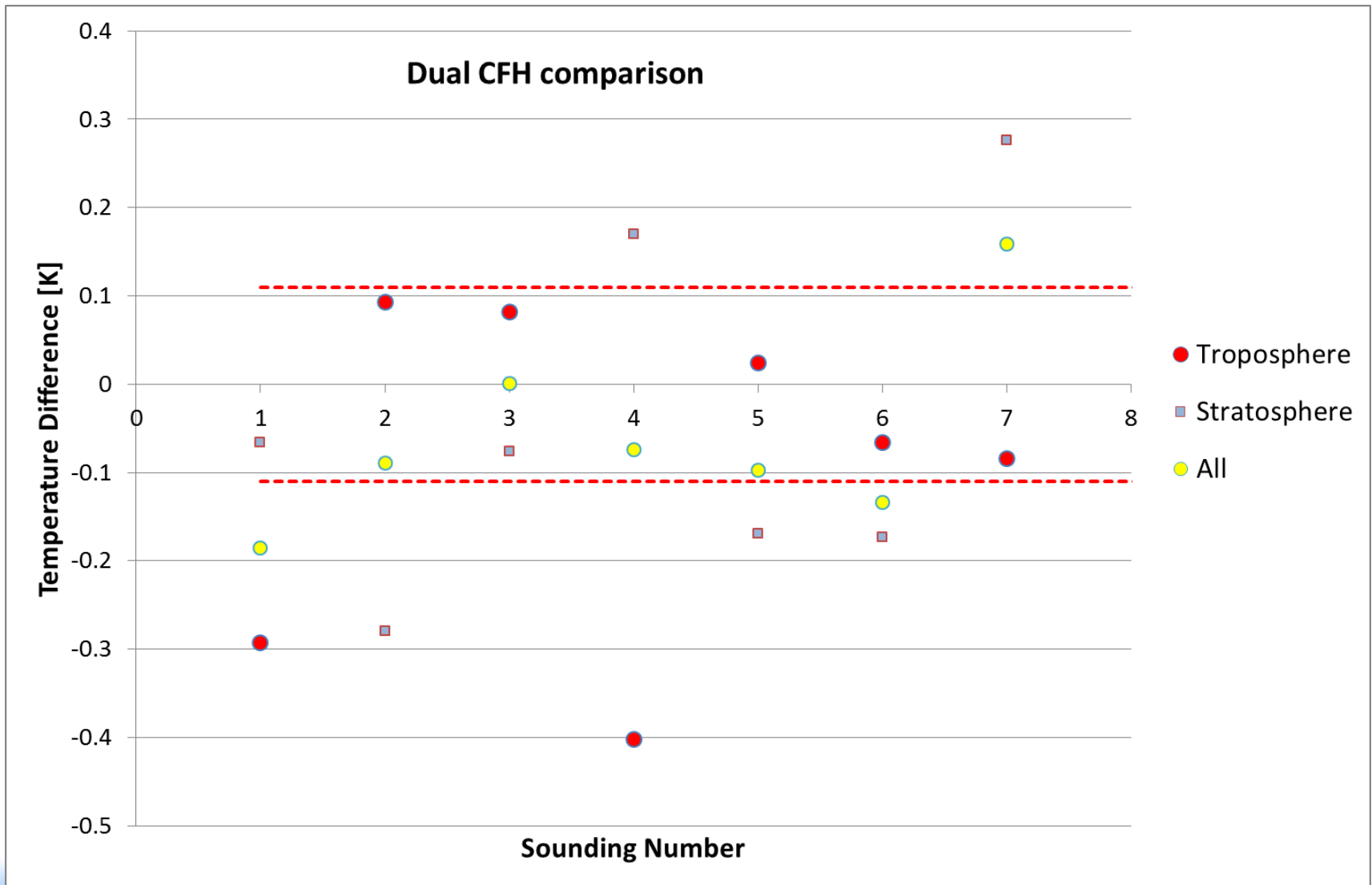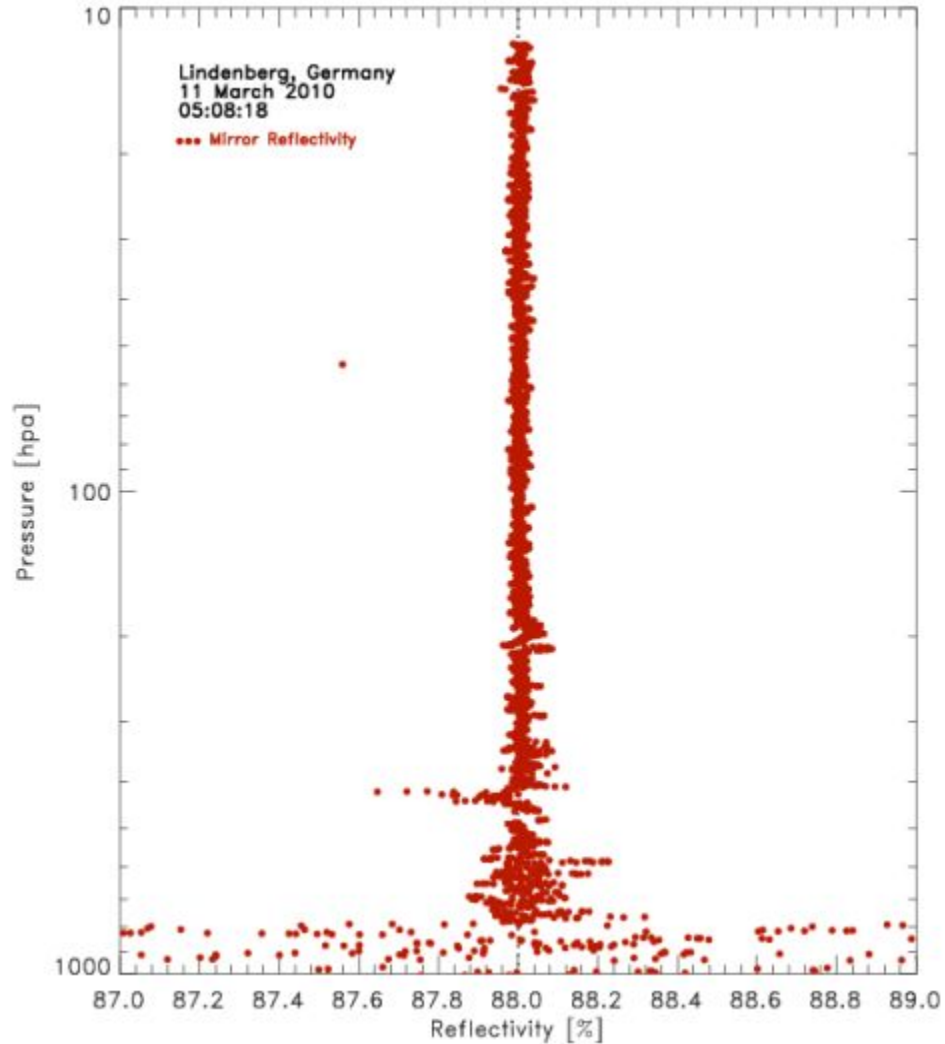
Dual CFH comparison

Lindenberg, Germany
11 March 2010
05:08:18

••• Mirror Reflectivity
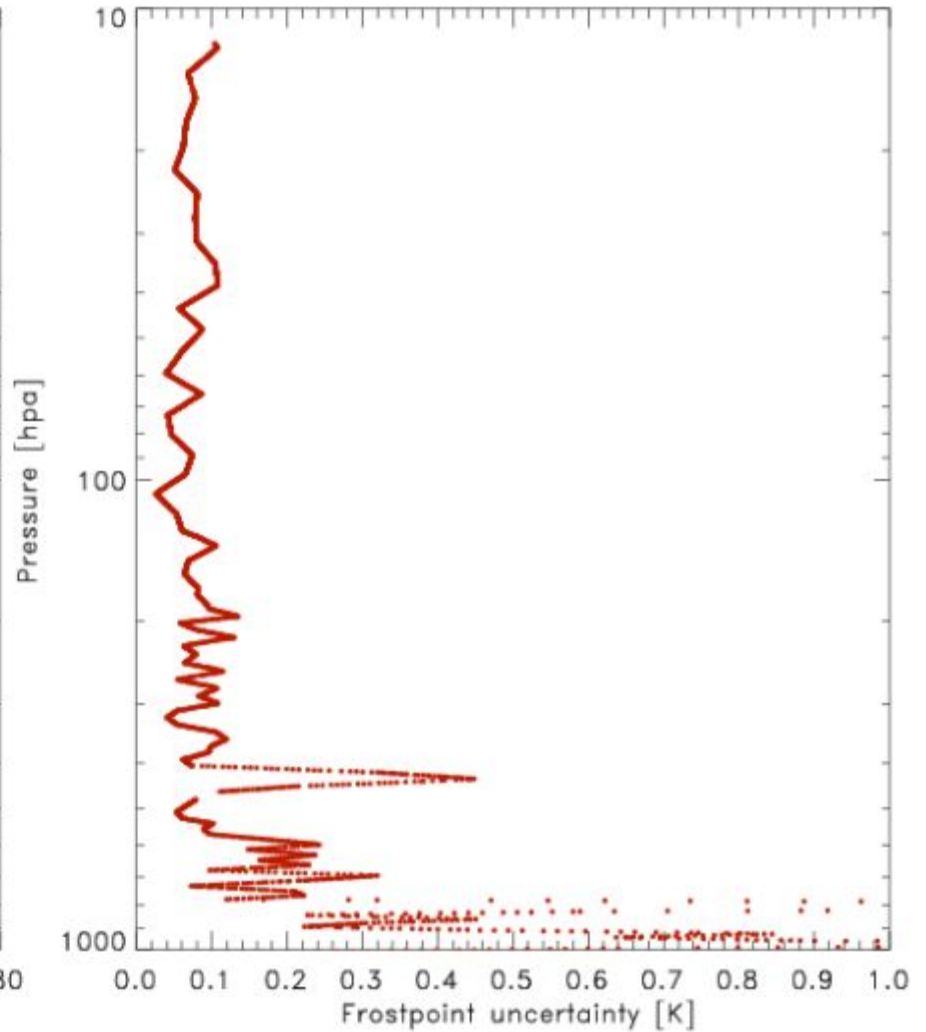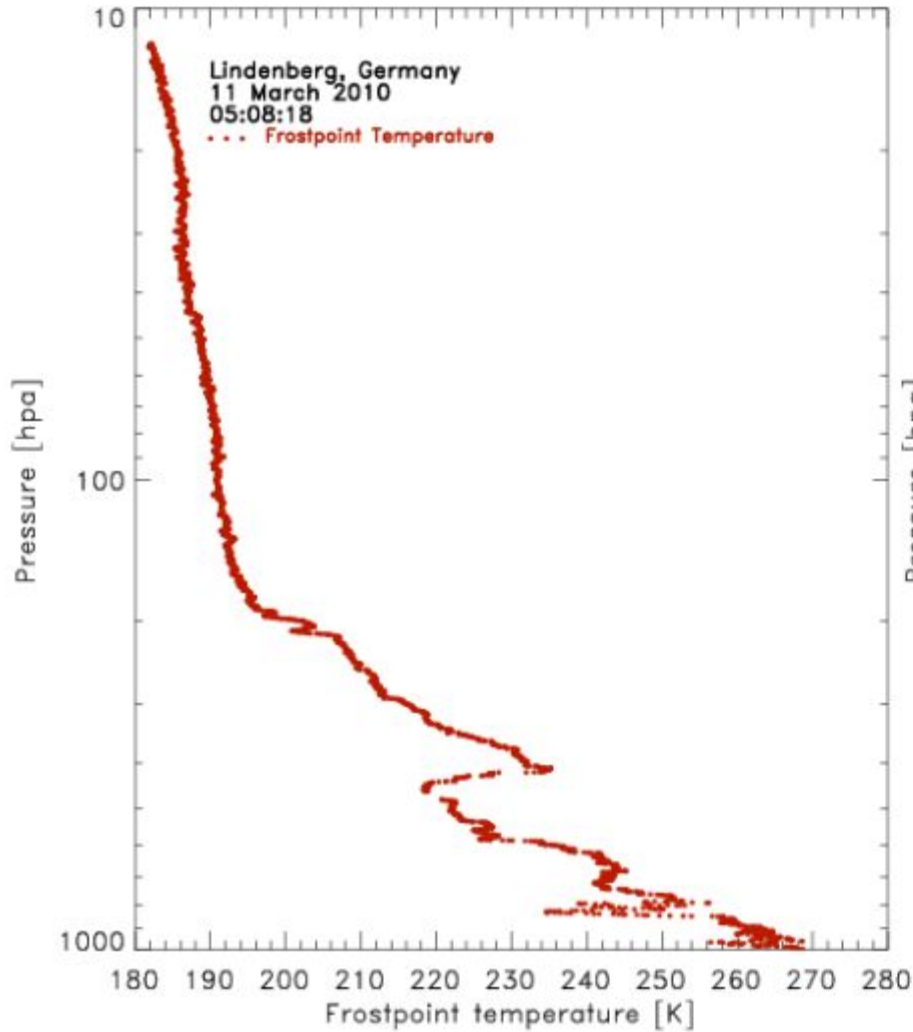
- Implement ground check

- Complete processing routines for CFH

- Merge with RS92 data product

- Publication