



# The ROM SAF multi-mission reprocessing: Temperature and humidity profiles.

J. K. Nielsen <jkn@dmi.dk>, K. B. Laurtsen, S. Syndergaard, H. Gleisner  
Danish Meteorological Institute, Copenhagen, Denmark.

## ROM SAF CDR1

The Radio Occultation Meteorology Satellite Application Facility (ROM SAF) is a decentralized facility under EUMETSAT responsible for delivering radio occultation products for Numerical Weather Prediction (NWP) and climate monitoring. Recent ROM SAF activities have focused on the preparations toward a full reprocessing to generate Climate Data Records (CDRs) from a number of Radio Occultation (RO) missions, namely CHAMP, GRACE, COSMIC, and Metop. Together these missions span more than 15 years of high-quality information about the state and change of atmospheric key variables. A total of 11e6 quality controlled profiles have been processed in CDR1, and are currently subject to validation. Early access can be granted on request at <http://www.romsaf.com>

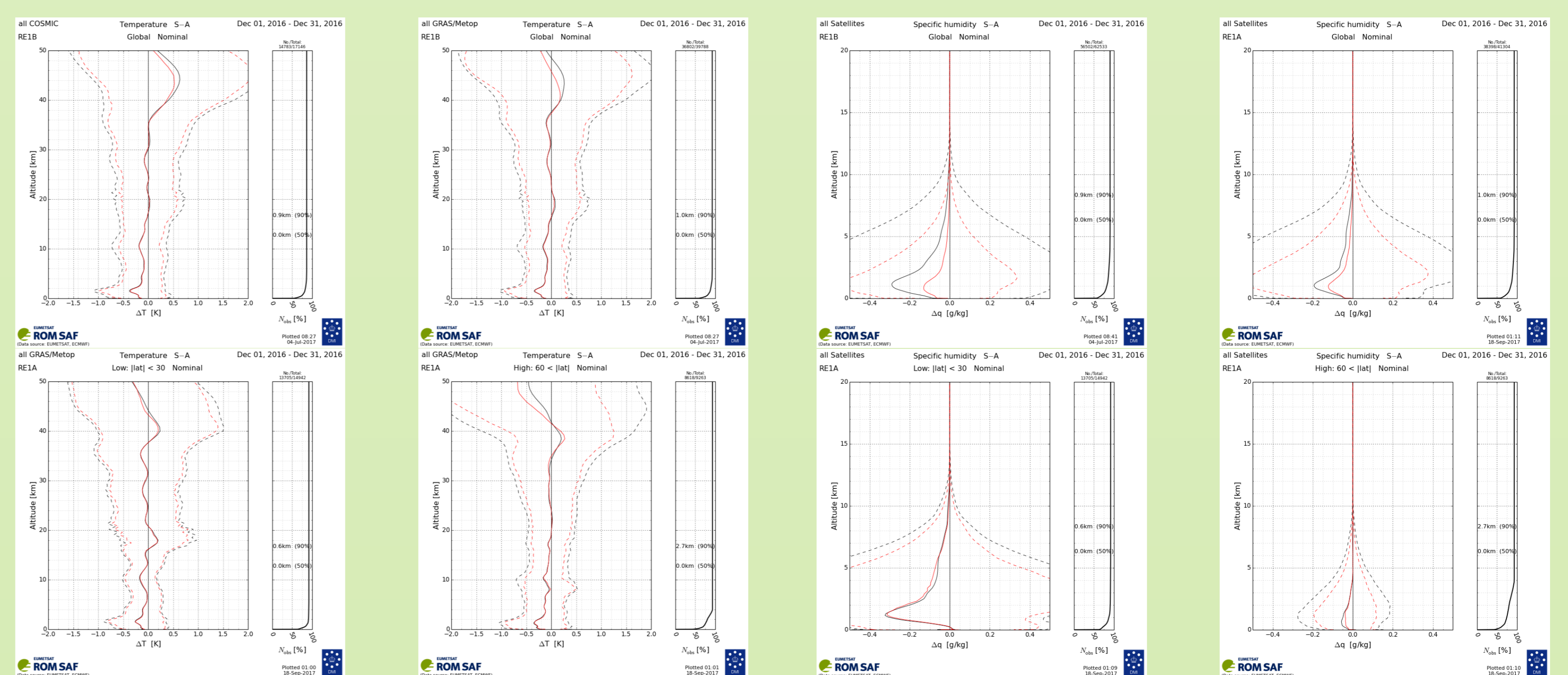
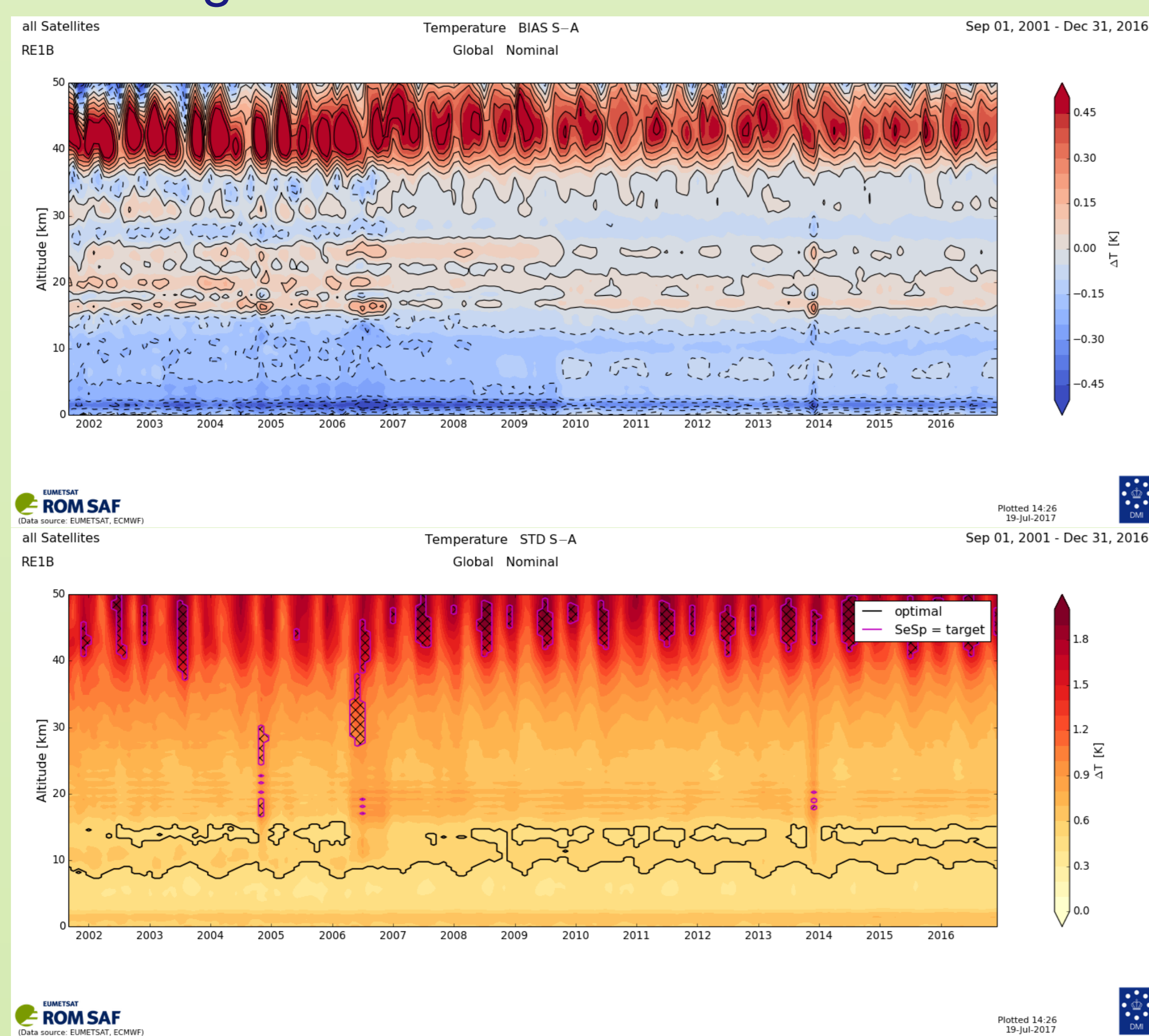
## 1D-Var setup.

Level 2B temperature, specific humidity and pressure have been produced with the ROPP 1D-Var tools. The 1D-Var configuration used for this product includes ERA-I background profiles and ERA-I background error covariance provided by the ECMWF. Due to relatively large specific humidity background error STDV the resulting retrieval is virtually a specific humidity product in the troposphere. A feature of the 1D-Var setup is allowance of negative values of specific humidity, which has been chosen in order to prevent a possible positive bias for small specific humidity values caused by asymmetric elimination negative errors. Two versions of CDR1 are discussed in this poster.

ROM SAF CDR1 vA: the ERA-I humidity error covariance is modelled as zonal mean profiles in 5 degree latitude bands.

ROM SAF CDR1 vB; the humidity background error covariance is calculated using a constant relative error profile.

## Validation against ERA-I



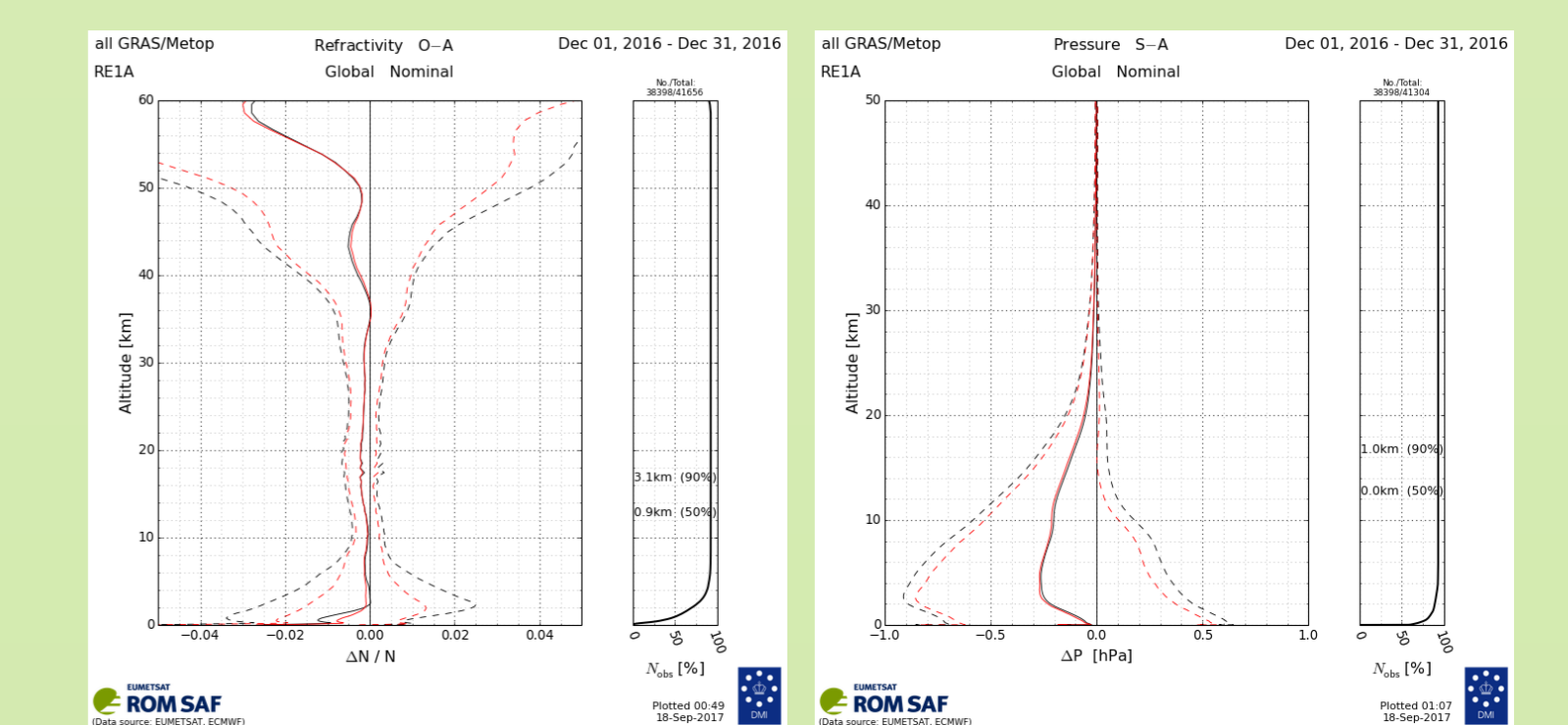
Comparison of temperature retrieval to ERA-I for COSMIC and Metop missions, upper row and Metop tropics and high latitudes (lower row). Dec 2016.

Specific humidity statistics for CDR1 vB, CDR1 vA (upper row) CDR1 vA tropics and high latitudes (lower row). Dec 2016.

Combined 1D-Var temperatures CHAMP, COSMIC, GRACE and METOP compared to ERA-I analysis. Bias and STDV.

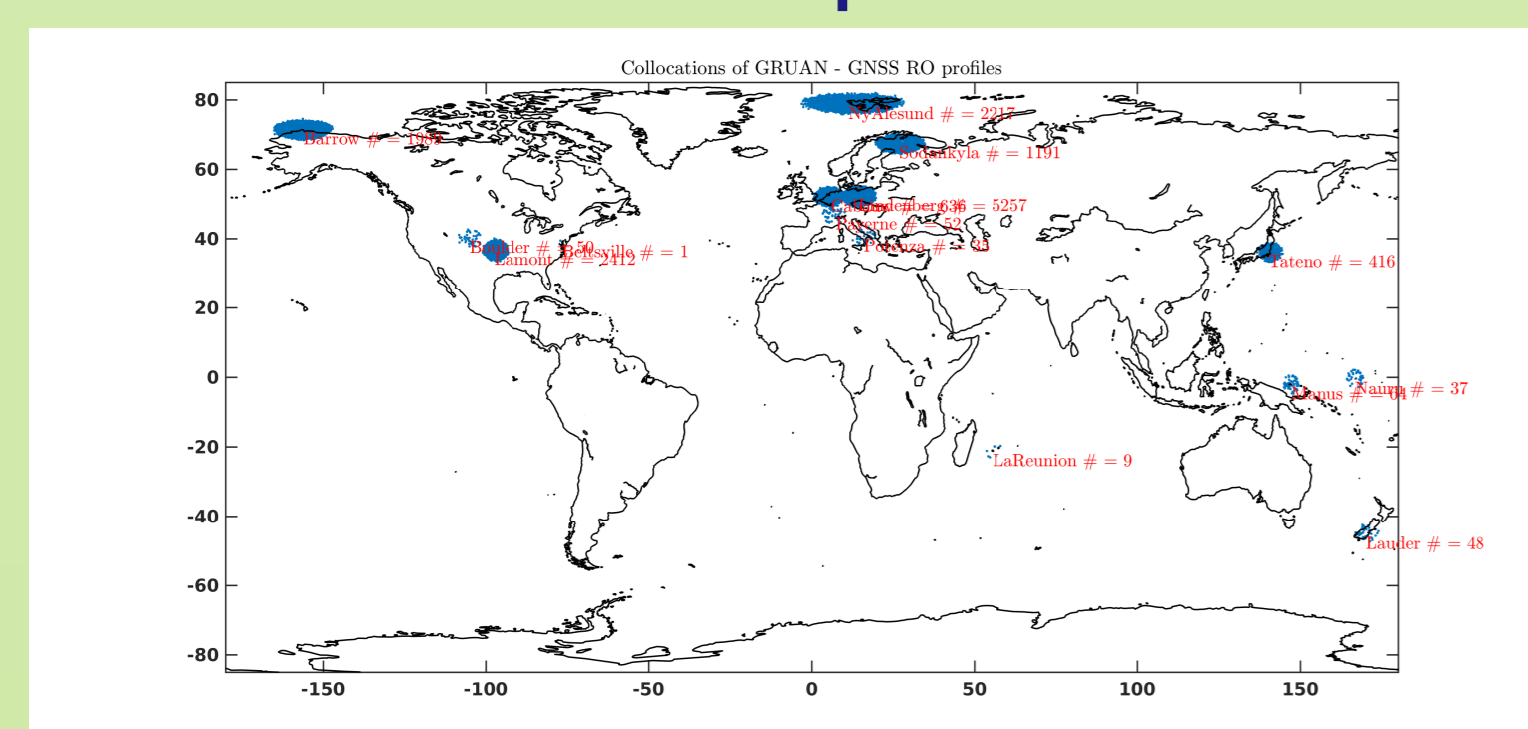
## Conclusions

- The 1D-Var products shows some biases that originates from multiple sources.
- Tropospheric biases in GRUAN validations and ERA-I validations are similar.
- Negative bias in sp. humidity is partly related to negative "bias" in refractivity.
- Negative temperature bias in troposphere is related to geopotential height issue.
- CDR1 vA is still subject to changes and will eventually become the official product.

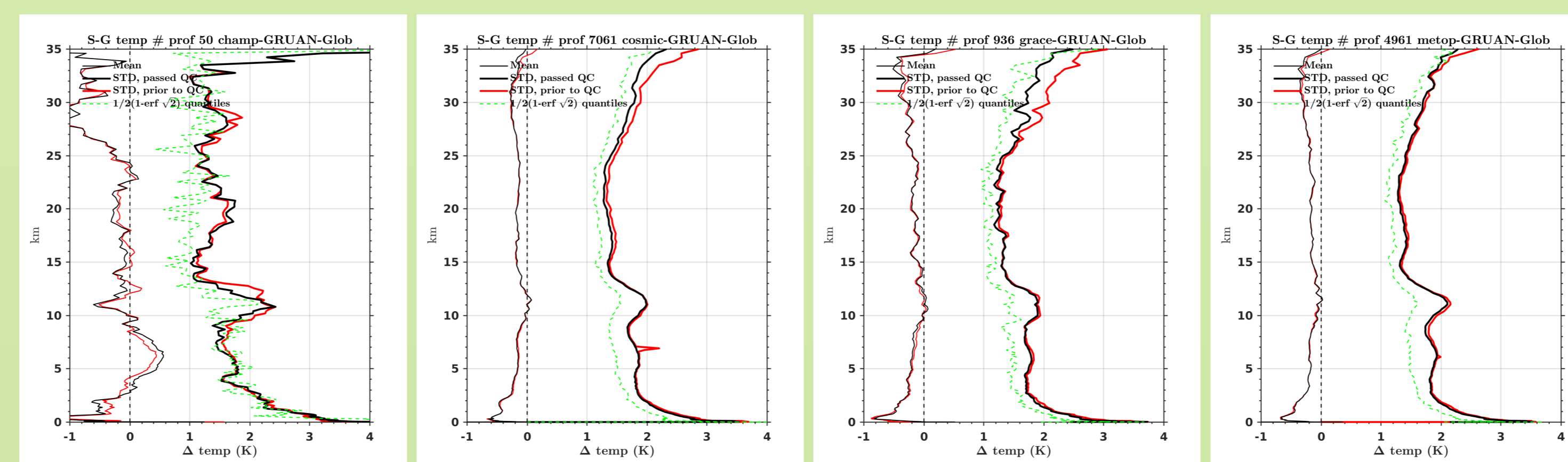


Negative refractivity bias near surface and geopotential height issue seen in pressure.

## RO 1D-Var compared to available GRUAN sondes



RO - GRUAN collocation criterion: Distance < 300 km and time difference < 3 hours.



The CDR1 vB - GRUAN temperature bias structure persist through all four missions, and is consistent with CDR1 vB - ERA-I bias.

## CDR1 vB RO-GRUAN Specific Humidity stats (relative and absolute)

