ON THE IMPACT OF SIGNAL CUTOFF AND SMOOTHING ON SYSTEMATIC AND RANDOM UNCERTAINTY IN RO RETRIEVALS

C. Marquardt, Y. Andres, L. Butenko, A. von Engeln, F. Martin-Alemany, R. Notarpietro, S. Padovan, S. Paolella, and F. Sancho

EUMETSAT

It is probably generally accepted that subjective choices in the setup of a RO processing chain impact the statistics of RO retrievals (e.g., bending angles) when compared to Numerical Weather Prediction data or co-located retrievals from other RO instruments. On the other hand, data from different RO missions or data providers are often compared statistically, with the results subsequently being used to infer the relative merits of *instruments*, or to derive uncertainty estimates which are assumed to be valid for RO data products in general. Also, requirements for instrument performance (or commercial data buys) are regularly expressed in terms of the statistical properties of end products.

Such analyses or requirements do not take the contribution of data processing details into account. We analyse the impact of two such choices - the cutoff of carrier phase signals in the noise-only region of deep occultations and the amount of vertical smoothing applied to bending angles - on both bias and standard deviation against NWP short-range forecasts as well as the penetration of retrievals into the lower troposphere for EPS/GRAS and Spire bending angle data. While we focus on the impact on tropical tropospheric bending angle statistics where we find the largest effect, we also show the variation of statistics due to these modifications in other latitude bands and altitude regions.

Based on the results of several experiments, we conclude that

- Upper altitude SNR is not much related to the penetration of retrievals into the lower troposphere;

- Data exhibiting high carrier phase noise levels (or low SNR) can be processed to exhibit random uncertainty statistics similar to or better than “normally” processed low-noise missions, but at the cost of significantly larger vertical error correlations (and possibly, positive biases in the lower tropical troposphere);

- Simply comparing first-order statitics between different instruments and/or processing scenarios without taking into account the vertical correlations introduced by smoothing hardly allow making judgements on the relative benefits of the said instruments and/or processing approaches.