Generation of Refractivity Climatologies Without Statistical Optimization

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In the generation of refractivity and dry-temperature climatologies from radio occultation (RO) data, the ionospheric corrected bending-angle profiles first undergo *statistical optimization*, i.e. the individual profiles are smoothed and extended upwards using some sort of background, often a bending-angle climatology. This is done to reduce noise and to force the bending-angle profiles to go asymptotically to zero. However, studies have shown that differences in the bending-angle optimization procedures constitute an important source of structural uncertainty. Above 25 kilometers and at high latitudes, it may be the dominating systematic difference between the various processing centers [Steiner et al., 2011].

We will investigate whether it is possible to derive refractivity and temperature climatologies without the statistical optimization, and using a relatively simple extrapolation of the bending angles. We will first average the raw bending angles, without any optimization, and then apply the Abel transform directly on the mean bending-angle field. The main benefit of this approach would be to remove a potential source of structural uncertainty from the processing scheme. It also has the additional advantage of simplifying the processing. Whether this is feasible depends on the bending-angle noise levels remaining after averaging, and on the degree of nonlinearity of the Abel transform.

We here discuss this approach and present preliminary results from a study on processing directly from bending-angle mean fields to refractivity mean fields. The effects of the nonlinearity of the Abel transform are discussed, as well as the upper-level noise reduction obtained by averaging large numbers of non-optimized bending angles.