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Poster
We evaluate and demonstrate the performance of a dynamic statistical optimization algorithm for radio occultation (RO) bending angles recently introduced by Li et al. (2013, dx.doi.org/10.1002/2013JD020763; 2015, dx.doi.org/10.5194/amt-8-3447-2015). This new algorithm uses background and observation error covariance matrices with geographically varying uncertainty profiles and realistic global-mean error correlation matrices. The background uncertainty profiles are estimated from ECMWF short-range forecast and analysis fields, while the observation uncertainty profiles are estimated from or obtained together with observed RO bending angle profiles.

The estimated error covariance matrices are more realistic than in previous algorithms and are therefore poised to provide an improved statistically optimized bending angle and likewise improved high-altitude initialization of the subsequent Abel transform retrieval of refractivity. Furthermore, the method does not only account for atmospheric intra-annual variability, from weekly to annual scales, but also can cope with small inconsistencies from technical upgrades of the ECMWF background data (e.g., increase in vertical model level resolution or start of assimilation of RO data).

We implemented the dynamic algorithm into WEGC's new reference occultation processing system (rOPS) and used simulated MetOp data to show a clean end-to-end cycle and compare statically optimized with dynamically optimized bending angle results to verify the implementation. The respective rOPS bending angle, refractivity and temperature profiles from real CHAMP, GRACE, COSMIC, and MetOp data are then compared with the corresponding UCAR/CDAAC profiles and validated with independent profiles from SABER, MIPAS and radiosondes. The evaluated altitude region starts at 80 km and covers the mesosphere and stratosphere down to 20 km, enabling quite rigorous assessment. We will discuss the results of the climatological evaluation for time periods with special characteristics, to demonstrate the coping with effects of intermittent changes in background information as well as with influences from significant climate variability such as sudden stratospheric warming events.
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