Analyzing structural uncertainty in rOPS and ROPP processing: the chain from bending angle to dry-air atmospheric profiles

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In a joint project of WEGC and the ROM SAF we investigated structural uncertainties within the Level 2a (L2a) processing chain of the radio occultation (RO) retrieval algorithms of two different processing systems, namely the GNSS Processing and Archive Center (GPAC) and the Radio Occultation Processing Package (ROPP) at DMI used for the generation of the first ROM SAF Climate Data Record and the Reference Occultation Processing System (rOPS) used for R&D processing by WEGC, with focus on validation and climate studies. We understand structural uncertainty as the part of the uncertainty emerging in retrieved profiles that derives from different plausible algorithmic choices and numerical implementations in the L2a retrieval steps of rOPS and GRAC/ROPP when we supply both processing systems with identical input data.

1 Schematic Flow

2 Results

2.1 DAR-in rOPS Setup: 1) Refractivity profile interpolated to a 100 m altitude grid. 2) Retrieved (ret.) dry density filled up to 120 km with a log-linear shifted at top of measurement background profile (bg.). 3) rOPS Pressure-Integral in residual mode (diff. profile of ret. minus bg.), integration step 10 m. Figure 2 shows, that only the initialization at 120 km causes differences and reaches a 1% diff. at 60 km and becomes unbiased at 40 km.

2.2 In Figure 1 the input data flow from ROPP to rOPS sub-processes to investigate the structural uncertainty is shown. The error bars in the L2a processing on the High Altitude Initialization (HAI-in), the Refractivity Retrieval (RER-in) and the Dry Air Retrieval (DAR-in) from ROPP data into the rOPS processing system. This enables selective analysis on structural uncertainty of different sub-processes for the bending angle initialization algorithm (optimized bending angle), the different Abel-Integral (refractivity) and the Pressure-Integral (dry pressure) implementations of rOPS and ROPP.

References and Acknowledgments