PROCESSING OF GRAS RAW SAMPLING DATA

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We have analysed GPS radio occultation data from the GRAS instrument onboard the Metop-A satellite. The GRAS receiver is designed for measuring setting and rising occultations with data recorded at 1000 Hz in raw sampling mode. The raw sampling data have been reconstructed by EUMETSAT and RUAG Space and provided for analyses through the ESA study contract no. 21995/08/NL/EL. In this study we report results based on data from the period 30 September - 27 October 2007. Excess phase and amplitude data is processed by wave optics processing to bending angles. The retrieved profiles are validated by comparing to co-located profiles extracted from ECMWF analyses.

We find that the agreement between GRAS and ECMWF profiles is good and the results are similar to comparisons of COSMIC data to ECMWF profiles. Our results show that the fractional bending angle deviation is smaller than 0.3% from about 5 to 30 km. In the lower troposphere in the tropics there is a negative bias that reaches about 5% at impact heights 2-3 km. The size of the negative bias can be minimized by using the data down to the lowest straight-line tangent altitude. A small positive bias at about 4 km can be minimised by performing a radio holographic filtering of the wave optics amplitude prior to the determination of the shadow border. The corresponding figures for the fractional refractivity deviations are as follows: from about 5 to 30 km the deviation is smaller than 0.1%. The negative bias in the tropics is up to -3% at the height 500 m.

We also present simulations for a few selected cases. The simulations are based on geometrical optics propagation through the ECMWF fields using the real observation geometry. Retrieved and simulated profiles for bending angles and dry temperatures are compared and good agreement between them is obtained.