



GPS radio occultation with GRACE: atmospheric profiling utilizing the zero-difference technique

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Together with the geo-research satellite CHAMP (CHALLENGING Minisatellite Payload), the GRACE-A and GRACE-B (Gravity Recovery and Climate Experiment) satellites constitute a new constellation of satellites for global atmospheric remote sensing. During 25 hours from 6:03 UTC on 28 July 2004 to 7:09 UTC on 29 July 2004 the GPS radio occultation receiver aboard the GRACE-B satellite was activated to perform test measurements and 109 setting occultation events were observed. The stability of the GRACE-B receiver clock significantly exceeds the clock stability aboard CHAMP allowing for the retrieval of excess phase paths using zero-differencing, i.e. the calibration process using carrier phase observations from a reference GPS satellite is not needed. Hence, the usage of ionospheric correction procedures for the derivation of excess phase paths is obsolete.

Comparisons of refractivity profiles obtained by zero-differencing with results calculated with the standard single-difference method yield good agreement with an average fractional refractivity deviation below 1% and a 1-sigma standard deviation of 2–3% at altitudes below 35 km. Both data sets are consistent with co-located ECMWF meteorological analyses.