

DETECTION AND ANALYSIS OF GPS RADIO OCCULTATION SIGNALS UNDER MULTIPATH CONDITIONS: RESULTS FROM SIMULATION STUDIES

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Sounding Earth's atmosphere by GPS radio occultation are key objectives of several satellites launched during the last two years. First results from the CHAMP satellite indicate that temperature profiles with good accuracy (about 1.5 K) and high vertical resolution are obtained at altitude ranging from the mid-troposphere to the upper stratosphere. In the lower troposphere, however, occurrences of multipath ray propagation cause strong phase fluctuations which are hard to track by current receiver instruments.

Recently, the canonical transform (CT) method has been introduced to solve the problem of calculating bending angle profiles within sub-caustic zones. Equally important, the CT method provides a diagnostic tool to assess measurement data quality. Multiple phase screen simulation studies using refractivity profiles derived from high-resolution radiosonde measurements demonstrate that the CT method accurately reproduces the true refraction angle profile even under severe multipath conditions. However, inserting a software implementation of a GPS receiver into the simulation chain causes significant deviations between true and retrieved refractivity. Similar deviations with respect to sign and magnitude are found in CHAMP radio occultation data processed with the CT method suggesting that the GPS receiver tracking algorithm contributes to the observed refractivity deviations. We present first results from the simulation studies and evaluate modifications and changes to the receiver tracking algorithms.