Recent Kwajalein Atoll Radio Science Studies

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Abstract

In September of 2007 and 2008, we conducted several incoherent scatter radar (ISR) data collections at Kwajalein Atoll. Some of the 2007 measurements corresponded to COSMIC/FORMOSAT-3 satellite GPS occultations that occurred within the steerable ISR field of view. Of six targeted occultations during the experiment period, three yielded simultaneous radar and occultation-derived ionospheric electron density profiles (EDPs) to be compared. The novel features of this set of EDP comparisons are at least three-fold. Firstly, we specifically targeted occultations where the "tangent point" remained within the ISR's field of view for an extended period. Secondly, we conducted further radar scans around the time of the occultation to establish additional geophysical context. Finally, Kwajalein Atoll lies between the magnetic equator and the northern equatorial ionization anomaly crest, one of the most challenging regions for ionospheric occultation inversion due to the presence of horizontal gradients in electron density and the potential for equatorial spread-F (ESF) disturbances. In particular, the presence of mild ESF significantly distorted the occultation-derived EDP on 16 September 2007. In order to validate GPS radio occultation as a technique for monitoring the global ionosphere it will be necessary to understand its limitations. The case study presented provides additional insight into the behavior of occultation-derived EDPs in near-equatorial regions. This talk will encompass the more recent field experiment as well. During September 2008 we conducted radar and other radio measurements as a field experiment studying ESF formation and development in conjunction with Communication/Navigation Outage Forecasting System (C/NOFS) satellite measurements. The 2008 experiment included GPS total electron content (TEC) and tri-band (150, 400, 1067 MHz) measurements from multiple sites. This talk will present an experiment summary and some initial results from the September 2008 measurements.