

#4 Received 11/08/2014

Brahmanandam, Potula Sree¹; Chu, Y H¹; Uma, Gouthu¹; Jens, Wickert².

1. Institute of Space Science, National Central University, Chung-Li, Tao Yuan Taiwan

2. GFZ German Research Center for Geosciences, Potsdam, Germany

On deletion of questionable electron density profiles retrieved using the COSMIC radio occultation (RO) technique

Abstract:

The crucial assumption made in the retrieval of radio-occulted atmospheric parameters based on the Abel transformation is the spherical symmetry of the atmospheric refractive index, which implies that no horizontal gradient of the refractive index exists along the spherical shell. Nevertheless, the presence of density irregularities will lead to scintillation and multipath effects that often create highly fluctuating and random electron density profiles. In this study, it is proposed a reliable approach to remove questionable electron density profiles retrieved using the COSMIC RO technique basing on two parameters, namely, the gradient and fluctuation of the topside density profile. Statistics of seven year density profiles (July 2006 – May 2013) show that, on average, 98% of the electron density profiles have upper electron density gradients and electron density fluctuations smaller than $-0.02 \text{ #/m}^3/\text{m}$ and 0.2, respectively, which can be treated as good data for further analysis. Though the percentage of questionable data are too meager (only 2%), global comparisons between density profiles before and after the removal of questionable data have revealed few differences. The computed gradients and fluctuations of the topside ionosphere electron density profiles have shown few important features including solar activity dependency and pronounced variations between around +400 and -400 latitudes. After the removal of questionable profiles, an analysis made between peak densities and heights of the ionosphere F layer during different seasons of years 2007 and 2012 revealed several important features. The important aspect of our algorithm is that it removes questionable electron density profiles effectively without relying on any model and other observations.