

Improvement of Retrieval Accuracy of Ionospheric E Region Electron Density from GPS Radio Occultation Technique for COSM

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It is widely accepted that the use of GPS radio occultation (RO) technique to retrieve ionospheric E region electron density suffers major disadvantage of considerably large retrieval error. In this study, we propose a method to significantly reduce the GPS RO retrieval error of the ionospheric E region electron density. On the basis of IRI model and orbital data of the COSMIC satellites, we first calculate the calibrated total electron content of the GPS signal piercing through the IRI model. The calibrated total electron contents for IRI model during the simulated radio occultation of the COSMIC satellites are then converted into the electron density profile in accordance with Abel transformation. The simulated retrieval errors of the E region electron density of the IRI model are estimated by calculating the difference of the electron densities between IRI model and the simulated GPS RO retrieval. After subtracting the simulated IRI retrieval error from COSMIC-measured electron density, we find that the resultant E region electron densities are in general agreement with the ionosonde measurements. With this procedure, the GPS RO retrieval accuracy of the E region electron density can be greatly improved by a factor ranging from 1.5 to 8, depending on season and geomagnetic latitude region.

Keywords: GPS Radio Occultation, E Region Electron Density, Retrieval Error, IRI Model