DIAGNOSTICS OF HEIGHT DISTRIBUTION OF THE IONOSPHERE ELECTRON DENSITY ON THE BASE OF FORMOSAT 3 / COSMIC MEASUREMENTS

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The Radio Occultation technique using GPS signals has been proven to be a promising technique to retrieve accurate profiles of the ionospheric electron density with high vertical resolution on a global scale. Formosat-3/COSMIC (Constellation Observing System for Meteorology, Ionosphere and Climate) is a joint scientific mission between Taiwan and the U.S.A. The mission placed six small micro-satellites into six different orbits at 700~800 kilometer above the earth surface. Each microsatellite has a GPS Occultation Experiment payload to operate the ionospheric radio occultation (RO). With the ability of performing both rising and setting occultation, Formosat-3/COSMIC has been producing about 2000 profiles of the ionospheric electron density per day – much more than ever before.

In the given paper we used the ionograms recorded by European ionosonde stations for 2007-2008 years and compare these ground measured data with the GPS COSMIC radio occultation ionospheric profiles. This result is important to validate the reliability of the COSMIC ionospheric observations using the radio occultation technique and for the ionosphere diagnostics in the places where ground-based stations do not exist.

The comparison of RO data with measurements provided by European ionosondes indicates that usually COSMIC RO profiles are in a good agreement with ionosonde's profiles both in the F2 layer peak electron density (NmF2) and the bottom side part of the profiles. The coincidence of profiles is better in the cases when projection of the ray path of tangent points is closer to the ionosonde location. Practically for all analyzed cases there are observed the understated values of electron density in the topside part of the ionosonde's profiles in compare with RO profiles. As the topside ionosonde profile is obtained by fitting a model to the peak electron density value, the COSMIC radio occultation measurements can make an important contribution to the investigation of the topside part of the ionosphere. For additional comparison we used the data from European GPS network and model calculation by IRI 2007.

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