Validation of High Latitude Electron Density Measurements from COSMIC Radio Occultations under Disturbed Ionospheric Conditions

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COSMIC (Constellation Observing System for Meteorology, Ionosphere and Climate) is an extremely powerful system to study the layered structures of ionosphere. Its aim is to obtain global and continuous electron density profiles, which have not been achieved by any other traditional tools. Papers have been published to validate the accuracy of RO measurements (such as Lei et al. [2007] [Hajj, et al., 2000] [Hajj, et al., 1998]) for extensive datasets. In this work further such studies will be conducted. Electron densities retrieved from COSMIC by CDDAC will be compared with those measured by incoherent scatter radars (ISR) under disturbed ionospheric conditions with a particular focus on high latitude regions. COSMIC RO will be selected from year 2007 disturbed nighttime events with co-located ISR observations available. Data from high latitude ISR (eg: PFISR, Millstone, and EISCAT) will be chosen using the Madrigal dataset. High latitude auroral scintillation RO events usually are associated with sporadic E layer at an altitude around 110 km - which produces signal fluctuations in receiver voltage amplitude and phases during the GPS-LEO occultation. The purpose of this analysis is to specifically validate COSMIC ionospheric electron density measurements for active conditions since auroral scintillation is a concern for satellite-based navigation systems at high latitudes. Results show that electron density profiles retrieved from COSMIC RO are reliable for ionospheric scintillation studies and can be included in space weather forecasting and ionosphere modeling for instabilities associated with scintillation conditions.


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