Space Science Seminar
Tuesday, 2022 October 18
10:30 a.m.
NASA/MSFC TEAMS

Design and Performance Validation of Artificial Neural Network (ANN)-based Total Electron Content (TEC) Models for Low-latitude Regions of Earth's Ionosphere

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Host: Dr. Alphonse Sterling (Sponsored by NASA/MSFC/ST13)

The ionosphere is a part of the earth's atmosphere which consists of charged particles alongside the neutral molecules, which affect the transionospheric satellite-based navigation signals such as Global Positioning System (GPS) adversely. In order to mitigate these problems, accurate predictions of ionospheric Total Electron Content (TEC) are essential. Equatorial or low latitude ionization can be characterized by its sharp day-to-day, diurnal and latitudinal variations. It also shows two specific phenomena such as Equatorial Ionization Anomaly (EIA) and post-sunset ionospheric irregularities. Standard ionospheric models based on midlatitude data are not efficient enough to predict the dynamic nature of the low latitude ionization. Efforts are given to design Artificial Neural Network (ANN)-based TEC models using local Global navigation satellite system (GNSS) data at Indian and South Asian longitude sectors. Performances of these models are compared alongside standard ionospheric models such as International Reference Ionosphere (IRI), Parameterized Ionospheric Model (PIM) and NeQuick during different solar activity periods. The effects of incorporation of neutral winds as model inputs are also observed. Initially the models are designed for geomagnetically quiet periods (Dst $\geq$ -50nT). Currently, efforts are also given in order to design models during geomagnetically disturbed periods.

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