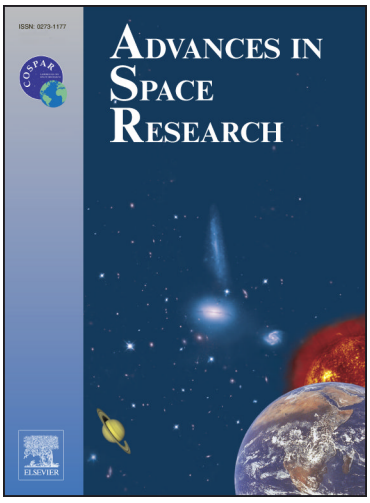

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Performance evaluation of Linear Time-Series Ionospheric Total Electron Content Model over Low latitude Indian GPS Stations

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Abstract

Precise modeling of the ionospheric Total Electron Content (TEC) is a critical aspect of Positioning, Navigation, and Timing (PNT) services intended for the Global Navigation Satellite Systems (GNSS) applications as well as Earth Observation System (EOS), satellite communication, and space weather forecasting applications. In this paper, linear time series modeling has been carried out on ionospheric TEC at two different locations at Koneru Lakshmaiah University (KLU), Guntur (geographic 16.44° N, 80.62° E; geomagnetic 7.55° N) and Bangalore (geographic 12.97° N, 77.59° E; geomagnetic 4.53° N) at the northern low-latitude region, for the year 2013 in the 24th solar cycle. The impact of the solar and geomagnetic activity on periodic oscillations of TEC has been investigated. Results confirm that the correlation coefficient of the estimated TEC from the linear model TEC and the observed GPS-TEC is around 93%. Solar activity is the key component that influences ionospheric daily averaged TEC while periodic component reveals the seasonal dependency of TEC. Furthermore, it is observed that the influence of geomagnetic activity component on TEC is different at both the latitudes. The accuracy of the model has been assessed by comparing the International Reference Ionosphere (IRI) 2012 model TEC and TEC measurements. Moreover, the absence of winter anomaly is remarkable, as determined by the Root Mean Square Error (RMSE) between the linear model TEC and GPS-TEC. On the contrary, the IRI2012 model TEC evidently failed to predict the absence of winter anomaly in the Equatorial Ionization Anomaly (EIA) crest region. The outcome of this work will be useful for improving the ionospheric now-casting models under various geophysical conditions.

Keywords: GNSS, TEC, Modeling, IRI, India

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