TEC variations during low to high solar activity period (2010 - 2014) for ascending phase of 24th solar cycle under the northern crest of the equatorial ionization anomaly region in the Indian sector

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Abstract

The measurement of ionospheric TEC (total electron content) is conducted at a low latitude Indian station Surat (21.16N, 72.78E), which lies under the northern crest of equatorial anomaly region. The data obtained are for a period of five years from low to high solar activity (2010-2014) using GPS (Global Positioning System) receiver. In this study we report the diurnal and seasonal variation of TEC, dependence of TEC with solar activity, geomagnetic condition and EEJ strength. From seasonal analysis it found that greater values of TEC were observed during equinox months followed by winter and summer. The appearance and disappearance of "winter anomaly" were observed at the station for different years. The correlation of seasonal and annual variation of TEC with different solar indices, i.e. solar EUV flux, F10.7cm solar radio flux and Zurich sunspot number (SSN) has been obtained. It can be concluded that the solar index EUV flux is a better indicator of TEC, compared to F10.7cm flux and SSN for low to high solar activity period (2010-2014). In order to see the response of geomagnetic condition on TEC we obtain Percentage deviation TEC(%) during the disturbed days and quiet days is found to be highest in equinox season in comparison to that in the winter and summer season. Moreover, for both quiet and disturbed conditions the standard deviation of TEC is high and it increases with increase in solar activity (2010-2014). From the statistical correlation between TEC and EEJ strength, we found positive correlation coefficient for the year 2010 (r=0.73), 2011 (r=0.60), 2012 (r=0.76) and 2013 (r=0.80).