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STUDY OF TOTAL ELECTRON CONTENT VARIATIONS OVER EQUATORIAL AND LOW LATITUDE IONOSPHERE DURING EXTREME SOLAR MINIMUM

Kavita Sharma[*], R.S. Dabas[*], R. M. Das[*], S.K. Sarkar[*] and Sudha Ravindran[†]

[*] Radio & Atmospheric Sciences Division, National Physical Laboratory
New Delhi-110012, India
[†] Space Physics Laboratory, Vikram Sarabhai Space Center
Thiruvananthapuram-695 022, India
sharmak@nplindia.org

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Abstract: In the recent years with the advancement in satellite based navigational applications, study of Total Electron Content (TEC) has gained significant importance. It is well known that due to dynamical behaviour of the equatorial and low latitude ionosphere, the levels of ionization is relatively high herein. The dual frequency signals from the GPS satellites continuously recorded at Delhi (a low latitude station) and Trivandrum (an equatorial station) have been analyzed to study the TEC variations during the extremely low solar activity period from January 2007 to June 2009. This study presents the diurnal, seasonal and solar activity variations of TEC as well as the response of low latitude ionospheric TEC to a major geomagnetic storm. The diurnal variation of TEC shows a short-lived day minimum which occurs between 0500 to 0600 LT at both the stations. Delhi TEC values show its steep increase and reach at its maximum between 1200 and 1400 LT, while at the equator the peak a broad peak occurred around 1600 LT. Further, the diurnal variations in TEC show a minimum to maximum variation of about 5 to 40 TEC units at Trivandrum and about 10 to 40 TEC units at Delhi, which correspond to range delay variations of about 1 to 8m at the GPS L1 frequency of 1.575 GHz. At both the locations, Maximum TEC values were observed during Equinoctial months (March, April, September, October), minimum during the Winter months (November, December, January, February) with intermediate values during Summer months (May, June, July, August), showing a semiannual variation. Also the TEC values have been decreasing since 2007 onwards showing positive correlation with solar activity. This study also demonstrates the

low latitude ionospheric response of TEC to a space weather event that occurred on December 15, 2006. Within a few hours of the time when the enhanced interplanetary electric field impinged on the magnetopause, the total electron content at Delhi increases by ~40% from the monthly median values for the this event.