



A comprehensive study of 30 geomagnetic storms of solar cycle 24 using NavIC and GPS satellite observations over low latitude Indian region

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Abstract

Geomagnetic storm induced ionospheric disturbances can severely impact navigation and communication systems. As each storm is unique in terms of its local impact, it is of utmost importance to characterize its ionospheric response. In this study, we have investigated the low latitude ionospheric responses of 30 geomagnetic storms of solar cycle 24 using dual frequency NavIC and GPS total electron content (TEC) for 2016-2018. The geomagnetic storms are categorized as weak, moderate and strong based on the minimum Dst Index. The interplanetary origins of the geomagnetic storms are obtained from existing literature. The variation in TEC due to geomagnetic storms are estimated with respect to the mean TEC of the quietest days of the month. Longitudinal asymmetries in TEC response to geomagnetic storms are determined using three geostationary satellites of NavIC. The geostationary link provides continuous monitoring of temporal evolution of various storm time effects, which is not possible using GPS as it is a moving link. Various effects such as positive and negative storm effect, traveling ionospheric disturbance (TID), TEC depletions etc. are observed and elucidated based on occurrence time, strength and the interplanetary conditions of the storm, its induced disturbances and local ionospheric conditions. TEC variations during different phases of storm are also investigated and classified. Statistical results and the extreme effects of those geomagnetic storms and the responsible mechanism will be presented.

Keywords: Geomagnetic storm, NavIC, GPS, Low latitude ionosphere.