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[Abstract]

Geomagnetic Storm Impacts on the Ionosphere in Solar Cycle 25

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Abstract: Interactions between the Sun and Earth play a critical role in shaping the near-Earth space environment, particularly during periods of enhanced solar activity. Geomagnetic storms, triggered by solar eruptions such as coronal mass ejections (CMEs), can significantly disturb Earth's magnetosphere and ionosphere. In this study, we investigate the ionospheric response to selected geomagnetic storm events that occurred during Solar Cycle 25. Hourly K_p and Dst geomagnetic indices are analyzed alongside global Total Electron Content (TEC) maps obtained from GNSS-based products. The results

demonstrate clear ionospheric anomalies correlated with storm intensity, highlighting short-term increases and irregularities in electron density. These findings emphasize the importance of continuous space weather monitoring, as ionospheric disturbances can impact navigation and communication systems. This work provides a regional perspective by focusing on the mid-latitude ionosphere, contributing to the understanding of Sun–Earth interactions during periods of heightened solar activity.

Keywords: Solar activity, Solar observations, Solar Cycle 25