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CLIMATOLOGY OF IONOSPHERIC IRREGULARITIES DURING SOLAR CYCLE 24

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The ionosphere, a dynamic region of the earth's upper atmosphere experiences a rapid fluctuations in electron density. These small perturbations can severely impact the trans- mission of radio signals through the ionosphere manifesting scintillation, signal delays, power grid failures, loss of lock in GPS receivers and other navigation issues. This work aims to investigate the climatology of ionospheric irregularities specifically, Rate of Total Electron Content Index (ROTI) in Nepal during solar cycle 24 to understand its spatio- temporal characteristics. For this study, dual frequency GPS data were accessed from UN- AVCO for two GPS stations in Nepal namely, CHLM (28.2072◦N, 85.3141◦E) and NPGJ (28.1172◦N, 81.5953◦E) from 2008 to 2018 to derive the ROTI values and assess their variations at different temporal scales. The analysis of the ROTI variations for CHLM and NPGJ along with sunspot numbers during the period of 2008 to 2018 revealed promi- nent peak for ROTI value ≥ 0.06 TECU/min on the year 2014 (solar maximum) implying that a period of high solar activity is attributed to the occurrence of ionospheric irregular- ities in Nepal. Furthermore, daily, monthly and seasonal variations in ROTI during solar minimum(2008) and solar maximum (2014) showed similar pattern for both the stations with utmost peak in ROTI value evident during april/march (spring equinox) and lower ROTI values during summer solstice(June-July) leading to the high possibility of iono- spheric perturbations during equinox periods. Equinoctial asymmetry was also distinct for both the stations during both phases of solar cycle 24. Similarly, we computed the correlation coefficient and R squared value between ROTI values of the two stations. It was found to be 0.69 and 0.47 respectively for both the phases of solar cycle 24.
Keywords: Ionospheric Irregularities, Ionospheric scintillations, Equatorial Plasma Bubbles, Rate of Change of Total Electron Content (ROTI), Rayleigh Taylor instability.

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