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Solar Flux Effects on the Variations of Equatorial Electrojet (EEJ) and Counter-Electrojet (CEJ) Current across the Different Longitudinal Sectors during Low and High Solar Activity

This study examined the effect of solar flux (F10.7) and sunspots number (R) on the daily variation of equatorial electrojet (EEJ) and morning/afternoon counter electrojet (MCEJ/ACEJ) in the ionospheric E region across the eight longitudinal sectors during quiet days from January 2008 to December 2013. In particular, we focus on both minimum and maximum solar cycle of 24. For this purpose, we have collected a 6-year ground-based magnetic data from multiple stations to investigate EEJ/CEJ climatology in the Peruvian, Brazilian, West & East African, Indian, Southeast Asian, Philippine, and Pacific sectors with the corresponding F10.7 and R data from satellites simultaneously. Our results reveal that the variations of monthly mean EEJ intensities were consistent with the variations of solar flux and sunspot number patterns of a cycle, further indicating that there is a significant seasonal and longitudinal dependence. During the high solar cycle period, F10.7 and R have shown a strong peak around equinoctial months, consequently, the strong daytime EEJs occurred in the Peruvian and Southeast Asian sectors followed by the Philippine regions throughout the years investigated. In those sectors, the correlation between the day Maxima EEJ and F10.7 strengths have a positive value during periods of high solar activity, and they have relatively higher values than the other sectors. A predominance of MCEJ occurrences is observed in the Brazilian (TTB), East African (AAE), and Peruvian (HUA) sectors. We have also observed the CEJ dependence on solar flux with an anti-correlation between ACEJ events and F10.7 are observed especially during a high solar cycle period.

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