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Variability of the Equatorial Ionization Anomaly on seasonal and day to day time scales

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The Equatorial Ionization Anomaly (EIA) is a persistent feature of the F layer, around 300 km altitude in the thermosphere, generated by the E-region dynamo driven equatorial fountain. When the EIA is present, electron densities on either side of the magnetic equator will become much higher during the local afternoon times. In our study we want to quantify short term EIA variability due to atmospheric, solar, and geophysical sources. Short-term anomalies in EIA region total electron content (TEC) from GPS-derived global ionosphere maps (GIM) at 105 degree West longitude are compared to anomalies in three different geophysical sources: solar flux (F10.7 solar flux proxy), geomagnetic storms (Kp index), and atmospheric zonal winds near the semidiurnal tidal peak at northern mid-latitudes (GAIA assimilative general circulation model). We present spectral and coherence analysis of EIA TECs and the aforementioned geophysical indices in 2008 and 2012, to illustrate the variability on seasonal and day to day time scales. The variability of the F10.7 solar flux proxy is dominated by 23-27 day periodicities. The Kp index indicates significant 9 day periodicities in 2008 for entire year, though 2012 is dominated by significant variations with 9-13 day periods during equinox and 5-7 day periods during boreal summer. F10.7 and Kp index both demonstrate good coherence with EIA TECs during specific seasons. With regard to the neutral zonal winds, TECs at the equator show good coherence with 100 km mid-latitude zonal winds in the same longitude region at specific planetary wave periods during the certain local times, suggesting modulation of the E-region dynamo.

キーワード: Equatorial Ionization Anomaly, ionosphere, mid-latitude, planetary wave, Kp index, E-region dynamo
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