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Equatorial ionization anomaly in the low-latitude topside ionosphere: Local time evolution and longitudinal difference

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We constructed an empirical model of topside ionospheric ion density (Ni) using ROCSAT-1 and DMSP Ni measurements according to the empirical orthogonal function (EOF) method. The climatology characteristics of the latitudinal structure of topside Ni were investigated in detail in terms of model Ni. Equatorial ionization anomaly (EIA) double-peak structure may exist at 600 km, depending on longitude, local time, season, and solar activity; while it is not a prevalent characteristic at 840 km even at solar maximum sunset. Local time evolution of the EIA at 600 km was presented. The double-peak structure begins to appear at noontime, being later than the appearance of the EIA in F2-peak region. The pronounced EIA induced by the strong prereversal enhancement at solar maximum begins to appear at 19:00 LT and can last to pre-midnight; EIA crest-to-trough ratio (CTR) is largest (lowest) at March equinox (June solstice) and reaches a maximum at 20:00 LT in all seasons. EIA structure shows evident longitudinal difference. Pronounced EIA exists around about 100°E at 13:00 LT at the two equinoxes and June solstice, while it exists at more extensive longitudes (about 90°E to 240°E) at December solstice. The trans-equator plasma transport induced by neutral winds can weaken the double-peak structure in the topside ionosphere. The longitudinal difference in the EIA structure at 600 km is related to the longitudinal variations of equatorial upward plasma drift and geomagnetic declination.