

Variations of scale height at F-region peak based on ionosonde measurements during solar maximum over the EIA region

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Scale height is an important parameter in characterizing the shape of the ionosphere and its physical processes. In this study, we attempt to examine and discuss the variation of scale height, H_m around the F-layer peak height during high solar activity at the northern crest of the equatorial ionization anomaly (EIA) region. The data analyzed in this investigation, including H_m , the bottomside profile parameter, the F2-layer maximum critical frequency, and its peak height are derived from ionograms recorded at Chung-Li ionosonde station (geographical coordinate 24.9°N, 121.1°E) in 1999. H_m exhibits a day-to-day and seasonal variation, with a greater average daily variation during daytime in summer. Furthermore, the diurnal variation of H_m exhibits an abnormal peak at pre-sunrise during all the seasons, particularly in winter. This increase is also observed in the F2-layer peak height for the same duration with an upward movement associated with thermospheric wind toward the equator; this upward movement increases the N₂/O ratio and H_m , but it causes a decrease in the F2-layer maximum critical frequency during the pre-sunrise period. In addition, the results show a strong/weak correlation between the bottomside/equivalent slab thickness and H_m throughout the year. Furthermore, we present a comprehensive discussion of the physical processes regarding the variation of H_m during high solar activity periods.

Keywords: scale height, ionospheric physics, EIA, ionospheric dynamics