Height Dependence of Equatorial Zonal Plasma Drifts

Debrup Hui* and Bela G. Fejer
Center for Atmospheric and Space Sciences
Utah State University
Logan, UT 84322

Equatorial ionospheric plasma drifts play important roles on the dynamics of the low latitude ionosphere. We use extensive *F* region measurements by the Jicamarca incoherent scatter radar and *E* region observations by the JULIA system to determine the season and solar cycle dependent altitudinal dependence of the equatorial zonal quiet-time plasma drifts. We also examine the altitudinal dependence of the zonal quiet-time drifts in the topside ionosphere over Peruvian equatorial region using Vector Electric Field Instrument (VEFI) onboard the C/NOFS satellite during the 2008-2011 very low solar flux period. The quiet-time *F* region zonal drifts are westward from about 06 to 16 LT with solar flux independent quiet-time peak values of about 40-60 m/s; they reverse to eastward at about 16-17 LT. Near noon, the zonal drifts do not change much with altitude during June solstice, but increase with height during equinox and December solstice. The nighttime *F* region drifts are generally eastward with peak values in the early nighttime sector that increase from about 100 to 200 m/s from solar minimum to solar maximum. The *F* region drifts exhibit large altitudinal variations near dusk where they are westward at the lowest altitudes and eastward near the *F* layer peak and above. We show that this altitudinal shear varies with season and solar cycle and is closely related to the height variation of the vertical plasma drifts and peak plasma density. We present C/NOFS measurements showing that near solar minimum the post-midnight eastward drifts decrease with altitude above the *F* layer peak. We also compare our climatological *E* and *F* region drifts with results from recent numerical modeling studies and briefly discuss the large short-term variability of these drifts.