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Topside ionosphere plasma bubbles, seen in He+ density: longitudinal dependence and thermosphere meridional wind influence

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He+ density depletions, considered as originating from equatorial plasma bubbles, or as fossil bubble signatures, were involved in this study. He+ density depletions, obtained from ISS-b spacecraft data, were observed during a high solar activity (1978-80, F10.7=200) in the topside ionosphere (900-1100 km) deeply inside the plasmasphere (L=1.3-3) (Sidorova, 2004, 2007).
(1) He+ density depletion statistics with respect to longitude is considered for the post-sunset hours under winter, summer and equinoctial conditions within of 35° invariant latitudes. The map of He+ density depletion distribution as function of latitude- and longitude was also derived. The statistics and the map were compared with Equatorial Spread-F statistics, plasma bubble distribution and Range Spread-F statistics, obtained by Maruyama and Matuura (1984, 1980) from ISS-b spacecraft data for the same period (1978-80). The longitudinal variations of the Equatorial F-region Irregularities probability, obtained from the AE-E spacecraft data (McClure et al., 1998) for the same period, were also taken. Comparison shows good conformity in statistics/spatial distributions of all mentioned irregularities. Their predominant occurrence area for all seasons and both hemispheres covers the region of Brasilia, Atlantic Ocean and Africa (270°-0°-30°), where the range of magnetic field declination angle varies from 0° to 20°.
(2) It is also suggested, that the plasma bubbles, produced by Rayleigh-Taylor (R-T) instability at the bottomside of ionosphere and transported up to the topside ionosphere/plasmasphere, could be strong affected by meridional wind during a generation due to inhibiting the growth of R-T instability and flux tube integrated conductivity. For better understanding competing/complementary roles of thermosphere winds in the development of plasma bubbles, observed in He+ density, the evaluation of the possible influence of the thermosphere meridional winds was done. The diurnal He+ density depletion statistics, averaged for solstices and equinoxes, were compared with the model velocity variations of the thermosphere meridional wind, taken from (Maruyama, 1996). It was revealed that the meridional wind influence shows itself as modulation effect. The modulation has seasonal dependence and the best correlation in equinoxes (R=0.87). The best amplitude correlation was found for the longitudes of 270°-360° (Brasilia, Atlantic regions), where the declination angle of the magnetic meridional wind component is near 20°. It was concluded that the topside plasma bubbles, seen as He+ density depletions, are strong enough affected by thermosphere meridional wind.

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