Dynamics of Plasma Structures in the Equatorial Topside Ionosphere

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Space based communication and navigation systems are significantly affected by large spatial gradients in the topside ionospheric plasma density and by irregularities that generally appear at the edges of these gradients. Spatial gradients commonly appear in the topside ionosphere at night driven by the gravitational Rayleigh-Taylor instability originating in the bottomside F region. Many previous studies of this feature have focused on the occurrence probability of small scale plasma structure as a function of season and longitude or on the longitude distribution of spatial scales that make up the plasma structures. To date there is little information about the latitude extent of such features, of their internal dynamics due in large part to the restriction of data sources from fixed locations on Earth or from data obtained by satellites in low inclination orbits. When such structures extend to latitudes beyond about 20^o, the plasma gradients have a far reaching affect on communication and navigation systems since they exist over a greater proportion of the land mass. In this study we plan to examine the latitudinal extent of equatorial plasma irregularity regions using data from the DMSP spacecraft. This data brings a unique perspective to the problem by examining latitudinal or apex height variations within the envelope of a single structure. We will discuss how the zonal and meridional drifts are related through a structure and the relationship between these drifts and the ion number density.