Effects of Planetary Waves and Thermospheric winds on Equatorial Spread F/Plasma Bubble Irregularities

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The development of the Spread F /plasma bubble irregularities of the post sunset equatorial ionosphere (ESF) is determined by a variety of parameters that define and control the equatorial atmosphere ionosphere system and its large day-to-day variability. The sunset electrodynamic processes lead to the generation of an enhanced prereversal zonal electric field (PRE) and the associated F layer rise that are primary requirement for the onset of the instabilities, by the Rayleigh-Taylor (R-T) mechanism, from density perturbations at the bottom side of a rising F layer. Other factors that are known to control the ESF development are the thermospheric winds and integrated conductivity of the potentially unstable flux tubes. While the evening zonal (eastward) wind contributes to the PRE development, a meridional/trans-equatorial wind tends to inhibit both the PRE and the ESF developments. External forcing from magnetosphere-ionosphere coupling processes as well as from vertical coupling through upward propagating atmospheric waves (planetary, tidal and gravity waves) also play important roles in the observed variability of the ESF on a day-to-day and shorter term basis. Recent studies have shown that Planetary waves propagating through the mesosphere to the thermosphere/ionosphere are important sources of variabilities in the PRE, F layer heights and ESF. This paper will present a brief review of ESF variability under the influences of upward propagating waves (mainly planetary waves) and thermospheric winds.