

IONOSPHERIC CONDITIONS AFFECTING THE MORPHOLOGY OF PLASMA BUBBLES IN THE TROPICAL REGION

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The equatorial ionospheric irregularities have been observed, in the past few years, by different techniques (e.g. ground-based radar, digisonde, GPS, optical instruments, in situ satellite and rocket instrumentation) and its time evolution and propagation characteristics can be used to study important aspects of ionospheric dynamics and thermosphere-ionosphere coupling. At present, one of the most powerful optical techniques to study the large-scale ionospheric irregularities is the all-sky imaging photometer system, which normally measures the strong F-region nightglow 630 nm emission from atomic oxygen.

The monochromatic OI 630 nm emission images usually show quasi north-south magnetic field aligned intensity depletion bands, which are the bottomside optical signatures of large-scale F-region plasma irregularities (also called plasma bubbles). Observation of the F-region OI 630 nm nightglow emission, with an all-sky imaging photometer, have been carried out at Cachoeira Paulista (22.7°S, 45.0W, dip latitude 17.95°S), Brazil, during the period October 1988 to September 2000, to study the electrodynamical processes associated with the bifurcation of plasma bubbles. We report observation of the apex height ranges of the plasma bubble bifurcations. The observed bifurcation altitudes when mapped back to the magnetic equator attain altitudes of 450-540 Km. These observations show that there is a preferential altitude range for the plasma bubble bifurcation. In addition, with respect to the east-west width sizes to explain the plasma bubble bifurcations, our observations do not support the mechanism of width dependence, since plasma bubble bifurcations has been observed for both narrow and wide bubbles. We explore a number of other possible explanations for the observed features. The implications on the observed spatial structures and the level of ambient plasma concentrations on the generation of bifurcations of plasma bubbles are discussed.

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