COORDINATED OBSERVATIONS OF IONOSPHERIC SCINTILLATIONS, DENSITY PROFILES AND TOTAL ELECTRON CONTENT ON A COMMON MAGNETIC FLUX TUBE

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Abstract:

Numerous studies of geophysical observables associated with large-scale instabilities in the post-sunset equatorial ionosphere have been conducted for several decades; these observables include electric fields, electron density profiles, total electron content (TEC), plasma and neutral drifts, scintillations and coherent radar backscatter. Despite a general understanding of the local correlations between these parameters during the on-set and evolution of equatorial bubbles, detailed knowledge of the simultaneous variations of these parameters as a function of latitude on a given magnetic meridian is lacking. During the Oct-Nov 2002 Conjugate Points Equatorial Experiment (COPEX) campaign was conducted at three sites in western Brazil; one site was situated at the magnetic equator while the other two were selected at magnetic conjugate locations approximately ±10° MLat. The campaign was organized and coordinated by the Aeronomy Group at the Brazilian National Institute for Space Research (Instituto Nacional de Pesquisas Espaciais- INPE). A number of diagnostic instruments, including digisondes, GPS scintillation and TEC diagnostics, VHF scintillations and plasma drifts, and all-sky imagers were operated routinely throughout the campaign period. The work presented here focuses on the meridional variations of GPS and VHF scintillations from the northern to the southern anomaly regions (~ ±15° MLat) and their correlation with total electron content and peak electron density over the same spatial extent. The outcome of this investigation guides techniques for extrapolating local measurements to other latitudes based on knowledge of the meridional density structure from, for example, an ionospheric model of the ambient density. Preliminary results indicate that even in the presence of large (~2x) north-south asymmetries in TEC, scintillation intensity and F0F2 remain essentially the same in both hemispheres. This suggests that the propagation effects are dominated by a relatively thin layer of irregularities near the F-region peak.