

# THE RADIO AND OPTICAL OBSERVATIONS OF EQUATORIAL-OFF-EQUATORIAL IONOSPHERIC IRREGULARITIES AND THEIR 3D NUMERICAL SIMULATION

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## Abstract:

We present the observation of F region field-aligned-irregularities from radar and optical airglow imagers located at different latitude stations over Brazil. The 5-meter scale sizes irregularities inside the F region plumes (or bubbles) are observed from São Luis (dip angle 2.3oS) 30 MHz radar. The airglow images of bubbles from two off-equatorial stations (Cariri (dip angle 20oS) and Cachoeira Paulista (dip angle 30oS)) are also observed simultaneously. The digisondes, located at these locations, are used to infer the ambient dynamics. Different instruments at different latitudes provide us the framework to study the development of irregularities over equator and their subsequent mapping along the field lines. Knowing the observational characteristics of bubbles; we attempt to simulate them by 3-D simulation model of Collisional-interchange instability (CII). The effects of off-equatorial dynamics onto the development of equatorial plasma bubble and vice versa are the main objectives of the simulation study. The off-equatorial electrodynamics mainly includes the sporadic E and South-Atlantic-Anomaly (SAA) phenomenon. These phenomena cause the significant ionization in the off-equatorial E region and significantly alter the field-aligned integrated conductivity distribution. Such off-equatorial electrodynamics modifies the growth rate of CII. The effects of meridional wind onto the onset of F region plume are further investigated.