Effect of equatorial plasma bubbles on midlatitude region

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Equatorial plasma bubble (EPB) is a well-known phenomenon in the equatorial ionospheric F region. As it causes severe scintillation in the amplitude and phase of radio signals, it is important to understand and forecast the occurrence of EPB from a space weather point of view. In order to simulate the instability in the equatorial ionosphere, a 3D High-Resolution Bubble (HIRB) model has been developed. It provides a unique opportunity to study the development of EPBs under various conditions. During a severe space weather event, intense penetration electric fields are expected even in the equatorial ionosphere. If the penetration electric fields enhance the pre-reversal enhancement of the eastward electric field in the dusk sector, the growth rate of the Rayleigh--Taylor instability is greatly intensified to force EPBs to reach very high apex altitude. Such EPBs can reach midlatitude regions along the flux tubes with very high apex altitude and cause communicaton/navigation outage in midlatitude. We will expand the simulation domain of the HIRB model to cover the midlatitude region, for example the latitude of Tokyo area, and estimate the background conditions under which EPBs can reach and affect the midlatitude ionosphere. Previous observations of such extreme events will be compared with the simulation results.

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