

Future development of numerical simulation of equatorial plasma bubbles

*Tatsuhiro Yokoyama¹

1. Kyoto University

Equatorial plasma bubbles (EPBs) have been a longstanding and increasingly important subject because they cause severe scintillations in radio waves from Global Navigation Satellite System satellites. The phenomenon was found in the 1930s as irregular ionosonde observations and was termed equatorial spread F (ESF). ESF is interpreted as plasma density irregularities associated with EPBs that have nonlinearly evolved into the topside ionosphere. Since late 1970s, numerical simulations have been powerful tools to study the fully nonlinear evolution of EPBs, which cannot be wholly understood from theoretical predictions. The most recent model, High-Resolution Bubble (HIRB) model, could reproduce very turbulent structures inside EPBs such as bifurcation, zonal asymmetry, and two-component power law spectral characteristics. Future directions toward scintillation evaluation and forecasting are discussed.

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