EFFECTS OF PRESSURE-GRADIENT FORCE AND TEMPERATURE ON THE NONLINEAR COLLISIONAL-INTERCHANGE INSTABILITY IN THE F REGION: ELECTROMAGNETIC EFFECTS

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In this work, we study the effects of pressure-gradient force and temperature in the nonlinear evolution of CII and temperature distribution inside a plasma bubble. Recent linear analysis of CII shows that the effects of pressure-gradient force in the CII enters through displacement current i.e. it is an electromagnetic effect. Thus, we developed an alternative numerical simulation model of CII adopting electromagnetic framework in the equatorial plane perpendicular to Earth's magnetic field. The electric field wave equation, continuity and energy equations form a closed set of equations for CII in this model and solved as an initial-value problem. The numerical simulation shows an accelerating effect of pressure-gradient force in the evolution of CII which is in confirmation with the linear analysis. The temperature distribution inside plasma bubble reveals the variations such that it is larger than ambient in the upper region of bubble while lower than ambient in the rest of bubble. These features are in confirmation with rocket measurements of temperature inside plasma bubble.

Equatorial atmosphere-ionosphere interactive processes: vertical and latitudinal coupling and magnetospheric forcing

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