

# **ELECTRODYNAMIC FORCING OF IONOSPHERE FROM ABOVE AND BELOW**

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Motions of plasma in the ionosphere are determined largely by balancing the collisional drag force between plasma and neutral particles against the Lorentz force of a distorted magnetic field. The processes that distort the field can be divided into two classes: (I) those above the ionosphere, associated with the magnetosphere and its interaction with the solar wind, and (II) those associated with neutral-atmosphere dynamics within and below the ionosphere. Processes I include the various manifestations of magnetospheric convection and their responses to changes of the solar wind; processes II, the tidal and dynamo effects of the atmosphere. At low magnetic latitudes, electrodynamics becomes coupled to changing vertical flows, which require forces that oppose gravity. The various forcing processes are transmitted primarily by waves, which propagate between the magnetosphere and the ionosphere (for processes of class I), vertically through the ionosphere (for II), and horizontally along the ionosphere (for both I and II). There is a hierarchy of time scales for ionospheric variability, including propagation delay times, dynamical evolution times of the magnetosphere and of the atmosphere, and intrinsic times of solar-wind changes.

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