Neutral-charged particle coupling process in the polar thermosphere/ionosphere

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Neutral dynamics in the thermosphere play an important role in ionospheric feature and magnetosphere-ionopshere interaction. One of the main purpose of DELTA campaign is to study the
neutral-charged particle interaction near auroral arcs. This presentation shows a review of post studies about the coupling processes.

There are several driving forces for neutral atmosphere in the polar thermosphere: Solar UV heating, Joule and particle heating corresponding to the field-aligned and ionospheric currents, mapping of magnetospheric convections, pressure gradients, momentum advection, and viscosity. In these sources, Joule and particle heating, and convection-mapping is driven by charged particles. Since the unexpected observation near the auroral zone of strong vertical winds with velocities greater than 100 m/s, many studies have examined this phenomenon. Vertical winds in the thermosphere can play a significant role
in determining the thermospheric composition, large-scale circulation, and energy balance. Sources of thermospheric vertical winds have been studied by numerical techniques. A study suggested two possible sources of vertical winds: a 'barometric' component that includes the effects of heating and cooling of the thermosphere, and a 'divergence' component
necessitated by the requirement of mass continuity. For downward winds, a lower altitude sink or cooling region, and down-welling as part of a large scale circulation system are convincing possibilities. The magnitude of convection-driven neutral flow is sometimes comparable with that of solar-driven wind, especially in a high magnetic activity period, and the effect of magnetospheric convection cannot be ignored when analyzing polar neutral dynamics.