Relations between horizontal structures/temporal variations in the polar thermospheric/ionospheric phenomena and vertical winds

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The vertical components of neutral winds in the auroral upper-thermosphere (200-300 km) have been observed with optical instruments such as Fabry-Perot interferometer (FPI) at far greater velocities than predictions with global circulation models. Recent observations made by a ground-based Fabry-Perot interferometer (FPI, wavelength = 630.0 nm) show latitudinal shear of the geomagnetic zonal wind in the premidnight time sector in association with both the equatorward and poleward boundaries of the discrete aurora [Conde et al., 2001]. These zonal winds are considered to be driven by geomagnetically westward ion convection. Because the direction of the observed westward neutral winds is in opposition to the global-scale pressure gradient caused by solar heating, the momentum transfer from ions to neutrals through collisions prevails the pressure gradients in the conducting ionosphere caused by auroral particle precipitation. Model calculations showed that the ion-drag acceleration of neutral wind could lead to the development of significant horizontal wind shears [e.g., Sun et al., 1995]. We used data simultaneously observed with the scanning FPI (630.0 and 557.7 nm), the all-sky FPI (630.0 nm), the meridian scanning photometer (557.7 nm), and the all-sky camera (no filter) at Poker Flat, Alaska (65.11 N, 147.42 W), and the auroral radar at Anchorage, Alaska (61.15 N, 149.48 W) to estimate horizontal distributions and temporal variations in the electron density, the horizontal wind, and plasma motion. In this paper, we will discuss relationship between the vertical winds and those horizontal distributions.