

## Strong neutral winds associated with auroral activity in the polar lower thermosphere

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It has been known that vertical winds of a few tens of meters per second and horizontal winds exceeding 500 m/s occur associated with auroral activity in the polar lower thermosphere (at altitudes of 90-150 km). However, the generation mechanisms of these strong neutral winds are still unknown. In the polar lower thermosphere where there are interactions between plasma and neutral particles and couplings with the magnetosphere along geomagnetic field lines, the dissipation of electromagnetic energy originating from the magnetosphere plays important roles in the energetics and dynamics in the neutral atmosphere. The previously proposed mechanisms suffer from a lack of the electromagnetic energy to explain the observed neutral wind speeds. For example, if the Joule heating due to the ionospheric current associated with the auroral activity causes the thermal expansion of the neutral atmosphere, the vertical wind speed is estimated to be at most a few meters per second. In order to quantitatively estimate the energetics and dynamics of the polar lower thermosphere and search for the generation mechanism of the strong neutral winds, we have conducted campaign observations that combines the European Incoherent Scatter (EISCAT) radar for the measurements of the plasma temperature, density, and velocity, with the Fabry-Perot Interferometers (FPIs) for the neutral wind speed measurements and a sounding rocket-borne instrument for the neutral temperature measurements. In this presentation, we will introduce the historical background and previous problems of the related studies and then discuss the key parameters and observations to solve this problem based on our latest findings.