Optical and radar observations of the coupling processes between thermospheric winds and plasma drifts in the auroral region

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In order to clarify the relationship between thermospheric winds and plasma drifts in the auroral region, we have analyzed thermospheric wind data obtained by a Fabry-Perot Doppler Imaging System, and plasma drift data obtained by HF and VHF radars at Syowa station, Antarctica. In the May 13 event, it is found that the direction of thermospheric neutral winds is parallel to that of F region plasma drifts, and that the neutral wind speed is about one-fourth of the plasma drift speed. Computer calculations of neutral winds suggest that a pressure gradient force due to Joule heating contributes to driving of neutral winds. On the other hand, from simultaneous observations of neutral winds and plasma drifts in the E region, strong VHF radar echoes were received on 6 nights.

In order to clarify the relationship between thermospheric winds and plasma drifts in the auroral region, we have analyzed thermospheric wind data obtained by a Fabry-Perot Doppler Imaging System (FPDIS), and plasma drift data obtained by HF and VHF radars at Syowa station, Antarctica (66.4 deg. MLAT) during the period from March to October, 1996. Simultaneous observations of neutral winds and plasma drifts in the F region were carried out on 38 nights, while strong echoes were observed on 2 nights. In the May 13 event, it is found that the direction of thermospheric neutral winds is parallel to that of F region plasma drifts, and that the neutral wind speed is about one-fourth of the plasma drift speed. Thus, it is suggested that neutral winds are driven by an ion drag force. Computer calculations of neutral winds with the MSISE-90 and IRI-95 models suggest that a pressure gradient force due to Joule heating contributes to driving of neutral winds. In the April 24 event, however, we found a rather complicated relationship between neutral winds and plasma drifts in the F region. On the other hand, from simultaneous observations of neutral winds and plasma drifts in the E region, strong VHF radar echoes were received on 6 nights. Based on the obtained results we will discuss the coupling processes between neutral winds and plasma drifts in the E and F regions.