

Initial results of thermospheric vertical winds observation above Alaska in HEX campaign

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Since the unexpected observation near the auroral zone of strong vertical winds with velocities greater than 100 m/s [Rees et al., 1984], many studies have examined this phenomenon [e.g., Crickmore et al., 1991; Conde and Dyson, 1995; Smith and Hernandez, 1995; Price et al., 1995]. Vertical winds in the thermosphere can play a significant role in determining the thermospheric composition, large-scale circulation, and energy balance. Sources of the thermospheric vertical winds have been studied by numerical techniques. However, in many cases the predicted wind velocity is significantly smaller than that of measured winds. Unfortunately, because of the considerable practical difficulties of measuring thermospheric vertical winds, useful comparisons between models and observations have been rare. Continuous measurements of the thermospheric vertical wind on the ground have been executed with Fabry-Perot interferometers (FPI), however, the measuring region is small and localized.

In February or March 2003 the University of Alaska will be conducting a rocket experiment to measure vertical winds near the aurora above Alaska, which is called HEX (Horizontal E-region eXperiment). The rocket will be launched from Poker Flat Research Range (PFRR; 65.12N, 212.6E). It will deploy a Trimethyl Aluminum trail at approximately 160-km altitude. Subsequent vertical drifts of this trail will be measured, allowing the vertical wind field near the aurora to be determined. Previous TMA releases have measured horizontal winds, however, this will be the first attempt to map the latitudinal variation of vertical wind by the chemical release method. Two Fabry-Perot interferometers of Communications Research Laboratory (CRLFPI) will observe the aurora/airglow during the release from PFRR and Eagle (64.8N, 218.8E). These observations will provide ground-based measurements of thermospheric winds and temperatures in support of the rocket. From this campaign, we will obtain estimates of the vertical wind distribution near an auroral arc, which will help us to reveal the mechanism of vertical wind and understand the large-scale dynamics in the thermosphere. In this presentation, an initial results obtained with CRLFPI will be shown.