

Relationship between magnetic field on the ground and vertical wind in the lower thermosphere

Mamoru Ishii[1], Mark Conde[2], Matthew P. Krynicki[3], Roger W. Smith[4], Eiichi Sagawa[1], Shinichi Watari[1]

[1] CRL, [2] Geophys. Inst., Univ. Alaska Fairbanks, [3] Geophys. Inst. Univ. Alaska Fairbanks, [4] GI, UAF

Some sources of vertical winds have been found near auroral zone are considered; (1) Joule and particle heating, (2) divergence and convergence of horizontal winds, and (3) gravity waves. Actually measured vertical winds can be considered as superposed ones of generating some different sources. It is very important to identify the source of individual vertical wind. For the first step of this study, the vertical wind is compared with magnetic field perturbations. The present results are as follows; (1) Temporal variation of vertical winds are qualitatively similar to that of magnetic field. (2) In a quantitative analysis, the time-lag between them is nearly zero before substorm on-set, on the other hand, wind variation delay from magnetic field perturbation for about 1-hour.

Since large vertical winds have been found near auroral zone with Fabry-Perot Interferometers (Rees et al., 1984), many studies have paid attention to the phenomena. Some sources are considered to generating such large vertical winds; (1) Joule and particle heating, (2) divergence and convergence of horizontal winds, and (3) gravity waves propagating from the lower atmosphere. Actually measured vertical winds can be considered as superposed ones of generating some different sources. It makes difficult to understand neutral dynamics in the polar region, and it is very important to identify the source of individual vertical wind. The motivation of the present study is to identify vertical winds generated by Joule heating from others. For the first step of this study, the vertical wind is compared with magnetic field perturbation observed on the ground. The neutral vertical winds are measured with Fabry-Perot Interferometer at the Poker Flat Research Range, and magnetometer data at three sites, Poker Flat, Fort Yukon and Gakona are used for the analysis. The present results are as follows; (1) Temporal variation of vertical winds (upward positive) are qualitatively similar to that of H-component magnetic field. However the relation does not seem to be linear. (2) In a quantitative analysis, the time-lag between them is nearly zero before substorm on-set, on the other hand, wind variation delay from magnetic field perturbation for about 1-hour. Some discussion will be also shown in the presentation.