

REMOTE SENSING OF THE MAGNETOSPHERIC MASS DENSITY IN HIGH-LATITUDES: INTERHEMISPHERIC GROUND-BASED MAGNETIC FIELD OBSERVATIONS IN THE AURORAL ZONES

S. Takasaki, N. Sato, A. Kadokura, Y. Ebihara, H. Yamagishi

National Institute of Polar Research, Japan, Tokyo, Japan

It is important to continuously monitor the magnetospheric plasma density in order to understand physical mechanisms of time-dependent phenomena, such as the effects of magnetic storms on perturbations of the magnetospheric plasma density. A network of ground magnetometers is useful for continuously monitoring variations in the magnetospheric mass density, as follows.

From the field-line eigenfrequency (i.e., the frequency of FLR) identified in the spectral analysis of the ground-based magnetic field variations, one can infer the equatorial mass density along the field line running through a point between the used two stations, if appropriate models are assumed for the magnetic field and the field-aligned magnetospheric mass density distribution.

Ground magnetometers can continuously observe FLRs for daylight hours; hence, FLRs observed on the ground are useful for monitoring the magnetospheric mass density in the dayside magnetosphere.

Surrounding Syowa station in Antarctica (mlat. -66.25, mlong. 71.62), three fluxgate magnetometers were installed in 2003. Four magnetometers including the one at Syowa formed a square of 100 ~ 150 km. We analyzed the data from the four Antarctic stations together with the geomagnetically conjugate station, Tjornes in Iceland (mlat. 66.53, mlong. 72.30).

In the coherence and phase analyses of geomagnetic pulsations, broadband noises with the period of 15 - 1000 sec were presented over the Antarctic stations, and the signature of FLRs were lost among the noises. On the other hand, interhemispheric coherence analysis could filter out the broadband noises, and thus we could identify the resonance structure and determine the eigenfrequencies of the field lines between each station pairs.

Coherence and phase analyses such as this study will be useful to monitor the eigenfrequencies of the magnetospheric field lines and infer the equatorial mass density with a high resolutions ($dL \sim 0.01 - 0.23$) in the auroral zones.