Reproducing eigenfrequency of high-latitude geomagnetic field line

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Shear Alfven waves propagating along the geomagnetic field line form standing waves along filed line. The magnetic field intensity and the plasma mass density affect the velocity of shear Alfven waves. Thus temporal and latitudinal variations in the field-line eigenfrequency are potentially caused by variations in the field-line length, the magnetic field intensity, and the mass density along the field line.

We estimated the eigenfrequency by numerically solving the standing Alfven wave equation along the geomagnetic field reproduced by an empirical model. The magnitude of diurnal variation in the eigenfrequency becomes larger according as the latitude increases. In low latitudes, the eigenfrequency agrees with that estimated with the empirical magnetospheric model (TS04). However, in high latitudes, we consider that the rate of variability is larger than the empirically-based assessment.

In this study, we compared the diurnal variations in the eigenfrequencies observed at the vicinity of Syowa Station, Antarctica with the estimated eigenfrequencies. The numerical simulation reproduce variations in the eigenfrequency at dawn and dusk. Actually, the geomagnetic field lines started from high latitudes are extend toward the night sector. These distorted field lines are not adequately reproduced by the empirical models.