Reproducing eigenfrequency of high-latitude geomagnetic field line in a global MHD simulation

Satoko Saita[1]; Akira Kadokura[2]; Hisao Yamagishi[3]; Natsuo Sato[2]; Shigeru Fujita[4]; Takashi Tanaka[5]; Yusuke Ebihara[6]; Ken T. Murata[7]; Daisuke Matsuoka[8]; Genta Ueno[9]; Tomoyuki Higuchi[9]
[1] Research Organization of Information and Systems; [2] NIPR; [3] National Inst. Polar Res.; [4] none; [5] SERC, Kyushu Univ.; [6] IAR, Nagoya Univ.; [7] NICT; [8] ESC, JAMSTEC; [9] ISM

The shear Alfven wave usually exhibits a standing wave structure along a magnetic filed line. Therefore, such a standing wave is called as the field-line eigenmode. As the field intensity and plasma mass density determine the velocity of shear Alfven waves, temporal and latitudinal variations in the frequency of the field-line eigenmode are 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 solving numerically the standing Alfven wave equation along the geomagnetic field in a global MHD simulation. The magnitude of diurnal variation in the eigenfrequency becomes larger as the latitude increases. In low latitudes, the eigenfrequency agrees with that estimated from the empirical magnetospheric model (TS04). However, in high latitudes, the range of the frequency variation estimated with the global MHD simulation is larger than the TS04-based assessment.

In this study, we carried out comparison between the diurnal variations in the eigenfrequencies observed in the vicinity of Syowa Station, Antarctica and those based on the simulation. We found that the global MHD simulation reproduces adequate variations in the eigenfrequency at dawn and dusk and the empirical model does not. This fact can be explained as follows: the geomagnetic field lines extending from the high-latitude ionopshere to the night sector are not adequately reproduced by the empirical models.