IMPROVED HODOGRAPH METHOD TO ESTIMATE THE LATITUDE DEPENDENCIES OF THE FREQUENCY AND WIDTH OF THE FIELD-LINE RESONANCE FROM GROUND MAGNETOMETER DATA

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Field-line eigen-oscillations caused by the field line resonance (FLR), observed in the ground magnetometer data, are useful for us to estimate the magnetospheric plasma mass density from the ground, because the eigen-frequency (FLR frequency below) decreases with increasing plasma mass along the field line.
However, FLR frequencies are often difficult to identify in the ground magnetometer data, because different kinds of waves with large amplitudes are often superposed onto the FLR signal and mask the FLR signal.
As countermeasures to this problem, methods called amplitude-ratio method and cross-phase method have been used; these methods take the difference between the data from two magnetometers that are latitudinally separated by an order of 100km. However, a problem here is that the two methods can yield different values of the FLR frequency from the same dataset.
Hodograph method [Pilipenko and Kurchashov, 2000] is a solution to this problem, because it merges the amplitude-ratio method and the cross-phase method into one method. It can also estimate the resonance width. However, the resonance width is assumed to be a constant of latitude in the hodograph method, while in reality the resonance width can be a function of latitude.
In this paper we have improved the hodograph method to solve this problem. That is, we have introduced a latitude dependence of the resonance width into the hodograph method. We have tested this improved method by simulated datasets and observed datasets, and the results are successful.

hodograph method, field-line resonance, resonance width

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