Plasmapause detection by analysis of high-latitude ground magnetometer data at multiple local times

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The dual-station H-component power ratio method is one of the useful techniques for identifying the eigenfrequency of ULF waves on the ground. This method is especially useful for detection of the plasmapause position; in this method, dynamic spectral pattern in the plasmapause boundary layer (named as Type2) is opposite to that outside the plasmapause boundary layer (named as Type1). This opposite pattern is caused by the rapid decrease of the plasma density in the plasmapause boundary layer. That is, (only) inside the plasmapause boundary layer, the plasma density drastically decreases, and thus the Alfven speed increases, with increasing L; therefore, the resonant frequency there increases with increasing L. On the other hand in other regions, Alfven speed decreases with increasing L, because the magnetic field strength decreases with increasing L more rapidly than the (square root of) density dose with increasing L. By using this difference, we can detect the position of the plasmapause boundary layer from the ground.

In this study, we apply this method to high-latitude (60-70 degrees) two station pairs belonging to two magnetometer networks whose local times differ: One is the Circum-pan Pacific Magnetometer Network (CPMN, located along 210 degrees magnetic longitude), and the other is the Geophysical Institute Magnetometer Array (GIMA, located along 265 degrees magnetic longitude.). As a preliminary analysis, we have found a Type 2 event for which the resonant frequency at CPMN (GIMA) decreased (increased) in time during the same interval: It is suggested that, during this event, both the CPMN and GIMA pairs were located within the plasmapause boundary layer but the CPMN (GIMA) pair was moving toward (away from) the plasmasphere (in a relative sense).