Statistical analysis of plasmapause features by using a ground magnetometer pair and IMAGE/EUV

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The plasmasphere is the region filled with high-density cold plasma of ionospheric origin, and has the radius of several Re. At the boundary layer of the plasmasphere, called the plasmapause, the plasma density drastically decreases with increasing L. In recent years, the ground-observed ultra low frequency waves generated by the field line resonance (FLR) are used for the purpose of diagnosing the plasmapause boundary layer, since the frequency of the FLR is related to the plasma density. One technique to determine the frequency of the FLR is the dual-station H-component power ratio method (the same as 'the amplitude-ratio method'). This method uses the magnetometer data obtained at two stations close to each other.

Another way to diagnose the plasmasphere is to use images taken by the Extreme Ultraviolet Imager (EUV) on board the IMAGE satellite. The EUV images visualize structures of the plasmasphere, in addition to providing line-of-sight integrated He+ column abundance. The He+ column abundance is roughly proportional to the equatorial density of He+.

Abe et al. [2006] compared, in a case study, the FLR frequency and the EUV He+ column abundance simultaneously observed at the same point of the plasmaspheric plume, and presented the first simultaneous identification of the plume from both the ground and the space. In more details, they used two ground magnetometers at Tixie(TIK: geomagnetic longitude=65.65, geomagnetic latitude=196.90, L=5.98) and Chokurdakh(CHD: 64.66, 212.14, 5.55) which belong to the Circum-pan Pacific Magnetometer Network (CPMN): As the plume monitored by IMAGE/EUV moved past the field line running through the midpoint of TIK and CHD, they monitored the FLR frequency of the field line (observed by the TIK-CHD magnetometer pair) and the EUV He+ column abundance along the line of sight of EUV that ran through the equatorial point of the field line. As a result, the He+ column abundance showed an increase-then-decrease pattern, and the FLR frequency showed a coherent decrease-then-increase pattern. In addition, the TIK/CHD H-power ratio showed an offset when either TIK or CHD (these stations have a longitudinal separation) stayed inside the plume.

In this paper we proceed from the above-stated case study to a statistical study: In order to examine in more detail the consistency between the TIK/CHD ground magnetometer data and the IMAGE/EUV data near the plasmapause boundary layer, we analyze these two quantities observed in 2001 on a statistical basis. We will show the results and discuss them in this conference.

Ref. Abe et al., Simultaneous identification of a plasmaspheric plume by a ground magnetometer pair and IMAGE Extreme Ultraviolet Imager, J. Geophys. Res., 111, A11202, doi:10.1029/2006JA011653.