Simultaneous monitoring of plasmapause features by ground magnetometer networks and IMAGE/EUV: Statistical results

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There are many methods to monitor the Earth's plasmasphere, which is the region filled with high-density cold plasma with a nominal radial extent of several Earth radii (RE). One technique uses ULF (ultra low frequency) waves observed at ground magnetometer stations to determine the local field line resonance (FLR) frequency, and thus the mass density of the field line. In this study, the gradient amplitude method and cross-phase method (two ways to determine the FLR frequency) are used to identify the steep radial (with L) density gradient typically found at the plasmapause, which is the boundary layer of the plasmasphere.

The IMAGE satellite Extreme UltraViolet (EUV) imager was designed to obtain full global images of the plasmasphere by detecting 30.4 nm photon resonantly scattered by plasmaspheric He+ ions . Thus, data from the EUV imager yields a measure of the global structure of the plasmasphere.

In a past study, Abe et al. [2006] compared the FLR frequency determined by the amplitude gradient method 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 space.

In this paper the case study of Abe et al. is extended to a statistical analysis. We compare, on a statistical basis, high-latitude magnetometer data from the Circum-pan Pacific Magnetometer Network (CPMN), located along the 210 degree magnetic meridian, and the IMAGE/EUV data, observed from 2000 to 2002. We apply not only the amplitude gradient method but also the cross-phase method. In addition, to check the local time effect, we use another set of ground magnetometer data from the Geophysical Institute Magnetometer Array (GIMA), located along 265 degrees magnetic longitude.