Statistical analysis of simultaneous monitoring of the plasmapause by the CPMN high-to mid-latitude magnetometers and IMAGE/EUV

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The Earth's plasmasphere is the region filled with high-density cold plasma with a nominal radial extent of several Earth radii, and observed by using many methods. One of the methods uses ULF (ultra low frequency) waves observed at ground magnetometer stations; for example, one can apply the methods called amplitude-ratio and cross-phase methods to ground magnetometer data to identify the FLR (Field Line Resonance) frequency, and from thus identified FLR frequency one can estimate the plasma mass density along the field line running through the ground station. On the other hand in this study, we use the amplitude-ratio and cross-phase methods to identify the steep radial density gradient typically found at the plasmapause boundary layer.

Another way to observe the plasmasphere is to use imager data. The Extreme UltraViolet (EUV) imager on board the IMAGE satellite has taken full global images of the plasmasphere by detecting 30.4 nm photon resonantly scattered by plasmaspheric He+ ions. Data from the IMAGE EUV imager have yielded many scientific results about the global structure of the plasmasphere.

In a past case study, Abe et al. [2006] compared the FLR frequency determined by the amplitude-ratio method with simultaneously observed IMAGE/EUV He+ column abundance data mapped to the equatorial footpoint of the field line whose eigenfrequency we obtained from the ground data; that field-line moved through a plasmaspheric plume, as shown by EUV images. That is, Abe et al. presented the first simultaneous identification of the plume from both the ground and space.

In this paper we use the plasmapause-detection method of Abe et al. [2006], and perform a statistical analysis; to trace the time and spatial evolution of the plasmapause boundary layer, we use data from high&#8211; to mid&#8211;latitude five magnetometers in the northern hemisphere along the 210 degree magnetic meridian, belonging to the Circum-pan Pacific Magnetometer Network (CPMN), and IMAGE/EUV images, observed from 2001 to 2005. We apply not only the amplitude-ratio method but also the cross-phase method. We show the results and discuss them at the meeting.