Diagnosis of the inner plasmasphere density based on ground-based CPMN data and IMAGE EUV data.

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The cross-phase method and the amplitude-ratio method [e.g., Baransky et al., 1989] are well known methods for identifying field-line eigenoscillations from ground magnetometer data at two stations closely located along the same meridian. The plasma mass density in the equatorial plane from the observed field-line eigenfrequency can be inferred if appropriate models of the magnetic field etcetera are assumed. With this plasma mass density, it is possible to estimate the temporal and spatial variations of the plasma mass density in the plasmasphere.

In these years we can also obtain visible images of the plasmasphere with the use of the extreme ultraviolet (EUV) imager on board the IMAGE satellite. EUV detects 30.4-nm and 58.4-nm radiations emitted by He and He+ ions and images the plasmasphere from outside [Goldstein et al., 2003]. In this paper we use the intensity of the EUV luminosity as a representative of the plasma mass density.

In this thesis we compare the above-stated two estimates for the plasmasphere plasma density; the cross-phase method and the amplitude-ratio method are applied to data from two adjacent CPMN (Circum-pan Pacific Magnetometer Network) Australian stations around L~1.65 (Adelaide (ADL) Geomagnetic Latitude=-45.91, Geomagnetic Longitude=213.97, L=2.10), and Dalby (DAL) Geomagnetic Latitude=-36.36, Geomagnetic Longitude=227.01, L=1.57)). First, we study a case of June 8-11, 2001: The density estimate from CPMN, at L~1.65, is compared with simultaneous EUV intensity (brightness) at L~1.65.

As a result, the two estimates are found to show the same increasing/decreasing pattern. It is also found that the absolute increasing/decreasing rates of the plasma mass density are larger than those of the EUV intensity. This result suggests that plasma along the field line at L~1.65 includes some contribution from ionosphere-origin heavy ions (e.g., O+), and that O+ density changes in a manner independent of that of the He+ density.

The above-stated event is also compared to another event on 17-18 August, 2001, which doesn't show a significant change of density. This August event shows a geomagnetic circumstance (the interplanetary magnetic field, the earth's magnetosphere and the ionosphere) different from that of the June 9-10 event.