Mass and He+ densities in Plasmaspheric Drainage Plumes

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Plasmaspheric drainage plumes are regions of cold dense plasma that connect to the main body of the plasmasphere and extend outer magnetosphere. Plumes form in response to sudden changes in magnetospheric convection and are associated with the drainage of plasmaspheric plasma into the outer magnetosphere. In this study we used two different techniques to study ion densities in plumes.

The first technique involves the extreme ultraviolet (EUV) camera onboard the IMAGE satellite. This instrument detects solar 30.4 nm radiation that is resonantly scattered by He^+ ions and produces images every 10 min. The images from near apogee (˜8 Re) can provide global perspectives of the plasmasphere with 0.1 Re special resolution.

The second technique involves measurements of magnetospheric field line resonances. Cross-phase analysis from closely spaced ground magnetometers yields the eigenfrequency of magnetic field lines, providing information on the plasma mass density near the equatorial plane. Data from an extended meridional array of ground magnetometers therefore allows the radial density distribution to be remotely monitored.

We studied an event during the interval from 9 to 12 June 2001. The EUV images show the presence of two plumes on 10 June, with the western edge of the one of them rotating with ˜60 % of the corotation velocity. The field line resonance measurements were used to produce time series of the plasma mass density at L = 3.6 - 4.1 in the European meridian, which indicated significant enhancements in density when the field line projections caught-up to the western edge of the plume. This is clear evidence of the simultaneous detection of plumes by both the EUV and field line resonance measurements techniques.

This presentation will show details of plasma density and composition in the plumes.