



Characteristics of Low Shear Plasma Depletion Layer

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Plasma Depletion Layer (PDL) is the region adjacent to the magnetopause and observed to occur typically under the northward IMF conditions. Despite the increased number of spacecraft missions, there has not been much study on the detailed characteristics of PDL region since its first theoretical existence in 1973 was shown. In this study, we used data from several recent spacecraft, THEMIS, CLUSTER and INTERBALL, and combine them to statistically determine the characteristics of PDL. We recognize the PDL region as the region of depleted density and enhanced magnetic fields just before or after the magnetopause encounter of the spacecraft. Searching through 3 years of data, we detected 10 clear PDL crossings. We looked at the latitude dependence of the PDL parameters, such as thickness of the PDL, density/magnetic field ratio, plasma beta variations, temperature and velocity variations, and shear angle dependence. In our cases, we found 9 out of 10 PDL crossings corresponding to the low shear angle and only one is found to occur during high shear magnetopause. We first established criteria to mark the boundaries of the PDL along the magnetosheath trajectory of the spacecraft. Using this and with the help of a magnetopause model, we determined the thickness of the PDL projected on the magnetopause normal as a simple approximation. Our initial results show that the thickness of the PDL ranges from about 2500 kms to about 8000 kms for the low shear magnetopause cases which indicates about 1 Re thickness on the average. The thickness of the PDL appears to decrease as the spacecraft moves toward higher latitudes. The corresponding shear angle increases with the increased latitude of the spacecraft. The temperature and velocity while approaching and within the PDL show distinct variations between low and high shear PDL cases as also seen by Phan et al. (1997) which helps to determine the PDL boundaries. Clear wave activity within the PDL is observed in form of out-of-phase variations in density and magnetic field. The IMF and solar dependence of PDL characteristics is still understudy while initially we see that our cases are representative of northward IMF. We will show and discuss our current and extended statistical results with those in literature in our presentation.