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Dayside Boundary Layer under Extreme Solar Wind Conditions: A Cluster Perspective

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The high latitude boundaries properties are quite different under different solar wind conditions. During northward interplanetary magnetic field (IMF), the interface between the magnetosheath and magnetosphere is clear. We present statistical results based on 2 years of data obtained by Cluster when these spacecraft were in the vicinity of the dayside magnetopause during northward IMF. The changes of the plasma density, temperature, velocity, energetic particle flux and magnetic field geometry across the magnetopause under northward IMF were analyzed by a superposed epoch analysis. The normal direction was calculated using a Minimum Variance Analysis method for each clear boundary.

The particle spectra are characterized by a power law and the power law index is found to be closely related to solar wind velocity. The spectra seem to be harder for higher solar wind velocity. We also found that the higher the solar wind velocity, the higher the ion flux in the Stagnant Exterior Cusp (SEC) region. The magnetic shear angle is the difference between local B vector and IMF clock angle projected on the plane perpendicular to the shock normal. The larger the magnetic shear angle, the more turbulent the magnetic field in the SEC. Further, the properties of the high latitude boundary layer during storm time have been studied in detail.