# Properties and position of the cusp regions for extreme solar wind conditions.

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During the ICME events on 28-29 October 2003 and 7-10 November 2004, the solar wind dynamic pressure varied between 7-60 nPa and the strength of the Interplanetary Magnetic Field (IMF) was 20-50 nT. Such extreme external conditions deform the magnetosphere. In this paper we present a study of the cusp response to these strong external parameters based on Cluster observations of the plasma properties inside the low-latitude boundary layer (LLBL)/cusp regions at mid-altitudes. In total we have 6 separate observations of the LLBL/cusp region. All these events were observed while Cluster was in the dawn sector, 7-9 MLT. During periods of strong southward IMF, the region containing injected magnetosheath-like plasma was very small, and moved equatorward (down to 66 deg ILAT) in comparison with the cusp position under more 'normal' external parameters. This can be explained by the occurrence of significant magnetopause erosion due to the enhanced dayside subsolar reconnection during southward IMF. During northward IMF periods, Cluster crossed a relatively thick LLBL/cusp region containing an accelerated injected magnetosheath population. The most significant result is that the cusp is observed to move equatorward, down to 68 deg ILAT, under strong northward IMF, Bz = 20-30 nT. Previous statistical studies (e.g. Palmroth et al, 2001; Zhou et al., 2000) have shown that the cusp shifts slightly equatorward, to 78-80 deg ILAT, for 'normal' northward IMF, Bz = 0-10 nT. However the cusp position for extremely strong northward IMF conditions had not been studied previously. We will discuss the relative influences of the solar wind dynamic pressure and magnetic field strength on the cusp position under these conditions. Using observations from the four Cluster spacecraft we will estimate cusp motion under different IMF orientations as well as discuss possible reconnection geometries.