

Asymmetric deformation of the magnetosphere under low-density solar wind

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The density of the solar wind around the Earth's magnetosphere sometimes decreases to only several percent of the usual value, and such density extrema results in a significant reduction of dynamic pressure and Alfvénic Mach number of the solar wind flow. While simple expansion of the Earth's magnetosphere by the low dynamic pressure was assumed in previous studies, a global-MHD simulation study predicted a remarkable dawn-dusk asymmetry of the magnetosphere in shape under low-density solar wind and Parker-spiral IMF configuration. Here we present evidence of asymmetric deformation of the magnetosphere under low-density solar wind and Parker-spiral IMF conditions, based on several events of GEOTAIL observations. As predicted by the global-MHD simulation, the magnetosphere on the dawnside expands much further than the magnetopause location of simple (symmetric) expansion, while no significant expansion is detected in the dusk tail flank. Fast ion beams detected at the flank magnetopause suggest that magnetic reconnection frequently occurs due to the low-beta environment of the magnetosheath.

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