Project Details

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Project Title:
Pre-noon Cusp and Boundary layers: Solar Wind Coupling to the Magnetosphere

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Summary:
The timing of merging of IMF magnetic field lines and magentospheric magentic field lines may involve significantly different lag times in each hemisphere because of the tilt of the phase plane as structures propagate toward the Earth in the solar wind. Recent results have shown that the cusp is bifurcated, with one side, which is connected to the small convection cell, being driven from merging in the opposite hemisphere. These studies showed that two-dimensional patterns from ground-based optical images of the cusp region can be separated relative to their source regions. This effectively separates spatial and temporal variations. The efficacy of these results depend to a degree on the antiparallel merging hypothesis. We will utilize correlations between Polar (during pre-noon overflights) and ground-based optics, SuperDARN radar measurements, ground-based ULF measurements, and DMSP. Solar-wind/IMF monitoring will be provided by Wind, ACE, IMP-8 or other ISTP satellites. We propose to determine when, where and under what conditions detailed structure in the solar wind and magnetosheath couples to the ionosphere (we anticipate that the coupling physics may be different away from the cusp), determine to what degree the small convection cell is driven from the opposite hemisphere, determine the thickness of and degree to which the boundary layer is open or closed, look for evidence of accelerated ions in the boundary layer and investigate their causes, and determine to what degree the Pc-1 and -2 oscillations are related to the low-latitude boundary layer ion dynamics. We will establish under what conditions the antiparallel merging hypothesis is dominant. We will compare the data driven results with large-scale MHD model results to key our interpretive thinking. This is a major building block for ionospheric convection models that are essential for describing geospace disturbances and predicting space weather effects, key elements of Living With a Star.

Publication References:

no references