Project Details

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Project Title:
Space Weather effects of Solar Wind Pressure Fronts: Atmospheric energy input and MeV Particle Energization

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Summary:
Recent studies have suggested that solar wind dynamic pressure enhancements can cause energetically very significant disturbances in our environment s Space Weather. Specifically, large amounts of energy are deposited on the Earth s upper atmosphere and energetic particles in the inner magnetospheric region are further energized. We propose to use dynamic pressure step changes and long-lasting pressure pulses in the solar wind unambiguously identified from 2-point measurements from SoHO and WIND from 1996 to present to determine the specific affect of such pressure fronts on the total energy input to the Earth s upper atmosphere and the energization of MeV particles in the inner magnetosphere. Complementary solar wind data from IMP 8, ACE, Geotail, and Interball 1 spacecraft will also be used when available in order to more accurately determine the timing of the pressure front impact on the magnetosphere. We will then use data from ground magnetometers (MACCS, CANOPUS, Greenland), the SuperDARN radars, all-sky imagers and median scanning photometers, Polar UVI, IMAGE FUV, low-altitude DMSP, and geosynchronous LANL and GOES spacecraft to determine the magnetospheric and ionospheric response and the temporal propagation of this response across the magnetosphere and ionosphere. We will focus our research on answering the following three scientific questions regarding the responses to solar wind pressure fronts: 1) the response of the auroral precipitating flux to solar wind pressure enhancements for different IMF conditions, 2) the response of the ionospheric and large-scale field-aligned currents as well as the ionospheric Joule heating under different IMF conditions, and 3) energization of MeV particles in the inner magnetosphere under different IMF conditions before and during the pressure front event. We will then investigate the physics driving the responses using the UCLA-GGCM global MHD model. This will be accomplished by comparing the observations with the results of the model, identifying what major features of the observations can be accounted for by the model and determining the causes of those features using properties in the model. We will also determine what features of the observations cannot be explained by the model physics, thus providing the modelers with clues on how to improve the model.

Publication References:

Summary: ''

Reference: Eftyhia Zesta / University of California, Los Angeles-Space Weather Effects of Solar Wind Pressure Fronts: Atmospheric Energy Input and MeV Particle Energization