# Project Details

**ROSES ID:** NNH05ZDA001N
**Selection Year:** 2006
**Program Element:** Focused Science Topic

**Topic:** Solar wind plasma entry and transport in the magnetosphere

**Project Title:**
Predicting the Spacecraft-Charging Environment in the Magnetosphere from Upstream Solar-Wind Parameters

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**Summary:**
A three-year project is proposed to determine how the solar-wind plasma drives the spacecraft-charging environment inside the Earth's magnetosphere. The project builds on a series of recent studies that have determined the correlations and time lags between the properties of the solar-wind plasma and the hot-ion plasmas of the magnetosphere. The present study will focus on the connection between the solar wind and (a) the hot-electron plasma, (b) the low-density cold-ion population, and (c) measured values of spacecraft potentials, all in the magnetosphere. The study will utilize approximately 20 million measurements of spacecraft charging and the charging environment taken around the Earth's dipole at geosynchronous orbit. The objectives of this project are (1) to establish which solar-wind parameters affect the charging environment in the magnetosphere and by how much, (2) to determine the time lags at various locations around geosynchronous orbit for the solar wind to affect the environment there, (3) to determine the functional forms of the best-fit expressions connecting solar wind parameters with magnetospheric-environment parameters, (4) to determine how substorms affect the coupling and time lags of the solar wind to the charging environment, (5) to determine whether dipole inflation by a stormtime ring current affects the coupling and time lags of the solar wind to the charging environment, and (6) to assess the ability of the best-fit expressions and time lags to predict the charging environment from solar-wind input. The data sets that will be used are uniquely suited to this project and techniques that have been successful in similar studies will be utilized. The primary data set resides at Los Alamos and the Investigators have sufficient expertise to perform the tasks and interpret the results. In support of NASA and the LWS Program, this project will greatly further the understanding of the origin and control of the spacecraft-charging environment and will provide the information needed to predict that environment with a few-hour lead time. The project will also significantly further our understanding of the entry and transport of plasmas in the Earth's magnetosphere.

# Publication References:

**Summary:** no summary

**Reference:** Denton, M. H.; Borovsky, J. E.; (2008), Superposed epoch analysis of high-speed-stream effects at geosynchronous orbit: Hot plasma, cold plasma, and the solar wind, Journal of Geophysical Research: Space Physics, Volume 113, Issue A7, CiteID A07216, doi: 10.1029/2007JA012998

**Summary:** no summary

**Reference:** Borovsky, Joseph E.; Denton, Michael H.; (2010), On the heating of the outer radiation belt to produce high fluxes of relativistic electrons: Measured heating rates at geosynchronous orbit for high-speed stream-driven storms, Journal of Geophysical Research: Space Physics, Volume 115, Issue A12, CiteID A12206, doi: 10.1029/2010JA015342