Project Details

ROSES ID: NRA-00-OSS-01
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Program Element: Independent Investigation: LWS

Project Title:
Investigations of the Space Plasma and Space Radiation Environments Responsible for Spacecraft Charging

PI Name: Harry C. Koons
PI Email: atn@g.ucla.edu
Affiliation: Aerospace Corporation
Summary:
We propose to investigate a number of basic physical processes in the Earth's magnetosphere related to spacecraft charging. The proposal addresses the LWS objectives for Aeronautics and Space Transportation, which seek further detailed characterization of the radiation environments useful for the design of more reliable space systems. The goal is to achieve a scientific understanding of the fundamental plasma interactions and particle transport processes responsible for the extreme conditions that pose the most serious threat to space systems. The objectives are to provide (1) models that accurately characterize the space weather conditions that are responsible for spacecraft charging, (2) the space environment information required for spacecraft manufacturers and operators to make sound technical decisions concerning all aspects of spacecraft charging, and (3) scientific inputs for the LWS Magnetospheric Multiscale and Radiation Belt Mapper missions by identifying gaps in current data and knowledge. Data from a number of NASA, NOAA, U.S. Air Force and commercial spacecraft including SCATHA, CRRES, GOES, POLAR, and ICO are available for the studies. The recently recovered SCATHA particle and plasma data, the LANL energetic particle data, and the CRRES energetic particle data will be the primary data used for the investigations. We expect to improve the basic understanding of the interaction of plasma sheet electrons with a spacecraft, and the transport, production, and loss processes that determine the intensity of the radiation belts. We will emphasize the extreme storms that pose the most serious threat to spacecraft. We will determine the common characteristics of typical storms and look for exceptional characteristics of super storms. We expect to develop empirical models of plasma injections and energetic particle dynamics during and following large storms that can later be used to validate physical models of particle transport and energization.

Publication References:

no references