Project Details

ROSES ID: NRA-03-OSS-01
Selection Year: 2004
Program Element: Independent Investigation: LWS

Project Title:
Quantifying energetic electron precipitation from the radiation belts and their relation to storm-time dynamics

PI Name: Reiner Friedel
PI Email: atn@g.ucla.edu
Affiliation: Los Alamos National Laboratory
Project Member(s):
- Thorne, Richard ; COI; UCLA
- Taylor, Matthew G.G.T.; COI; Los Alamos National Laboratory
- Hixson, Laurie L; Authorizing Official; Los Alamos National Laboratory
- Evans, David S; Collaborator; NOAA/OAR
- Fennell, Joseph F.; Collaborator; Aerospace Corporation
- Soraas, Finn ; Collaborator; University of Bergen

Summary:
One of the major obstacles to understanding dynamic inner magnetospheric dynamics of energetic electrons is our limited understanding of their dynamic loss processes. The recent LWS Geospace Mission Definition Team Report states: ``To be able to specify and predict changes in the radiation belt populations requires measurement and a quantitative understanding of the dominant loss processes''. Losses are the most dominant feature during the onset-phase of geomagnetic storms, and lead to increased fluxes at LEO orbit which is occupied by a large amount of space hardware, including the International Space Station. Energetic electron precipitation increases during active times, but it is not known whether this increase is due to increased loss rates or simply an overall increase in the radiation belt population. Several of the wave particle interaction processes that may be responsible for both losses and acceleration of relativistic electrons are thought to exhibit strong local time preferences - dawn for whistler chorus, afternoon to dusk for EMIC waves, and are active during different phases of a geomagnetic storm. We plan to test these and other hypotheses directly. We expect to answer the following specific scientific questions, which are directly in line with the ``questions critical for the quantitative understanding of the role of electron loss'' as stated in the LWS Geospace Mission Definition Team Report: 1.Can we quantify and document a relative increase of particle losses during active times? 2. Is there a local time and/or radial dependence to enhanced particle losses? Do these dependencies agree with theoretical predictions? 3. What is the relation of these losses with regard to the onset, main phase and recovery phase of geomagnetic storms? We intend here to use low altitude data from four recent NOAA POES spacecraft together with (near-)equatorial data from several satellite missions - from POLAR (one spacecraft, L=3--8), from HEO (2 spacecraft, L=2--4), LANL GPS (4 spacecraft, L=4--5.5) and LANL GEO (6 spacecraft, L=6.2--7.2) to investigate the location and strength of energetic electron loss processes during geomagnetically active times. POLAR, the DOE/DOD geosynchronous and GPS missions, HEO and NOAA spacecraft are all currently operational. They form an inner magnetospheric constellation and are an ideal testbed for future constellation-type missions such as envisioned by the Living with a Star Program. The resources of this existing constellation can be used by the Living with a Star Program at no operational cost.

Publication References:

Summary: ''

Reference: Reiner Friedel / Los Alamos National Laboratory-Quantifying Energetic Electron Precipitation from the Radiation Belts and their Relation to Storm-Time Dynamics