Project Details

ROSES ID: NRA-02-OSS-01
Selection Year: 2003
Program Element: Independent Investigation: LWS

Project Title:
Investigations of Interplanetary Propagation of High-Energy Radiation from Poorly Connected CME Events

PI Name: Ming Zhang
PI Email: atn@g.ucla.edu
Affiliation: Florida Institute of Technology
Project Member(s):
- Rassoul, Hamid K.; Collaborator; Florida Institute of Technology (FIT)
- McKibben, Robert Bruce; Collaborator; University of Chicago
- Dwyer, Joseph Richard; Collaborator; Florida Institute of Technology

Summary:
We will investigate the propagation of solar energetic particles in the 3-dimensional heliospheric magnetic fields. We will study solar energetic particles from large gradual CME events, which are particularly dangerous to astronauts working in space. This data analysis project will be combined with our effort using new theoretic tools recently developed by the Principal Investigator that allow us to calculate particle propagation in a realistic 3-dimensional magnetic field of the heliosphere, including all the particle propagation effects such as pitch-angle scattering, focusing, cross-field diffusion, convection, drift, and particle energy change. Specific tasks of this investigation are: (1) develop theoretic tools based on the transport equations to incorporate realistic spiral (Parker, and random walking or Fisk) magnetic fields and a propagating shock and derive a new type of Fokker-Planck equation for the anisotropic distribution function that includes the effects of particle propagation across the magnetic field, convection and adiabatic energy loss, (2) with the newly enhanced theoretic tools, we will run various models suggested by researchers in the community and (3) analyze solar particle events and compare observations with our model calculations. By investigating the behaviors of solar energetic particles at various locations in the heliosphere, such as the time intensity profile, spectrum, anisotropy and elemental composition, and using them to constrain our models and parameters, we hope to increase our understanding of the interactions of particles, magnetic fields and plasma in the heliosphere. The goal of this investigation is to gain understanding of how solar energetic particles arrive at Earth from events that seem to have poor magnetic connections. The software we gain from this study will become an important asset for the interpretation of observations from the up-coming NASA STEREO mission. The knowledge from this investigation will form basis for future tools to forecast near-earth space radiation environment.

Publication References:

Summary: ''

Reference: Zhang, Ming FLIT - Investigations of Interplanetary Propagation of High-Energy Radiation from Poorly Connected CME Event