Project Details

ROSES ID: NNH06ZDA001N
Selection Year: 2007
Program Element: Focused Science Topic

Topic: Understand how Flares Accelerate Particles near the Sun (i.e., through Shocks and/or Reconnection) and how they Contribute to Large SEP Events

Project Title:
Solar Flares as a Source of Gradual Solar Energetic Particle Events

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Summary:
We propose a multi-disciplined study of the origin of gradual solar energetic particle (SEP) events with detectable >50 MeV protons, focusing on how the variability of SEP properties is accounted for by the conditions or properties of the associated solar flares and coronal mass ejections. Many gradual SEP events have been shown to exhibit the properties close to those of impulsive SEP events, such as elevated Fe/O ratios and high heavy ion charge state. We examine low coronal images and white-light coronagraph images to identify any special conditions of the flares associated with Fe-rich SEP events, and combine these results with detailed timing analysis of radio signatures, to find out when and where particles are accelerated and released to the interplanetary medium. The importance of how accelerated particles access open field lines that intersect spacecraft should not be neglected even in the context of gradual SEP events. This will be addressed by characterizing the magnetic field topology in and around the flaring regions, including the evaluation of magnetic field extrapolations. Using extrapolated coronal magnetic fields combined with CME geometrical and kinematical parameters, we will test the hypothesis that the angle between the magnetic field and the normal of the CME-driven shock may affect the observed SEP properties. The remote sensing observations and magnetic field modeling will be compared with SEP properties at >25 MeV/nuc including spectra and abundance for heavy ions as well as high-energy protons and electrons. The temporal variation of these properties will be a key aspect of the analysis. The proposed study directly responds to the LWS TR&T Focused Science Topic ``Understanding how flares accelerate particles near the Sun and how they contribute to large SEP events.'' This investigation will also advance our understanding of the origin of CMEs.

Publication References:

Summary: no summary

Reference: Nitta, N. V., and M. L. DeRosa, "A comparison of solar open field regions found by type III radio bursts and the potential field source surface model", Astrophys. J. Lett., 673, L207, 2008.