

Project Details

ROSES ID: NRA-NNH04ZSS001N

Selection Year: 2005

Program Element: Focused Science Topic

Topic: To relate solar-energetic particles to their origin at the sun and inner heliosphere.

Project Title:

Particle acceleration at CME-driven and interplanetary shock and transport in inner heliosphere

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Project Member(s):

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Summary:

Understanding the origin and acceleration of solar energetic particles and its interaction with interplanetary plasma is one of the outstanding problems in heliospheric physics and astrophysics. Over the past 30 years, an enormous amount of data on solar energetic particles events (SEPs) has been obtained. To fully appreciate these observational data, especially in-situ measurements by spacecraft such as ACE and WIND, a proper understanding of the properties of the turbulent interplanetary magnetic field and its role in the particle acceleration process, together with a realistic particle acceleration model, is necessary. In this proposal, we propose to perform the following studies, 1) We will investigate the generation and amplification of upstream turbulence (often in the form of Alfvén waves) and its role in the particle acceleration process. We will re-examine the transmission of upstream turbulence to the downstream region at a CME-driven/interplanetary shock. 2) We will continue the work of Li et al. [2004a] and investigate correlations between the upstream turbulence and particle spectra at the shock. Specific SEP events with clean turbulent magnetic field data and particle data will be identified, and the necessary data analysis on the turbulent magnetic field will be performed. 3) We will study particle acceleration at a perpendicular shock using a recently developed theory, known as non-linear guiding center theory (NLGC) [Matthaeus et al., 2003, Zank et al., 2004] and we will extend our existing particle acceleration model to incorporate quasi-perpendicular shocks. These goals are in excellent agreement with the objective T3d - Solar Energetic Particle, of the Living With a Star program. We believe our study will further help us understand basic questions such as the seed population of SEPs, the time scale for accelerating particles and the time intensity profile of energetic particle populations at L1.

Publication References:

Summary: no summary

Reference: Zank, G. P.; Li, Gang; Verkhoglyadova, O.; (2008), Modeling Particle Acceleration at Interplanetary Shocks, PARTICLE ACCELERATION AND TRANSPORT IN THE HELIOSPHERE AND BEYOND: 7th Annual International Astrophysics Conference. AIP Conference Proceedings, Volume 1039, pp. 203-213, doi: 10.1063/1.2982446