

# SPACE AND COSMIC RAY PHYSICS SEMINAR

University of Maryland  
Computer & Space Sciences Building, Room 2400  
4:30 pm, Monday, October 4, 2004  
Coffee, Tea & Cookies 4:00-4:30 PM

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## **Intensity Variation of Large Solar Energetic Particle Events**

Large solar energetic particle (SEP) events are closely associated with coronal mass ejections (CMEs). It is thought that CME-driven shocks accelerate the SEPs. One of the traditional supports for this connection is the correlation between SEP intensity and CME speed. However, these scatter plots often show a 3-4 orders magnitude variation in SEP intensity for a given CME speed. We explore the possibility of CME interaction as a source of this scatter. We consider all the SEP events with intensity  $> 10$  pfu in the GOES energy channel  $> 10$  MeV. The SEP events can be divided into three groups: (i) those with preceding wide CMEs (P) within a day, (ii) those not preceded (NP) by wide CMEs within a day, and (iii) those with CMEs interacting with another one very close to the solar surface or with another CME (O). We find that group P has the highest median intensity and group NP has the lowest median intensity. Since most of the CME properties such as speed, width, mass, and kinetic energy are the same between P and NP events, we conclude that the presence of preceding CMEs must have resulted in the high intensity of P events. This is further supported by the fact that most of the O events are also of high intensity (they interact with other CMEs close to the surface or with streamers). Considered separately, the scatter in the correlation plot reduces significantly. The preceding CMEs are, on the average, fast and wide, so they are capable of producing seed particles. The presence of preceding CMEs near the Sun implies that the shocks have to propagate through an ambient medium severely disturbed and distorted in density and magnetic field, rather than through a normal solar wind.

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