

Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Solar Energetic Particles as a Laboratory for the Study of Shock Physics¹ ALLAN J. TYLKA, US Naval Research Laboratory — Shocks driven by fast coronal mass ejections (CMEs) are generally believed to be the dominant accelerators in large, gradual solar energetic particle (SEP) events. A key challenge for this notion has been the highly variable spectral and compositional characteristics above a few tens of MeV per nucleon. Although this variability is a daunting problem, there are also high levels of correlation among the variable factors, which provide compelling clues to their origin. I will review observations from ACE, Wind and other spacecraft that have yielded these clues. I will also review recent efforts to understand this high-energy variability in terms of the interplay of two factors: evolution in the shock-normal angle as the shock moves outward from the Sun; and a compound seed population, typically comprising at least suprathermals from the corona (or solar wind) and suprathermals from flares. A simple analytical implementation of these ideas has been shown to semi-quantitatively account for a wide range of SEP phenomenology, including facets that have been known but unexplained for more than 20 years. These simple calculations also highlight a number of questions where we should be able to use SEP observations to deepen our understanding of shock acceleration.

¹Supported by the Office of Naval Research and NASA's Living with a Star Program under DPR NNH05AB581

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Date submitted: 21 Jul 2006

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