

Multiple CMEs and large gradual SEP events

G. Li^a, G. P. Zank^a

(a) *IGPP, University of California at Riverside, G. P. Zank, IGPP, University of California at Riverside, CA, 92521, USA*
Presenter: Gang Li (gang.li@ucr.edu), usa-li-Gang-abs1-sh14-poster

Gradual Solar Energetic Particle events (SEPs) are now believed to be associated with shocks driven by Coronal Mass Ejections (CMEs). As CMEs propagate out from the Sun, particles are accelerated at the shock front, reaching energies to 10's of MeV and occasionally GeV's. Understanding the time intensity profiles of these gradual events and the spectra of the accelerated particles are of practical importance to, for example, manned spacecraft program since these particles are the No. 1 space-weather hazard. Recently, there are observational indications that large gradual events usually happen when two or more CMEs occur closely. In this work, using our previously developed model, we investigate particle acceleration at two close CME-driven shocks. We find that comparing to the case of a single CME-driven shock, the maximum particle energy, at the second CME-driven shock, can increase significantly due to the enhanced turbulence between the shock pairs. Implications of our calculation to the observations of gradual SEP events are discussed.