

Long Duration Gamma-Ray Flares & Solar Energetic Particles —Is there a Connection?

Little is known still about the origin of the high-energy and sustained emission from Long Duration Gamma-Ray Flares (LDGRFs), identified with Compton Gamma-Ray Observatory (CGRO), the Solar Maximum Mission (SMM), and now Fermi. Though Fermi/LAT has identified dozens of flares with LDGRF emission, the nature of this emission has been a challenge to explain both due to the extreme energies and long durations. The highest energy emission has generally been attributed to pion production from the interaction of high-energy protons with the ambient matter, suggesting that particle acceleration occurs over large volumes extending high in the corona, either from stochastic acceleration within large coronal loops or from back precipitation from CME-driven shocks. It is possible to test these models by making direct comparisons between the accelerated ion population at the flare derived from the observations of Fermi/LAT with PAMELA measurements of solar energetic particles in the energy range corresponding to the pion-related emission observed with Fermi. For nearly a dozen SEP events, we compare the two populations (SEPs in space and the interacting population at the Sun) and discuss the implications in terms of particle acceleration and transport models.

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