



Spectral Fits Of Protons During Solar Particle Events Measured With The PAMELA Experiment

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The great challenge in constraining scenarios for particle acceleration through modeling the properties of solar energetic particles (SEPs) is due to the fact that the signatures of acceleration itself are heavily modified by transport within interplanetary space.

PAMELA (Payload for Antimatter-Matter Exploration and Light-nuclei Astrophysics) offers unique possibilities to study the link between the highest energy solar events and the low-energy in-situ observations, bridging a critical gap in energy.

We report spacecraft measurements of the energy spectra of solar protons properties during 3 Ground Level Events or GLEs of Solar Cycle 23 and 24 (December 13th of 2006, May 17th of 2012 and January 6th of 2014). The measurements were made by seven instruments on the ACE, GOES, STEREO and PAMELA spacecraft and extend from 0.1 MeV/n to 2 GeV/n. All of the proton spectra exhibit spectral breaks at energies ranging around tens of MeV and all are well fit by a multiple power-law shape (following the so called Band function). Fits with simple power law are also presented.

A comparison of GLE events with a sample of other SEP events (which took place in the current solar cycle) is also carried out to show that GLEs generally have harder spectra.