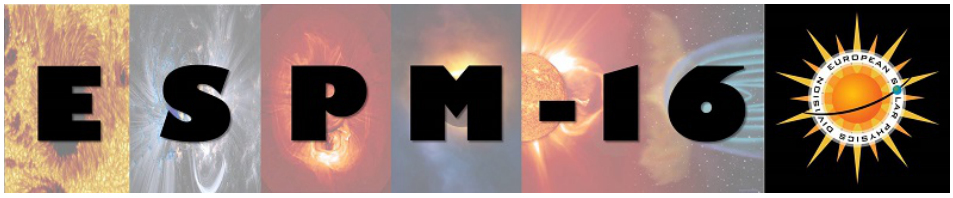

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Proton energy spectra of energetic storm particle events and relation with shock parameters and turbulence

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The proton energy spectra of 23 Energetic Storm Particle events, occurring either in association with (16 events) or in absence of (7 events) Solar Energetic Particles, are investigated by using data from particle instruments aboard STEREO A in the energy range from 84.1 keV to 100 MeV. For the SEP events at quasi-perpendicular shocks, the Weibull distribution provides good fits to the spectra, over the whole energy range for some events, and only at high energies for the others, being lower energies explained by the power law predicted by the DSA. Instead, the SEP spectra at quasi-parallel shocks are better reproduced by a double power law. In the cases non associated with SEPs, an Ellison-Ramaty form fits the observed spectra. Moreover, a significant correlation of the downstream turbulence level is found with the Weibull parameters for quasi-perpendicular shocks, and with the proton peak value in the intermediate energy range 4-6 MeV for all the 16 shocks. Our results suggest that the downstream turbulence is a relevant factor in particle acceleration and that stochastic acceleration can be a plausible mechanism for re-acceleration at interplanetary shocks.

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