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Extreme solar energetic particle events

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Properties of extreme solar energetic particle (SEP) events, here defined as those leading to ground level enhancements (GLEs) of cosmic rays, are reviewed. We review recent efforts on modeling SEP acceleration to relativistic energies and present simulation results on particle acceleration at shocks driven by fast coronal mass ejections (CMEs) in different types of coronal magnetic structures and turbulent downstream compression regions. Based on these modeling results, we discuss the possible role of solar and CME parameters in the lack of GLEs during the present sunspot cycle.

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