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New reconstruction of the event-integrated spectra for GLE events

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Here we report the new reconstruction of the event-integrated spectra of solar energetic particles (SEP) detected by neutron monitor (NM) network and satellite experiments (mainly GOES data) during ground-level enhancement (GLE) events. The reconstruction of SEP particle fluences is based on the "bow-tie"method employing the latest advances in NM data analysis (time-dependent GCR background and the use of the NM yield function directly verified with the AMS-02 experiment data) and a detailed study of different uncertainties. For the pre-GOES period, we used all available SEP datasets. As a result of this work, we obtained integral fluences of SEPs in the energy range from 30 MeV to a few GeV for 58 moderate and strong GLE events since 1956. The results were fitted with the modified Band-function (a double power-law function with two exponential cutoffs) which is continuous together with its derivative. An easy-to-use presentation of SEP fluences in the form of an analytical expression forms a solid basis for new studies in different fields, such as the influence of SEPs on the atmosphere and a statistical study of extreme solar activity.

Keywords

solar energetic particles; ground-level enhancements; SEP; GLE

Collaboration

other Collaboration

Subcategory

Experimental Results

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