

## A new reconstruction of solar energetic particle fluence for GLE events

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A ground-level enhancement (GLE) is defined as a strong event with high-energy solar energetic particles (SEPs) detected by the network of ground-based neutron monitors. Until now, 73 GLEs have been registered. In this work, we report a new reconstruction of the event-integrated spectra (fluences) of SEPs during 59 moderate and strong GLE events detected by NM network and satellite experiments. The reconstructions of SEP fluences are based on the “bow-tie” method employing the latest advances in NM data analysis (time-dependent GCR background and the use of the altitude-dependent NM yield function directly verified with the AMS-02 experiment data) and a detailed study of different uncertainties. As a result of this work, we obtained fluences of SEPs in the energy range from 30 MeV to a few GeV for GLE events since 1956, which were fitted with the modified Band-function (a double power-law function with two exponential cutoffs). An easy-to-use presentation of SEP fluences in the form of an analytical expression makes a solid basis for new studies in various fields, such as the influence of SEPs on the atmosphere and a statistical study of extreme solar activity.

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