

Relativistic solar proton dynamics in some GLE of 23 solar cycle

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The ground level enhancements (GLEs) registered by neutron monitors remain up to now the basic data source on the relativistic solar protons (RSP). Distributed over the globe the neutron monitor network may be considered as a unit multidirectional device measuring parameters of primary RSP flux. The paper considers some recent GLEs occurred at the rise and phase of recent 23 cycle of solar activity. The spectra, pitch-angle distributions and anisotropy of RSP flux obtained from ground based observations by successive moments of time allowed studying dynamical changes of these parameters in course of event. Two distinct populations of relativistic solar protons: prompt and delayed one can be revealed in all the events. The prompt component (PC) of RSP is observed at the very start of GLE. It is characterized by an impulsive intensity profile, hard energetic spectrum and the strong directed out the Sun anisotropy. The probably source of the PC in the corona can be acceleration by an electric field arising in a localized impulsive magnetic reconnection process. The softer delayed RSP component arrives to Earth later and starts to dominate the RSP flux at 0.5-1 hours after the GLE onset. The delayed RSP component sometimes is associated with a bidirectional anisotropy which may be an indication of a loopelike IMF structure associated with a CME.

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