

Features of the GLE's of the 23rd Solar Cycle from Recordings of SANA E Neutron Monitors

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The features of proton flare events, deduced from the recordings of the 6NM64 and 4NMD neutron monitors at SANA E, Antarctica, will be discussed in relation to solar proton energy spectra and the prevalent interplanetary magnetic field. This discussion will also be a follow-up of the review by the author in Space Science Reviews 73, 327, 1994, titled 'Relativistic Solar Proton Events'.

The GLE of 2 May, 1998, had two phases, an impulsive and a delayed phase, extreme anisotropy and an unusual short duration of one hour. These observations may be explained by the loop-like structure of the magnetic field inside a CME, which then enveloped the Earth.

SANA E's asymptotic cone of acceptance was in the direction of the IMF on the arrival of the solar protons on 7 November 1997 and on 14 July 2000. The recordings of the two neutron monitors suggested a progressive softening of the solar proton spectrum during the enhancement of 7 November, while the spectral form did not change during the enhancement on 14 July.

The GLE of 20 January 2005 was markedly anisotropic. The power spectral index of the solar protons arriving at SANA E during this double peaked enhancement will be presented.

Numerical values of the power indexes of solar proton spectra, deduced from the recordings of neutron monitors, appear to depend on the method used. Reason for these differences will be discussed.