
Large Solar Proton Events in Association With Large Solar Flares from January 1996 to May 2001

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Abstract

We have selected 39 of extremely high solar energetic particle (SEP) events (with flux of over 10 protons $(\text{cm}^2.\text{sec}.\text{ster})^{-1}$) with energies > 60 MeV and 30 MeV) that recorded at the Earth between Jan' 1996 and May 2001. A list of major SEPs in association with solar flares and coronal mass ejections (CMEs) has been presented. The two-class paradigm of solar particle event have been studied. The Nov. 6, 1996 and Apr. 15, 2001 flares emitted intense hard X-and γ compared with July 2000. The fluence of these flares are larger than other, although the SEP fluxes are two orders of magnitude smaller. We find weak correlation between the flare-associated protons and SEPs fluxes.