Solar proton spectrum and acceleration during the 20 January 2005 flare

R.G.Wang(1,2), J.X.Wang(1)

(1)National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China (2)Institute of High Energy Physics, Chinese Academy of Sciences, Beijing 100049, China

A extreme solar cosmic ray event was broken out on 20 January 2005. It was not only the most intense solar energetic particle (SEP) event measured by GOES satellites since 1976 but also the largest ground level enhancement(GLE) recorded in neutron monitors since 1956. We present the solar proton energy spectra of this event, data from GOES measurements in multi-channels of energy. These spectra are well fit by a double power law form. It was shown that the January 20 event had the hardest energy spectrum during solar cycle 23 and the highest fluxes for above 30 MeV protons in past 30 years. We examine variations of the spectral index from -1.4 to -0.8 within the rise phase of proton intensity. Combing X-ray, radio emission, and CME observation as well as available neutron monitor data, relativistic proton acceleration and travel is discussed. It seems to imply that the first arrival relativistic protons are released in low corona and accelerated up to GeV within minutes. This impulsive high energy process more likely associated with solar flare, instead of CME.