

Development of GLE alarm system and observation of recent SEP events by neutron monitors

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We have developed a system that watches for count rate increases recorded in real time by eight neutron monitors, which triggers an alarm if a ground level enhancement (GLE) is detected. In this work, we determine optimal strategies for detecting the GLE at a very early stage, while still keeping the false alarm rate at a very low level. The highest level alarm, which we term an "alert," is generated when a 4% increase is recorded at 3 stations in 3-min averaged data. At this level the false alarm rate obtained by backtesting over the 4.4 years from October 2000 to May 2005 is zero. Ten GLEs occurred in this period, and our system produced GLE alarms for nine events. Alarm times for these nine events are compared with satellite proton data. The GLE alert precedes the earliest alert from GOES (100 MeV or 10 MeV protons) by 10-30 min. An automated e-mail alert system is now under beta testing at <http://www.bartol.udel.edu/~takao/neutronm/glealarm/index.html>. Real-time GLE data may be viewed at <http://neutronm.bartol.udel.edu/spaceweather>. We also report the recent observation of solar energetic particle events in this year.

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