

CLIMAX NEUTRON MONITOR RESPONSE TO INCIDENT IRON IONS: AN APPLICATION TO THE 29 SEPT 1989 GROUND LEVEL EVENT

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We present the response function of the Climax Neutron Monitor to iron ions incident on the upper atmosphere. We have calculated the relative yield function of iron versus protons using the CORSIKA air shower Monte Carlo code. We then multiply the yield function for protons and iron by appropriate incident source spectra to determine the relative neutron monitor response functions. The source spectra we use are those determined for the 29 September 1989 ground level event (GLE), using data from IMP-8, GOES-6/7 and the neutron monitor network which observed this GLE. Like all the GLEs observed with the Climax neutron monitor, the 29 September 1989 event was iron-rich at high energy and had a hard solar energetic (SEP) iron spectrum which extended beyond 500 MeV/nucleon. This event had perhaps the hardest iron spectrum and greatest iron flux at high energy than any other GLE observed at Climax. Despite the fact that, during the peak of this event, the iron flux at GeV/nucleon energies may exceed that of protons, we determine that the integrated neutron monitor response to iron is less than 0.1 of that to protons. Thus it is unlikely that the response of the neutron monitors to iron-rich GLEs is due to the greatly enhanced flux of high energy iron. We discuss this result in terms of the reported correlation between ground level events observed at Climax and iron-rich gradual SEP events simultaneously observed at IMP-8.