

Study of Proton cutoffs during geomagnetically disturbed times

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Solar energetic particles (SEP) are currently classified into impulsive and gradual events. The former are understood to be accelerated at solar flares and the latter at interplanetary shocks driven by coronal mass ejections (CMEs). It is well known that CMEs also cause intense geomagnetic storms during which the geomagnetic field can be highly distorted. During these times, SEP fluxes penetrate the terrestrial magnetosphere and reach regions which may not be normally accessible to them. The SEP access is of course controlled by the geomagnetic field configuration. The cutoff latitude is a well defined latitude below which a charged particle of a given rigidity (momentum per unit charge) arriving from a given direction cannot penetrate. SEPs constitute a radiation hazard to spacecraft and humans and measurement and prediction of the cutoff location are an important aspect of space weather.

This paper reports on the measurements of solar energetic proton cutoffs made by two satellites, SAMPEX and Polar during geomagnetically disturbed times. We study select SEP events occurring during the period 1996 to 2005 when both SAMPEX and Polar provide high quality data. We will compare our measurements with cutoffs calculated by a charged particle tracing code which utilizes several currently used models of the geomagnetic field. The measured SEP proton cutoffs cover a range of rigidities and are obtained at high-altitudes by the HIST detector onboard Polar and at low-altitudes by the PET and HILT detectors onboard SAMPEX.