

HIGH ENERGY IONIC CHARGE STATE COMPOSITION IN LARGE SOLAR ENERGETIC PARTICLE EVENTS

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The ionic charge states of solar energetic particles (SEPs) provide information on the temperature of the source region and on conditions of acceleration and transport during which additional electron stripping may occur. Measurements of SEP charge states at relatively high energies (> 15 MeV/nucleon) are possible using the Mass Spectrometer Telescope (MAST) on board the Solar, Anomalous, and Magnetospheric Particle Explorer (SAMPEX) satellite by making use of the Earth's magnetic field as a particle rigidity filter. When particle fluxes are high enough to clearly determine the geomagnetic cutoff for a particular species, a comparison of the cutoff locations for different elements together with the measured energies of the particles reveals their relative charge states. Higher Z particles such as Fe are particularly interesting, as measurements have occasionally shown energy dependence in the charge states, and the mean charge state is often considerably higher (~ 20) in impulsive SEP events than in gradual events (~ 14). Using MAST and the geomagnetic filter technique, we have examined the largest SEP events of solar cycle 23 and determined ionic charge states of Fe and other elements in several of these events. Surprisingly, in a number of cases, relatively high charge states of around 20 were found for Fe in very large events which are most likely gradual. We present these results and compare them with charge states obtained from other instruments where such measurements are available.

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