Abstract for Spring 2003 AGU/EGS Meeting, Nice, France

EXCEPTIONAL ELEMENTAL AND ISOTOPIC COMPOSITION PATTERNS IN THE ^{3}HE-RICH SOLAR ENERGETIC PARTICLE EVENTS OF AUGUST 2002

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Two series of ^{3}He-rich solar energetic particle (SEP) events that occurred in August 2002 had a number of exceptional characteristics. They were among the largest ^{3}He-rich events observed during the present solar maximum in terms of peak intensities of MeV heavy ions. In addition, the energy spectra were unusually hard, resulting in measurable fluxes of a wide variety of elements and isotopes at energies above 10 MeV/nuc. The observed pattern of composition enhancements (relative to coronal composition) was not a monotonic function of particle mass (or charge) such as is commonly found in ^{3}He-rich events. Rather, large deviations of a variety of element and isotope ratios from standard values were present, including N/O, ^{26}Mg/^{24}Mg, and many others. It is possible that these August 2002 events, like those reported by at lower energies by Mason et al. (ApJL 565, L51, 2002), are exhibiting signatures of a heating or acceleration process that affects particles within a relatively narrow range of mass-to-charge ratio. Such resonant processes, which are commonly thought to be responsible for the enormous enhancements of ^{3}He relative to ^{4}He, have not previously been observed to affect composition of elements heavier than He. We present observations of elemental and isotopic composition and of energy spectra obtained in these events from the Solar Isotope Spectrometer (SIS) on the Advanced Composition Explorer (ACE). In addition, we discuss results of model calculations in which we fit the parameters of a resonant fractionation process dependent on the mass-to-charge ratios of the ions. In an accompanying paper (Leske et al., this conference) the nature of these events is discussed in the context of correlated observations from in-situ and remote-sensing instrumentation.

This research was supported by NASA at Caltech (under grant NAG5-6912), JPL, and GSFC.