

Energetic ^3He in the Inner Heliosphere: 1997–2002

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Abstract

Sensitive measurements of the elemental and isotopic composition of solar energetic particles (SEPs) detected near the orbit of Earth have led to the realization that impulsive solar flares must be providing a suprathermal particle population which can efficiently be further accelerated by interplanetary shocks. The isotope ^3He , which tends to be strongly enriched in impulsive SEP events, provides a reliable indicator of the presence of this material. Using data collected by the Solar Isotope Spectrometer (SIS) and the Ultra-Low-Energy Isotope Spectrometer (ULEIS) on the Advanced Composition Explorer (ACE) over a period of >4 years, we have investigated the frequency of occurrence of ^3He intensity enhancements over the energy range ~ 150 keV/nuc to ~ 15 MeV/nuc. Although there are numerous instances of ^3He enhancements which extend over this entire energy range, it is not unusual to find a relatively high intensity of ^3He at the lower energies without a significant flux at the higher energies, or vice versa. Some factors which could be contributing to these complicated time and energy dependences include varying spectral forms of the accelerated ^3He , velocity dispersion during the transit from the Sun to Earth, and the variation of the magnetic connectivity between the spacecraft and the acceleration site on short time scales. We discuss these patterns and their implications for further interplanetary acceleration of flare suprathermals.

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