Geophysical Research Abstracts, Vol. 8, 01454, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01454

Acceleration of low-energy Ions at the Termination Shock and in the quiet-time Solar Wind

G. Gloeckler (1,2) and L. A. Fisk (1)

(1) University of Michigan, USA, (2) University of Maryland, USA (gglo@umich.edu / Phone: +301.249.0667)

Suprathermal tails are observed ubiquitously in the heliosphere. In quiet-time solar wind conditions, the tails are found to have a common spectral shape, a distribution function in velocity space that is a power law with spectral index of –5. Remarkable, power law spectra with the same spectral index of –5 (up to a few MeV/nucleon) have been reported by Voyager 1 investigators both upstream and downstream of the heliospheric Termination Shock at 94 AU. The intensity of these low-energy ions ($<\sim$3 Mev/nucleon) was observed to increases abruptly at the shock by about a factor of ten. We show that in the quiet-time solar wind power law spectra with index –5 are expected if the tails are formed by stochastic acceleration due to random compressions and expansions generated in part by variations in the pressure of the suprathermal ($<\sim$0.1 Mev/nucleon) particles. The spectrum is formed by a cascade in energy, analogous to turbulent cascades. Furthermore, we argue that the spectral shapes of the low-energy ions observed at the Termination Shock, both upstream and downstream, require that the pressure of the accelerated particles is behaving like that of a simple ideal gas, without heat flux, and that the intensity increase across the Termination Shock can be determined by assuming that the pressure of the accelerated particles behaves according to the Rankine-Hugoniot relationship. The approach taken here is contrasted with diffusive shock acceleration.