Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Acceleration of pickup ions by intermittent compressive plasma waves in interplanetary space[1] MING ZHANG, Florida Institute of Technology — Pickup ions are created in interplanetary space when penetrated interstellar neutral atoms are ionized by the solar wind or UV. Their initial speed in the plasma frame is equal to the solar wind speed V_{sw} and they are the dominant supra-thermal population. Their distribution function is basically flat below V_{sw}, and is often accompanied by a power-law high-energy tail that sometimes can extend much above V_{sw}. More interestingly, power-law slope index is often very close to -5. Fisk and Gloeckler (2008, ApJ, v686, p1466) suggested this spectrum is produced by stochastic acceleration in compressive plasma turbulence or waves. We have studied the behaviors of particle acceleration by compressive wave trains. It is found that the waves can efficiently accelerate pickup ions with an exponential increase of pressure. This pressure may moderate the wave amplitude, so that the system eventually establishes equilibrium. At the point, a p^{-5} distribution is automatically fulfilled by balancing the effect of acceleration with any particle loss mechanisms. This situation is more easily achieved with intensive intermittent compressive waves that only occupy a limited volume of space. We hope these phenomena will be verified in laboratory plasma experiments.

[1]Supported by DOE Grant DE-SC0008721

Ming Zhang
Florida Institute of Technology

Date submitted: 11 Jul 2014 Electronic form version 1.4