

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Acceleration of pickup ions in interplanetary space¹ MING ZHANG, Florida Institute of Technology, NIKOLAI POGORELOV, University of Alabama in Huntsville — Pickup ions are created in the solar wind through charge exchanges or photoionization with the interstellar neutrals. Their initial speed in the plasma frame is equal to the solar wind speed V_{sw} . So pickup ions can build up its internal energy quickly. In the spacecraft frame, they have a cutoff speed of $2V_{sw}$. Observations returned from the SWICS instrument on Ulysses show that the cutoff energy can go higher than $2V_{sw}$. Furthermore, there is always a tail distribution of pickup ions much beyond $2V_{sw}$. All these observations suggest that pickup ions are accelerated in the solar wind. Since interplanetary shocks do not occur more frequently than a few times per month, the pickup ions may have to rely on small-scale plasma turbulence prevalent in the solar wind. In this paper, we will discuss the roles of Alfvénic turbulence and compressive plasma turbulence in the acceleration of pickup ions. We will show that the Alfvénic turbulence is ineffective. Although compressive turbulence has a much smaller amplitude than the Alfvénic turbulence in the solar wind, the acceleration is much faster. If its initial amplitude is high enough, a fully evolved compressive turbulence will tend to yield a v^{-5} speed spectrum of high-energy pickup ions.

¹NASA grant NNX15AN72G

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Date submitted: 02 Jul 2019

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