

Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Pickup proton instabilities and scattering in the outer heliosheath: Hybrid simulations S. PETER GARY, Space Science Institute, KAIJUN LIU, Los Alamos National Laboratory, EBERHARD MOEBIUS, University of New Hampshire, DAN WINSKE, Los Alamos National Laboratory — The consequences of injection of pickup protons perpendicular to a background magnetic field in a homogeneous, collisionless plasma are studied using one-dimensional hybrid simulations. Freshly ionized protons are continuously injected into the simulations at constant rates and relative speeds approaching conditions in the outer heliosheath. The pickup protons initially form a ring-velocity distribution unstable to the electromagnetic proton cyclotron instability which leads to enhanced magnetic fluctuations near and below the proton cyclotron frequency. The magnetic fluctuations first have a quiescent phase, followed by a phase of exponential growth. There is little proton scattering during the quiescent phase, but rapid pitch-angle scattering of the pickup protons toward an isotropic velocity shell distribution during the exponential growth phase. The pickup proton density at onset of rapid scattering increases with the pickup proton injection rate; scaling relations for the onset density and the subsequent scattering rate are derived from the simulations. These results suggest that significant scattering of pickup protons in the outer heliosheath occurs in a relatively limited spatial regime close to the heliopause.

S. Peter Gary
Space Science Institute

Date submitted: 09 Jul 2012

Electronic form version 1.4