

Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Plasma Electron Hole Oscillatory Velocity Instability¹ CHUTENG ZHOU, IAN HUTCHINSON, Massachusetts Institute of Technology — We report a new type of instability of electron holes (EHs) interacting with passing ions. The nonlinear interaction of EHs and ions is investigated using a new theory of hole kinematics. It is shown that the oscillation in the velocity of an EH parallel to the magnetic field direction becomes unstable when the hole velocity in the ion frame is slower than a few times the cold ion sound speed. This instability leads to the emission of ion-acoustic waves from the solitary hole and decay in its magnitude. The instability mechanism can drive significant perturbations in the ion density. The instability threshold, oscillation frequency and instability growth rate derived from our theory yield quantitative agreement with the observations from a novel high-fidelity hole-tracking Particle-In-Cell code. The instability can drive anomalous transport in space. Our result is important for studying slow electron holes that are strongly coupled to the ions.

¹This work is supported by NASA grant NNX16AG82G "Electron Hole Instabilities in the Plasma Wake of Moons, Asteroids, and Comets."

Chuteng Zhou
Massachusetts Institute of Technology

Date submitted: 14 Jul 2017

Electronic form version 1.4