Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

A Kinetic Plasma Rosetta Stone for Understanding Plasma Heating and Particle Acceleration in Space and Astrophysical Plasmas[1] GREGORY G. HOWES, ANDREW J. MCCUBBIN, SARAH A. HORVATH, PETER MONTAG, COLLIN R. BROWN, JAMES JUNO, Univ of Iowa, KRISTOPHER G. KLEIN, Univ of Arizona, JASON M. TENBARGE, Princeton Univ, JAMES W. R. SCHROEDER, Wheaton College — The general question of how plasmas are heated and particles accelerated underlies many key challenges at the frontier of heliophysics and astrophysics, including solar coronal heating, particle acceleration in solar flares and supernova remnants, and auroral electron acceleration. The hot and diffuse plasmas in many space and astrophysical environments lead to weakly collisional conditions, so plasma kinetic theory is essential to understand both how particles are energized and whether that leads to heating of the bulk plasma or the directed energization of accelerated particles. The field-particle correlation technique is an innovative method to understand how the electromagnetic fields energize particles in weakly collisional plasmas, yielding a velocity-space signature that is characteristic of a given mechanism of energization. These signatures can be used both to distinguish and identify the mechanism at play and to determine the net rate of particle energization. I will present the construction of a "Rosetta Stone" of these velocity-space signatures that can be used to identify the mechanisms of energization in kinetic plasma turbulence, collisionless magnetic reconnection, and collisionless shocks.

[1]Supported by NASA 80NSSC18K0643, 80NSSC18K1217, and 80NSSC18K1371; DOE DE-SC0014599; and NSF AGS-1842561.

Gregory Howes
Univ of Iowa

Date submitted: 29 Jun 2020 Electronic form version 1.4