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Using Field-Particle Correlations to Diagnose Particle Energization in Turbulence, Magnetic Reconnection, and Shocks GREGORY G. HOWES, ANDREW J. MCCUBBIN, SARAH A. HORVATH, PETER MONTAG, University of Iowa, JENNIFER L. VERNIERO, Space Science Laboratory, UC Berkeley, KRISTOPHER G. KLEIN, University of Arizona, JASON M. TENBARGE, Princeton University, CHRISTOPHER H. K. CHEN, Queen Mary University, London, JAMES W. R. SCHROEDER, Wheaton College, FRANCESCO VALENTINI, University of Calabria — The recently devised field-particle correlation technique is a generally applicable kinetic approach that can be used to understand the energization of particles due to a broad range of fundamental plasma processes, including turbulence, magnetic reconnection, and shocks. The technique generates a signature of the energization of particles as a function of velocity space, providing valuable information about the mechanisms governing the energization of particles in weakly collisional plasmas, ultimately yielding plasma heating or particle acceleration. In many cases, these velocity-space signatures are unique, providing a means for identifying and distinguishing the processes responsible for the particle energization. Furthermore, the technique requires only information about the electromagnetic fields and particle velocity distributions at a single-point in space, making it possible to apply the method to in situ spacecraft observations. Here we will present a number of applications of the field-particle correlation technique to different problems, including the dissipation of turbulence, acceleration of auroral electrons, energization of particles in magnetic reconnection, and energization of particles at collisionless shocks.

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