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Using Field-Particle Correlations to Show that Landau Damping Leads to Spatially Intermittent Particle Energization in Current Sheets¹ GREGORY G. HOWES, ANDREW J. MCCUBBIN, University of Iowa, KRISTO-PHER G. KLEIN, University of Michigan — Understanding the removal of energy from turbulent fluctuations in a magnetized plasma and the consequent energization of the constituent plasma particles is a major goal of heliophysics and astrophysics. Previous work has shown that nonlinear interactions among counterpropagating Alfven waves—or Alfven wave collisions—are the fundamental building block of astrophysical plasma turbulence and naturally generate current sheets in strong turbulence. A nonlinear gyrokinetic simulation of a strong Alfven wave collision is used to examine the damping of the electromagnetic fluctuations and the associated energization of particles that occurs in self-consistently generated current sheets. A simple model explains the flow of energy due to the collisionless damping and the associated particle energization, as well as the subsequent thermalization of the particle energy by collisions. Using the recently developed field-particle correlation technique, we show that particles resonant with the Alfven waves in the simulation dominate the energy transfer, demonstrating conclusively that Landau damping plays a key role in the spatially intermittent damping of the electromagnetic fluctuations and consequent energization of the particles in this strongly nonlinear simulation.

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