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A Wave-Coherent Structure Duality in Plasma Turbulence: Are They Two Sides of the Same Coin? GREGORY HOWES, University of Iowa — The dissipation of turbulence in weakly collisional space plasmas remains controversial. Both fluid and kinetic turbulence simulations ubiquitously generate coherent structures—in the form of current sheets—at small scales, and the locations of these current sheets appear to be associated with enhanced rates of dissipation of the turbulent energy. The quest to understand the physical mechanisms by which the energy of turbulent fluctuations is converted to particle energy or plasma heat has driven vigorous debate about the relative roles of wave damping processes vs. localized dissipation mechanisms associated with current sheets, such as magnetic reconnection. A major unanswered question is how these coherent structures arise in the first place. Recent analytical and numerical work has demonstrated that strongly nonlinear interactions among counterpropagating Alfven wavepackets—known as Alfven wave collisions—naturally generate current sheets self-consistently. Subsequent work has shown that the dissipation of the turbulent energy is localized near these current sheets but is clearly mediated through the process of collisionless Landau damping. Together, these results suggest that framing the debate as a choice between waves or coherent structures is a false dichotomy.

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