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Properties of Plasma Turbulence in Two and Three Dimensions
TAK CHU LI, GREGORY HOWES, University of Iowa, JASON TENBARGE, University of Maryland — Two important time scales in a turbulent system are the time of nonlinear energy cascade, which occurs dominantly in the plane perpendicular to a strong background magnetic field B_0, and the crossing time of Alfven waves propagating parallel to B_0. Two-dimensional (2D) turbulence studies assume the former to be much shorter than the latter and hence neglect the latter. Without the direction along B_0, 2D studies can only account for a weak in-plane component of Alfven waves, which does not fully describe the dynamics involving the propagation of Alfven waves dominantly along B_0. Using gyrokinetic simulations, we explore the properties of plasma turbulence with equivalent systems in two and three dimensions. Preliminary results show very different behavior in the two cases. The 3D system is much more dynamic than the 2D system, implying that processes in 3D are occurring at a different time scale than those in 2D. Key properties of the two systems are being investigated.

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