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Transport and discrete particle noise in gyrokinetic simulations[1]
THOMAS JENKINS, W.W. LEE, Princeton Plasma Physics Laboratory — We present results from our recent investigations regarding the effects of discrete particle noise on the long-time behavior and transport properties of gyrokinetic particle-in-cell simulations. It is found that the amplitude of nonlinearly saturated drift waves is unaffected by discreteness-induced noise in plasmas whose behavior is dominated by a single mode in the saturated state. We further show that the scaling of this noise amplitude with particle count is correctly predicted by the fluctuation-dissipation theorem, even though the drift waves have driven the plasma from thermal equilibrium. As well, we find that the long-term behavior of the saturated system is unaffected by discreteness-induced noise even when multiple modes are included. Additional work utilizing a code with both total-f and δf capabilities is also presented, as part of our efforts to better understand the long- time balance between entropy production, collisional dissipation, and particle/heat flux in gyrokinetic plasmas.

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