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Comparison of 2-D PIC simulations with 2-D quasilinear calculations of ion-election energy transfer from instabilities driven by counter-streaming ion beams JAEHONG PARK, ERIC G. BLACKMAN, XIANGLONG KONG, CHUANG REN, University of Rochester, Z.-M SHENG, Shanghai Jiaotong University — Whether an efficient collisonless energy equilibration mechanism exists for an ion-electron plasma, with $E_i > E_e$, is important for understanding collisionless astrophysical shocks and for constraining models of radiatively inefficient accretion flows. Instabilities driven by counter-streaming ion beams is one candidate mechanism. Previously, we compared 2-D PIC simulations of the resulting instabilities with a quasilinear calculation for two separate 1-D limits corresponding to the filamentation and two-stream instabilities, and found qualitative agreement (Park et al., Phys.Plasmas 17, 022901,2010). Here we generalize the quasilinear calculation to include the fully 2-D oblique modes. Compared to PIC simulations, this quasilinear calculation is more computationally efficient and facilitates studying the problem with the actual ion/electron mass ratio. In addition, by comparing the PIC results with the quasilinear predictions, we can assess the relative importance of various nonlinear processes. This work was supported by NSF under Grant PHY-0903797, by DOE under Grant DE-FG02-06ER54879, and by the National Natural Science Foundation of China under Grant No. 10828509.

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