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Energy Transfer via Ion-Beam Driven Weibel and Two-stream instabilities in Two-Temperature Electron-Ion Plasmas JAEHONG PARK, CHUANG REN, ERIC BLACKMAN, XIANGLONG KONG, University of Rochester — Whether a collisionless faster-than-Coulomb energy transfer mechanism exists in two-temperature accretion flows is an open question. Using 2D PIC simulations, we generalize Ren et al.2007 (Phy.Plasmas 012901) into counter-streaming ion beam-driven oblique instabilities where Weibel, two-stream, and oblique modes coexist. We explain in detail the evolution patterns in both linear and non-linear regimes, and how to reach saturation. To compare with simulations, we solve a set of 1+1D quasi-linear calculations. In a real mass ratio, $M/m = 1836$, we estimate that electrons gain 3.2% of initial ion energy for the case, $T_e = 0.2$KeV, $T_i = 375$KeV, and $v_{id} = 0.7c$. While this gain of 3.2% does not threaten the existence of two-temperature accretion flow models per se, one might ask whether it threatens the subset of models (Narayan et al.1998 (ApJ492,554)) which employ less than this percentage of energy to be transferred from ions to electrons on an infall time scales. However, in the solution of Narayan et al.1998, the electron and ion temperature are much larger than ours and ion beam drifts as high as $0.7c$ would probably occur at most in localized regions. As a result, the electron-ion coupling could be smaller than 3.2%. At present, our results do not therefore definitively rule out existing two-temperature accretion solutions.

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