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Investigation of Current Sheet Instabilities Using a GKE/FKI Particle Simulation Model YU LIN, XUEYI WANG, Auburn University, LIU CHEN, ZHIHONG LIN, WENLU ZHANG, University of California, Irvine — The instability of current sheet under finite guide field (B_y) is investigated using our new gyrokinetic (GK) electron and fully kinetic (FK) ion particle simulation code, which resolves wave modes ranging from Alfvén waves to lower-hybrid/whistler waves. Compared with full-particle codes, the rapid electron cyclotron motion is removed in this model, while the realistic mass ratio m_e/m_i, finite electron Larmor radii, and wave-particle interactions are kept. The computation power is significantly improved. The preliminary simulation of Harris sheet is carried out in the 2D yz plane, with z being along the current sheet normal and anti-parallel B_x perpendicular to the simulation plane. The simulation has been performed with both a linearized (δf) GKe/FKi code and the nonlinear code, for $B_y/B_x = 0.1$-10. Under very small B_y, our results show LHDI modes at the current sheet edge propagating mainly in the y direction, as seen in previous simulations. As B_y increases, $k_\perp$ and diamagnetic drift direction shift away from the current flow direction y. The LHDI modes become weaker while high frequency modes stronger. In the cases with a large B_y, the LHDI modes evolve to a globally propagating instability, and multiple ion cyclotron modes are excited. A more complete 3D simulation is planned to investigate the new physics introduced by the large guide field.

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