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3-D Gyrokinetic Electron and Fully Kinetic Ion Simulation of Current Sheet Instabilities ZHENYU WANG, YU LIN, XUEYI WANG, Auburn University, KURT TUMMEL, University of California at Irvine, LIU CHEN, Zhejiang University — Instability of a Harris current sheet is investigated using a 3-D linearized (δf) electromagnetic gyrokinetic electron and fully kinetic ion (GeFi) particle simulation code. The equilibrium magnetic field consists of an asymptotic anti-parallel component B_{x0} and a guide field B_G, with the current sheet normal in the z direction. The simulation is performed for cases with a broad range of B_G. The eigenmode structure, real frequency, and the growth rate of instabilities are calculated as a function of wave numbers k_x and k_y. In the cases with a small $k_y\rho_e$, tearing mode is found to dominate, with peak growth rate at $k_xL = 0.4$-0.5, where L is the half-width of the current sheet. On the other hand, in the cases with a small $k_x\rho_e \leq 0.1$, there exist two unstable modes: a quasi-electrostatic mode at the current sheet edge with wave number $0.3 \leq k_y\rho_e \leq 0.6$ and frequency around the lower-hybrid frequency ω_{LH} and an electromagnetic mode with $k_y\rho_e \leq 0.2$ at the sheet center under a guide field $B_G/B_{x0} = 0.1$. The transition from the tearing-like instability to the k_y-dominant instabilities is presented by scanning through the (k_x, k_y) space. The complete 3-D profile of instabilitie

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