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3-D Particle Simulation of Current Sheet Instabilities ZHENYU WANG, YU LIN, XUEYI WANG, Auburn Univ, KURT TUMMEL, Univ of California, Irvine, LIU CHEN, Univ of California, Irvine and IFTS Zhejiang Univ —
The electrostatic (ES) and electromagnetic (EM) instabilities of a Harris current sheet are investigated using a 3-D linearized (δf) gyrokinetic (GK) electron and fully kinetic (FK) ion (GeFi) particle simulation code. The equilibrium magnetic field consists of an asymptotic anti-parallel B_{x0} and a guide field B_G. The ES simulations show the excitation of lower-hybrid drift instability (LHDI) at the current sheet edge. The growth rate of the 3-D LHDI is scanned through the (k_x, k_y) space. The most unstable modes are found to be at $k_\| = 0$ for smaller k_y. As k_y increases, the growth rate shows two peaks at $k_\| \neq 0$, consistent with analytical GK theory. The eigenmode structure and growth rate of LHDI obtained from the GeFi simulation agree well with those obtained from the FK PIC simulation. Decreasing B_G, the asymptotic β_{e0}, or background density can destabilize the LHDI. In the EM simulation, tearing mode instability is dominant in the cases with $k_y < k_x$. For $k_y > k_x$, there exist two unstable modes: a kink-like (LHDI) mode at the current sheet edge and a sausage-like mode at the sheet center. The results are compared with the GK eigenmode theory and the FK simulation.

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