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Particle simulation of current sheet instabilities under finite guide field XUEYI WANG, YU LIN, Auburn University, Auburn, Alabama 36849, LIU CHEN, ZHIHONG LIN, University of California at Irvine, Irvine, California 92697
— The instability of a Harris current sheet under a broad range of finite guide field B_G is investigated using a gyrokinetic electron and fully kinetic ion particle simulation code. In this particle model, the rapid electron cyclotron motion is removed, while the realistic mass ratio $mi\ /me$, finite electron Larmor radii, and wave-particle interactions are kept. Firstly, a linearized δf GKe/FKi simulation is carried out in the 2-D plane containing the guide field along $y$and the current sheet normal along z. It is found that for a finite B_G/B_{x0} $\leq$1, where B_{x0} is the asymptotic antiparallel component of magnetic field, three unstable modes, i.e., modes A, B, and C, can be excited in the current sheet. Modes A and C, appearing to be quasielectrostatic modified two-stream instability/whistler mode, are located mainly on the edge of the current sheet. Mode B, on the other hand, is confined in the current sheet center and carries a compressional magnetic field B_y perturbation along the direction of electron drift velocity. In the cases with extremely large B_G/B_{x0} >>1, the wave modes evolve to a globally propagating instability. Secondly, the effects of k_x is calculated. Finally, nonlinear δf GKe/FKi simulation is conducted to study the nonlinear physics of the unstable modes in the current sheet..

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