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Investigation of Instabilities in a Harris Current Sheet Using a Gyrokinetic Electron and Fully Kinetic Ion Particle Simulation[1] XUEYI WANG, WEI KONG, YU LIN, Auburn University, LIU CHEN, UCI, XIANG LV, Auburn University, WENLU ZHANG, USTC, ZHIHONG LIN, UCI — A novel gyrokinetic electron and fully kinetic ion (GeFi) particle simulation model has been developed for the purpose of investigation of collisionless magnetic reconnection. In this model, the rapid electron cyclotron motion is removed, while retaining the finite electron Larmor radii, wave-particle interaction, and off-diagonal components of the electron pressure tensor. In this talk, we (1) present our recent improvement of scheme by adopting the potential formulations for both electrons and ions and (2) show simulations of current-sheet driven instabilities in a Harris sheet using GeFi code. The simulation is carried out for finite guide field and with a realistic mi/me. Code is benchmarked against our eigen-theory of the tearing instability and the results are compared with the asymptotic matching results of Drake and Lee. For the current-sheet driven instability, in addition to the quasi-electrostatic modified two-stream instability/whistler mode on the edge, a new mode is found in the sheet center, which may contribute to the anomalous resistivity in reconnection.

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Xueyi Wang
Auburn University

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