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Current Status of the Gyrokinetic-Electron and Fully-Kinetic Ion Particle Simulation Model XUEYI WANG, YU LIN, Auburn University, ZHIHONG LIN, LIU CHEN, University of California at Irvine — A novel gyrokinetic (GK) electron and fully kinetic (FK) ion particle code has been developed for the investigation of dynamics in collisionless plasmas, e.g., magnetic reconnection. In this model, the rapid electron cyclotron motion is removed, while keeping realistic mass ratio m_e/m_i, finite electron Larmor radii, wave-particle interactions, and off-diagonal components of electron pressure tensor. In such model, the wave modes ranging from Alfvén waves to lower-hybrid/whistler waves can be handled on an equal footing. The computation power is significantly improved over that of the existing full-particle codes, and thus the microscopic physics and the global dynamics of reconnection are expected to be solved simultaneously. Following the successful code benchmark for 1-D uniform plasma, the code has been further benchmarked for (1) linear waves in uniform plasmas in 2-D and 3-D simulations against the analytical GKe/FKi dispersion relation and (2) a 2-D current sheet with a strong guide field against the eigenmode theory of tearing mode. Our numerical results agree very well with the linear theories. Furthermore, the GKe/FKi code has also been benchmarked for (3) the lower-hybrid drift instability (LHDI) in a 2-D current sheet. The results are compared with the linear theory as well as previous kinetic simulations of LHDI. The detailed results and comparisons will be presented. *Supported by DOE grant DE-FG02-05ER54826.

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