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Gyrokinetic Simulations of Low-n Tearing Modes YANG CHEN, JUGAL CHOWDHURY, WEIGANG WAN, SCOTT PARKER, University of Colorado at Boulder — Low-n tearing modes in cylintrical plasmas are studied with the GEM code using the gyrokinetic ion/fluid electron model. Particle trajectories and the evolution equations for $A_{\parallel}$ and ϕ are advanced in the field-line-following coordinates, but new field solvers for the vorticity equation and the Ampere's law are developed for global, low-n modes to avoid the usual high-n approximations made in the Laplacian $\nabla_{\perp}^2$ operator in gyrokinetic simulations. Since the tearing mode growth rate is small, numerical dissipation must be minimized. The hybrid model properly reduces to the reduced MHD model when ion kinetic effects are neglected. Eigenmode analysis for the reduced MHD cylindrical tearing mode problem has been developed to provide a direct verification of the simulation algorithms. Excellent agreement between the simulation and the eigenmode analysis is obtained for the tearing mode growth rate. When the finite-Larmor-radius effect in the ion polarization term in the vorticity equation is fully retained, simulations show an increase of the growth rate. The effects of gyrokinetic ions on the tearing mode stability will be studied and reported.

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