Abstract Submitted
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A new drift-kinetic equation solver for coupled neoclassical- magnetohydrodynamic simulations in axisymmetric systems[1] B.C. LYONS, S.C. JARDIN, PPPL, J.J. RAMOS, MIT-PSFC — A set of time-dependent drift-kinetic equations (DKEs) is solved for the non-Maxwellian part of the distribution function (f_{NM}) for both electrons and ions using the full, linearized Fokker-Planck-Landau collision operator. The plasma is taken to be axisymmetric and in the neoclassical banana regime. The DKEs are formulated such that the resulting f_{NM} carries no net density, parallel momentum, or kinetic energy. Rather, these quantities are contained within the background Maxwellian and are assumed to be evolved by an appropriate set of extended magnetohydrodynamics (MHD) equations. Computational methods and convergence results will be discussed. The calculated neoclassical conductivity and bootstrap current are benchmarked against theoretical models and other neoclassical codes. Moments of f_{NM} are used to provide a neoclassical closure to the reduced, extended MHD equations, allowing for self-consistent simulations of the inductive formation of the Ohmic and bootstrap currents. Progress towards coupling with TSC and M3D-C^1 as well as plans for extensions to nonaxisymmetic geometries will be discussed. This future work will be ideally suited for coupled neoclassical-MHD simulations of core plasma instabilities (e.g., neoclassical tearing modes).

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B.C. Lyons
PPPL

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