Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Electromagnetic full-f continuum gyrokinetics in the tokamak scrape-off layer[1] NOAH MANDELL, Princeton University, GREGORY HAMMETT, AMMAR HAKIM, Princeton Plasma Physics Laboratory, MANAURE FRANCISQUEZ, Massachusetts Institute of Technology — We present the first electromagnetic continuum gyrokinetic simulations of turbulence on open field lines in the tokamak SOL. Gkeyll, a full-f continuum gyrokinetic code, is being developed to study turbulence in the edge region of fusion devices. The edge region involves large-amplitude fluctuations, electromagnetic effects, and plasma interactions with material walls, making it more computationally challenging than the core region. Gkeyll models the turbulence by solving the 5D full-f gyrokinetic system in Hamiltonian form using an energy-conserving high-order discontinuous Galerkin scheme. The Gkeyll code has been extended to include self-consistent electromagnetic perturbations using a symplectic ($v_\parallel$) formulation. We present linear benchmarks of kinetic Alfvén waves and kinetic ballooning mode instability calculations that illustrate the success of the electromagnetic scheme and the avoidance of the Ampère cancellation problem. We then present nonlinear electromagnetic turbulence simulations in a model helical SOL geometry with sheath boundary conditions on open field lines. These simulations use parameters from NSTX SOL measurements. We make comparisons between the electromagnetic simulations and electrostatic simulations with the same setup.

[1]Supported by DOE CSGF (DOE Contract DE-FG02-97ER25308) and the MGK SciDAC project (DOE Contract DE-AC02-09CH11466).

Noah Mandell
Princeton University

Date submitted: 02 Jul 2019 Electronic form version 1.4