Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Advances in continuum kinetic and gyrokinetic simulations of turbulence on open-field line geometries[1] AMMAR HAKIM, Princeton Plasma Physics Laboratory, ERIC SHI, Princeton University, JAMES JUNO, University of Maryland, TESS BERNARD, University of Texas, GREG HAMMETT, Princeton Plasma Physics Laboratory — For weakly collisional (or collisionless) plasmas, kinetic effects are required to capture the physics of micro-turbulence. We have implemented solvers for kinetic and gyrokinetic equations in the computational plasma physics framework, Gkeyll. We use a version of discontinuous Galerkin scheme that conserves energy exactly. Plasma sheaths are modeled with novel boundary conditions. Positivity of distribution functions is maintained via a reconstruction method, allowing robust simulations that continue to conserve energy even with positivity limiters. We have performed a large number of benchmarks, verifying the accuracy and robustness of our code. We demonstrate the application of our algorithm to two classes of problems (a) Vlasov-Maxwell simulations of turbulence in a magnetized plasma, applicable to space plasmas; (b) Gyrokinetic simulations of turbulence in open-field-line geometries, applicable to laboratory plasmas.

[1]Supported by the Max-Planck/Princeton Center for Plasma Physics, the SciDAC Center for the Study of Plasma Microturbulence, and DOE Contract DE-AC02-09CH11466

Ammar Hakim
Princeton Plasma Physics Laboratory

Date submitted: 14 Jul 2017 Electronic form version 1.4