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Continuum Gyrokinetic Simulations of Turbulence in a Helical Model SOL with NSTX-type parameters[1] G.W. HAMMETT, Princeton Plasma Physics Laboratory, E.L. SHI, Princeton University, A. HAKIM, Princeton Plasma Physics Laboratory, T. STOLTZFUS-DUECK, Princeton University —
We have developed the Gkeyll code to carry out 3D2V full-F gyrokinetic simulations of electrostatic plasma turbulence in open-field-line geometries, using special versions of discontinuous-Galerkin algorithms to help with the computational challenges of the edge region. (Higher-order algorithms can also be helpful for exascale computing as they reduce the ratio of communications to computations.) Our first simulations with straight field lines were done for LAPD-type cases[†]. Here we extend this to a helical model of an SOL plasma and show results for NSTX-type parameters. These simulations include the basic elements of a scrape-off layer: bad-curvature/interchange drive of instabilities, narrow sources to model plasma leaking from the core, and parallel losses with model sheath boundary conditions (our model allows currents to flow in and out of the walls). The formation of blobs is observed. By reducing the strength of the poloidal magnetic field, the heat flux at the divertor plate is observed to broaden.
[†] E.L. Shi et al., (2017) J. Plasma Physics 83, 905830304

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