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A Simulation Model for Drift Resistive Ballooning Turbulence Examining the Influence of Self-consistent Zonal Flows[1] BRUCE COHEN, MAXIM UMANSKY, ILON JOSEPH, Lawrence Livermore National Laboratory —
Progress is reported on including self-consistent zonal flows in simulations of drift-resistive ballooning turbulence using the BOUT++ framework. Previous published work [1] addressed the simulation of L-mode edge turbulence in realistic single-null tokamak geometry using the BOUT three-dimensional fluid code that solves Braginskii-based fluid equations. The effects of imposed sheared ExB poloidal rotation were included, with a static radial electric field fitted to experimental data. In new work our goal is to include the self-consistent effects on the radial electric field driven by the microturbulence, which contributes to the sheared ExB poloidal rotation (zonal flow generation). We describe a model for including self-consistent zonal flows and an algorithm for maintaining underlying plasma profiles to enable the simulation of steady-state turbulence. We examine the role of Braginskii viscous forces in providing necessary dissipation when including axisymmetric perturbations. We also report on some of the numerical difficulties associated with including the axisymmetric component of the fluctuating fields.

[1] B. I. Cohen, M. V. Umansky, W. M. Nevins, M. A. Makowski, J. A. Boedo, D. Rudakov, G. M. McKee, and Z. Yan, Phys. Plasmas 20, 055906 (2013).

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