Abstract Submitted
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Flux-driven 3D global fluid simulations of plasma edge turbulence[1] BO LI, Peking University and MIT PSFC, D.R. ERNST, MIT PSFC — We have developed a new 3D electromagnetic, profile evolving fluid edge turbulence code based on drift-ordered Braginskii equations. In this flux-driven code, fixed background profiles are not used. Instead, plasma density and temperature profiles are evolved self-consistently in response to heat and particle source profiles, subject to the transport produced self-consistently by plasma turbulence, and plasma losses at the sheath resulting from sonic parallel flows in the scrape-off layer. To allow large fluctuations such as blobs, no separation is made between perturbations and equilibrium. In contrast to a local simulation with fixed, radially constant equilibrium gradients and periodic boundary conditions, the global code allows radial variations of the equilibrium profile gradients with non-periodic radial boundary conditions. Large radial structures do indeed develop, comparable in size to equilibrium radial scale lengths. For tokamak magnetic geometry, a strong curvature-driven instability is observed around the outboard mid-plane and the self-consistent pressure profiles are monotonically decreasing. The ballooning structure of turbulence along the field line is evident.

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