Abstract Submitted
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Fundamental physics behind the divertor heat-flux width in the present tokamaks and ITER[1] C.S. CHANG, S. KU, R.M. CHURCHILL, R. HAGER, Princeton Plasma Physics Laboratory, SCOTT PARKER, Univ. Colorado Boulder, JIM MYRA, Lodestar Research — Electrostatic gyrokinetic simulation using XGC1 recovers the empirical scaling for the divertor heat-load width λ_q in the present tokamaks ($\lambda_q \propto 1/B_p^\gamma$, with $\gamma \sim 1$). λ_q is dominated by the neoclassical magnetic drift of ions. However, XGC1 predicts that λ_q in ITER is much larger than the value predicted by the empirical scaling. An in-depth study shows that the edge turbulence characteristics in ITER is highly different from that in the present tokamaks. In the present tokamaks, the edge turbulence in an H-mode plasma is blobby, with most of the convective blob motion in the poloidal direction yielding little radial transport. Blobby electron radial transport is passive, only keeping the quasi-neutrality with ion magnetic drift. However, in ITER, the edge turbulence is found to be streamer-like, giving rise to active radial particle and thermal transport. There appears to be a bifurcation of the edge turbulence characteristics from blobs to streamers between JET and ITER, most likely due to the size effect, in the XGC simulation. Fundamental physics behind this turbulence bifurcation will be discussed, in relation to the sheared ExB flow, and the Kelvin-Helmholtz, TEM and ITG turbulence.

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