Abstract Submitted
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TEMPEST simulations of the neoclassical transport in a single-null tokamak geometry[1] X.Q. XU, R.H. COHEN, T.D. ROGNLIEN — TEMPEST simulations were carried out for plasma transport and flow dynamics in a single-null tokamak geometry. The core radial boundary ion distribution is a fixed Maxwellian F_M with $N_0 = N(\psi_0)$ and $T_{i0} = T_i(\psi_0) = 300eV$, and exterior radial boundary ion distribution is Neumann boundary condition with $\partial F_i(\psi, \theta, E, \mu)/\partial\psi|_{\psi_w} = 0$ during a simulation. Given boundary conditions and initial profiles, the interior plasmas in the simulations should evolve into a neoclassical steady state. A volume source term in the private flux region is included, representing the ionization in the private flux region to achieve the neoclassical steady state. A series of TEMPEST simulations are conducted to investigate the scaling characteristics of the neoclassical transport and flow as a function of ν_{*i} via a density scan. Here ν_{*i} is the effective collision frequency, defined by $\nu_{*i} = \epsilon^{-3/2}\nu_{ii}\sqrt{2}qR_0/v_{Ti}$, ν_{ii} is the ion-ion collision, and v_{Ti} the ion thermal velocity. Simulation results show significant poloidal variation of density and ion temperature profiles due to the end-loss machanism at the divertor plates. Each region (Edge, the SOL and private flux) achieves the dynamical steady state at its own time scale due to the different physical processes. The impact of self-consistent electric field on transport and flow will be presented.

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