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BOUT++ flux-driven simulation of edge transport barrier formation with sheared equilibrium flows G.Y. PARK, S.S. KIM, T. RHEE, H.G. JHANG, National Fusion Research Institute, P.H. DIAMOND, National Fusion Research Institute, CMTFO and CASS, UCSD, USA, X.Q. XU, LLNL — The BOUT++ three-dimensional electromagnetic turbulence simulation code [1] is used to study edge transport barrier (ETB) formation and its underlying dynamics. A set of reduced MHD equations is solved including the effects of both equilibrium shear and turbulence driven zonal flows. The form of equilibrium flow profiles can be either proportional to the equilibrium pressure gradient or analytically given. We have applied flux-driven boundary condition near the inner simulation boundary to inject a finite amount of heat flux into the simulation domain and reach the steady flux-driven states. It has been found that externally imposed equilibrium shear flow can trigger ETB formation. Large turbulence is observed to be generated near and propagate into the pedestal region and strongly suppressed there by the local equilibrium flow shear. It has also been found that actual ETB formation is significantly influenced by various effects, i.e., turbulence driven zonal flow and its damping rate, outgoing heat flux level, etc. Detailed dynamics of edge transport barrier formation and its parametric dependence on varying parameters (zonal flow damping rate, heat source and sink rates, etc) will be discussed.

[1] B.D. Dudson, et al., Comput. Phys. Commun. 180, 1467 (2009)

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