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Linear and nonlinear Analyses of Kinetic Ballooning Modes (KBM) in High-beta Pedestal Plasma .[1] LI PENGFEI, School of Physics Peking University, XU XUEQIAO, Lawrence Livermore National Laboratory — We present the 3D simulations of edge plasma instabilities using a set of shifted circular geometry equilibria based on the gyro-Landau-fluid (GLF) model in the BOUT++ framework. The initial realistic equilibria are generated by a global equilibrium solver CORSICA, in which the Shafranov shift, elongation effects and bootstrap current are scanned. The linear growth rate spectrum shows that with the consideration of bootstrap current the growth rates of instabilities are smaller. The unstable region decreases compared to the region neglecting the bootstrap current, and it shifts to the direction of low toroidal mode number because of the kink drive of the edge bootstrap current. Considering the three kinetic effects, the FLR effect is the main stabilizing effect, the Toroidal Resonance has weak impact on KBM and the Landau Damping broadens the growth rate spectrum. In the nonlinear simulation, the saturated state is observed. The heat and particle transport are calculated under different β and different fractions of bootstrap current including all the three kinds of kinetic effects. The threshold of the instability is also checked. When the system comes into the nonlinear phase there are big energy transport events. Then the system enter turbulence stage, in which the prturbation level decreases. This part of work is in progress. More results will be shown soon.

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