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Gyrokinetic revelation of transport bifurcation events in tokamak edge plasmas using XGC1[1] C.S. CHANG, S. KU, R. HAGER, R.M. CHURCHILL, PPPL, I. CZIEGLER, Univ. York, UK, G. TYNAN, UCSD, J. HIGHES, A. HUBBARD, M. GREENWALD, MIT, SCIDAC EPSI TEAM — Even though the edge transport bifurcation phenomenon was discovered in a tokamak experiment over three decades ago, and is critical to the success of the magnetic fusion program, there has been no kinetic level theoretical reproduction of such a phenomenon in realistic geometry. We report the first kinetic simulation of edge transport bifurcation events in realistic single X-point magnetic field geometry using XGC1, with the ion magnetic drift oriented both toward and away from the X-point. We observe that the edge turbulence and transport bifurcation is triggered when the shearing rate of the turbulence-driven edge ExB-flow exceeds a critical level, and that the actual bifurcation may be completed in conjunction with the neoclassical orbit loss phenomenon. It is also found that there is a significant difference in the behaviors of geodesic acoustic modes depending upon the direction of the magnetic drift.

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