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Gyrokinetic Simulations of Edge Pedestal Turbulence SCOTT PARKER, WEIGANG WAN, YANG CHEN, University of Colorado, GUN-YOUNG PARK, C.-S. CHANG, New York University, NORBERT PODHORSZKI, SCOTT KLASKY, Oak Ridge National Laboratory — First-principle simulations of edge pedestal micro-instability are performed with the global gyrokinetic turbulence code GEM. The density, temperature and magnetic equilibrium profiles are obtained from both numerical simulation and experiments. The turbulence from simulation results peaks at the position of strongest pressure gradient and the bottom of Er. The dominant linear instability appears to be caused by the strong density gradient. As a result, the H-mode pedestal is linearly more unstable than L-mode. However, the nonlinear steady-state flux level of H-mode is indeed lower than L-mode. The linear instability requires kinetic electrons but is not due to trapped electrons, and it is nearly insensitive to ion and electron temperature gradients. The dominant instability is likely to be electron drift wave. In a systematic study, we find that there are two "branches," low-n and high-n, of the pedestal instability. The electromagnetic effect is destabilizing in the low-n branch and stabilizing in the high-n branch. In a set of simulations with fixed pedestal height but varying pedestal width, the linear growth rate is first lowered then increased as the pedestal width get thinner and thinner, a phenomenon consistent with kinetic ballooning mode (KBM).

Weigang Wan
University of Colorado

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