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Gyrokinetic particle simulation of linear instabilities in DIII-D pedestal plasmas DANIEL FULTON, ZHIHONG LIN, IHOR HOLOD, YONG XIAO, University of California, Irvine — Understanding the physics in the edge pedestal region of toroidal plasmas is critical to obtaining confinement with high core temperatures. The pedestal region is characterized by large gradients in pressure, temperature, and density profiles, providing a source of free energy to drive instabilities, such as ion and electron temperature gradient modes (ITG/ETG), kinetic ballooning mode (KBM), and trapped electron modes (TEM). Studying these instabilities can provide information on the limits of allowable gradients in the pedestal. In this study, we explore linear instabilities, in the pedestal region of the DIII-D discharge 131997 using the gyrokinetic toroidal code (GTC). Results using parameters from a region at the top of the pedestal show dominant mode to be an ion temperature gradient instability. In the peak gradient region, a qualitatively different mode structure, peaking at $\theta = \pm\pi/2$ is observed. Mode structure with this property have been predicted in theoretical papers. Additionally, we present a β_e scan of linear frequency and growth rate demonstrating the transition from ITG to TEM to KBM instability, as a verification of GTCs electromagnetic capability.

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