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BOUT++ Simulations of Edge Turbulence in Alcator C-Mod's EDA H-Mode[1] EVAN DAVIS, MIKLOS PORKOLAB, JERRY HUGHES, NAOTO TSUJII, PAUL ENNEVER, TED GOLFINOPOULOS, SEUNG GYOU BAEK, JIM TERRY, MIT PSFC, XUEQIAO XU, LLNL — Energy confinement in tokamaks is believed to be strongly controlled by plasma transport in the edge region, just inside the last closed magnetic flux surface. The Boundary-plasma Turbulence (BOUT++) code is capable of simulating nonlinear fluid turbulence in this region and is well-suited to Alcator C-Mod's Enhanced D-Alpha (EDA) H-mode ($\nu^* > 1$). The EDA H-mode is always accompanied by the quasi-coherent mode (QCM), an edge fluctuation believed to reduce impurity confinement and allow steady-state H-mode operation. Using experimentally measured profiles as input, BOUT++ calculations show that typical C-Mod EDA H-modes are ideal MHD stable but become linearly unstable when the pedestal resistivity is included ($\eta > 10^{-7}$ Ω-m). The computed growth rate in these resistive ballooning modes is found to be consistent with theory, while incorporation of experimentally measured flow profiles has allowed the self-consistent temporal evolution of the edge radial electric field. Nonlinear simulations have reached turbulent steady state, and the computed turbulence spectrum will be compared with measurements from relevant C-Mod diagnostics, such as phase contrast imaging (PCI), reflectometry, gas puff imaging (GPI), and magnetic probes.

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