Pressure-Gradient-Limiting Instability Dynamics in the H-Mode Pedestal on DIII-D*

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Detailed 2D measurements of long-wavelength density fluctuations in the pedestal region with beam emission spectroscopy during the inter-edge localized mode (ELM) phase indicate two distinct bands of fluctuations propagating in opposite poloidal directions in the plasma frame: one lower frequency band (50-150 kHz) advects in the ion-diamagnetic drift direction (ion mode), and a higher frequency band (200-400 kHz) advects in the electron diamagnetic drift direction (electron mode). The ion mode amplitude is modulated with the ELM cycle: it increases rapidly after an ELM and then saturates, similar to the evolution of the pedestal electron pressure and density gradient. The electron mode, in contrast, has no significant time evolution between ELMs. The decorrelation time of the ion mode is <5 μm [$\tau_c(c_s/a)\leq 1$], the radial correlation length is of order 10 ρ_i and has poloidal wave-number $k_\theta\rho_i \sim 0.1$, and the mode advects at near the ion diamagnetic velocity in the plasma frame. These spatiotemporal dynamics are qualitatively similar to features predicted for kinetic ballooning modes (KBM).

*This work was supported by the U.S. Department of Energy under DE-FG02-89ER53296, DE-FG02-08ER54999, DE-FC02-04ER54698 and DE-FG02-95ER54309.