

Observation of a critical gradient threshold for electron temperature fluctuations in the DIII-D tokamak

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A critical gradient threshold has been observed for the first time in a systematic, controlled experiment for a locally measured turbulent quantity in the core of a confined high-temperature plasma. In an experiment in the DIII-D tokamak where $L_{T_e}^{-1} = -\nabla T_e/T_e$ and toroidal rotation were varied, long wavelength ($k_\theta \rho_s \lesssim 0.4$) electron temperature fluctuations exhibit a threshold in $L_{T_e}^{-1}$: below they change little, above they abruptly increase. The increase in $\delta T_e/T_e$ is concurrent with increased electron heat flux and transport stiffness. Observations were insensitive to rotation. Above the threshold, measurements are consistent with ∇T_e -driven trapped electron mode turbulence.

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