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Perturbative transport modeling and comparison to cold-pulse and heat-pulse propagation experiments in Alcator C-Mod and DIII-D[1]

P. RODRIGUEZ FERNANDEZ, A. E. WHITE, N. M. CAO, A. J. CREELY, M. J. GREENWALD, N. T. HOWARD, A. E. HUBBARD, J. W. HUGHES, J. H. IRBY, Massachusetts Institute of Technology, C. C. PETTY, General Atomics, J. E. RICE, Massachusetts Institute of Technology, ALCATOR C-MOD TEAM —

Possible "non-local" transport phenomena are often observed in tokamak plasmas. Different models have been proposed to explain fast responses during perturbative transport experiments, including non-diffusive effects. Specific tools to characterize the dynamic behavior and power balance analysis using TRANSP and the quasi-linear trapped gyro-landau fluid code TGLF have been developed to analyze Alcator C-Mod experiments. Recent results from cold pulse experiments show that fast core temperature increases following edge cold-pulse injections (peak within $\sim 10ms$, while $\tau_E \sim 25ms$) are not correlated with the direction of intrinsic rotation, and instead the amplitude of the core response depends on density, plasma current and RF input power. The propagation of the cold pulse can be compared with propagation of heat pulses from sawteeth, and both may be used to probe changes in temperature profile stiffness. A Laser Blow Off (LBO) system is being developed for DIII-D that will allow further validation and cross-machine comparison of cold pulse experiments. LBO at DIII-D will also allow for direct comparisons with ECH perturbative heat pulse experiments.

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Pablo Rodriguez Fernandez
Massachusetts Institute of Technology

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