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**Connecting Microscopic L-H Transition Physics to the Power Threshold**[1] L. SCHMITZ, T.L. RHODES, L. ZENG, UCLA, B.A. GRIERSON, D. ELDON, PPPL, Z. YAN, G.R. MCKEE, U. Wisc-Madison, J. BOEDO, UCSD, C. CHRYSTAL, ORAU, P. GOHIL, J.R. GROEBNER, K.H. BURRELL, GA —
A physics-based model of the L-H transition power threshold $P_{th}$ is needed to confidently extrapolate auxiliary heating requirements for burning plasmas. The goal of this work is to link differences in the microscopic turbulence-flow interaction to the macroscopic power threshold density and isotope scaling. The turbulence-driven poloidal ion flow is found decisive for initial turbulence suppression, with a Reynolds stress gradient (evaluated from BES data) sufficiently large to account for the measured poloidal flow acceleration. The turbulence-flow energy transfer rate $P_E =< \tilde{v}_r \tilde{v}_q > \partial(v_q + v_{dia}) \ / \ \partial r$ depends on the L-mode seed flow shear, which shows a similar density dependence than $P_{th}$ (increasing below the density $n_{min}$ where $P_{th}$ has a minimum, and increasing above $n_{min}$). Differences in turbulence properties, and lower L-mode diamagnetic seed flow shear are found in hydrogen plasmas compared to deuterium plasmas, supporting the experimentally observed $P_{th}$ isotope scaling.

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