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[ ] Theory [X] Experiment

The Role of Zonal Flows and Predator-Prey Oscillations in Triggering the L-H Transition and in Internal Transport Barriers,* L. Schmitz, L. Zeng, T.L. Rhodes, J.C. Hillesheim, W.A. Peebles, *UCLA*; G.R. McKee, Z. Yan, *U. Wisconsin*; R.J. Groebner, K.H. Burrell, *GA*; G.R. Tynan, J.A. Boedo, *UCSD*; W.M. Solomon, *PPPL* – Low frequency Zonal Flows (ZFs) have been observed to trigger the L-H transition near the power threshold, by either an extended predator-prey limit cycle oscillation (LCO [1]) or a short (~0.5–1.5 ms) ZF burst executing only part of one limit cycle. Localized turbulence suppression ($k_\theta\rho_s$~0.5) is initiated as the ZF shearing rate approaches the turbulence decorrelation rate. Turbulence-flow correlations (via Doppler Backscattering) show that the ZF amplitude and shear initially lag the rms fluctuation level by 90° during LCO, transitioning to 180° as the increasing ion pressure gradient and resulting equilibrium **E**x**B** shear secure the final transition to ELM-free H-mode. In a separate experiment, localized suppression of electron-scale fluctuations ($k_\theta\rho_s$~3) by ZF shear is also observed in an internal thermal electron transport barrier. However, in contrast to the L-H transition, here the density fluctuation level is always anti-correlated (180° out of phase) with the ZF shearing rate.

[1] L. Schmitz, et al., Phys. Rev. Lett. **108**, 155002 (2012).

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