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On How Decoherence of Vorticity Flux by Stochastic Magnetic Fields Quenches Zonal Flow Generation[1] CHANG-CHUN CHEN, PATRICK DIAMOND, University of California, San Diego, STEVEN TOBIAS, University of of Leeds — Recent experiments indicate that RMP fields can reduce fluctuation-driven Reynolds forces and so inhibit the initiation of the L-H transition. We present a theory of vorticity flux decoherence and its implications for zonal flow evolution. This theory builds upon recent fundamental work on vorticity mixing in a tangled magnetic field. We calculate the decoherence of the vorticity flux due to stochastic magnetic field scattering in presence of a strong toroidal field. The three relevant rates are: (1) the bandwidth of the ambient electrostatic micro-instabilities ($\Delta\omega$), (2) the bandwidth of Alfvén waves excited by Drift-Alfvén coupling ($|v_A \Delta k_\parallel|$), and (3) the stochasticity-induced decorrelation rate ($1/\tau_c = max(k_\perp^2 D, (k_\theta^2 v_A^2 D/L_s)^{1/3})$), where D accounts for scattering by the stochastic field. Decoherence requires (3) $>$ (1) and (3) $>$ (2) (i.e. Kubo number $Ku \geq 1$). These inequalities define the critical value of $\langle(\delta B)^2/B^2\rangle$ for an effect on the transition. The analysis proceeds by considering the Elsässer population responses. The implications for decoherence of the particle and heat flux are discussed, as well.

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Chang-Chun Chen
University of California, San Diego

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