Abstract Submitted
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Zonal flow dynamics with noise and modulations[1] RAMESWAR SINGH, PATRICK DIAMOND, University of California, San Diego — Spectral equations for zonal flow and turbulence energy have been derived for the drift wave turbulence. The spectral equation for the zonal flow energy shows two distinct mechanisms of zonal flow excitation- modulational growth and zonal noise drive. The two are of comparable strength. The zonal noise term scales as spectral Reynolds stress squared times the triad interaction time. The zonal noise is positive definite and is insensitive to the spectral slope. Zonal nonlinear noise generates the zonal flow even when the drift waves are modulationally stable. Noise eliminates the threshold in the linear growth rate of turbulence for zonal flow excitation within the predator prey model. This is consistent with the observation of zonal flows without a critical power in experiments. The zonal intensity increases and turbulence intensity decreases with the strength of zonal noise. A 0D model is advanced to study the effect of zonal noise on L-H transition dynamics. With noise, substantial zonal flows appear much below the threshold for the modulational excitation without noise. This reduces the predicted threshold power for the transition to the H mode. I-phase persist, but with lower onset threshold and reduced oscillations.

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