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**Nonlinear dynamics of turbulence driven vortex flows at low-$q$ resonances** P.H. DIAMOND, O.D. GURCAN, C.J. MCDEVITT, UCSD, T.S. HAHM, PPPL — Motivated by recent observations of transport barrier formation near integer $q$ surfaces, we consider the theory of turbulence driven vortex flows at low-q resonances. The essence of the problem is to understand the spatial relationship between profile modification at resonance and the profile steepening immediately nearby. Flattening can be due to low-m resonant vortex modes driven by turbulence in a manner similar to zonal flows or the direct effect of secondary structures on profiles. Both will flatten turbulence intensity profiles on resonance, but steepen it nearby, thus enhancing shear flow drive by Reynolds stress and so producing a barrier. The key issue is to understand how low-$q$ resonances modify the envelope, since it is this structure which ultimately controls the shear flow. We study envelope modifications expected at low-q surfaces, and examine the effect of turbulence spreading on the intensity profiles. We aim to elucidate te bifurcation threshold for barrier formation.

References
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