Abstract Submitted
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Pressure Balance in the Presence of Zonal Flows[1] W.W. LEE, Princeton Plasma Physics Laboratory, Princeton University — The presence of equilibrium zonal flows in the gyrokinetic particle simulation of the gradient-driven microinstablities was first observed in 1983 [1]. It was caused by the difference of the second-order finite Larmor radius effects between the electrons and the ions, which, in the presence of background spatial inhomogeneity, gave rise to a zeroth-order radial mode, $\phi_{00}(x)$. Recently, a more complete formulation taking into account both the density and temperature gradients has been derived [2]. The question concerning its relationship with the usual diamagnetic current was raised by Bolton [3]. For this presentation, we will explore the pressure balance,

$$\sum_\alpha n_\alpha q_\alpha \mathbf{E} + \frac{1}{c}\sum_\alpha q_\alpha n_\alpha \mathbf{V}_\alpha \times \mathbf{B} = \nabla \sum_\alpha p_\alpha,$$

in the presence of the equilibrium zonal flows as well as the global zonal flows, $\phi_{00}(x)$, generated nonlinearly due to the ITG turbulence [4].

[1] W. W. Lee, Phys. Fluids **26**, 556 (1983).
[2] W. W. Lee, R. A. Kolesnikov, Phys. Plasmas **16**, 044506 (2009).
[3] C. Bolton, private communication.
[4] W. W. Lee et al. Comp. Sci. & Disc. **1**, 015010 (2008).

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