TH/P7-23

Interplay between particle transport, zonal flows and zonal density in Dissipative Trapped-Electron Mode turbulence

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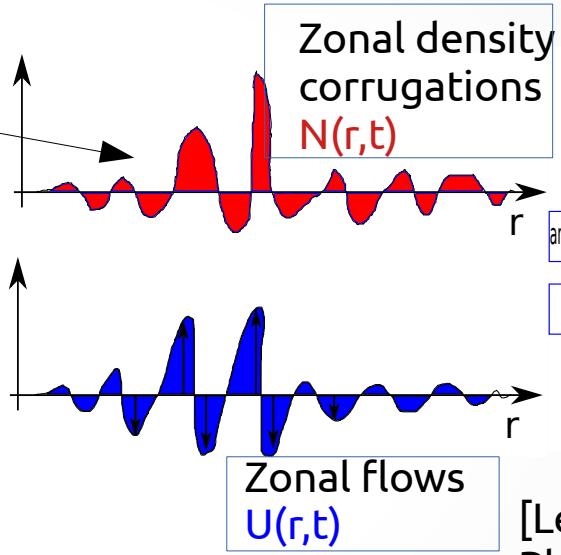
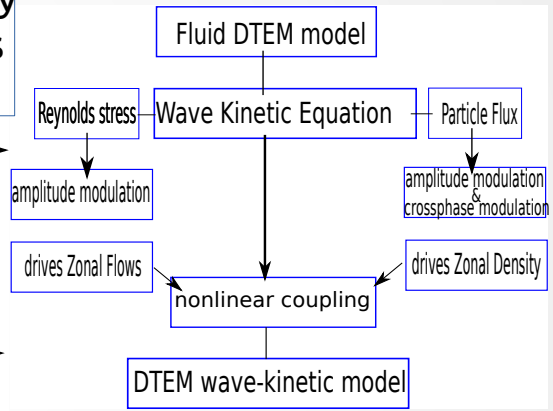
- Model for saturation of DTEM turbulence via nonlinear drive of **zonal density corrugations**
- Based on DTEM Fluid model [Baver et al, 2002]
- Extension of the Wave Kinetic Equation (WKE) to include dependence of growth-rate on crossphase
- 1) DTEM turbulence can drive zonal density corrugations
- 2) zonal density suppresses transport via radial modulation of the transport crossphase
- 3) Energy is conserved in the Predator-Prey like relation between zonal density N and turbulence (W)



Schematic derivation of the model



$$\frac{\partial W}{\partial t}+v_g\nabla_r W-k_y\nabla_r U\frac{\partial W}{\partial k_r}=2\omega_k\alpha_k^0 W-2c_k W\nabla_r N-\Delta\omega W^2$$

$$\frac{\partial U}{\partial t}=\nabla_r\sum_{k_\theta}\int dk_r\left(1+k_\perp^2\right)^{-2}k_r k_\theta W+\nu\nabla_{rr}U-\mu U$$

$$\frac{\partial N}{\partial t}=-\nabla_r\sum_{k_\theta}\int dk_r\left(1+k_\perp^2\right)^{-2}k_\theta\left(\alpha_k^0+\Delta\alpha_k\right)W+D_0\nabla_{rr}N$$

[Leconte & Kobayashi Phys. Plasmas 28, 014503 (2021)]

α^0 : - Linear crossphase between n and Φ

$\Delta\alpha(r,t)$: - Crossphase modulation

$$\Delta\alpha\simeq-\nabla_r N$$

$$W=(1+k_\perp^2)^2|\phi_k|^2$$