Global Gyrokinetic PIC Simulation of Finite-Beta Effects on Microturbulence in NSTX

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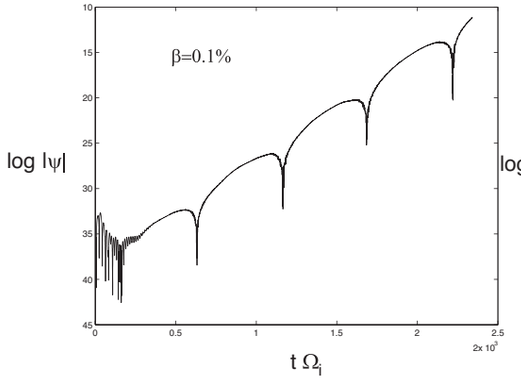
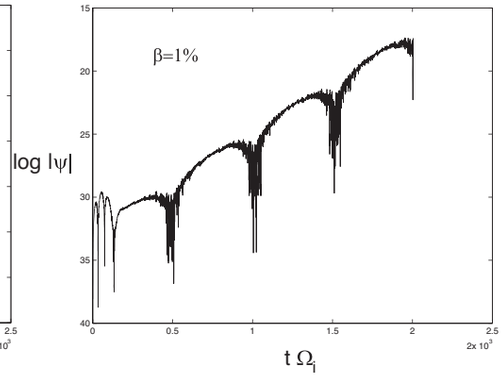
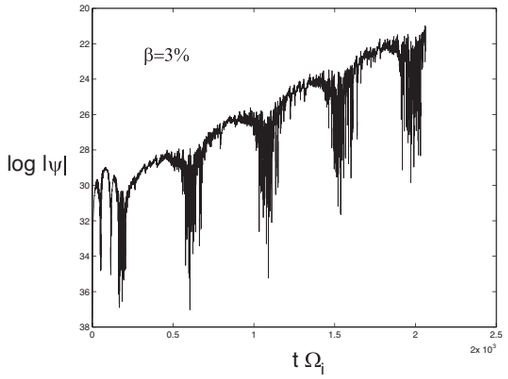
- Solving singular perturbed equation of the form:

$$\delta_e^2 \nabla_\perp^2 \phi - \phi = G,$$ δ_e - electron skin depth

- Numerically stiff: needs $\Delta x = \delta_e$ and $v_\parallel^3$ moments { Very High Resolutions
- Finite-beta stabilization of slab ITG modes - agrees with theory:

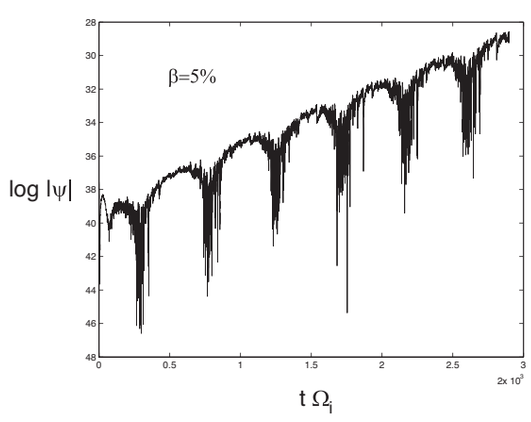


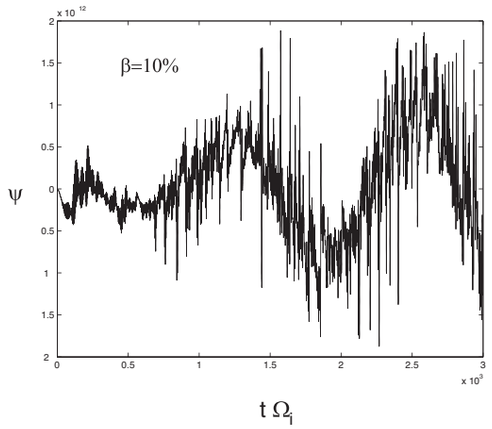




$$\gamma_L \propto 1/\beta_e$$

$$\beta_e \approx 0.1, 1, 3, 5, 10\%$$





Double Split-Weight Scheme [in preparation]

- 1FTE needed to implement in GTS for kinetic-MHD physics