Neutral Recycling Effect on Edge ITG Turbulence & Transport

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- Using full-*f* edge gyrokinetic code XGC1 with adiabatic electron option:
  - Neoclassical + turbulence + MC neutrals.
- 2 simulations of DIII-D like H-mode plasma:
  - One without neutral recycling ⇒lower edge turbulence,
  - One with 99% recycling ⇒ higher edge turbulence.

- Charge exchange of neutral atoms with ions enhances turbulence intensity by:
  - Increasing pedestal ∇T_i ,
    - Nonlocal banana mixing is important for spreading ∇T_i from localized CX cooling.
  - Reducing ExB shearing rate.

Figure (top right): Turbulence Intensity $\times 10^2$ vs ψ_n. Turbulence intensity = $e \langle \delta\Phi \rangle / T_e$. — with neutrals; --- no neutrals

Figure (bottom center): Temperature (eV) vs ψ_n. Legend: initial; with neutrals; no neutrals; T_e

Figure (bottom right): $E \times B$ Shear (10^6/s) vs ψ_n. — with neutrals; --- no neutrals