TH-C/6-1: Progress in simulating turbulent electron thermal transport in NSTX (Guttenfelder et al.)

(1) Experimental context: Breadth of discharges (L,H mode; NBI,RF; w & w/o Li; RS) and theoretical parameters (β_e, ν_e, Z_{eff}, a/L, s, α_{mhd}) → many linear instabilities predicted (MT, ETG, ITG/TEM/KBM)

Approach: simulate turbulence for isolated conditions (r/a=0.5-0.8), determine key parametric dependencies for experimental interpretation and model development

Caveats: only *local* simulations thus far, not yet simulating multi-scale (e.g. MT+ETG) or multi-mode (e.g. TEM+MT), not considering dynamic fast ions

(2) Microtearing simulations (H-mode ν^* scan w/o Li, r/a~0.6-0.7)

Stochastic fields, large flutter transport; *scaling with ν_e loosely consistent with ν_* confinement trends*

But, also sensitive to β_e, a/L_{Te}, γ_E [and s, Z_{eff}, a/L_n]

Many numerical issues to overcome (high resolution, convergence issues, boundary conditions)

(3) ETG simulations (low β H-mode ν^* scan; H-modes w/Li, r/a~0.6-0.7)

Predicts exp. transport in some cases, insensitive to ν_e, γ_E, sensitive to a/L_n (beyond linear), Z_{eff}, s, q

ITG/TEM also unstable, multi-scale likely required

ETG simulations (RS L-modes, r/a~0.3)

e-ITB's in strong RS, ETG *nonlinearly* suppressed by s<<0, sensitive to Z_{eff}

Above (MT, ETG) can't reconcile anomalous χ_φ, still suspect ion scale ballooning modes

(4) TEM/KBM simulations (H-modes w/ Li, r/a~0.7-0.8)

Ion scale ballooning modes (overlap with MT), driven by ∇n_e, ∇T_e, stabilized by increasing ν_e, decreasing s

Relatively large $\alpha_{mhd} = q^2 R \nabla \beta$, *very sensitive to β (threshold behavior)*, influence of ∇T_i varies

Predicts large transport, Q_e can dominate, but with finite Q_i, Π_φ

(X) Probably no time for TGLF stuff (and not much to show); Instead maybe a summary table?