Predictions of electron scale turbulent transport in H-mode pedestals [W. Guttenfelder]

Key results

- ETG transport predicted by nonlinear gyrokinetics predicts substantial electron heat flux in DIII-D type-I ELMy H-mode pedestals (part of FY18 milestones & FY19 TPT)
- Neoclassical transport accounts for substantial electron particle flux (inferred from SOLPS)
- Developed an initial ETG pedestal transport model based on nonlinear simulations for use in integrated modeling; made initial profile predictions

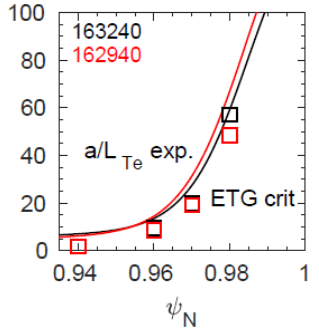
Why is this exciting

- One of only a few pedestal transport validation exercises in the field
- ETG pedestal transport model one necessary element to develop a pedestal transport model
- Not aware of anyone having previously presented such an ETG pedestal transport model

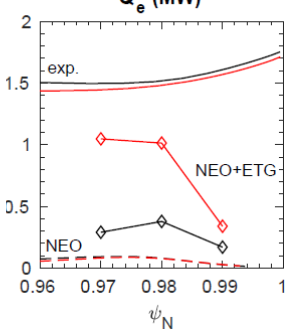
Multiple theory/experiment comparisons

- ETG critical gradient vs. experimental gradient
- Γ_e and Q_e from nonlinear gyrokinetics (CGYRO) + neoclassical theory (NEO) compared with experimental analysis (SOLPS-ITER)
- Model profile predictions (using NEO + newly developed ETG pedestal transport model) compared to experimental profiles

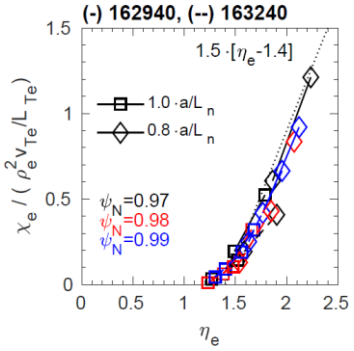
Linear threshold comparison



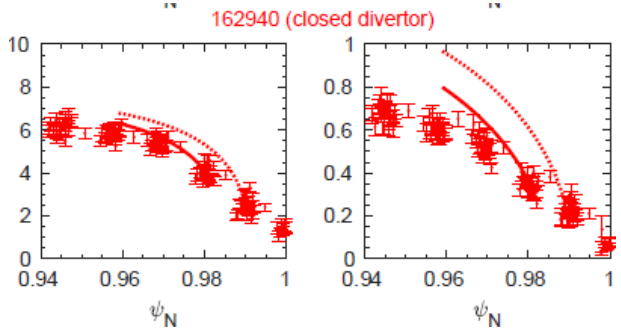
Nonlinear ETG sims vs. exp.



Pedestal ETG model developed from NL sims



Profile predictions using ped-ETG model + NEO (SOLPS target fluxes)



We are continuing with analysis, simulations and modeling for already available experimental results:

Most likely

- Additional ETG simulations for other DIII-D and NSTX cases + parameter scans to expand ETG pedestal transport model (W. Guttenfelder)
  - Database of kEFITs already assembled (w/ Groebner, Osborn, Snyder, Hatch)
  - Include previous (unpublished) NSTX ETG results (J. Canik)
- SOLPS-ITER sensitivity studies (J. Canik)

Possibly

- Some analytic theory to guide and interpret simulation results and model development (w/ I. Abel, W. Dorland)
- Test the ability of TGLF to reproduce pedestal ETG gyrokinetic predictions
- If available, include some ion scale simulation results (w/ D. Hatch, E. Hassan)