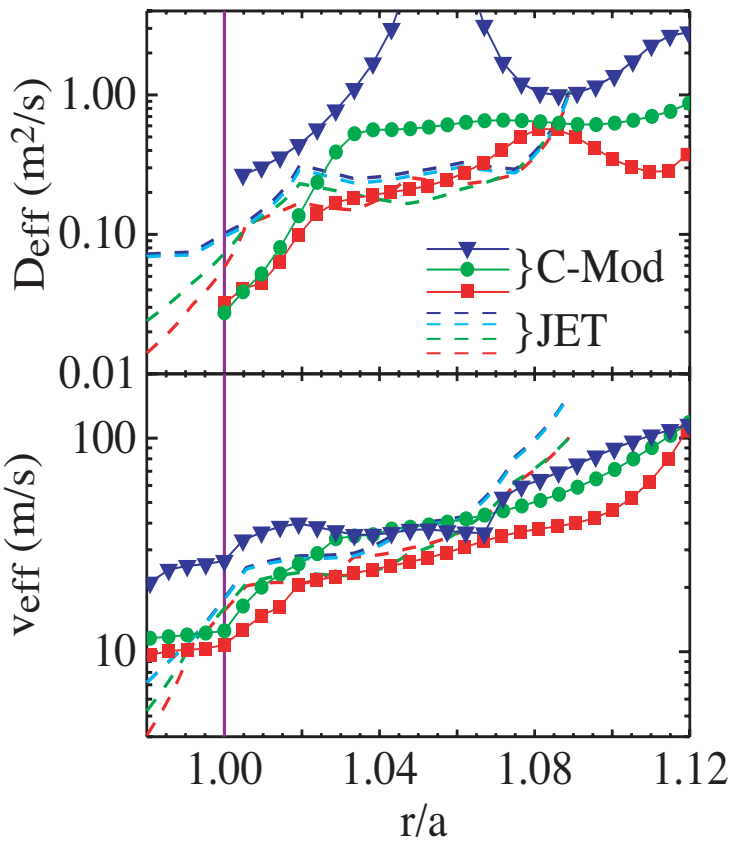
Extend SOL radial transport analysis to an ST

- **Motivation**
  - **Evidence is accumulating that there is strong plasma interaction with the main chamber structures (not as envisioned for an ideal divertor)**
    - Main chamber recycling is comparable or stronger than in the divertor (C-Mod, AUG, DIII-D), driven by turbulent cross-B transport
    - **ELMs travel great distances across the SOL and hit the wall (MAST, NSTX, JET, AUG)**
    - **Main chamber impurity sources appear to dominate the core Z_{eff}.**
  - **A radial transport analysis based on particle balance has been applied to C-Mod, JET and DIII-D**
    - **Transport is well described by convective v_{eff} (= $\Gamma_{\perp}(r)/n(r)$) increasing with distance from the separatrix**
    - **Dimensionlessly similar discharges show the same transport**
    - **Further comparisons are needed**

Comparison of C-Mod and JET implies transport a weak function of plasma parmeters



- Transport coefficients derived
  - Analysis based on particle balance
  - $D_{eff} \equiv \Gamma_{\perp}/\nabla n$, $v_{eff} \equiv \Gamma_{\perp}/n$
  - Dimensionless scaling successful connecting C-Mod, DIII-D, JET
  - Transport appears to be a weak function of plasma parameters (ν^*, ρ^*, β).
- More cross-machine work needed
  - On NSTX we will not be able to achieve dimensionlessly similar discharges. But this will be a good test of the inferred weak scaling.

Experimental plan

- **Diagnostics needed**
  - Ionization source profile in outer SOL
    - From toroidally viewing diagnostic filtered for D_α
  - N_e, T_e profile over SOL and into shadow of limiters

- **Conditions needed**
  - Discharges with reasonable gaps ~ 4-6 cm (2-4 cm in 'far' SOL).
  - L-mode and H-mode, ideally steady-state conditions for 100-200 ms.
  - 3-4 different densities from low to density limit