Coupled FACETS Core/Edge/Wall Modeling of NSTX Lithium Discharges.

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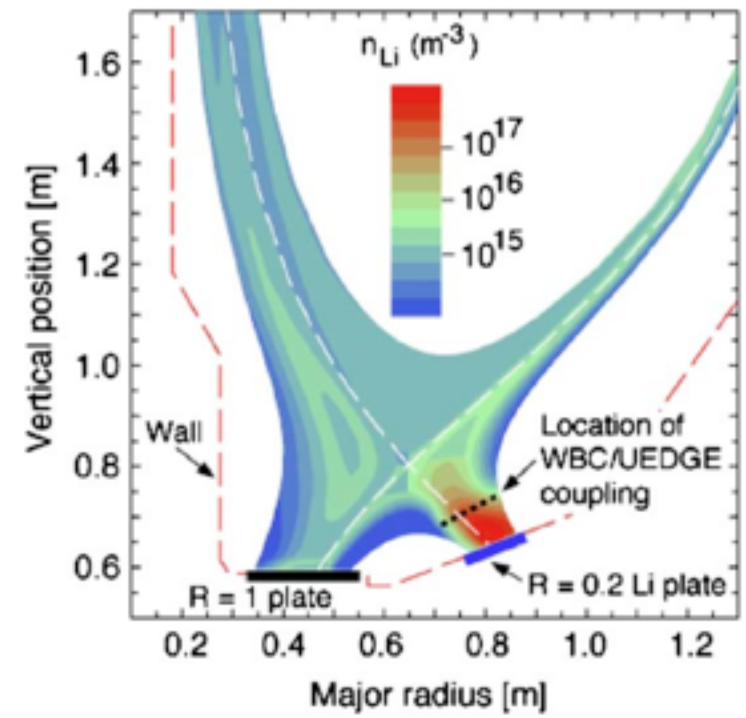
Study Impact of Lithium Conditioning on Core/Edge Profile Evolution

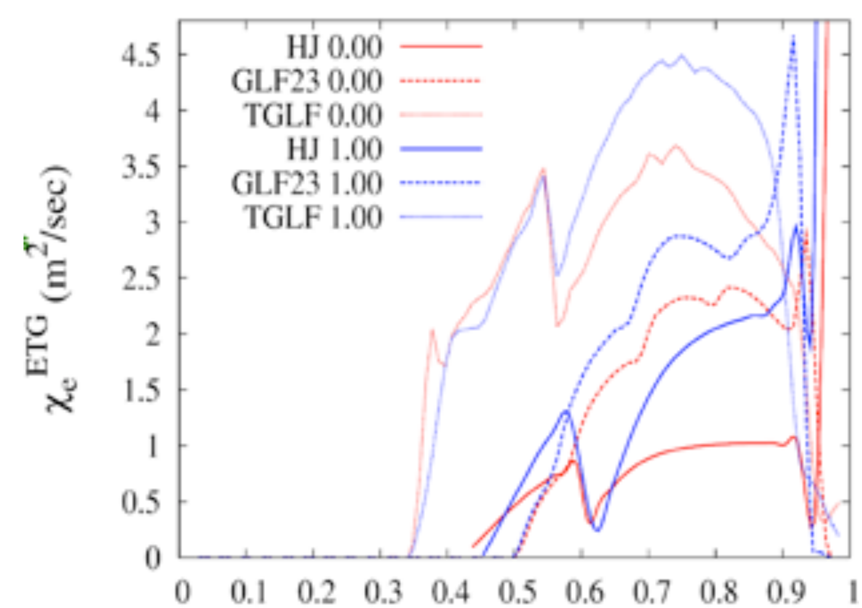
- Objective is to understand impact of Lithium conditioning on core and edge profile evolution. For this we will perform coupled core/edge/(wall) transport time-scale simulations, evolving density and temperature for NSTX discharges with and without Lithium conditioning.

- Step I: Do interpretive UEDGE analysis of selected NSTX discharges (with and without Lithium coating). This determines initial edge plasma profiles, effective diffusivities, recycling coefficients, and thermal conductivities.

- Step II: Setup a FACETS core simulation to evolve density and electron and ion(s) energy profiles. Use: Chang-Hinton (NCLASS, NEO, ...) for neoclassical transport, and various ETG models (TGLF, GYRO, Horton-Jenko, MMM71, ...) for electron transport. Take toroidal rotation profiles from experiment.



J.N. Brooks et. al., *J. Nucl. Mat* **337-339** (2005) 1053-1057



A. Pankin et. al. *ITPA Pedestal Meeting*, York. 2011

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- Step III: Couple to edge evolution with UEDGE using interpretive simulation results. Study consistent core/edge evolution and impact of Lithium conditioning on core profiles. (Similar work done for DIII-D in Hakim et. al. Phys. Plasmas accepted, IAEA 2012)
- Longer Term (FACETS/SWIM Pending SciDAC):
  - Couple to XGC0/DEGAS-2 (Pankin, Hakim et. al. IAEA 2012). Improves fidelity of edge neoclassical transport modeling as well as brings in DEGAS-2 via XGC0.
  - Improve and compare core solver algorithms for use with stiff transport models like TGLF.
  - Implement dynamic edge equations in UEDGE to account for evolution of magnetic geometry on transport time-scales.