

**Task A: Plasma/Liquid Surface Interactions
and Plasma-Edge Modeling**

Presented by

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1. Overview of impurity intrusion studies

- **high and low recycling comparing Flibe and Lithium**
- **engineering edge plasmas**

2. Status of specific tasks

3. Plans

Modifications to UEDGE model for impurities



- **Impurity reabsorption at wall**
- **Spatially dependent anomalous diffusion; Bohm limited**
- **Improved heat conduction for long mean-free-path kinetic regime**



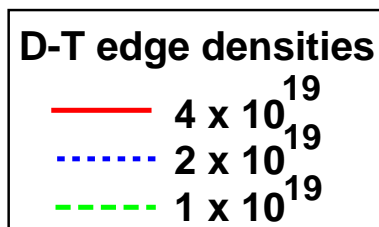
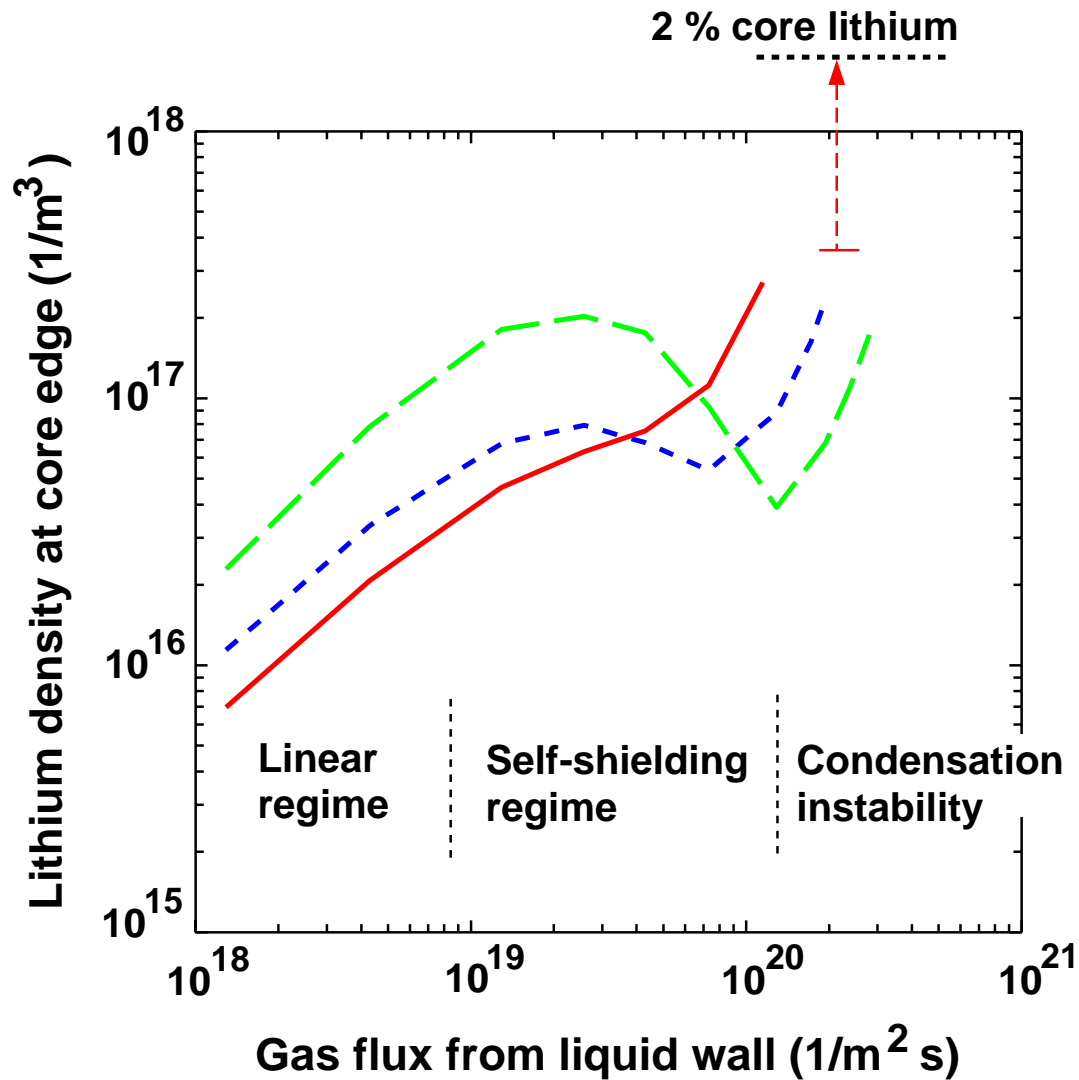
- **High recycling**

- **nearly stagnant parallel flow near midplane; poor flushing action**
- **high density at plate; can shield sputtered impurities**
- **large particle confinement time; fueling easier**

- **Low recycling**

- **strong flow along core boundary; good flushing action**
- **low density at plate; shielding sputtered impurities somewhat harder**
- **short particle confinement time; need strong fueling**

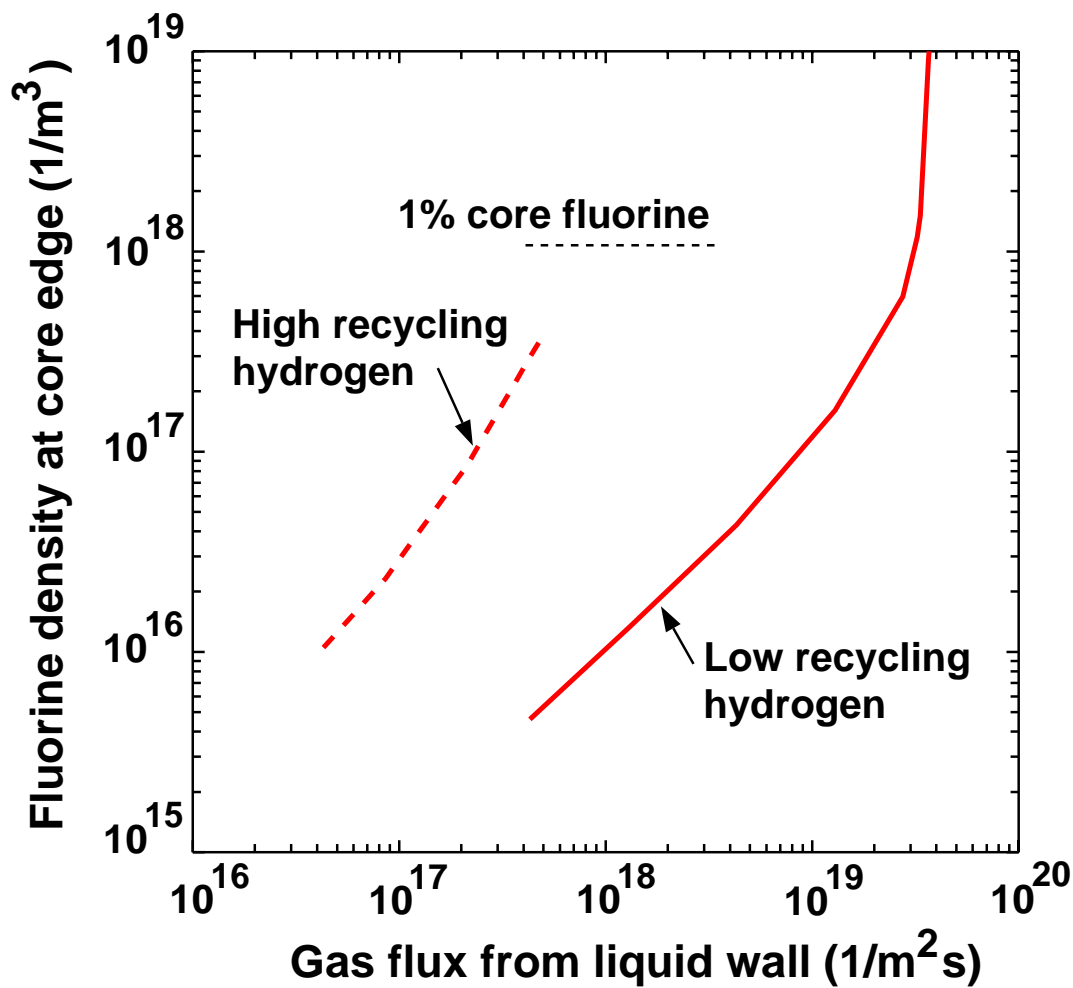
Impurity intrusion has three regimes for Li



More impurities for high recycling than low



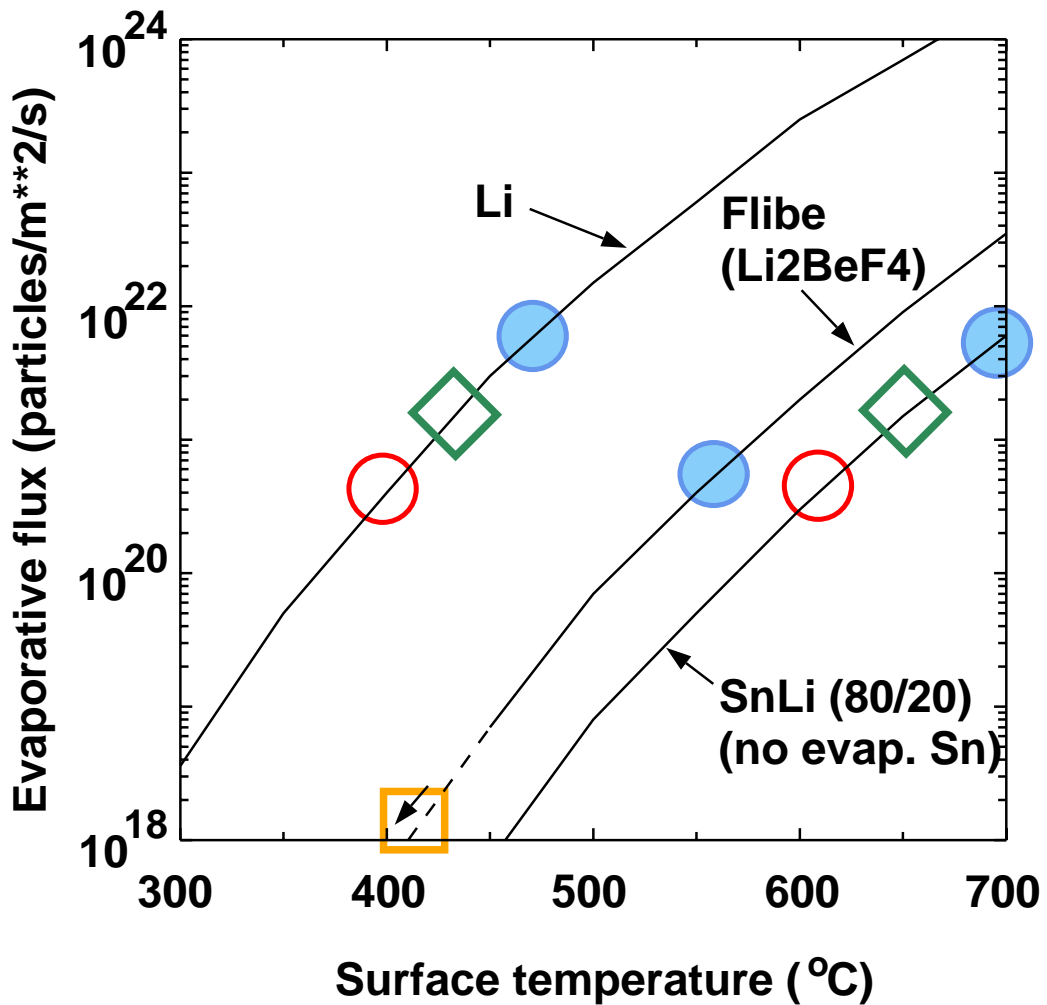
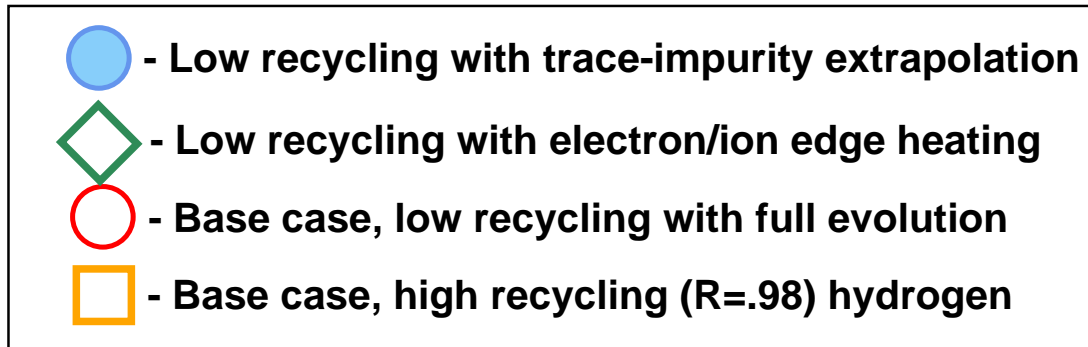
Fluorine case with edge D-T density = $4 \times 10^{19} \text{ m}^{-3}$



Impurity influx sets liquid temperature limits



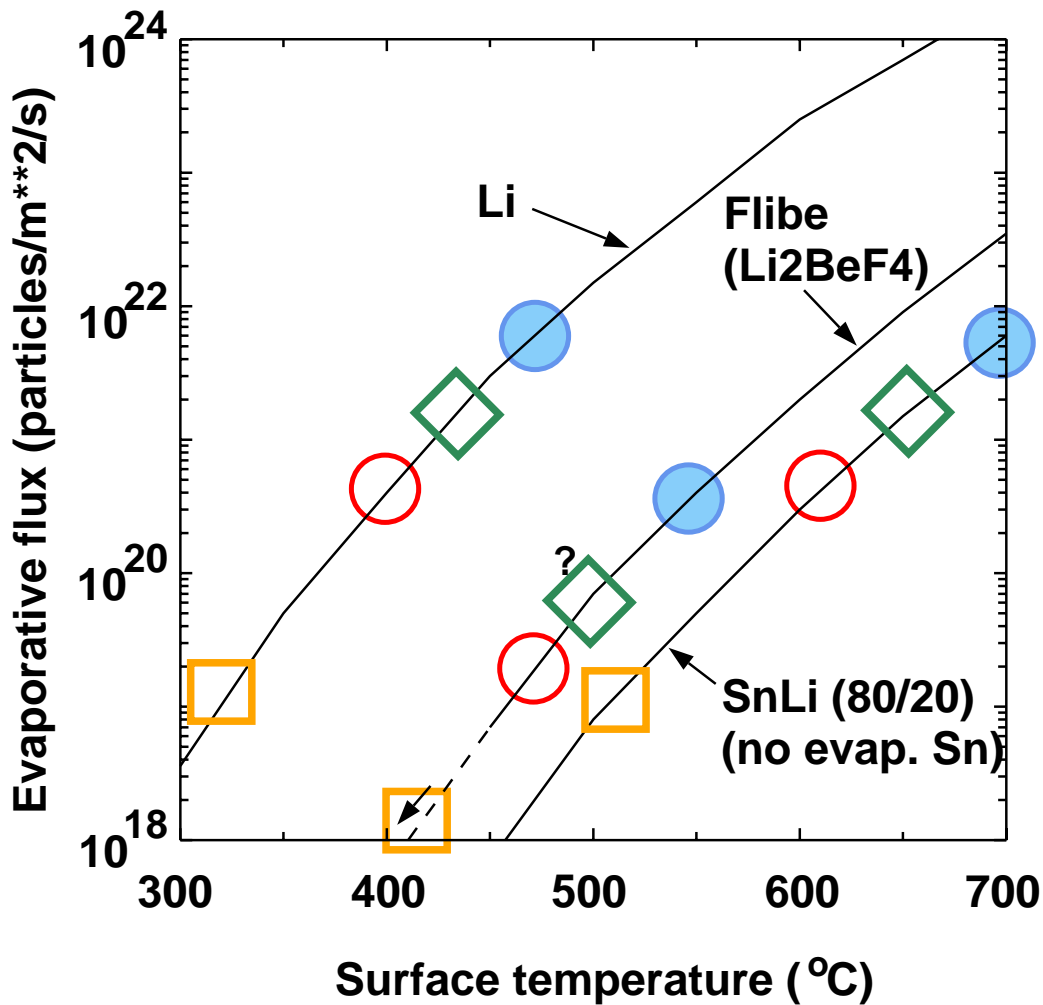
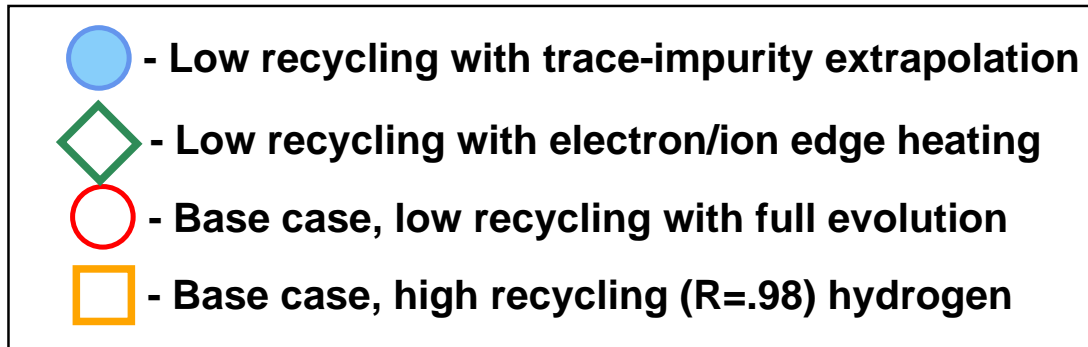
Tokamak impurity transport from 2-D UEDGE code



Impurity influx sets liquid temperature limits



Tokamak impurity transport from 2-D UEDGE code





(Date is original plan and items in *italics* yet to be done; Task I needs merged into Task II as per December plan)

- 1/00 Provide hydrogen edge-plasma for ARIES-RS design (Tasks II.1b & III.2c)**
- generated single-null equilibrium for ARIES-RS
 - provided edge-plasma solutions for high and low recycling cases
 - *assess plate tilting*
- 3/00 Complete lithium wall simulations; compare with kinetic MCI code (Task II.1b)**
- completed limit studies for various densities in a slab
 - performed limit study for one density in ARIES-RS; *others to be done*
 - setup plasma profile data needed by MCI, and sent to Evans at GA; *comparison to be done*
- 4/00 Initial assessment of geometry and edge heating (Task II.1b)**
- implemented spatially dependent electron and ion heating terms (ad hoc)
 - *geometry and effect of heating to be done*



- 5/00 Initial modeling of CDX-U plasma for lithium (Task II.1b)**
- *to be done*
- 6/00 Flibe evaporation limits; couple UEDGE/WBC (Tasks II.2b & III.2c)**
- **calculated impurity-limits for high-recycling Flibe wall in slab**
 - **WBC finds low impurity flux owing to sputtering with high-recycling (Brooks)**
 - *ARIES-RS yet to be done with Flibe*
 - **provided UEDGE solution to WBC; prepared UEDGE source term to receive WBC results; *coupling to be done***
- 7/00 Initial assessment of non-tangent B-field at walls (Tasks II.2b & III.2c)**
- *to be done*
- 9/00 Assess helium pumping / helium concentrations near surfaces (Task III.2c)**
- **single comparison between flat and tilted plates show strong change in helium concentrations**
 - *systematic study to be done*



By May Meeting

- **Complete lithium study for ARIES-RS**
- **Compare with MCI Monte Carlo code**
- **Coupled UEDGE/WBC runs**

Beyond May

- **Fill out original plan**
- **Seek new solutions to high-recycling impurity problem**