Recent Wall-Temperature Limits for Sn in the ARIES-RS/AT Tokamaks for CLiFF*

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Lithium-DiMES Modeling and Sn Divertor Sputtering Analysis

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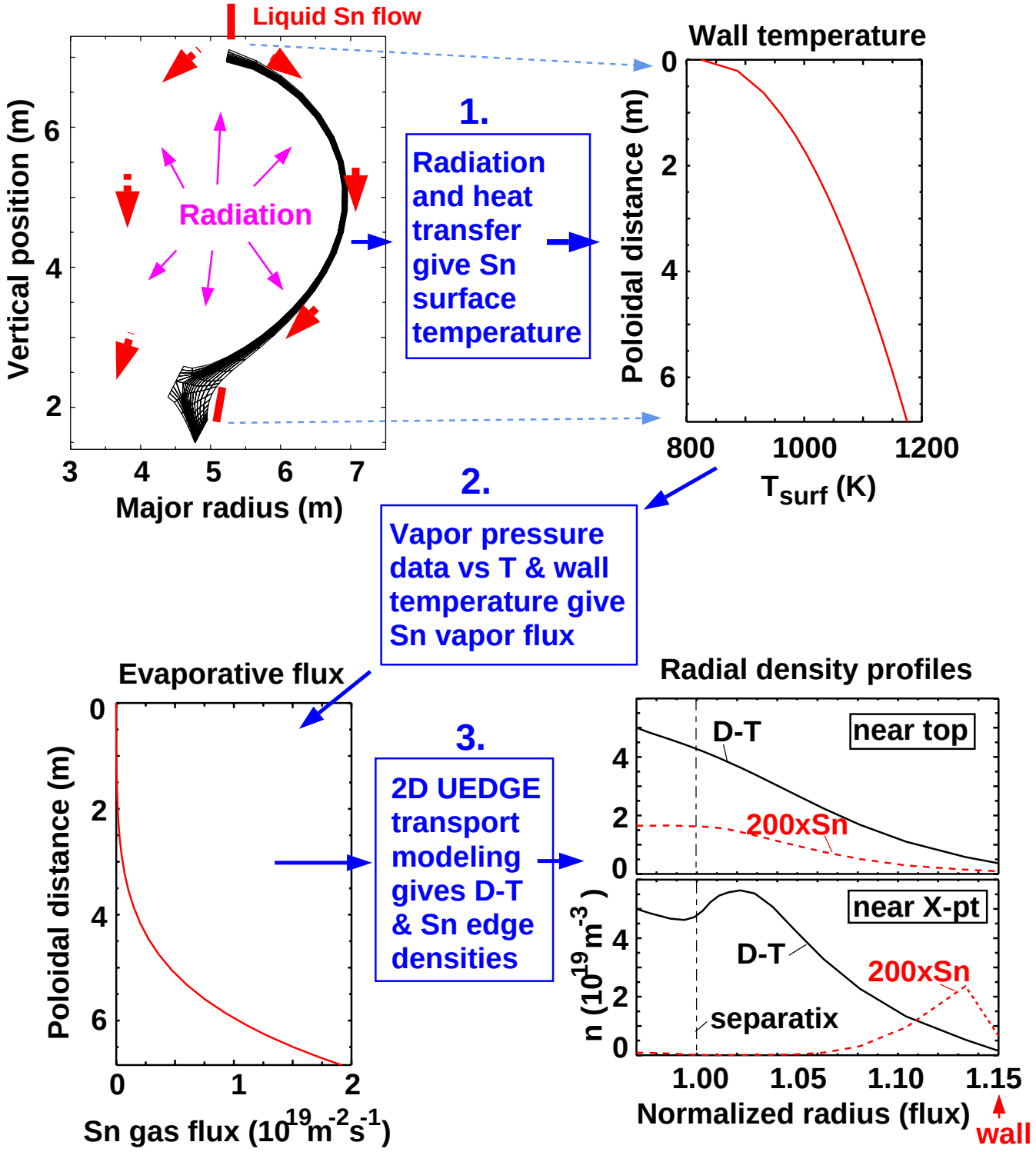
A systematic set of steps predicts the core impurity level from liquid walls

An acceptable core Sn level is obtained for ARIES case:



Summary of core-impurity-based surface temperature limits for tokamaks

No auxiliary impurity removal scheme used

Red numbers imply same wall/divertor material

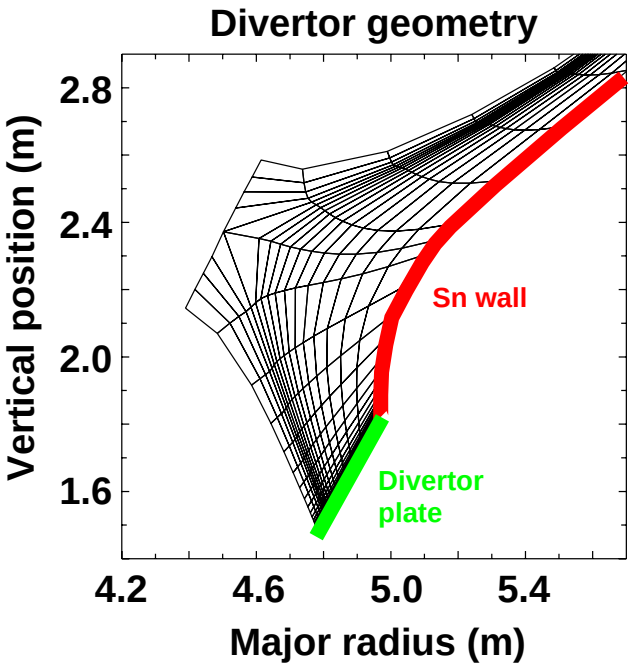
Hydrogen recycling	Lithium °C	Flibe (F) °C	$Sn_{80}Li_{20}$ °C	Sn °C
$R_h = 0.25$	380	480	590	> 850
$R_h = 0.99$	> 300	400 (solid)	> 500	830

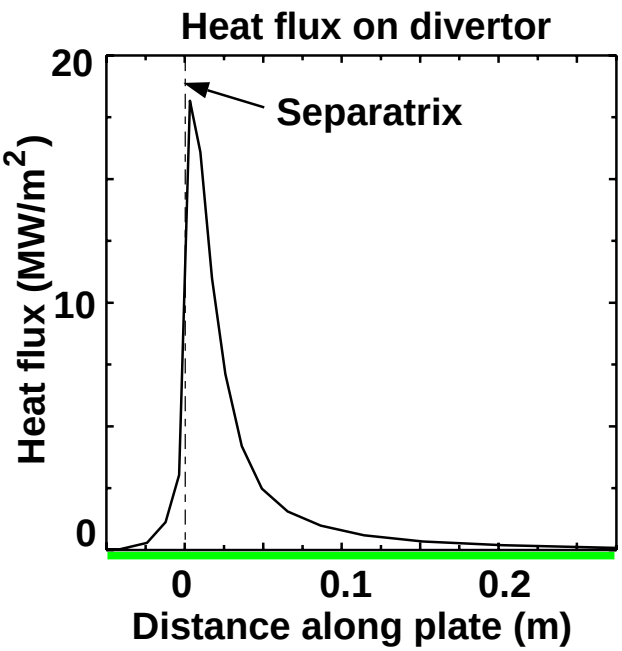
Effective wall temperatures are quoted as determined by the total acceptable impurity flux; e.g., for Sn, the inlet is 550 C and the outlet is 900 C.

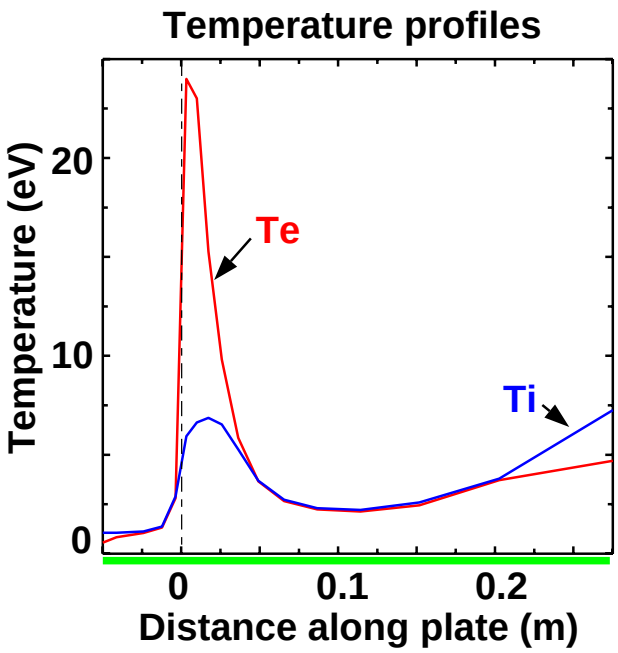
Global edge plasma/neutral transport modeling used to aid divertor design

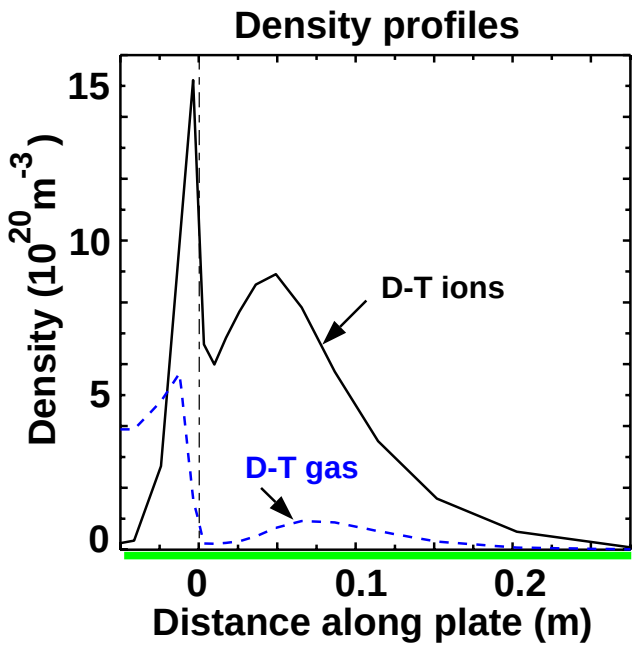
- Designing divertor-region hardware is a critical element

- Validated 2D UEDGE predicts divertor plasma conditions









ALPS Erosion/Redeposition Activities-of Interest to APEX

J.N. Brooks
ANL

- **Analysis of DIII-D/DiMES 2/01 Lithium Experiments**

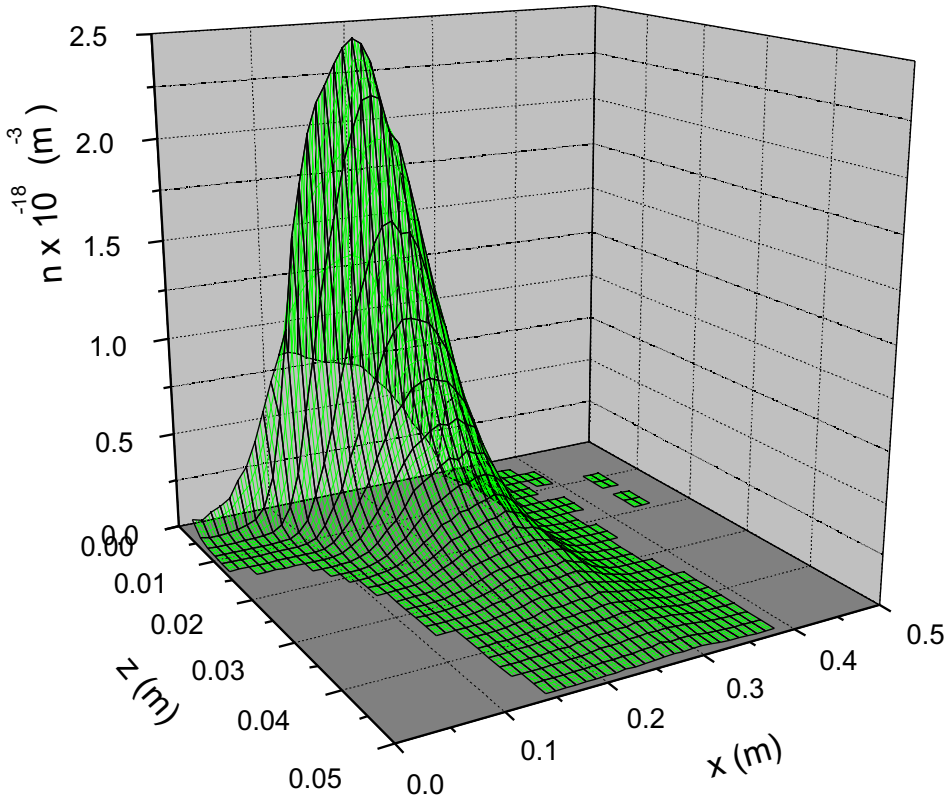
Non-disruption shots: being analyzed via coupled plasma fluid and impurity transport codes (ALPS/APEX plasma modeling group). Initial results show ballpark match with expected sputtering coefficients, sputtered Li transport.

Disruption shot: Sheath superheat scenario being analyzed via coupled BPHI-3D/THERM code. Other scenarios (self-sputter runaway, MHD, etc.) being analyzed.

- **Analysis of liquid tin divertor**

Tin divertor system being analyzed as complement to Sn APEX liquid wall application. Erosion/redep. analysis performed for ARIES-AT tokamak design. Results look good.

WBC Monte Carlo code analysis of liquid tin divertor erosion/redeposition. Sputtered tin ion density in the near-surface region.



(Divertor surface at z = 0 along poloidal direction "x"). Analysis uses UEDGE near-surface, high-recycle plasma conditions (T. Ronglien) for ARIES-AT tokamak design. Sputtering coefficients from VFTRIM (self-sputt., Ruzic et al.), TRIMSP (D-T sputtering, Bastasz). 10^6 particle histories.

- **Low plasma contamination: Peak Sn density is ~ 2.5 x10^{18} m^{-3}. (Peak D-T density ~ 2.5x10^{21} m^{-3})**
- **Sn density falls to ~ 0 within 5 cm of the plate.**