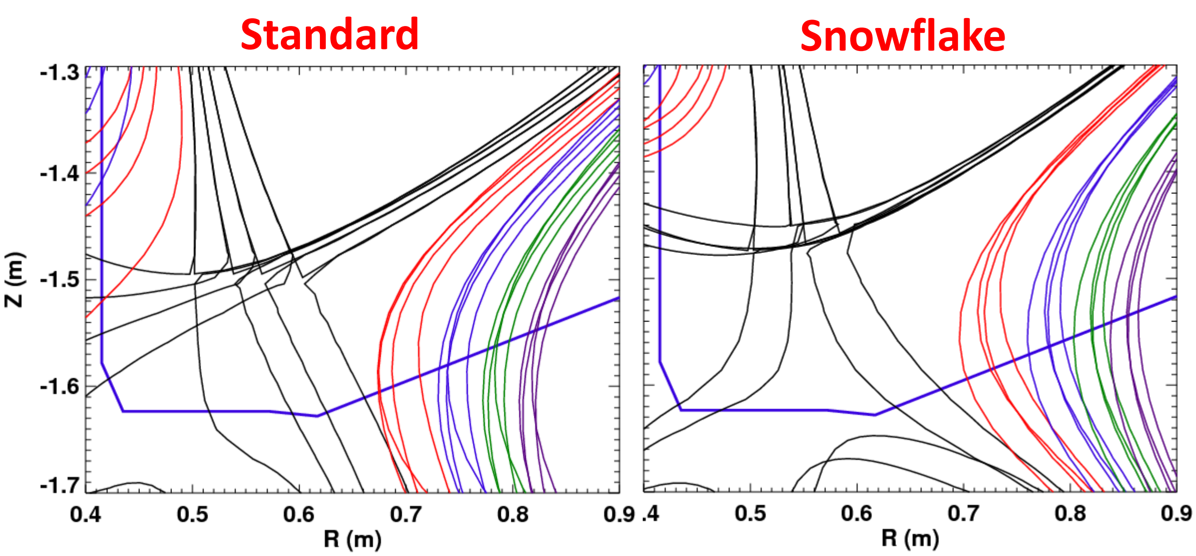
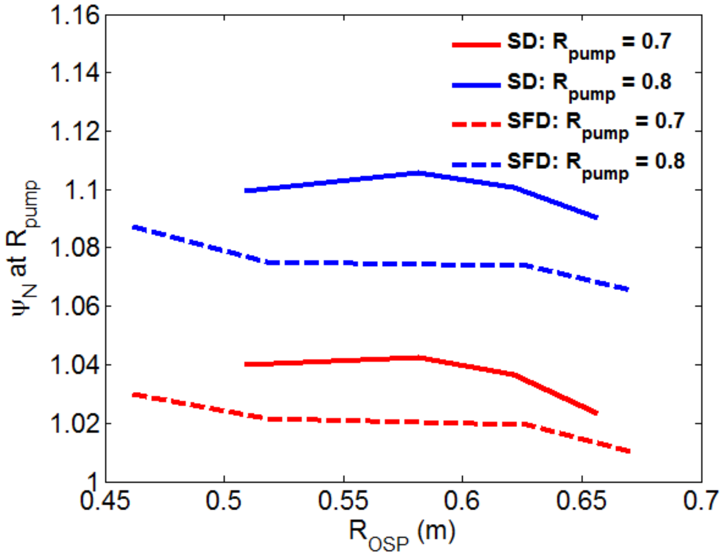
Moving R_{OSP} doesn't change ψ_N at pump entrance very much

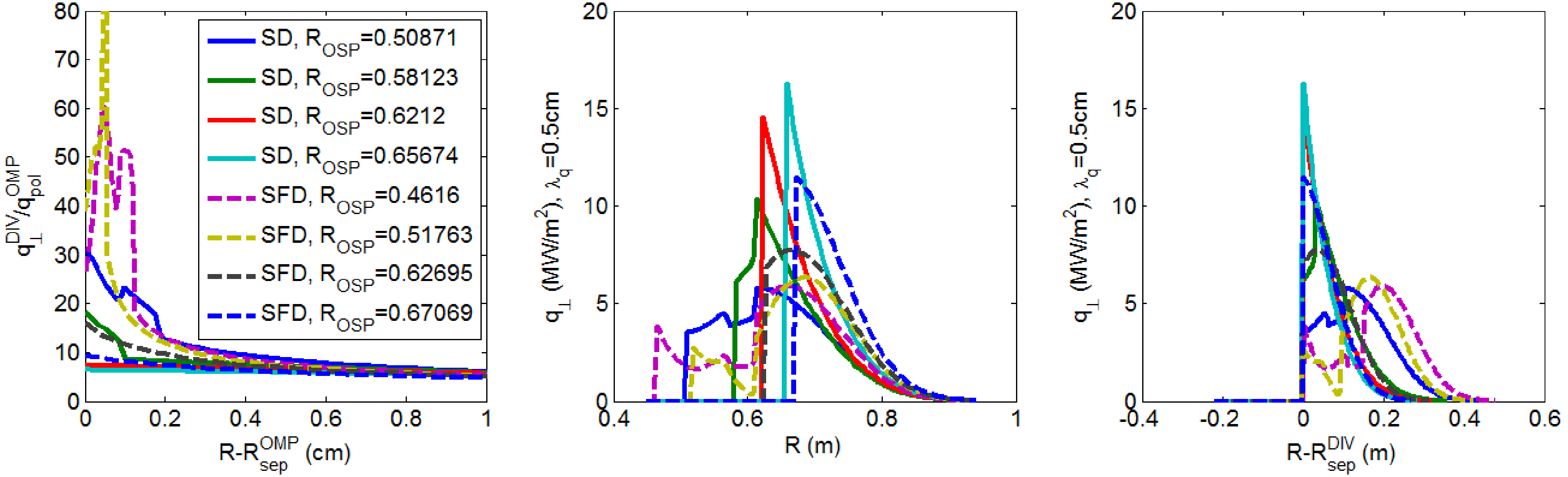
- Two sets of equilibria considered
  - Standard divertor, R_{OSP} at four positions
  - Snowflake, again R_{OSP} scan
- Contours: ψ_N=1.0,1.03,1.06,1.09,1.12
- Strike points for ψ_N > 1.0 move much less than separatrix
  - ψ_N at likely pump positions varies weakly with R_{OSP}
  - Moving R_{OSP} outwards towards pump doesn't help much until R_{OSP} is very close to pump



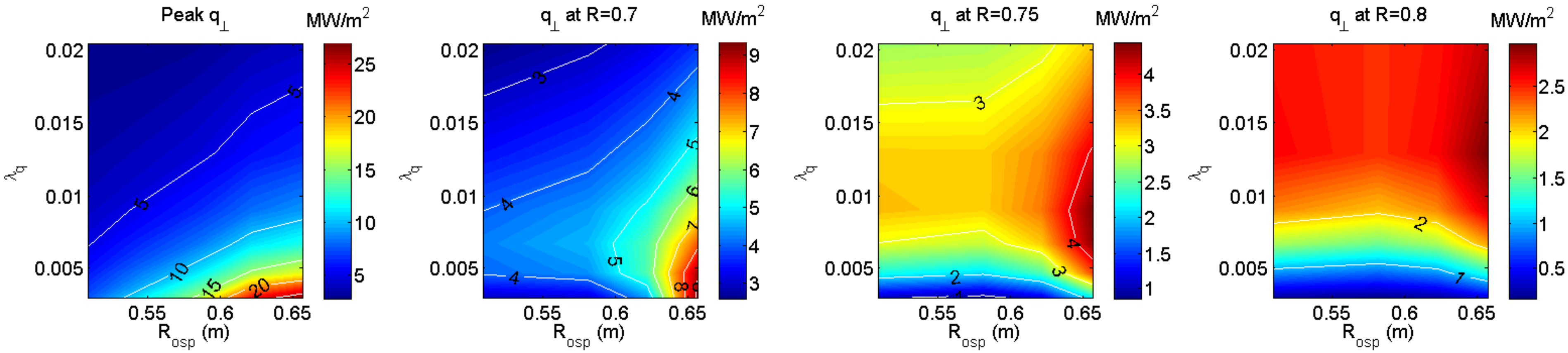


Projecting heat flux profiles

- Exponential poloidal heat flux profile imposed at midplane
  - P=5 MW (e.g., 1/2 of 10 MW goes to outer divertor)
  - λ_q^{OMP} ~ 0.3-2.0 cm
- Mapped along field lines to divertor
  - Total geometric heat flux reduction factor shown on left
  - Example heat flux profiles showing for λ_q^{OMP}=5mm
    - Lots of heat flux at R=0.7, not much at 0.8



Heat flux at pump locations: standard divertor



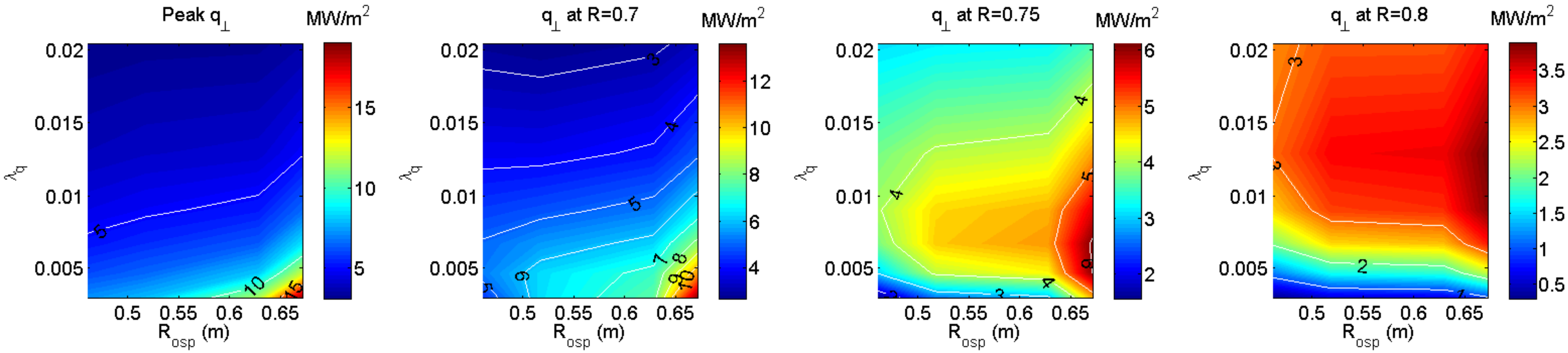
- To keep peak heat flux < 10 MW/m^2
  - R_{OSP} < 0.55 m OR
  - λ_q > 8 mm

- With pump entrance at R=0.7m, heat flux is >3 MW/m^2 for all heat flux widths, OSP positions

- R=0.75 m: pumping only ok ($q_\perp$ > 2 MW/m^2) for λ > 5 mm
  - Can't beat this by moving OSP to larger R$\Rightarrow q_{pk}$ becomes too large

- R=0.8 m: pumping works only for λ > 8 mm

Heat flux at pump locations: snowflake divertor

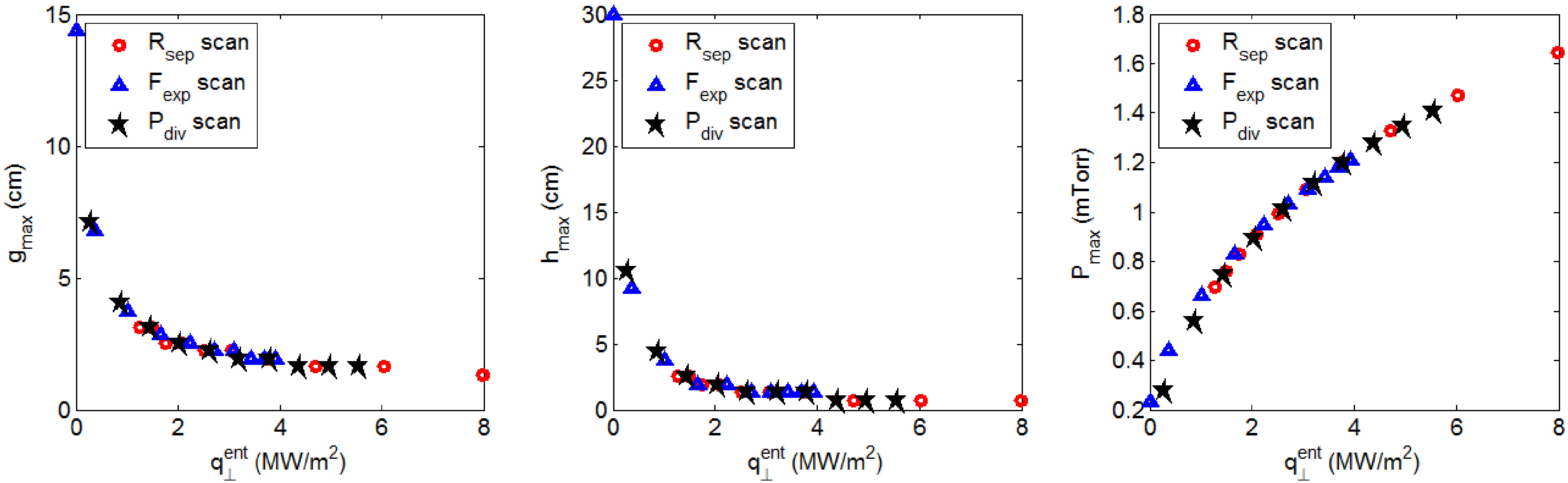


- Power handling:
  - Region with $q_{pk} < 10$ MW/m² is a bit larger than SD
    - R_{OSP} can be moved out to ~0.6 m even for the narrowest SOL

- Pumping:
  - Works a little bit better than SD
    - Large flux expansion puts higher fluxes in the far SOL locations of the pump
  - Pump entrance at either R=0.7 or 0.75 m should work for basically any SOL width
  - R=0.8 only works for $\lambda > 5$ mm

Updating duct optimization for likely entrance position

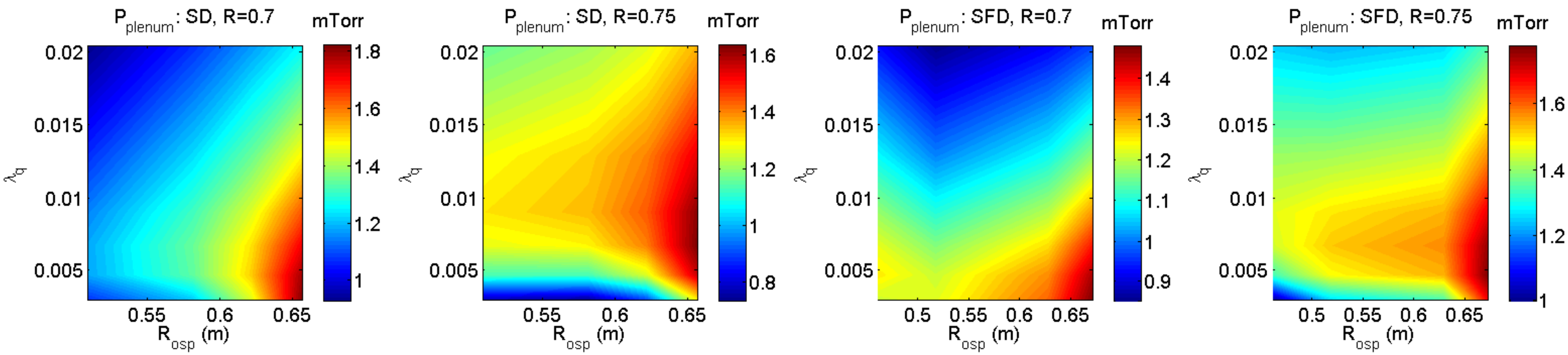
- Looks like R=0.7 is good position for duct entrance
- New analytic calcs performed for new (old) parameters
  - R_{ent} = 0.7 (0.9) m
  - Field line angle = 3.0^o (5.0^o)
  - T_e = 15.0 (10.0) eV
- Need $q_\perp$~2 MW/m^2 to reach 1 mTorr
  - g~2.5 cm, h~2.0 cm



Projecting plenum pressure

- Fix g/h of entrance at 2.5/2.0
- Use profiles directly in pressure calculation (including angles)

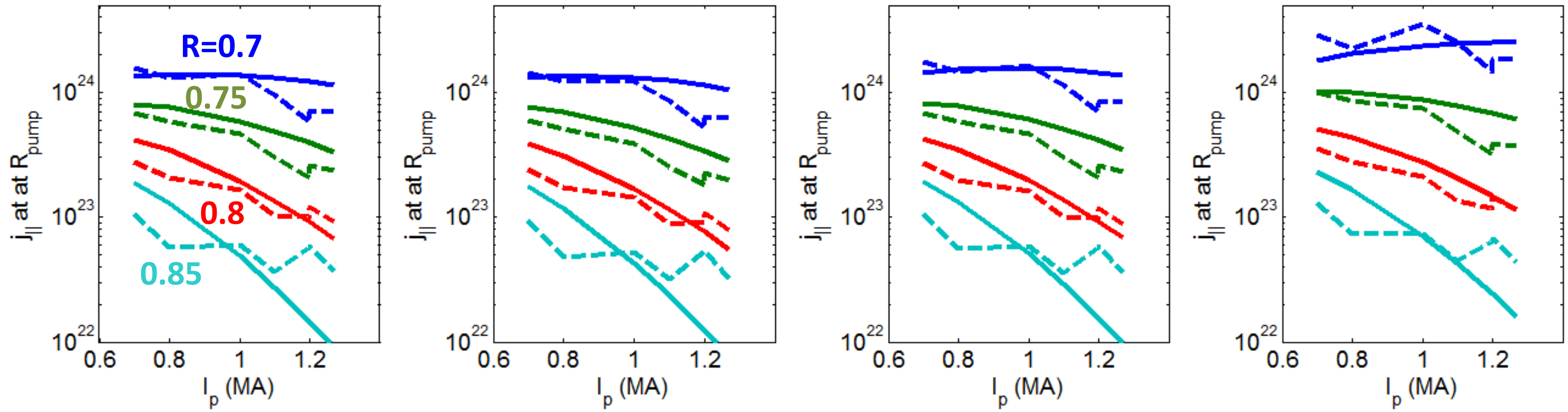
- Results consistent with heat flux arguments
  - R=0.7 or 0.75 should ~work for all R_{OSP}, λ_q
  - Moving R_{OSP} increases pressure some, need R_{OSP} near R_{pump} to really make a difference
  - Snowflake has somewhat lower maximum pressure, but has better pumping at low λ_q
    - And you can move ROSP close to pump in snowflake without exceeding $q_{\perp}$ limits



Sanity check of flux projections against LP data

- Probe flux at pump entrances (R=0.7,0.75,0.8,0.85): dashed
  - From Mike's fits vs. ψ_N
- Projections based on heat flux: solid
  - λ_q from the same data set
- Not too shabby-especially if you plot it on a log scale

Standard



Snowflake