Wide divertor heat-flux width $\lambda_q$ in ITER from turbulence bifurcation across separatrix

- XGC predictions for $\lambda_q$ has been well-validated against representative DIII-D, C-Mod, NSTX, and JET data: neoclassical effect is dominant.
- The same XGC predicts 6X greater $\lambda_q$ in full-current (15MA) ITER than extrapolation ($\lambda_q^{Eich}$) from present tokamaks:
  - turbulence effect is dominant in 15MA ITER.
- $\lambda_q$ on 1st phase ITER at 5MA agrees with $\lambda_q^{Eich}$
  - Wider $\lambda_q^{ITER}(15MA)$ is not a pure size effect, but a $\rho_i/a$ effect.
- Turbulence across separatrix bifurcates from JET(4.5MA) to ITER(15MA)
  - from “blobs” to “streamers,” and
  - from high to low ExB shearing rate.
  - Strong “streamer transport” is seen across separatrix in ITER(15MA) $\rightarrow$ wider $\lambda_q$