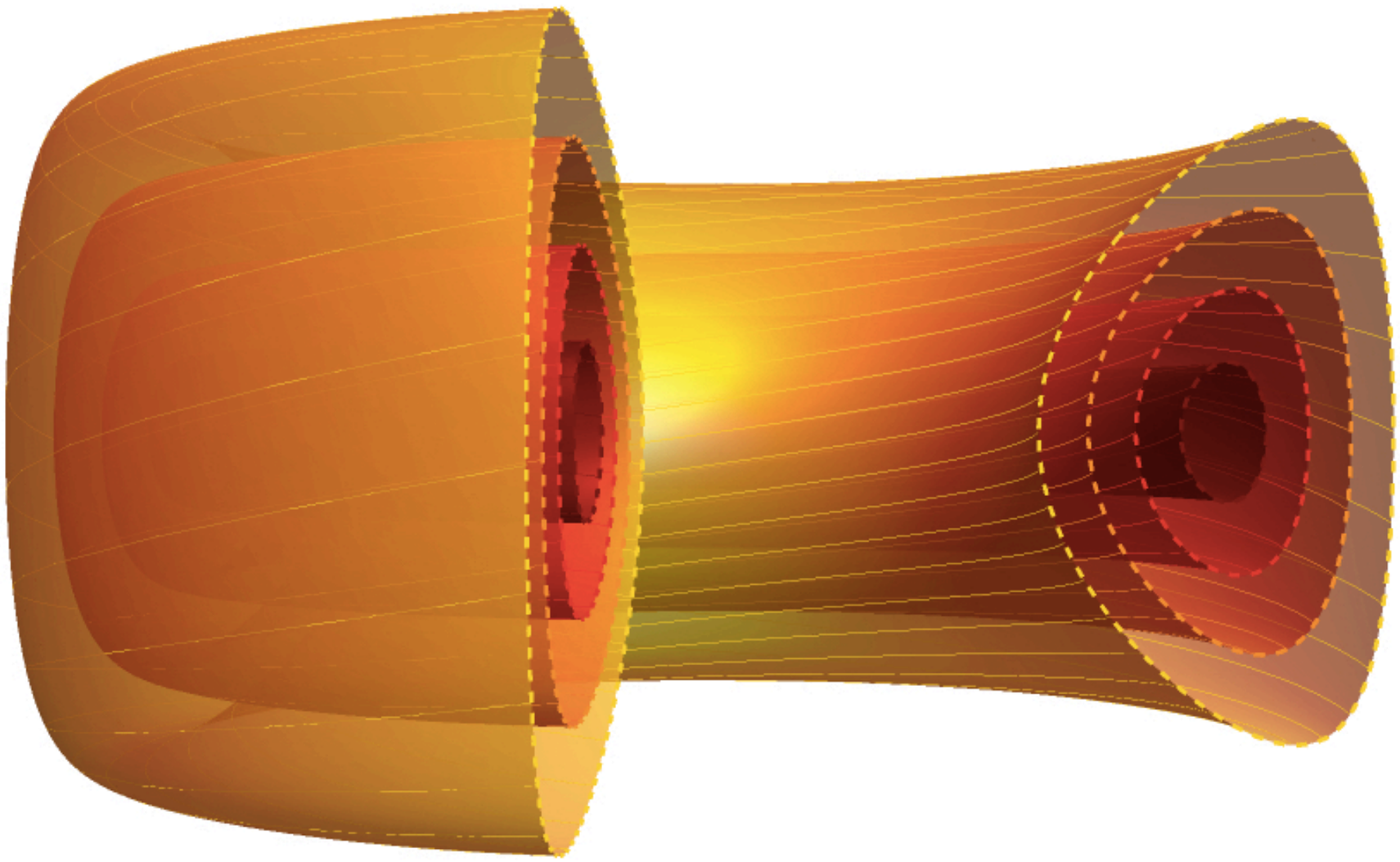
TSVV 2: February core topical group meeting

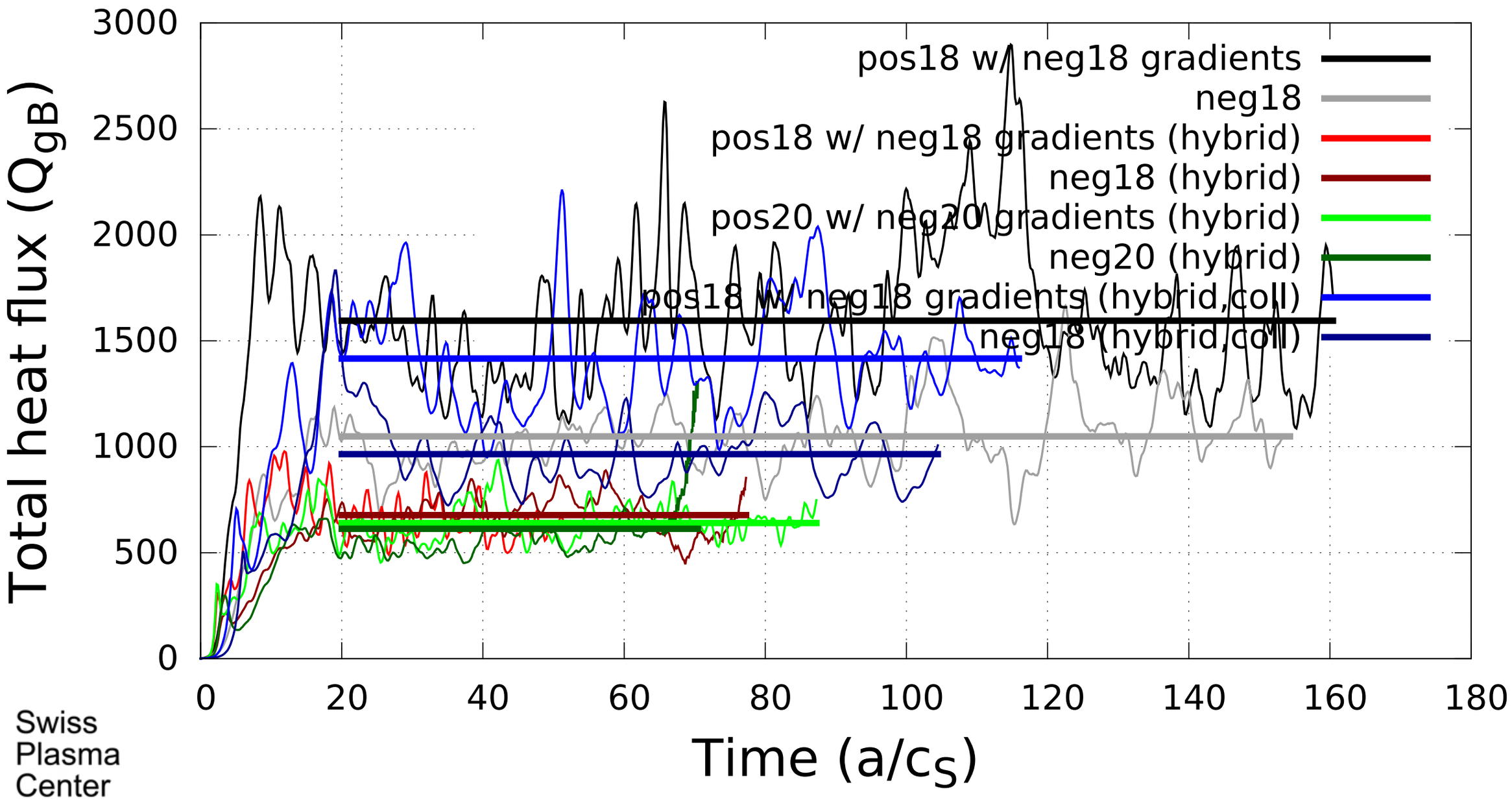


Justin Ball

10 February 2022

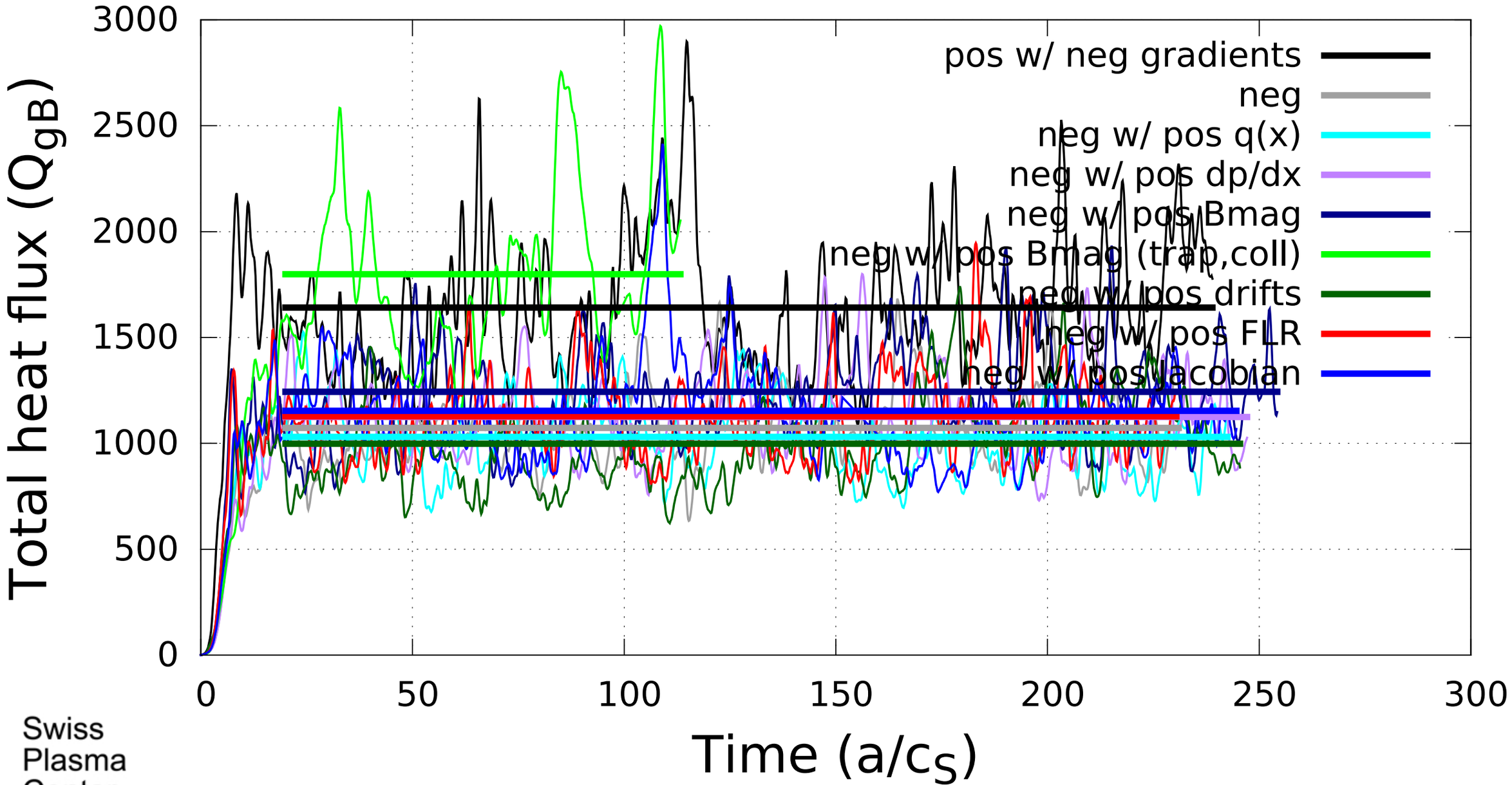
ITG-dominated DEMO inspired equilibria

- Negative triangularity only beneficial for hybrid electron model (i.e. kinetic trapped and adiabatic passing electrons) **when collisions are present**



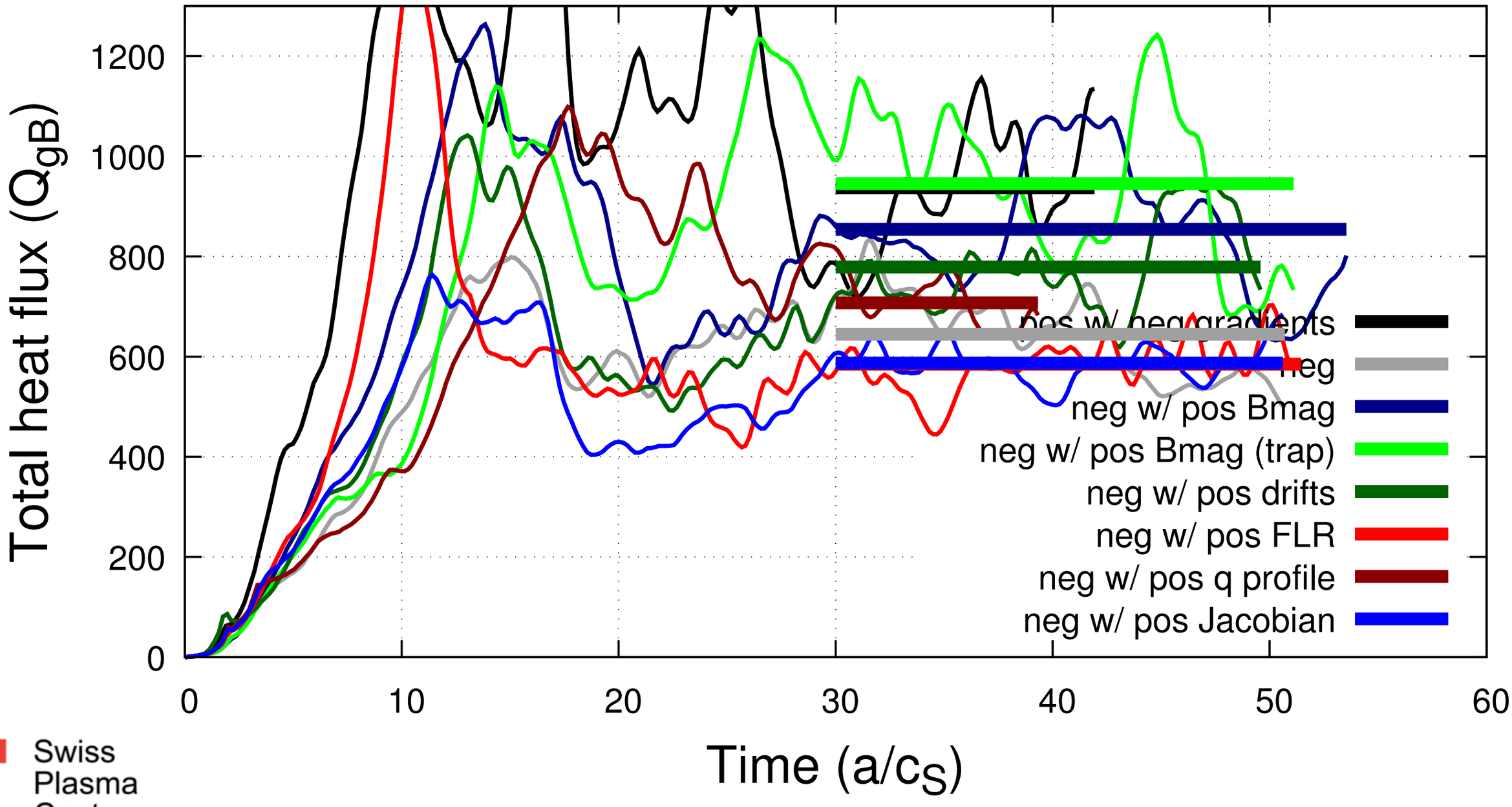
ITG-dominated DEMO inspired equilibria w/o coll

- Parallel dynamics (i.e. magnetic mirror force **and/or parallel streaming**) seem very important



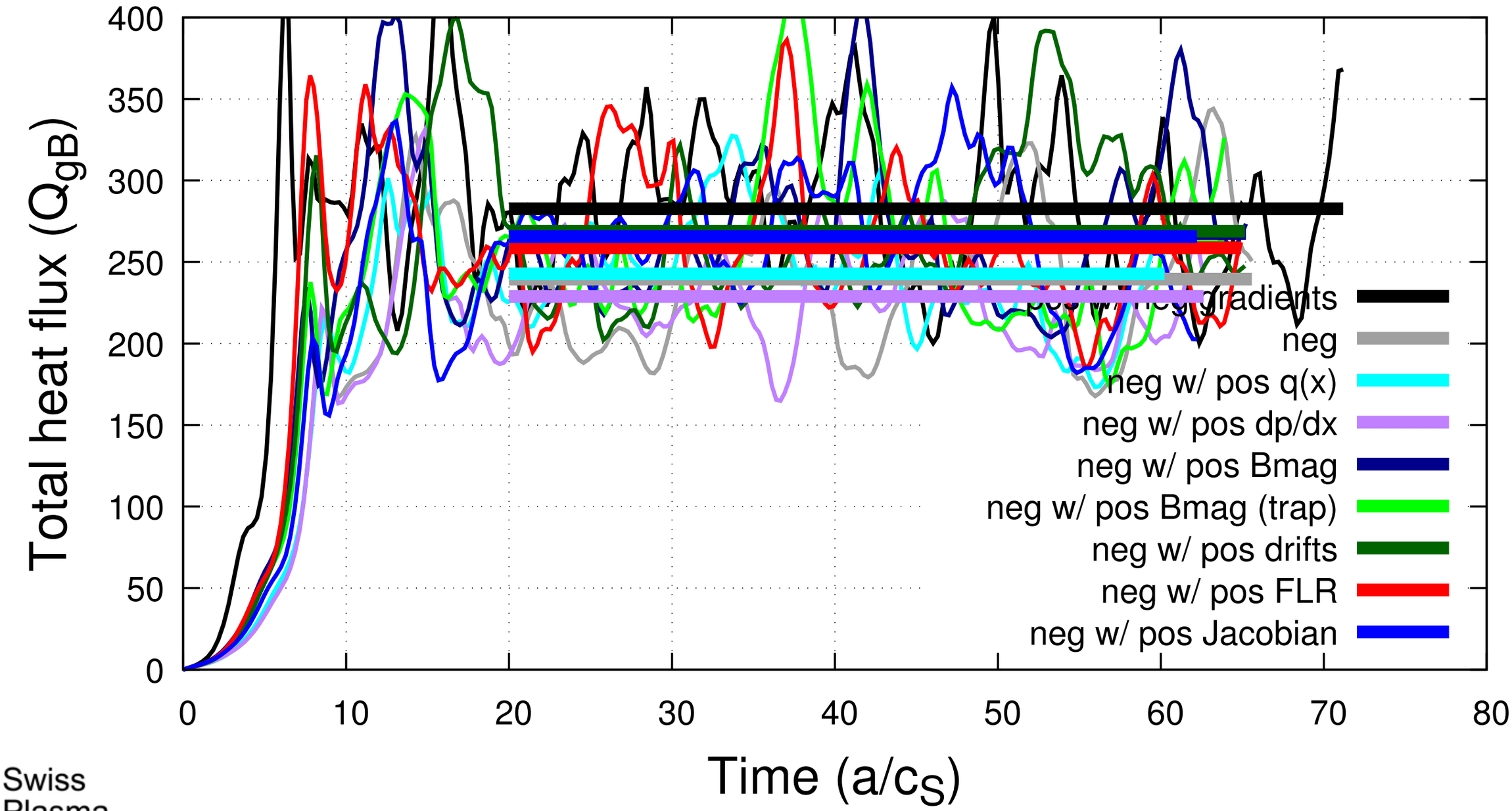
ITG-dominated DEMO inspired equilibria w/ coll

- With collisions, parallel dynamics still seem very important



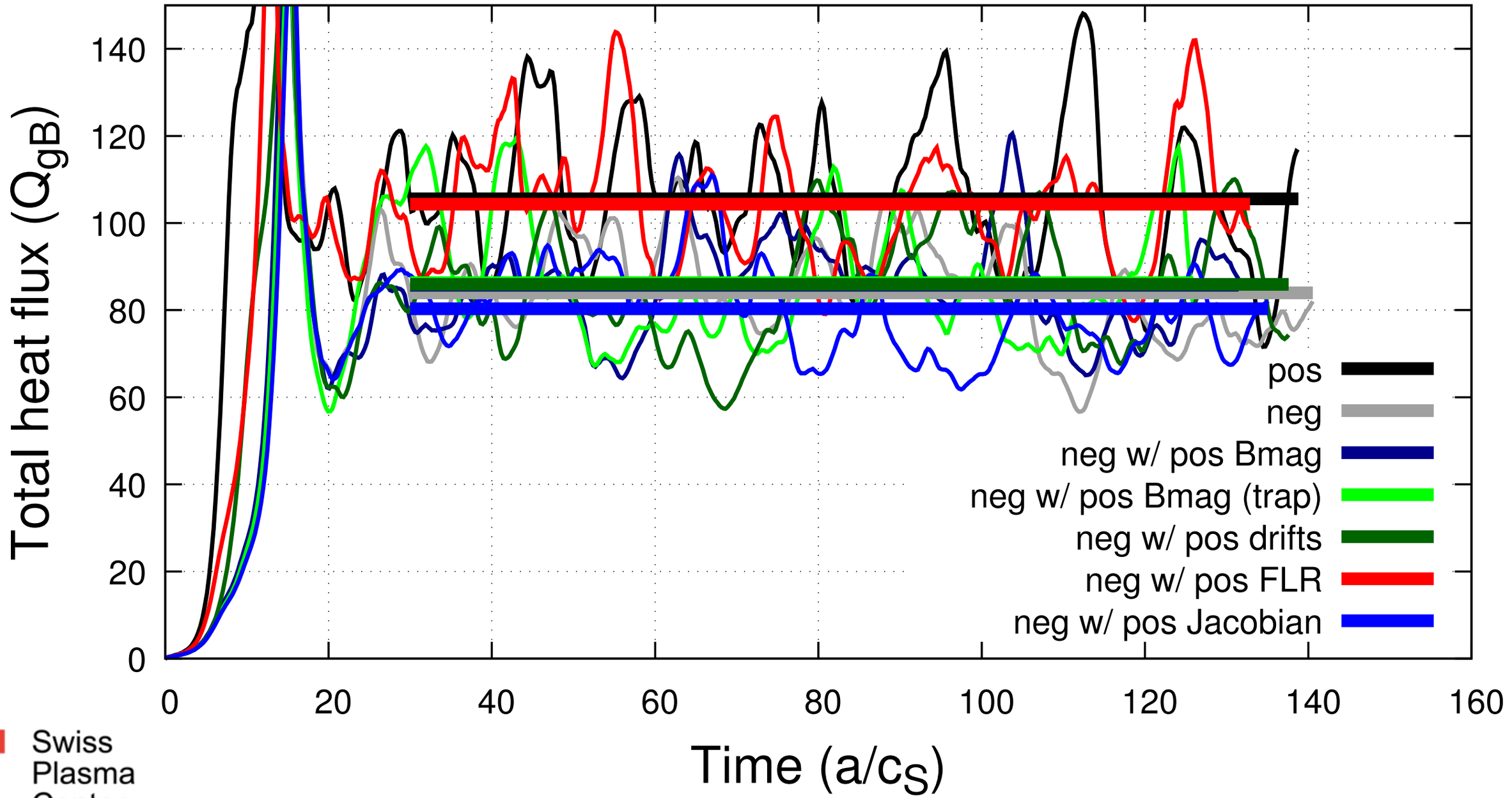
TCV equilibria in mixed ITG/TEM regime w/ coll

- Other mechanisms important too, but a bit inconclusive



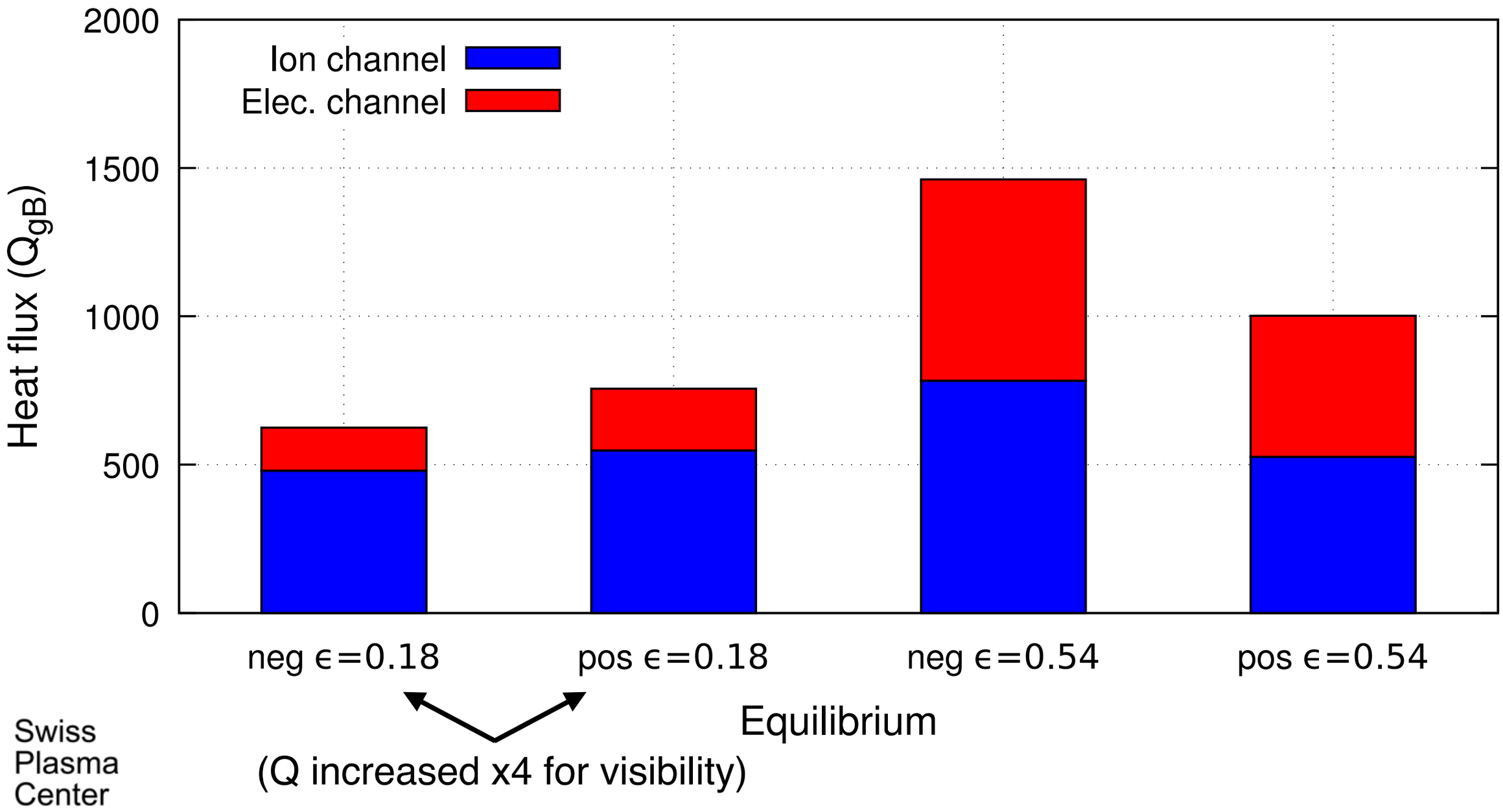
Idealized Miller, pure ITG drive w/o collisions, $\epsilon = 0.06$

- FLR effects are responsible for improvement, no longer parallel dynamics



Cyclone Base Case parameters w/o collisions

- Unlike at standard aspect ratio, at tight aspect ratios negative triangularity appears to be **de**stabilizing



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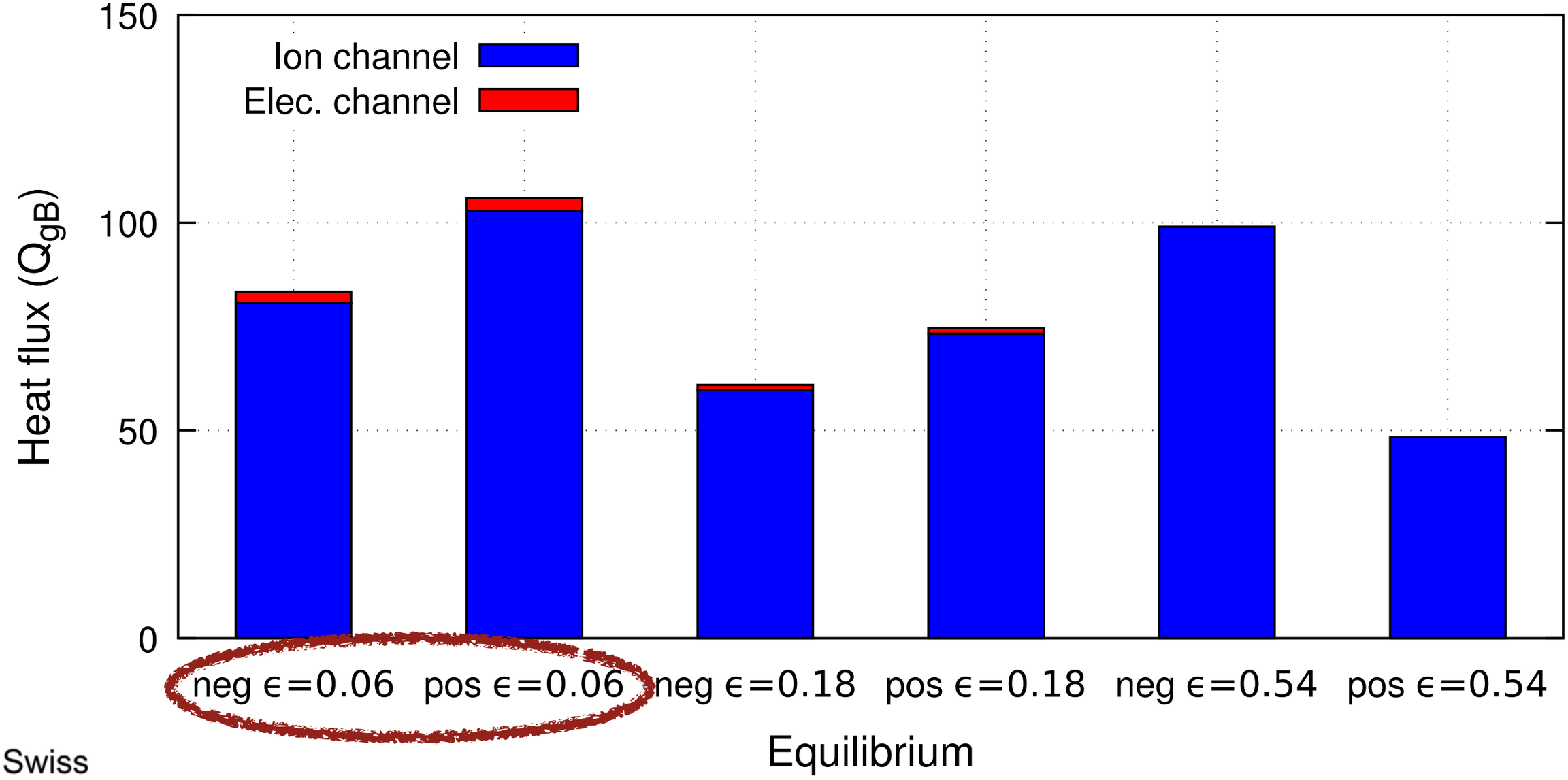
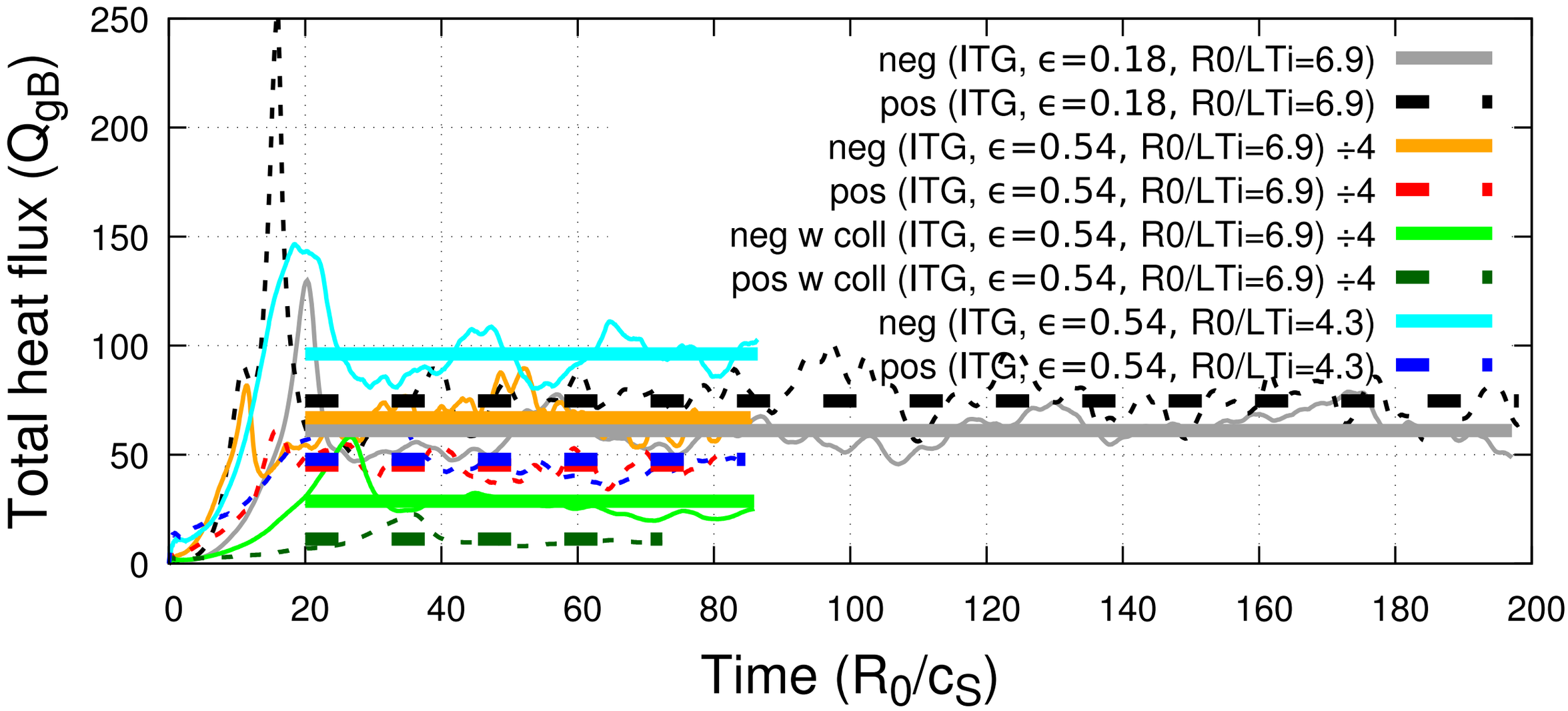
Pure ITG drive parameters w/o collisions

- Same trend is clearer for pure ITG drive: $\nabla T_e = \nabla n = 0$, while changing $R_0/L_{Ti} = \{10, 6.9, 4.3\}$ for $\epsilon = \{.06, .18, .54\}$ to keep Q approx. constant



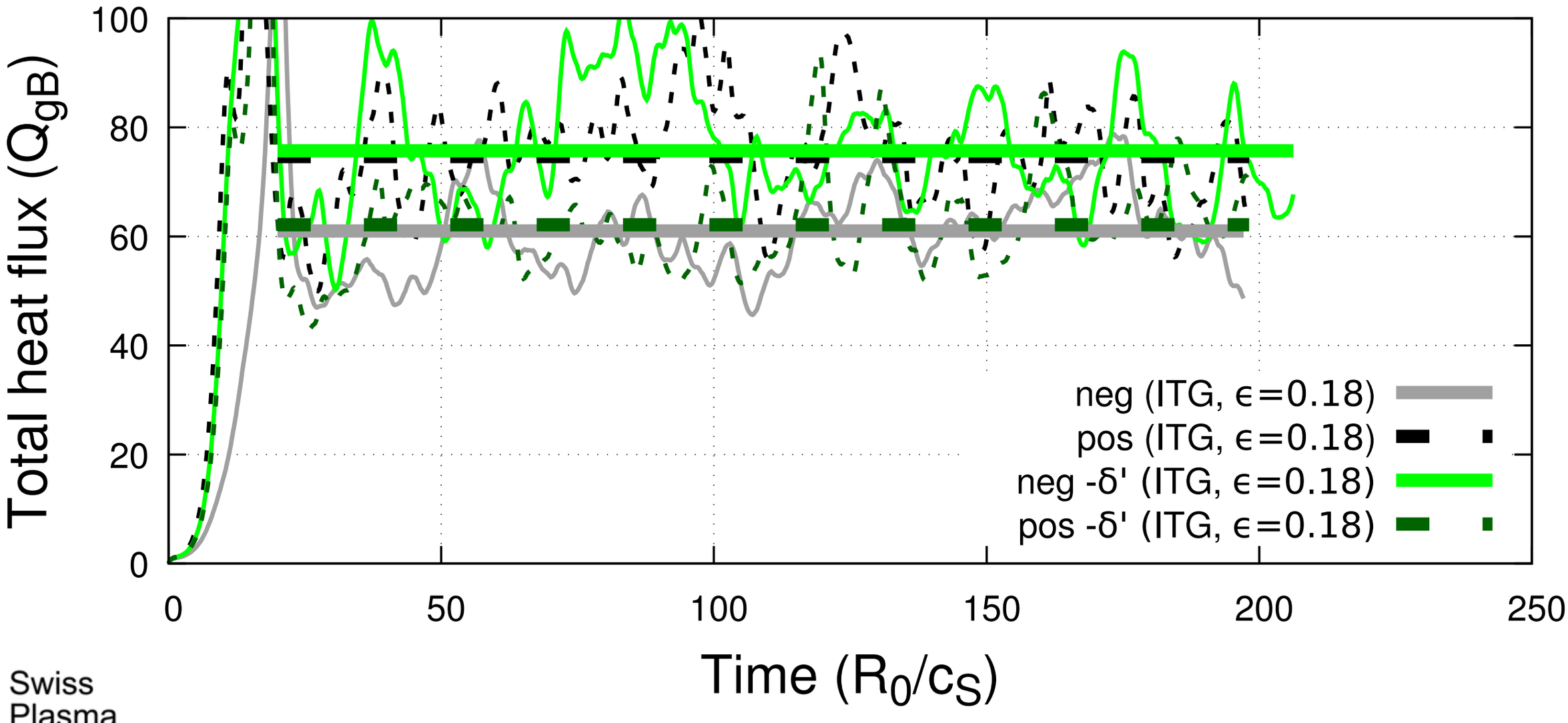
Pure ITG drive parameters with collisions

- Also holds when collisions are included (see dark and light green data)



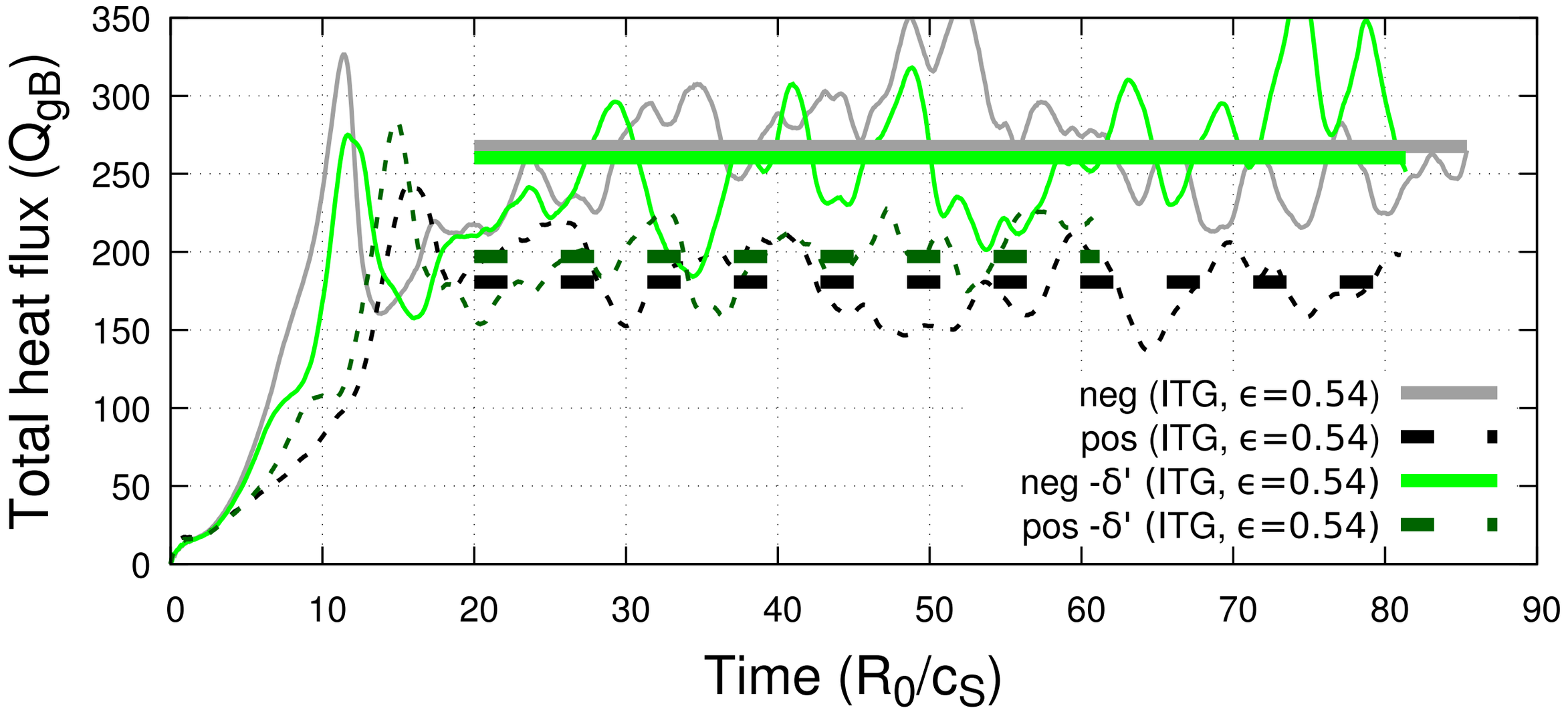
Pure ITG drive parameters w/o collisions, $\epsilon = 0.18$

- At standard aspect ratios, the stabilizing effect of negative triangularity appears to be entirely due to the radial gradient of flux surface shape (i.e. swapping the radial gradient of shape entirely swaps the resulting Q)



Pure ITG drive parameters w/o collisions, $\epsilon = 0.54$

- At tight aspect ratios, the **de**stabilizing effect of negative triangularity appears to be entirely **unaffected** by the radial gradient of flux surface shape



Summary

- Fully kinetic or hybrid (with collisions) electrons are needed to observe NT stabilization

- In ITG-dominated standard aspect ratio DEMO, parallel dynamics seem crucial

- For large aspect ratio with pure ITG drive, FLR effects are key

- At tight aspect ratios, NT appears to be **de**stabilizing

  - Physics at tight aspect ratio (determined by flux surface shape) are different than large aspect ratio (determined by gradient of flux surface shape, e.g. FLR effects)

Pure ITG drive parameters w/o collisions

- Trend still holds for somewhat different driving gradients