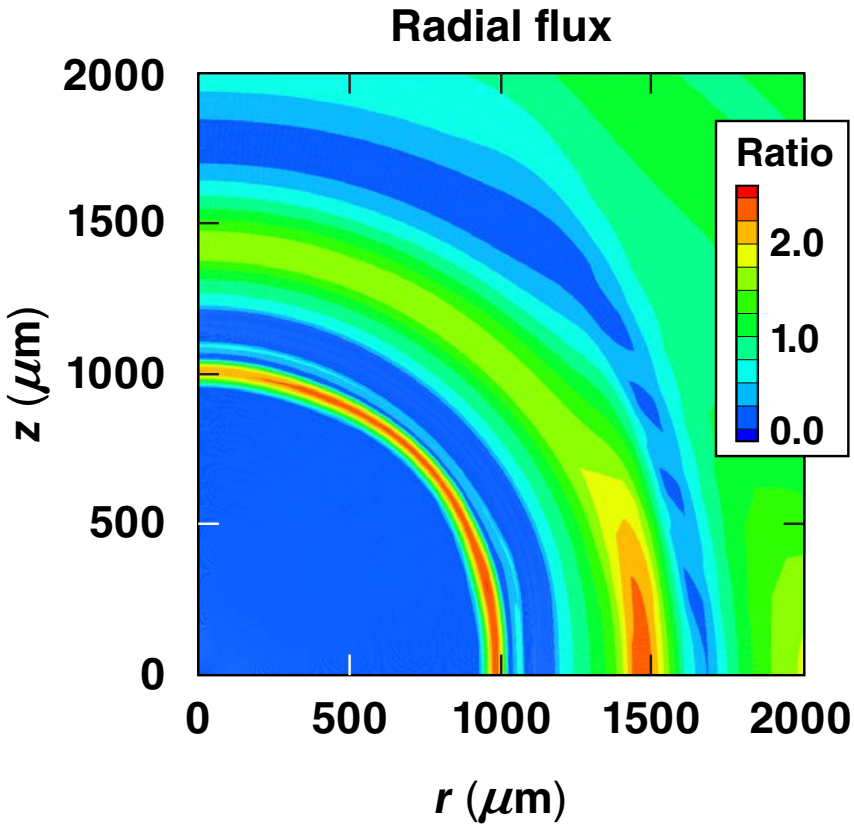
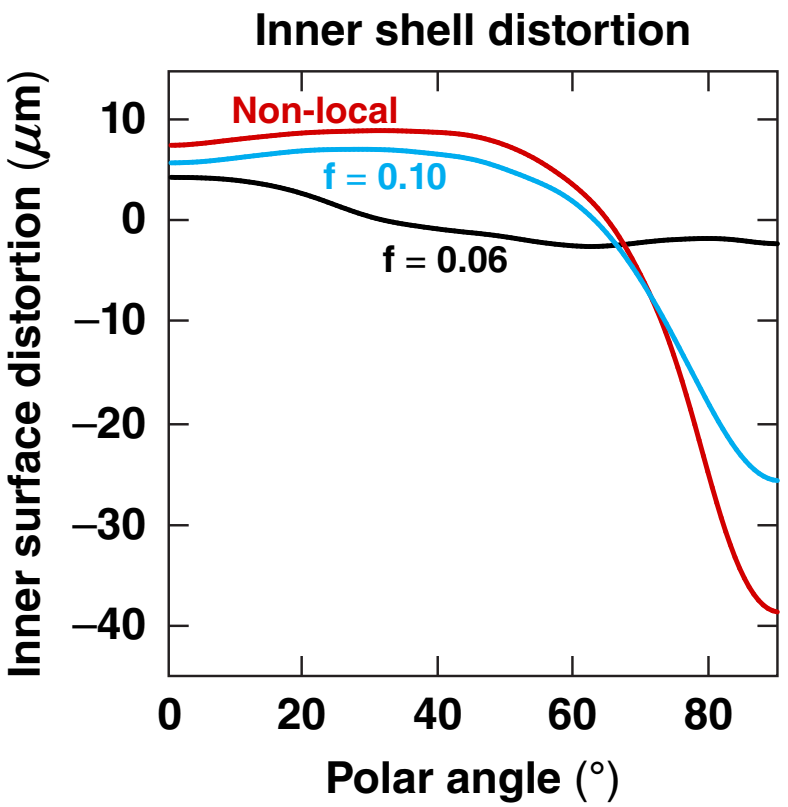
Effect of Nonlocal Electron Transport on the Two Dimensional Symmetry of Polar-Drive Ignition Targets





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Summary

Nonlocal electron transport (NLET) must be considered to optimize polar-drive ignition designs

UR LLE

- A 2-D nonlocal electron thermal transport model has been added to the 2-D hydrodynamics code *DRACO*
- Traditional flux-limited simulations indicate primarily radial heat flux near critical density without any appreciable flux in the transverse direction
- NLET provides for higher drive near the equator, which can compensate for deficiencies in equatorial drive in polar-drive implosions

Collaborators

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Implementation of a 2-D NLET model in *DRACO* allows for consistent comparisons with nonlocal *LILAC* runs

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- One dimensional simulations have shown that non-local heat transport is required to reproduce experimental results[1]
- The NLET scheme in *DRACO* was developed at the University of Wisconsin[2], using a modified version of the Schurtz model[3]
- A correction to the local Spitzer flux is obtained from a set of multi-energy-group diffusion equations, which is iterated to a self-consistent solution

[1] I. V. Igumenshchev *et al.*, Phys. Plasma 19, 056314 (2012).
[2] D. Cao, CP8.00079, this conference.
[3] G. P. Schurtz, Ph. D. Nicolaï, and M. Busquet, Phys. Plasmas 7, 4238 (2000).

The NLET model agrees well with experiment and the non-local model in 1-D *LILAC*

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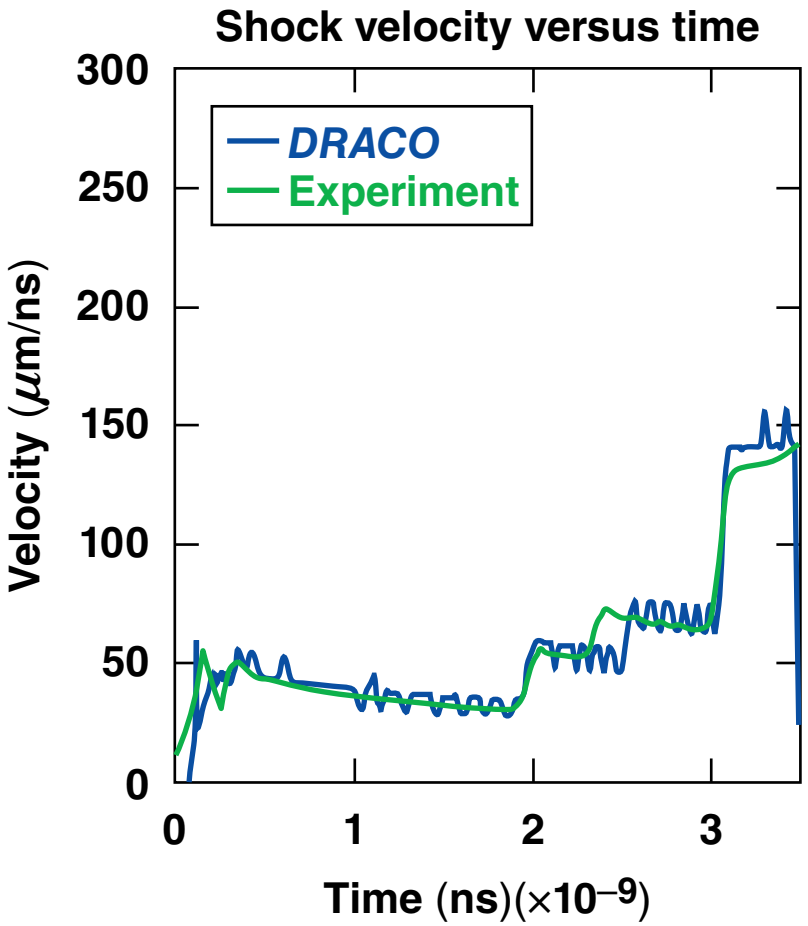
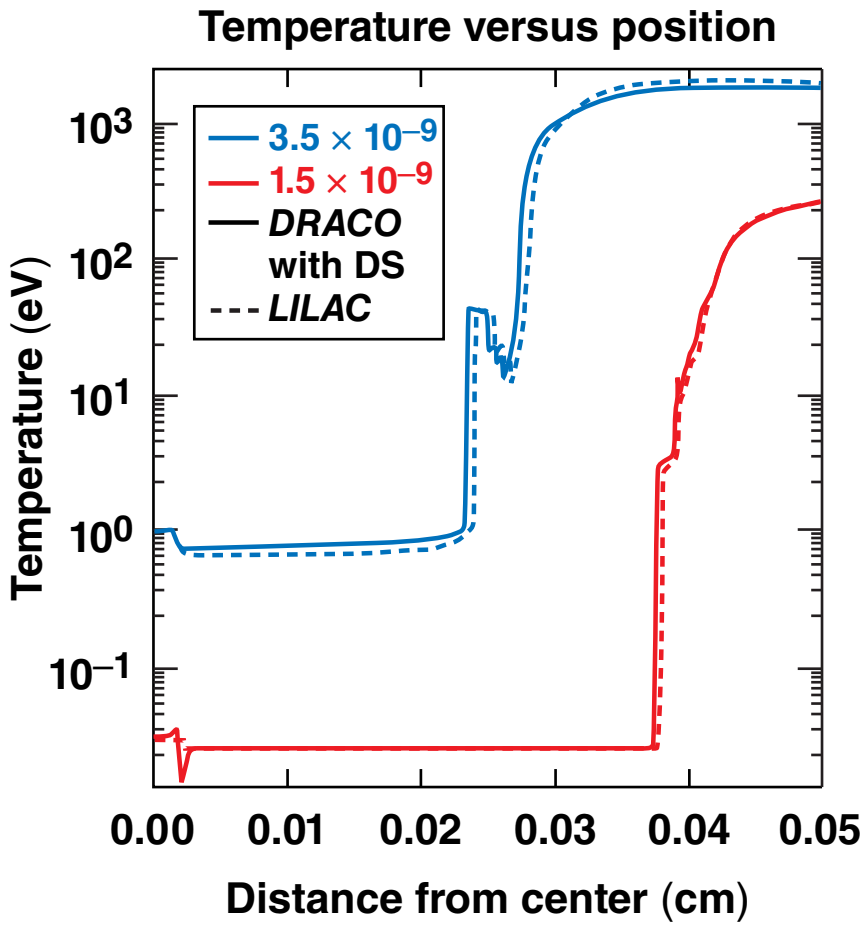
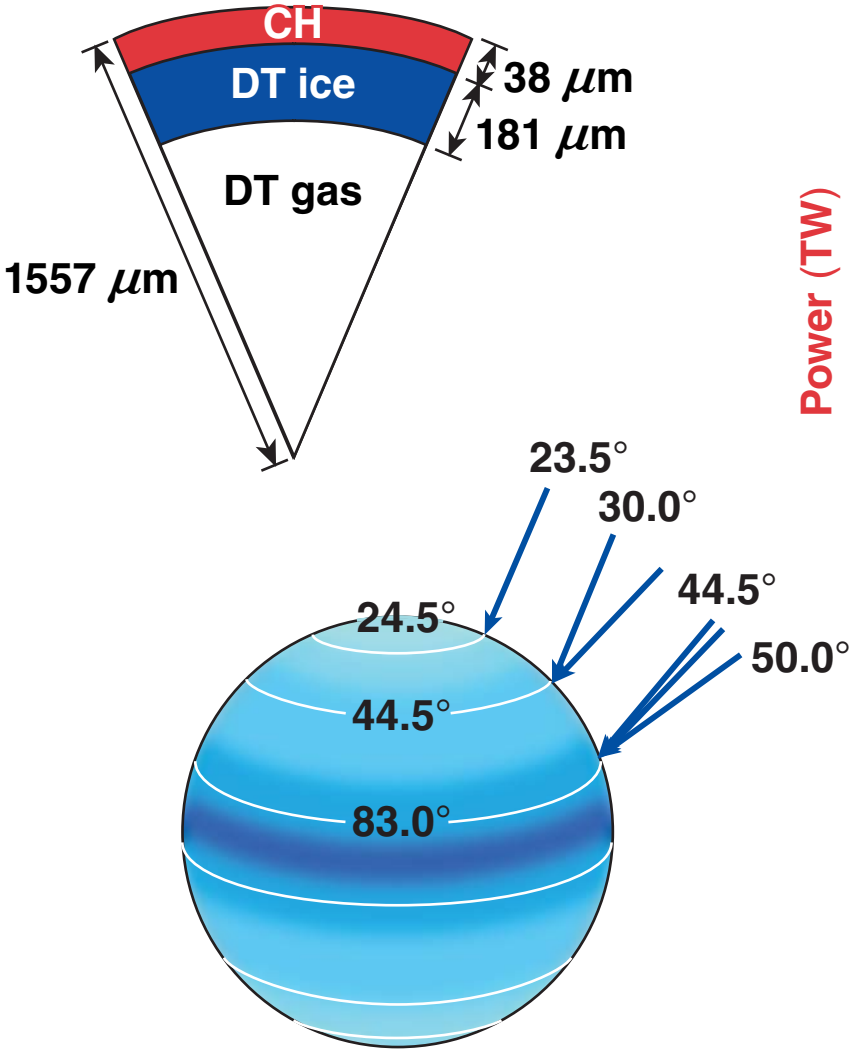
Comparisons of simulations with a triple-picket, shock timing experiment

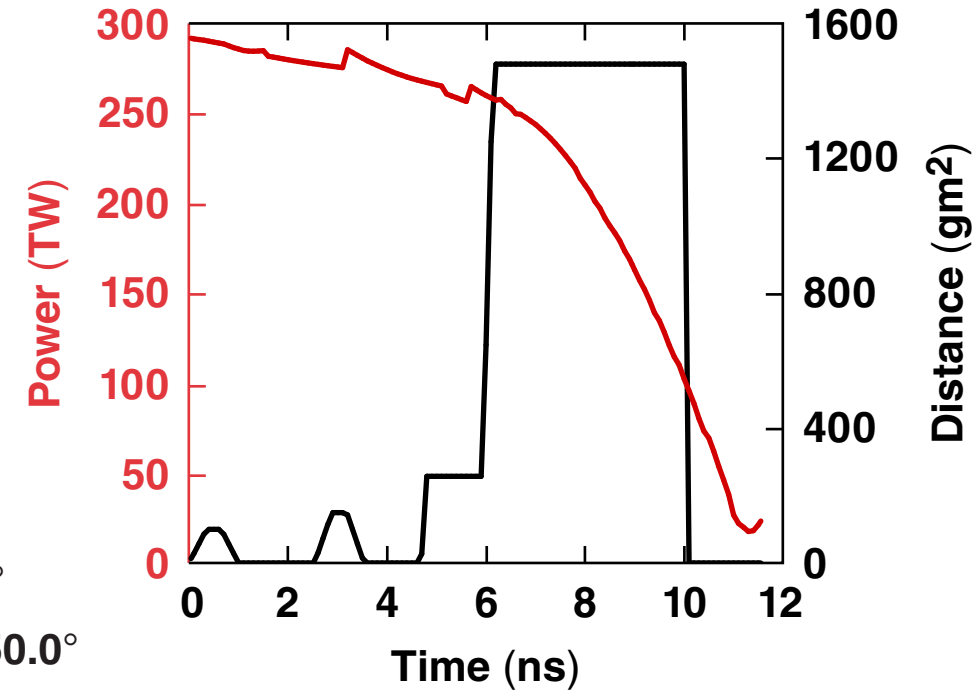




TC10233

The effects of the nonlocal transport model were studied in a polar-drive ignition target*



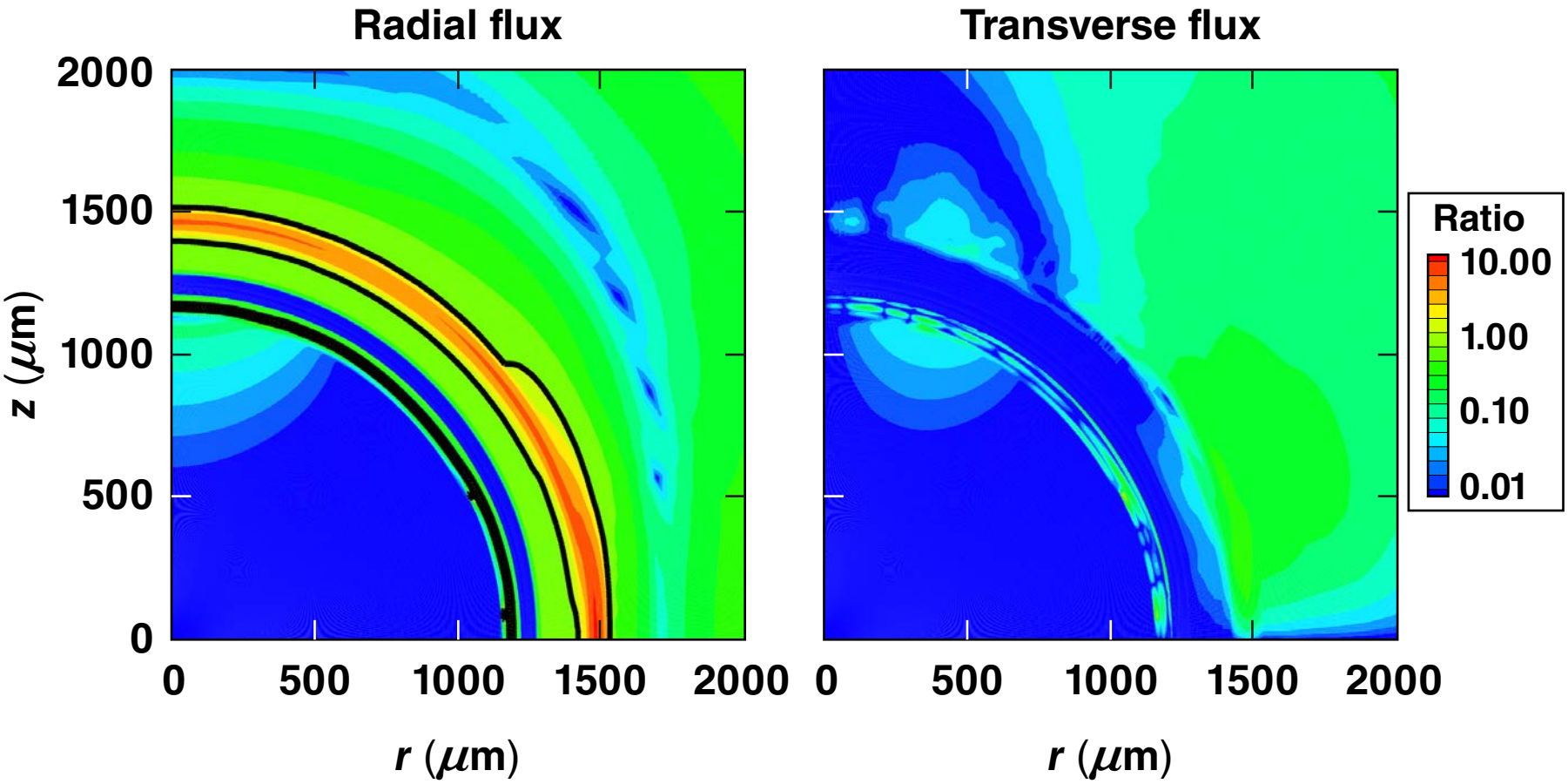


TC10232

*T. J. B. Collins, JO4.00010 , this conference.

Flux-limited simulations indicate strong radial flux without any significant transverse gradients

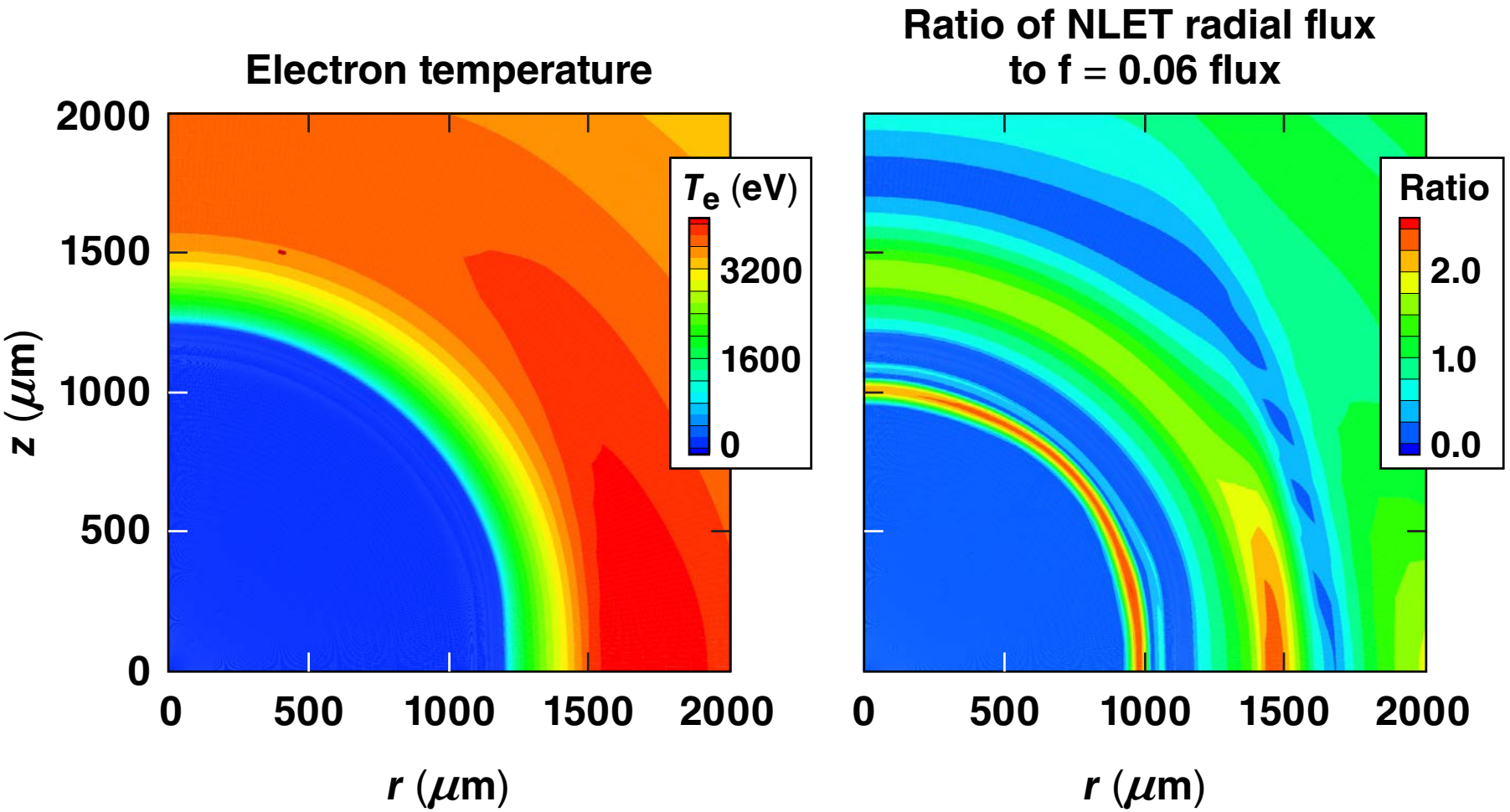
- Ratio of the Spitzer heat flux to the f = 0.06 flux-limited flux at 7.1 ns



Black contour line is ratio = 1.

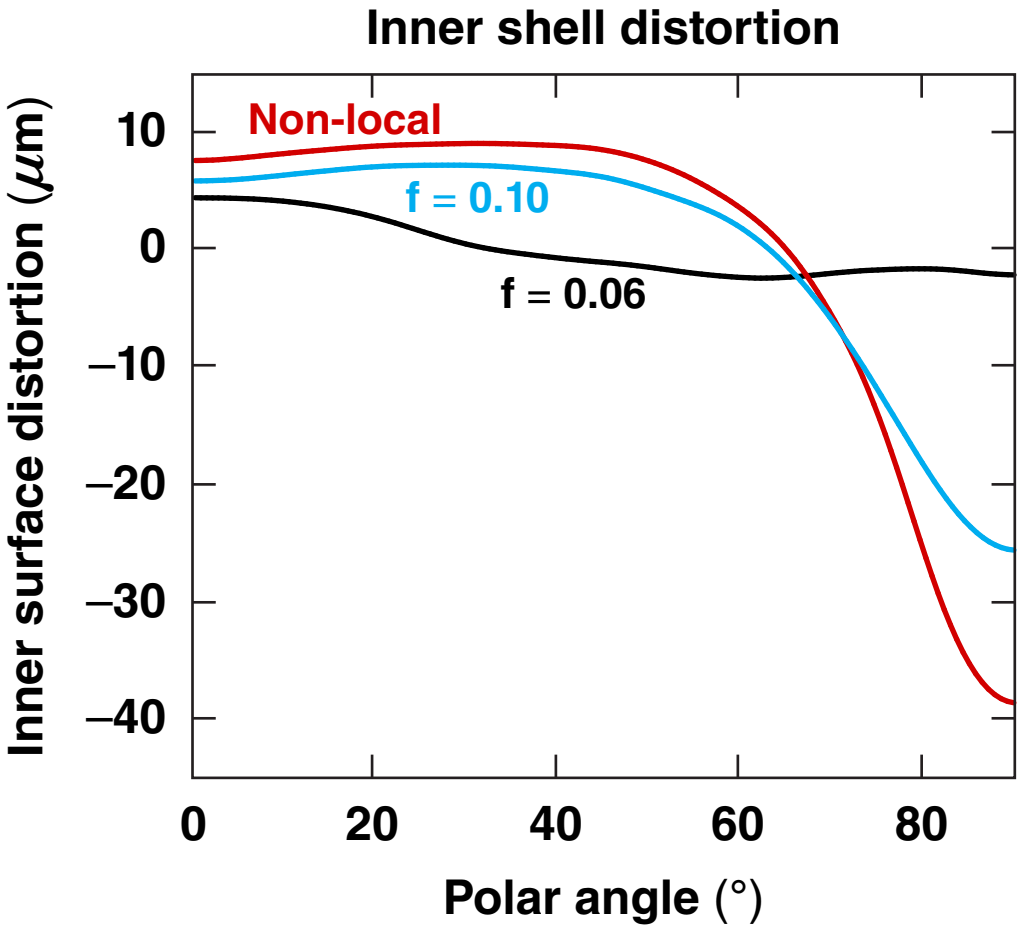
TC10235

NLET simulations show a high T_e near the equator resulting in a larger radial heat flux



TC10234

The increased radial heat flux predicted by NLET leads to a larger drive at the equator



Maintaining adequate equatorial drive is a key component in developing polar-drive ignition designs.

Summary/Conclusions

Nonlocal electron transport (NLET) must be considered to optimize polar-drive ignition designs

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- A 2-D nonlocal electron thermal transport model has been added to the 2-D hydrodynamics code *DRACO*
- Traditional flux-limited simulations indicate primarily radial heat flux near critical density without any appreciable flux in the transverse direction
- NLET provides for higher drive near the equator, which can compensate for deficiencies in equatorial drive in polar-drive implosions
- Optimization of ignition polar-drive implosions requires modeling both non-local thermal electron transport and cross-beam energy transfer*

*J. A. Marozas and T. J. B. Collins, UO5.00003, this conference.