THERMODYNAMIC SIMULATIONS OF SHAPE EFFECTS ON STAGNATING INERTIAL CONFINEMENT FUSION CAPSULES

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The detailed 3-dimensional shape of the assembled hotspot in inertial confinement experiments is known to dramatically affect capsule performance. State of the art 3D radiation-hydrodynamic simulations are supremely challenging due to long runtimes, memory constraints, and potential numerical difficulties. As a result, exploring the full space of shape effects is not possible, and 3D studies are limited to a handful of representative points.

Dynamic thermal models simplify the radiation-hydrodynamic picture by integrating over an analytic spatial distribution [1]. The result is a semi-analytic approach with a reduction in numerical workload of several orders of magnitude. Such models have had success in interpreting experimental data [2] and in motivating figures of merit for current ICF experiments [3]. We will discuss the extension of this approach to describe 3D hotspots, and in particular the coupling between shape and energy balance during stagnation. Our thermal model includes realistic physical models and diagnostic quantities, and is fast enough to allow the production of ensembles of simulations that span several dimensions. We will present initial results investigating several interesting shape parameters and compare against full 3D radiation-hydrodynamic simulations.

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