**Maestro and Castro: Simulation Codes for Astrophysical Reacting Flows**

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**Abstract**

Stellar explosions come in a wide variety, powered by either by gravitational collapse or thermonuclear energy release. These are truly multiphysics problems---modeling them requires the coordinated input of gravity solvers, reaction networks, transport, and hydrodynamics together with microphysics recipes to describe the physics of matter under extreme conditions. Furthermore, these models involve following a wide range of spatial and temporal scales, which puts tough demands on simulation codes. As a result, a variety of methods have been developed to model the different phases of these explosions. We developed the codes Maestro and Castro to meet the computational challenges of these problems. Maestro uses a low Mach number formulation of the hydrodynamics to efficiently model convection. Castro solves the fully compressible radiation hydrodynamics equations to capture the explosive phases of stellar phenomena. Both codes share the same microphysics and use the BoxLib library to provide adaptive mesh refinement and manage the parallelism. We give an overview of the capability and performance of these codes.