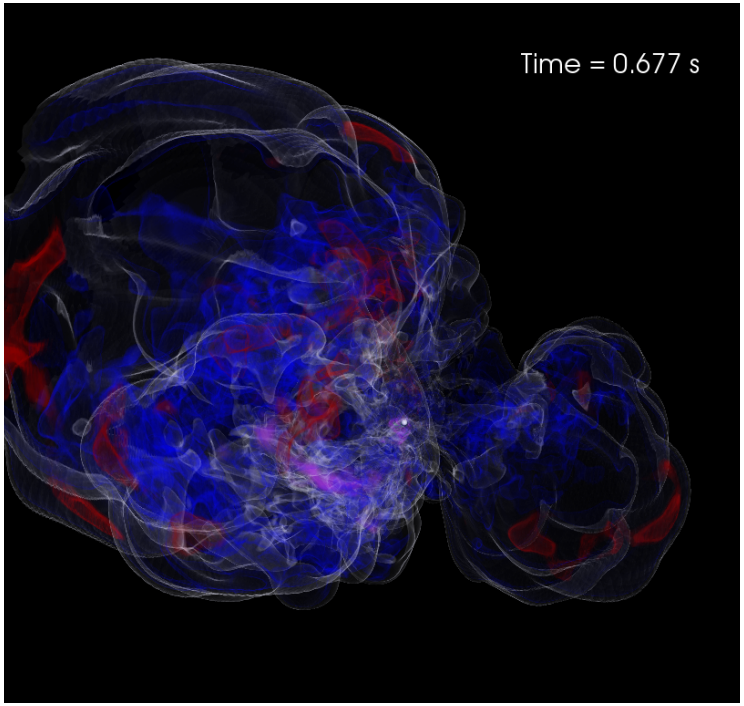
3D CCSN Explosion Model

Objectives

To make the simulation of core-collapse supernovae in 3D as routine as has been the calculation in 2D during the last five years.

Impact

Simulations in 3D with the full suite of physics and competitive algorithms for solving the set of PDEs would inaugurate a new era in CCSN theory.



Accomplishments

Using Fornax, the Princeton group has published (arXiv:1809.05106) a model of the explosion in 3D of a 16-solar-mass star. The calculation explodes ~100 ms after bounce, has been carried out to ~970 ms after bounce, and explodes asymmetrically with one hemisphere predominating. The gravitational mass of the residual proto-neutron star is ~1.42 solar masses. The ejecta are a combination of both neutron- and proton-rich components, with important consequences for the nucleosynthesis.

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