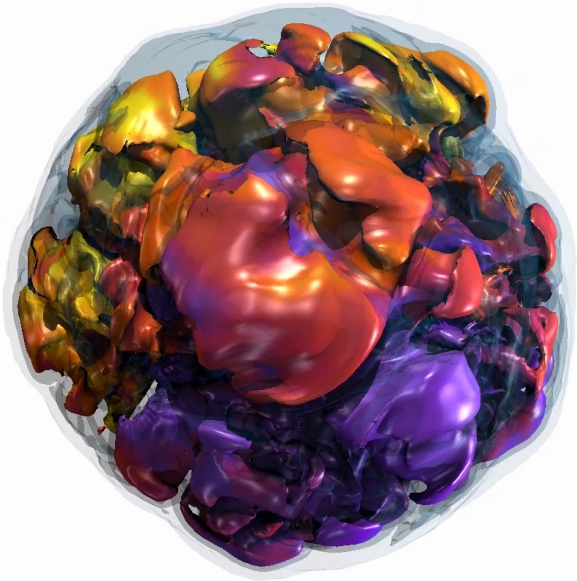
The Overarching Framework of Core-Collapse Supernova Explosions as Revealed by 3D Fornax Simulations

Objectives

To explore the neutrino-driven mechanism of core-collapse supernovae by simulating many models in 3D using state-of-the-art tools and methods.

Impact

This study constitutes the largest set of 3D CCSN models ever performed and assembled, revealing for the first time detailed aspects of the systematics of the outcome with progenitor structure.



Accomplishments

We have conducted nineteen state-of-the-art 3D core-collapse supernova simulations spanning a broad range of progenitor masses. This is the largest collection of sophisticated 3D supernova simulations ever performed. We have found that while the majority of models explode, not all do, that most 3D explosions have a dominant dipole morphology, and that they experience simultaneous accretion and explosion. We reproduce the general range of residual neutron-star masses inferred for the galactic neutron-star population and find that the ejecta are proton-rich.

Citation: Adam Burrows et al. MNRAS, in press, 2019 (arXiv:1909.04152) Contact : A. Burrows (Princeton)