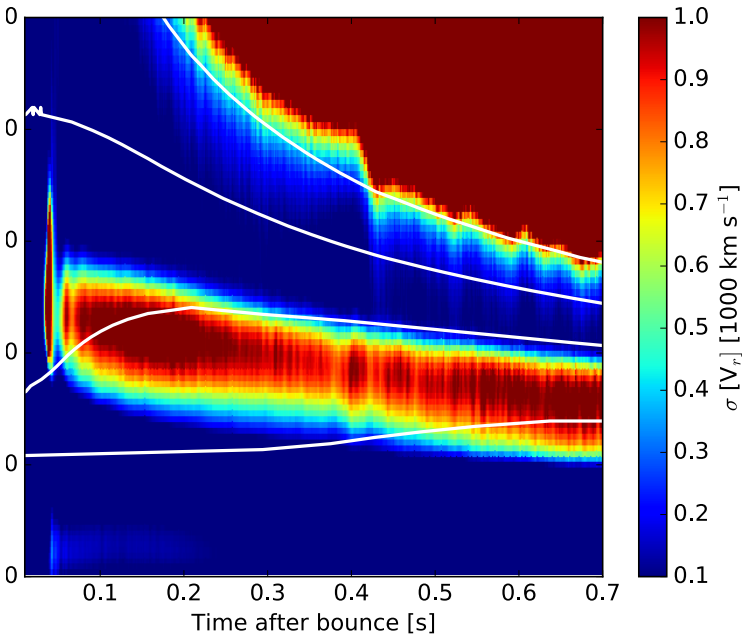
A Systematic Study of Proto-neutron Star Convection in Three-dimensional Core-collapse Supernova Simulations

Objectives

To determine the physical character of the inner proto-neutron star convection that attends every one of our recent 3D models of CCSNe.

Impact

This is the most comprehensive investigation of PNS convection ever performed in 3D. Such convection affects the neutrino emissions, the generation of B-fields, and, perhaps, the proton-richness of the ejecta.



Accomplishments

Based on our latest 3D Fornax simulations, we find a correlation between the vigor and hydrodynamic power of PNS convection and both the mass of the neutron star made and the progenitor ZAMS mass. PNS convection persists for the duration of all simulations, even when gravitational wave emission subsides and the explosion energy have asymptoted. Moreover, it enhances the emission of mu and tau neutrinos. We speculate that the site of PNS convection could also be the context for neutron-star B-field generation.

Citation: Hiroki Nagakura et al. MNRAS, in press, 2020 (arXiv:1912.07615) Contact : A. Burrows (Princeton)