

Radiation hydrodynamics of supernova shock breakouts

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Abstract

The first powerful burst of photon radiation in a supernova appears when the shock front is a few photon mean-free paths below the star photosphere. This is called "shock breakout" and it is the first observable event after the neutrino and gravitational wave bursts in core-collapsing supernovae. Any early information about collapse is vitally important for understanding the physics of explosion, constraining speed of neutrino propagation etc. We witness direct observations of shock breakouts in a few supernovae. I will discuss some puzzles related to those objects. The theory must be developed here and this may lead eventually to better understanding of presupernova stars and physics of strong radiative shocks. Finally, I describe our current understanding of the most luminous subtype II supernovae (SNIIn). The potential use of their long living radiative shocks as a tool for measuring distances and cosmological parameters without invoking the distance ladder will be discussed.