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Shock Breakout and Cooling Envelopes - From Supernovae to Low Luminosity GRBs

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Abstract
We discuss the physics of the breakout of relativistic and non relativistic shocks from the envelopes of stars. While most of the luminosity escapes from the diffusion/convection transition, the thermalization of the photons happens farther out.
Special treatment of these different regimes is important in order to capture correctly both luminosity and color temperature of the observed radiation. At late times, recombination plays an important role in setting the temperature, and only at later times it could affect the luminosity as well.
For compact enough stars, relativistic breakout will occur. We discuss the evidence in favor and against the association of such event with low luminosity GRBs.

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