The circumstellar environment of massive stars and all kinds of evidence for all types of core-collapse supernovae in long-duration GRBs

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The goal of this report is to review GRB afterglow spectra (the X-ray lines, blueshifted absorption lines of C IV, Si IV, blueshifted H absorption lines in these spectra) and the ever-increasing list of the photometric evidence of late-time bumps in GRB afterglows. These are all signs of the direct relation between GRBs and explosions of massive stars; they further support the view that, in fact, all long-duration GRBs provide obvious evidence for SN explosions. GRBs *must always* be accompanied by Type Ib/c SNe or other types of massive (Type II) SNe if GRBs/SNe are really produced by the same astrophysical cauldron. A surprising news (e.g., astro-ph/0311326) is the presence of blueshifted H absorption lines in early spectra of GRB afterglows (GRB 021004, GRB 030226). It can directly indicate massive windy envelopes arising due to massive star evolution before core-collapse SN explosions.

1. *The early spectra*: The variety of envelopes surrounding pre-SNe is quite natural in the evolution of massive stars (e.g., astro-ph/0309637). Also, the properties of early spectra of GRB 030329/SN 2003dh (astro-ph/0312359) can be consistent with a shock moving into a stellar wind formed by the pre-SN. Such a behavior (similar to that near the UV shock breakout in SN 1993J; also see, e.g., astro-ph/0312464) can be explained by a dense matter in the very vicinity of a massive stellar GRB/SN progenitor (astro-ph/0012396). Hydrogen appears to be generally present also in SNe Ib/c, although in most events it can be identified reliably only in the earliest spectra of GRB/SNe Ib/c. The bolometric luminosities in the first SN UV peaks can also be of the same order of magnitude as in the GRB OTs ($\sim 10^{45}$ ergs s^{-1}).

2. *The late spectra*: We interpret the BVRI light curves of the GRB 970508 afterglow by the interaction (the "bump" on $\sim$ second day after the GRB) between a relativistic jet and a dense extended circumstellar envelope (with characteristic radius $\sim 10^{15}$ cm) and the subsequent interaction (the "shoulder" on the light curve: astro-ph/0107399 and 9710346) of SN ejecta (the shock breakout) with the same extended envelope. The luminosity at the "shoulder period" ($>$ 200 days) was of the same order of magnitude ($M_B \approx -19.5$) as for Type IIn SNe (e.g. SN 1994W, astro-ph/0405369). If Type II SNe can be *still* associated with a part of the GRB afterglow sample, then an observation of blueshifted absorption H lines in *the late spectra* of the long lasting "shoulder" of *some* GRB afterglow light curves would be another observational consequence of the scenario "massive star$\rightarrow$ pre-SN = pre-GRB", *but* in the compact GRB model (see our report at this conf.) with sizes of dense ambient/circumstellar windy envelopes up to $\sim 10^{15}$ cm around massive star-progenitors of GRB sources.

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