Two for one:
a long GRB and a broad lined Type Ic supernova from a single central engine

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SNe Type Ibc

- Core collapse of stripped massive stars
- Spectra lack Hydrogen (Ib, Ic), and may lack Helium (Ic)
- Subset of SNe-Ic exhibit very broad lines and strong line-blending

“broad-lined Ic”
• What is the source of the extreme kinetic energies \(10^{52}\) erg implied by these broad lines?
• What is the nature of the GRB/Ic-BL connection?
Wolf-Rayet Star

(Paul Duffell)
JET (m.m. rel. hydro)

Wolf-Rayet Star

jet
Sedona
Light curves, spectra

JET (m.m. rel. hydro)

Wolf-Rayet Star

jet

(Paul Duffell)
Sedona
Light curves, spectra

JET (m.m. rel. hydro)

SN 1998bw!

Wolf-Rayet Star

jet

(Paul Duffell)
$L_{\text{eng}} = \frac{1.8 \times 10^{52}\ \text{erg}}{1.1\ \text{s}} \times \exp[-t/1.1\ \text{s}]$

adapted from Barnes+17
Bolometric light curves

Spectrum at peak

adapted from Barnes+17
A single engine is capable of producing both a long-duration GRB and a broad-lined Type Ic SN
- mild viewing-angle dependence
- engine duration != burst duration
  - important for 56-Ni synthesis

Yet to come:
- full parameter-space study to explore different engine and progenitor parameters
  - choked/failed jets