A Remarkable Supernova Gone Unremarked

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KITP - Stellar Death, Aug. 2009

Collaborators

Berkeley SN group:

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- D. Leonard (SDSU)
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- J. Silverman (UCB)
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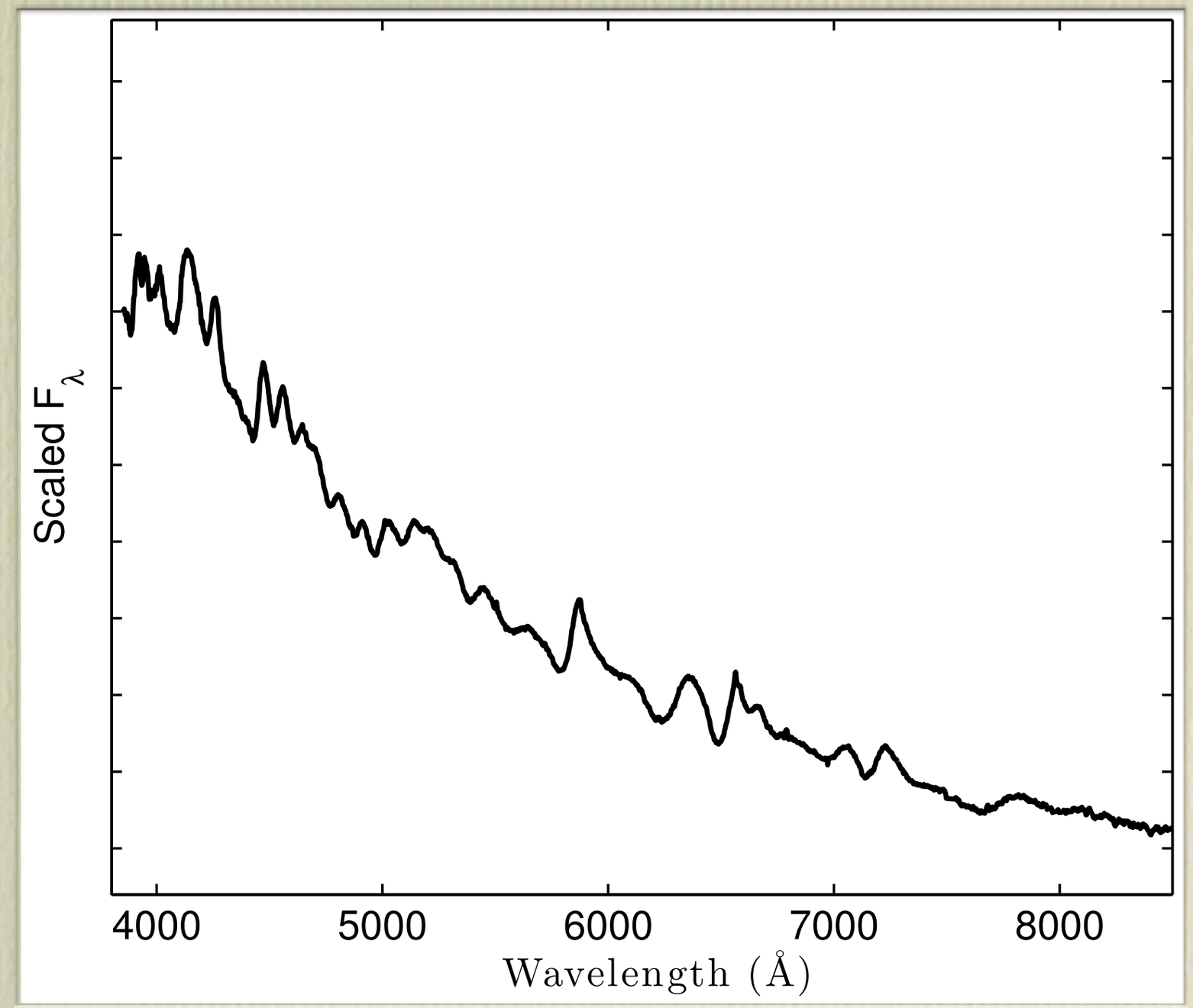
And:

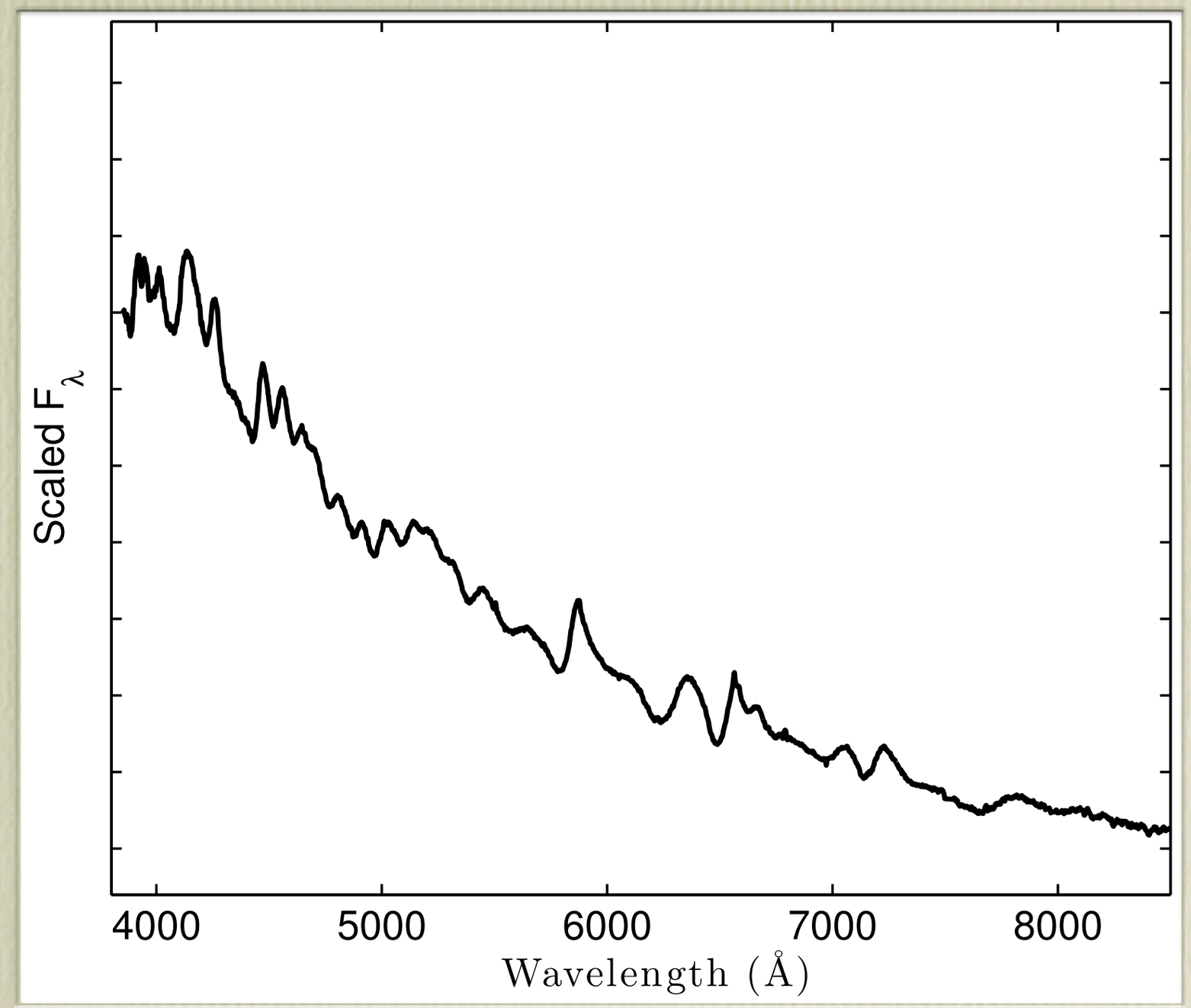
- P. Nugent (LBNL)
- R. Thomas (LBNL)
- J. Bloom (UCB)
- S. Darbha (UCB)

SN2002bj – Odd Spectrum



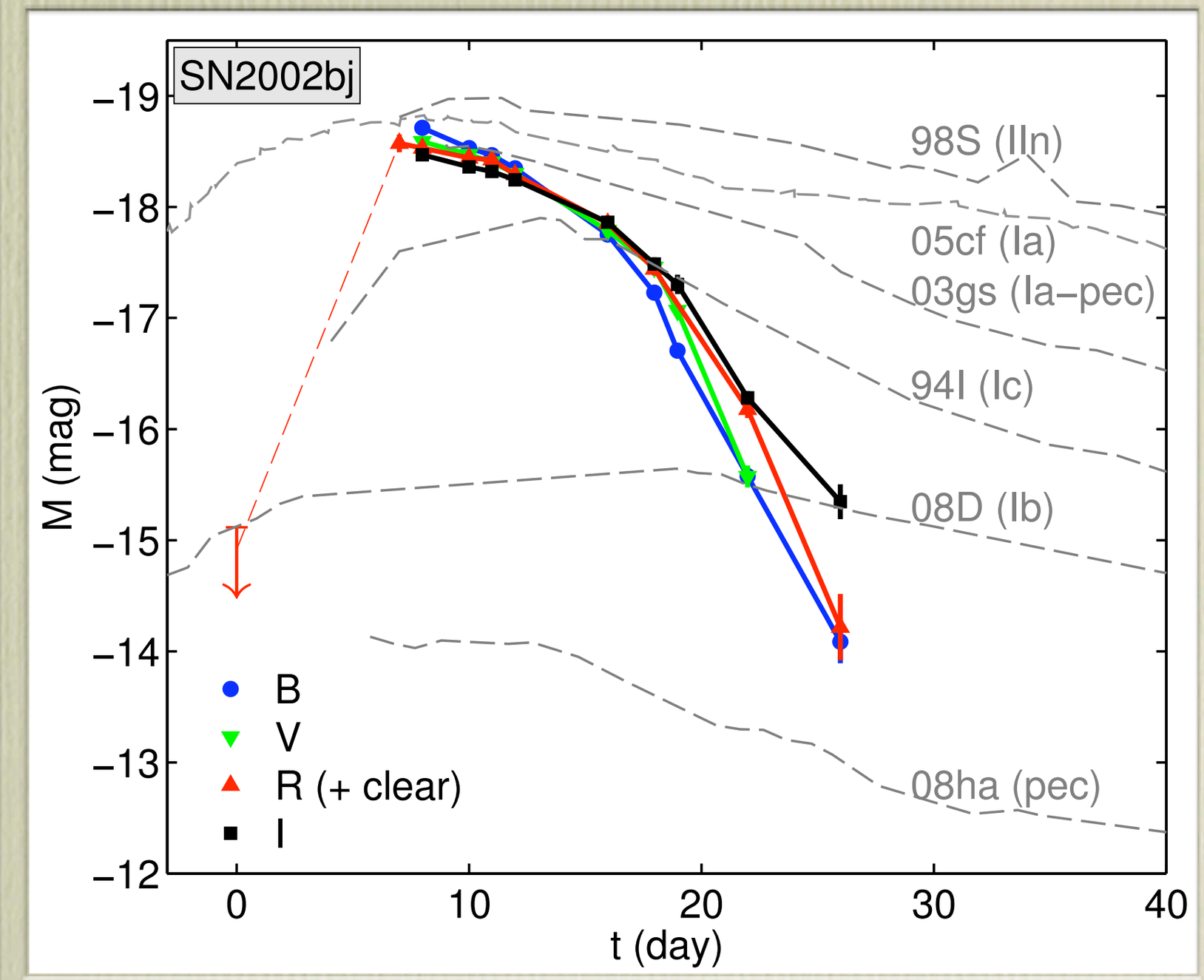
SN2002bj – Odd Spectrum

- Not a IIn.
- Helium.
- Carbon.
- No Hydrogen.



Odd Lightcurve

- Faster than any SN type.
- Bright for a CC, faint for a Ia.



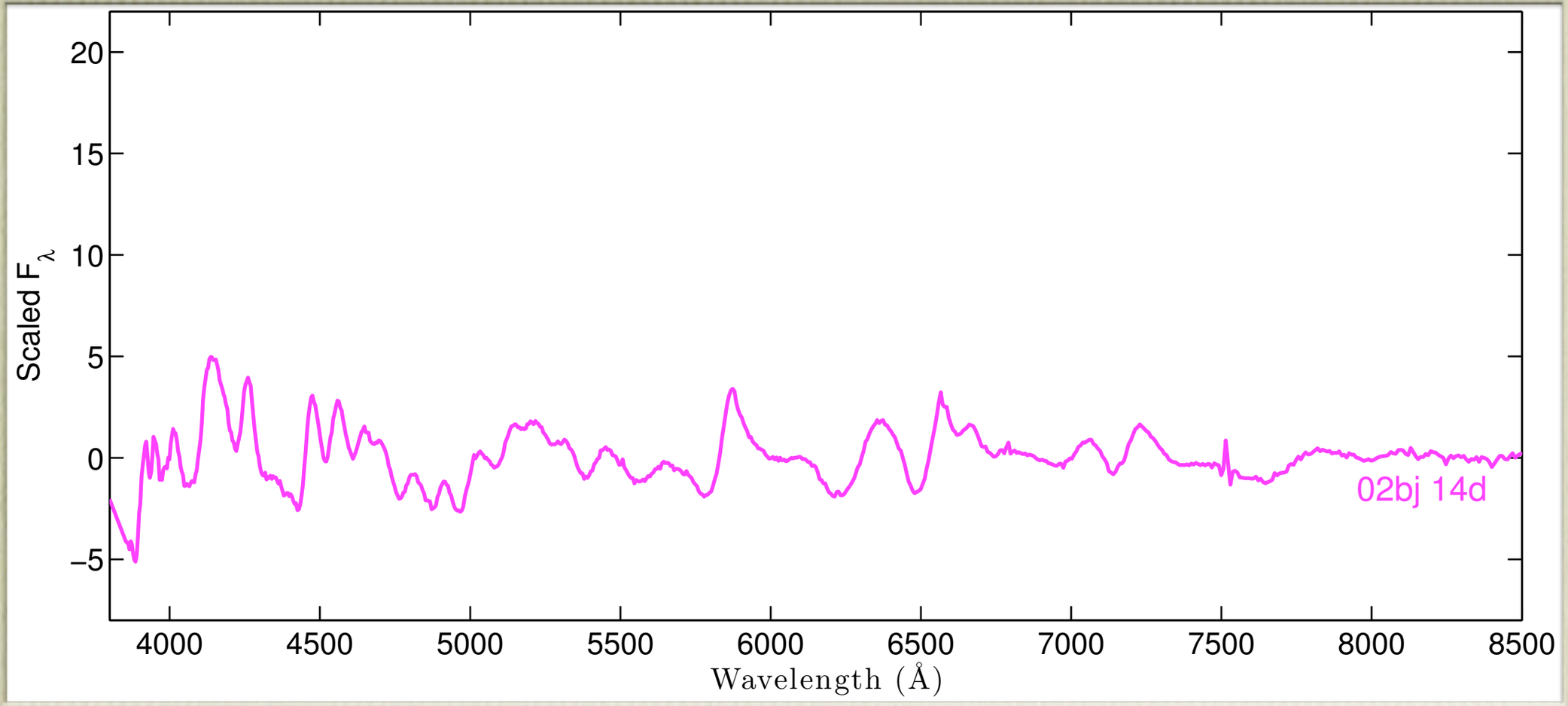
Spectral Analysis

- Cross matching with ~4000 spectra of ~1400 SNe gave **no good match.**

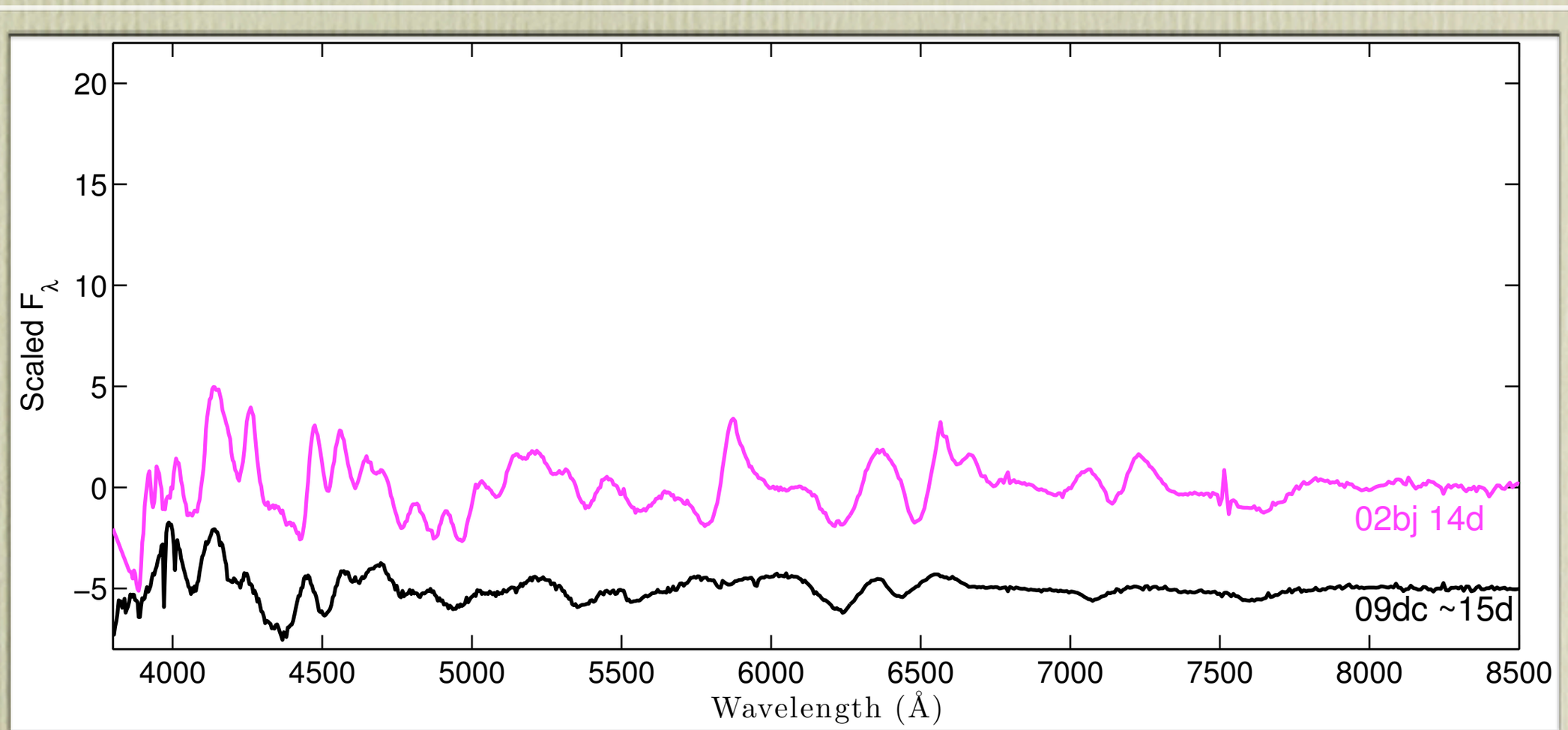
- Literature search - same.

- “Least bad” is a C-rich Ia (SN2009dc; but slower).

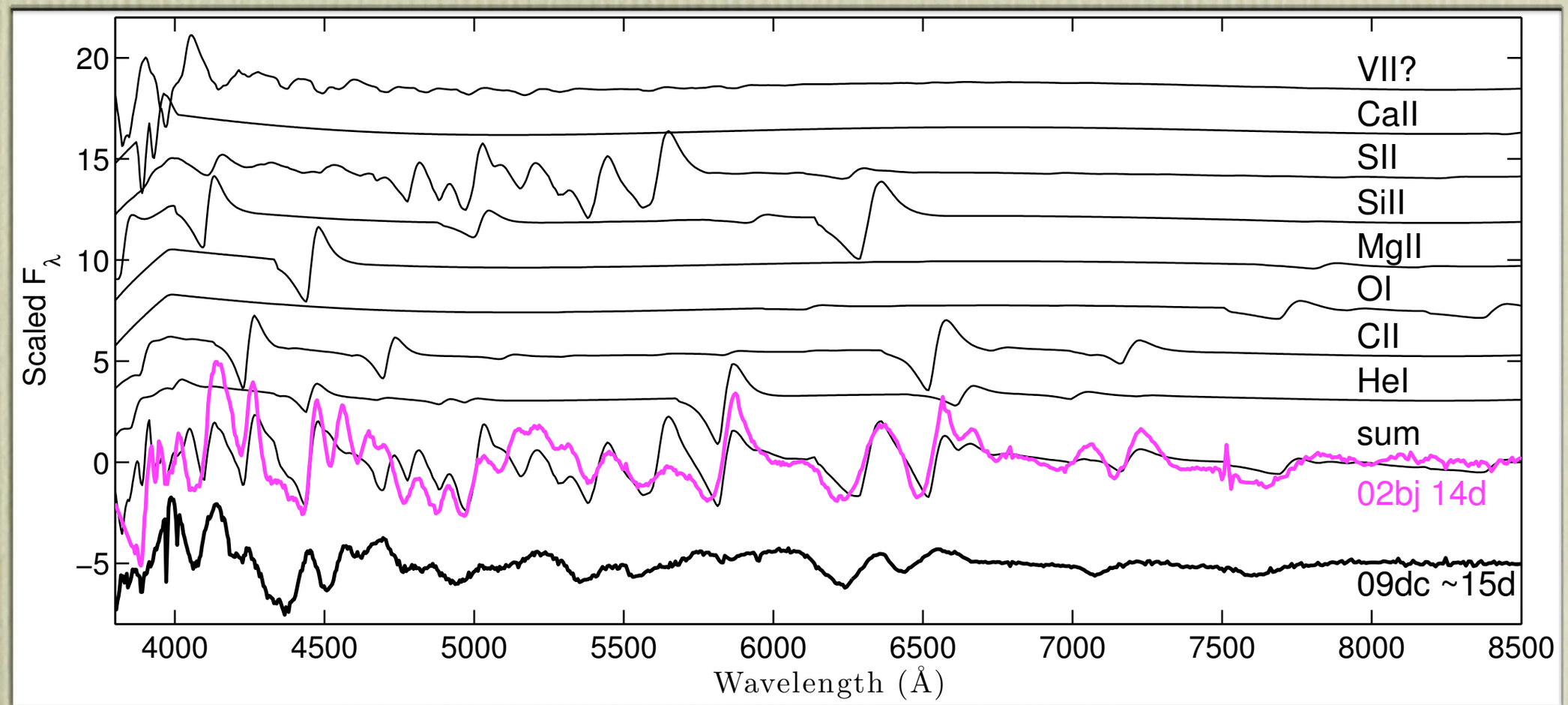
Spectral Analysis



Spectral Analysis



Spectral Analysis



SYNOW - Fisher et al. 1997

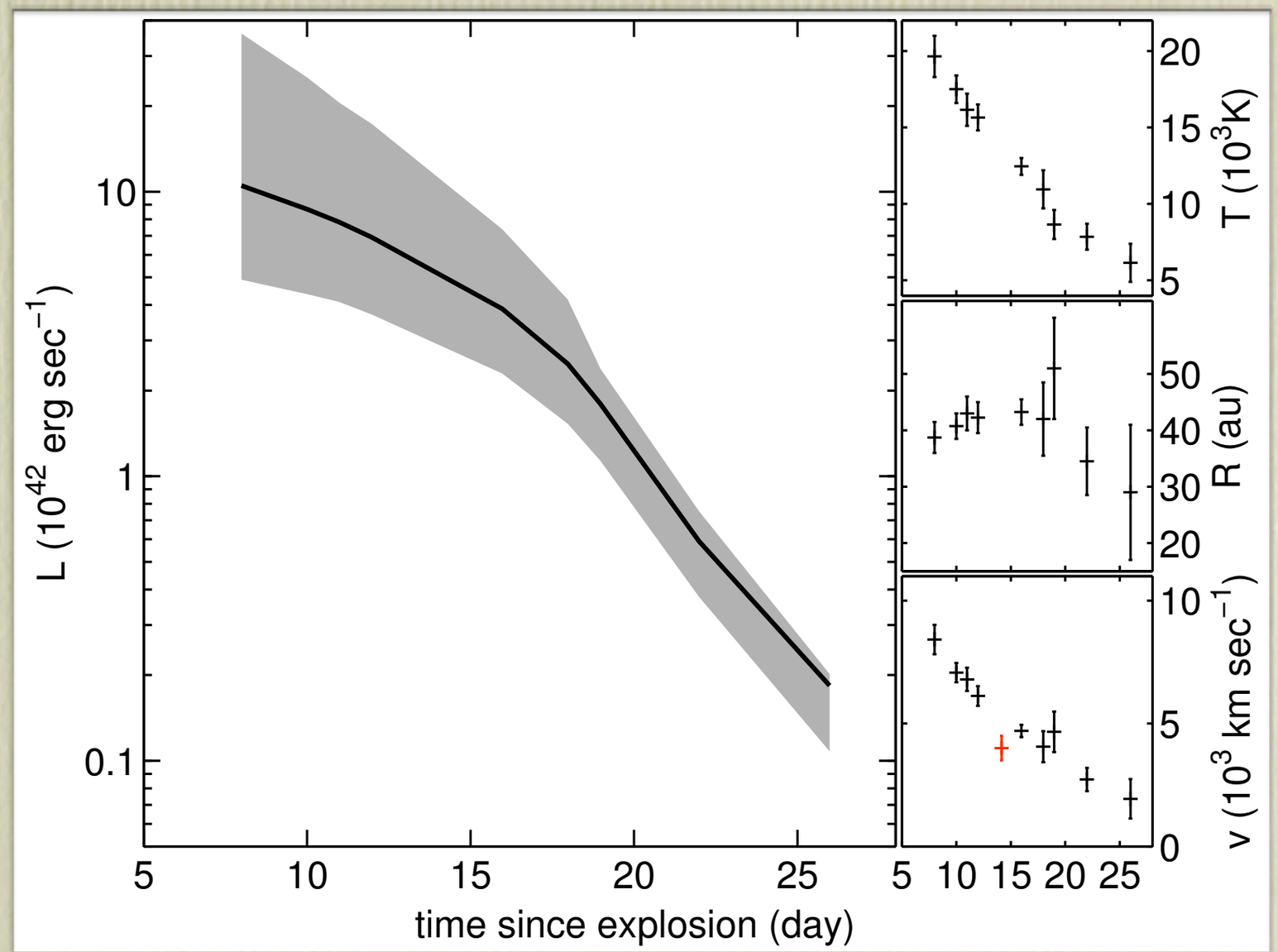
Bolometric Properties

- Rise → M_{ejecta} ~ 0.14 $M_\odot$

- Quick decline → small envelope.

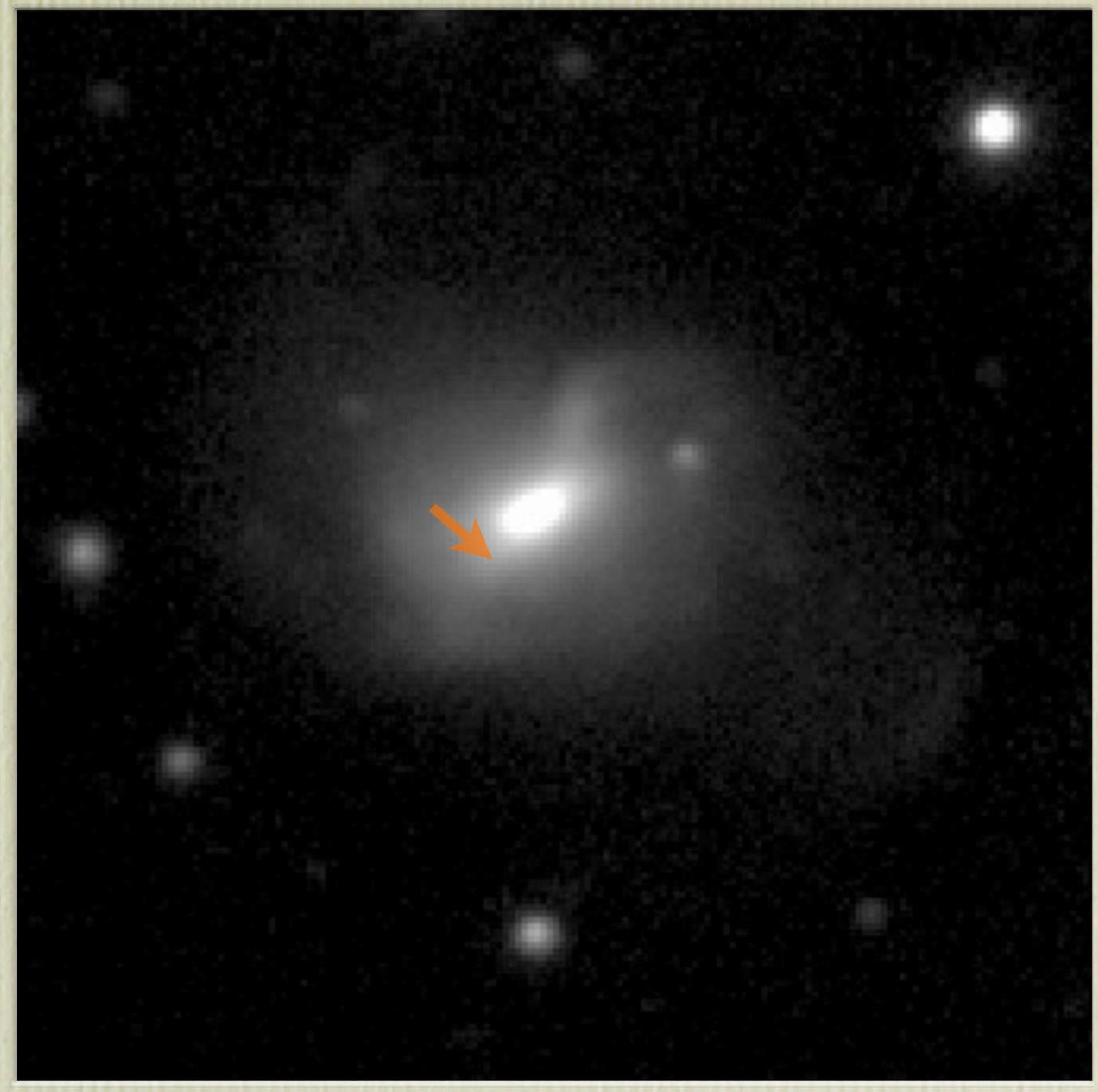
- However:

  Peak → 0.26 $M_\odot$ of ^{56}Ni



Host Properties

- NGC 1821
- Barred spiral.
- @ 50Mpc.
- ~1000pc projected.



Source - DeepSky (P. Nugent)

.Ia?

.Ia Hypothesis

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FAINT THERMONUCLEAR SUPERNOVAE FROM AM CANUM VENATICORUM BINARIES

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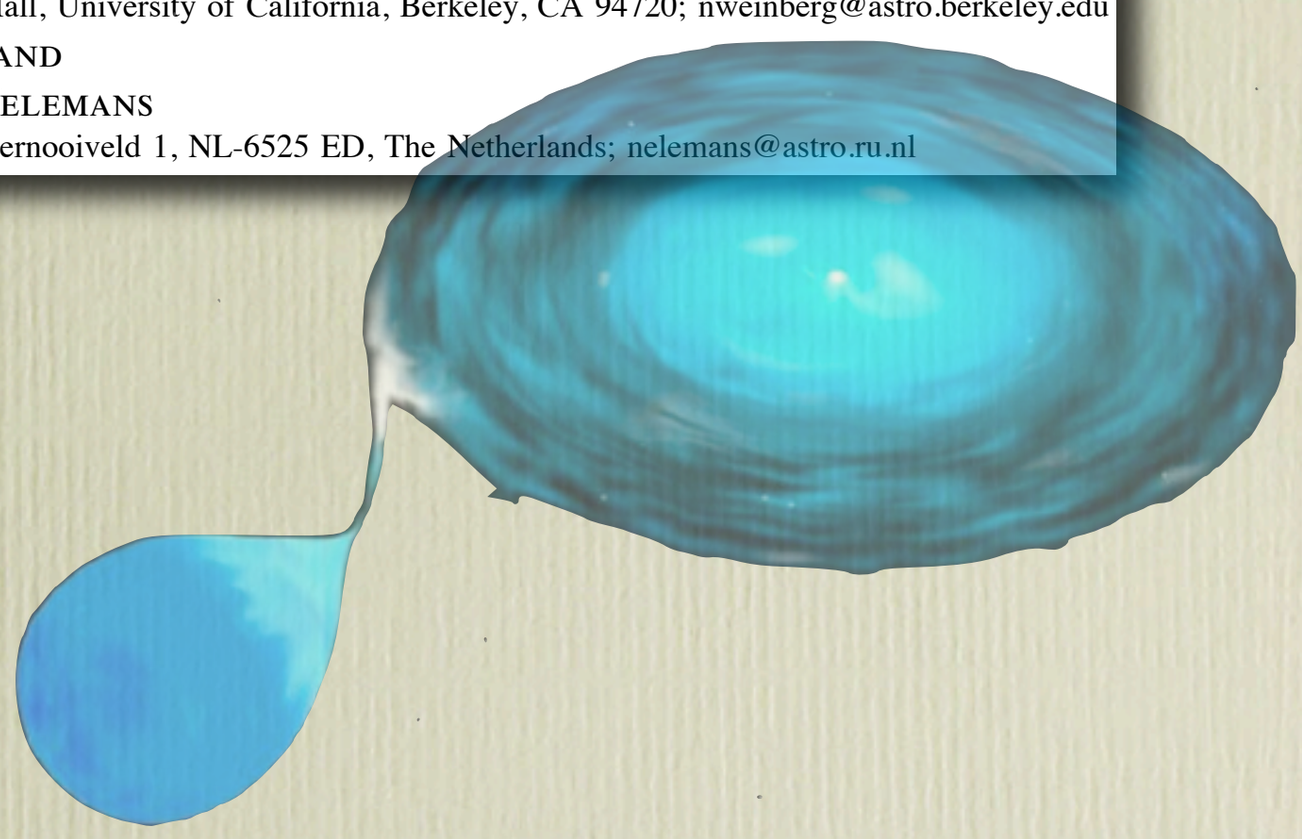


- 2 WD system.
- He accretion.
- Multiple He flashes.
- The last dynamical.

10% of Ia luminosity for 10% of the time

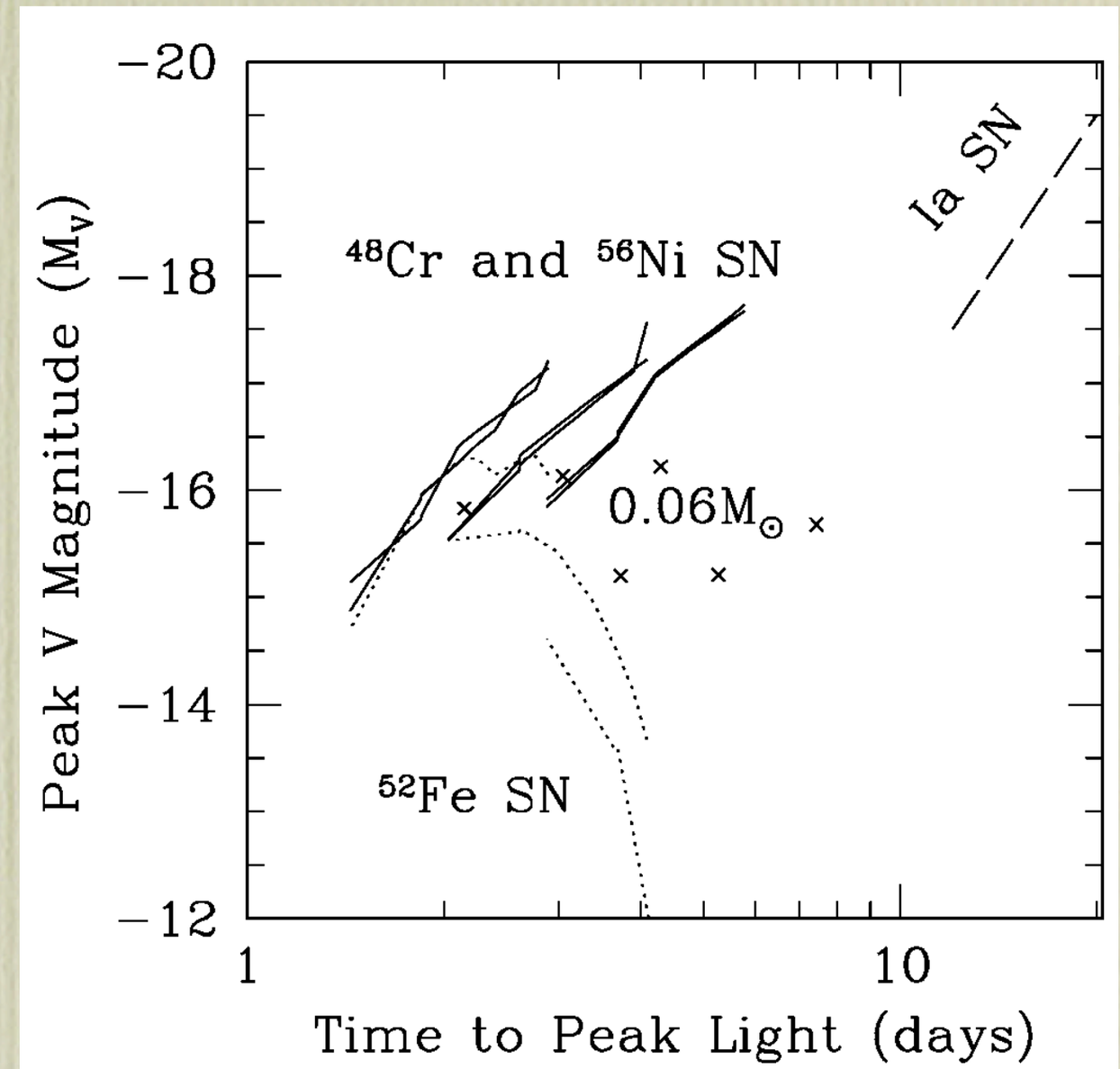
.Ia Hypothesis

Explicit:

- Fast rise.
- M_V ~ -15 to -18
- "Peculiar" Nucleosynthesis.
- Few % of Ia rate.

Implicit:

- Fast decline.
- Spectral properties?



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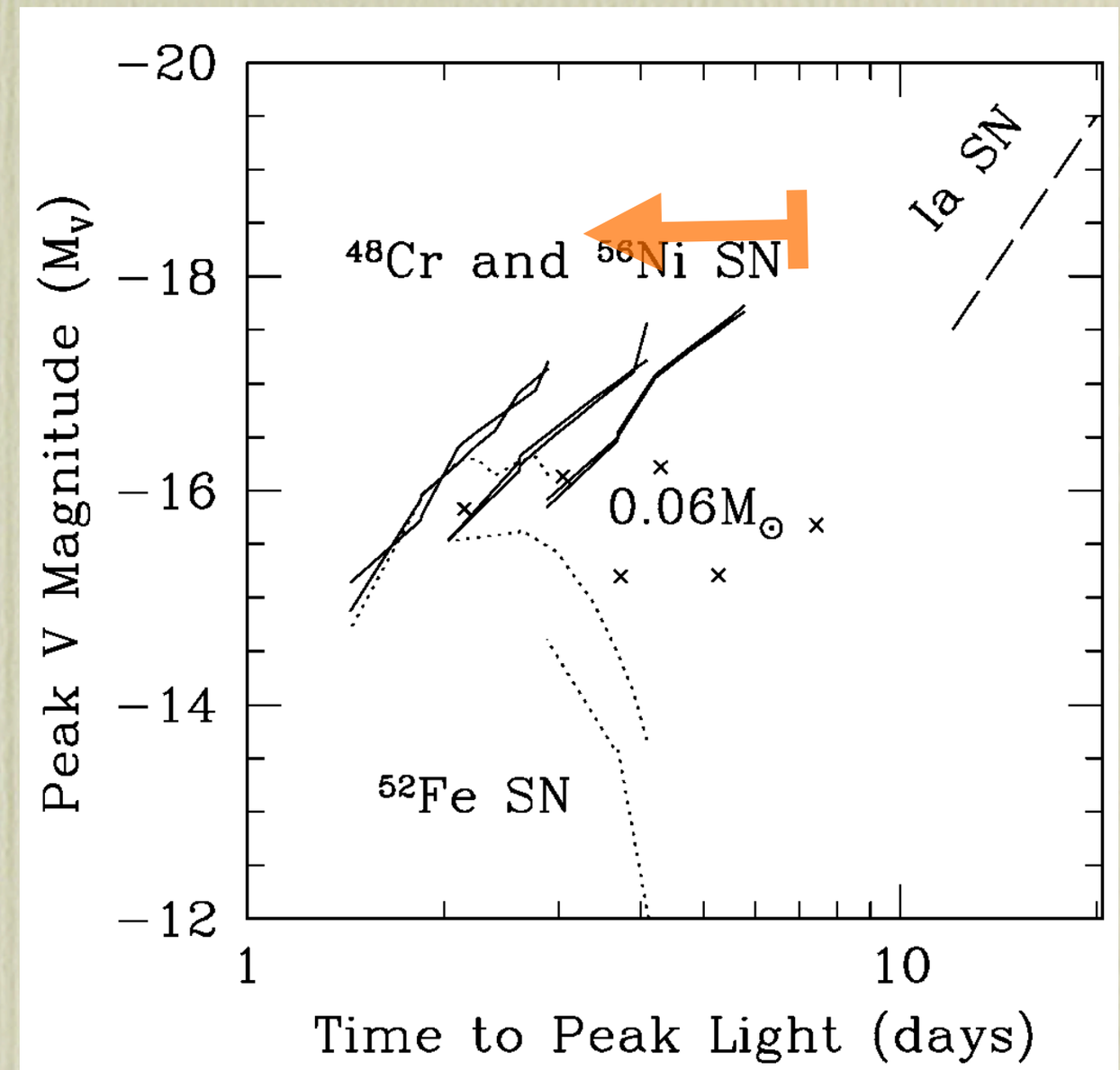

.Ia Hypothesis

Explicit:

- Fast rise. ✓
- M_V ~ -15 to -18 ✗
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Implicit:

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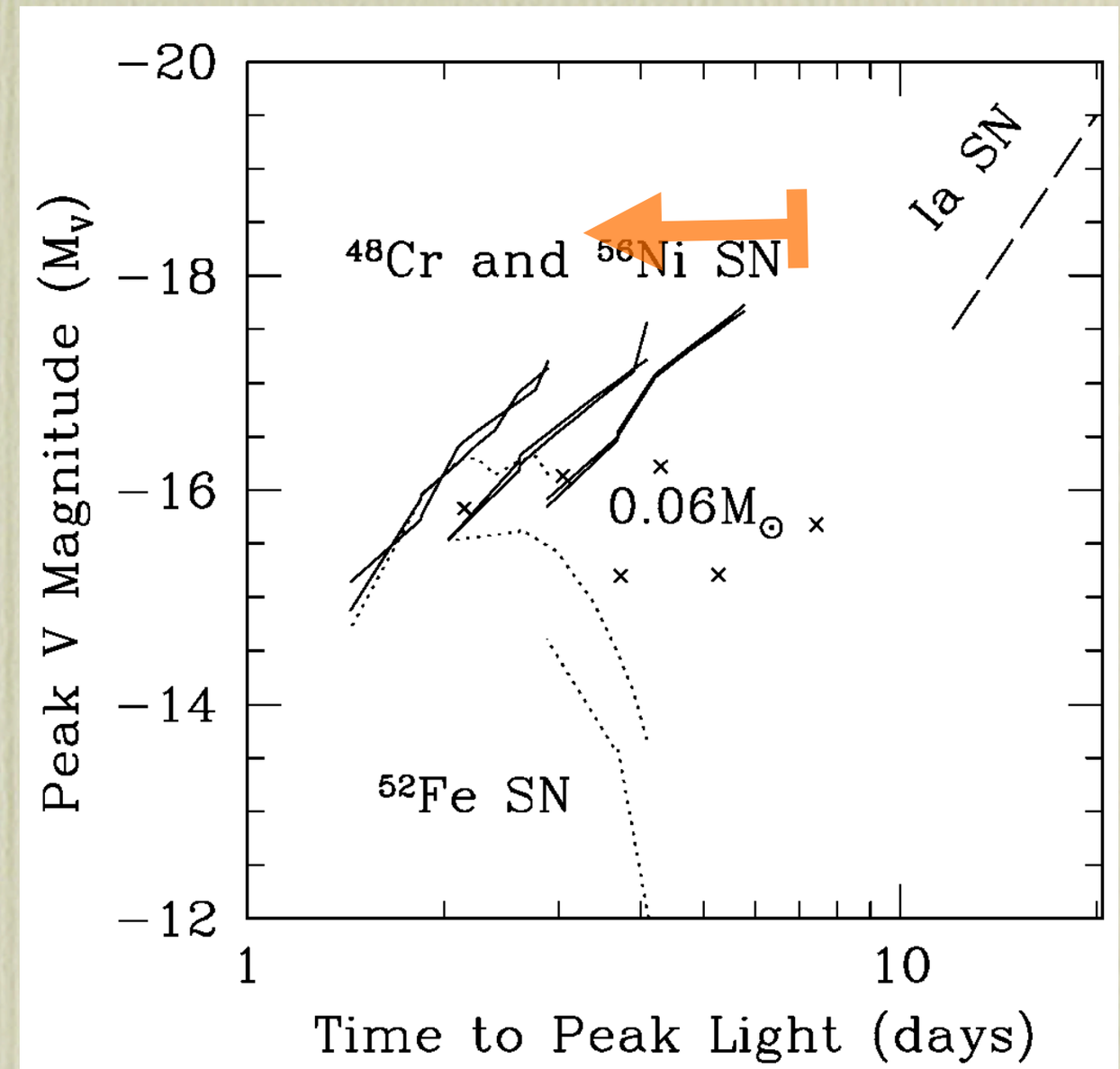

Bildsten et al. 2007

Conclusions

- SN2002bj was weird.
  - Fast lightcurve.
  - Very blue.
  - He + Intermediate mass elements.
- The best .Ia candidate yet.
- Need more explicit model predictions.
- PTF, Pan-STARRS, LSST - lots of good stuff.

Thanks!