

Rapidly declining type II_n supernovae

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Classification of supernovae (SNe)

Type I: no H lines

- Ia: Si II feature
- Ib: lines of He
- Ic: no lines of He

Tyyppi II: H lines

- IIP: light curve shows slow decline after maximum brightness
- IIL: light curve shows linear decline after maximum brightness
- IIn: narrow H lines (CSM interaction)
- IIb: H lines are detected only at the early times \Rightarrow Ib

Explosions mechanisms

Thermonuclear SNe (Ia)

- C/O white dwarf (WD) explosion at Chandrasekhar mass ($\sim 1.4 M_{\odot}$)
- No progenitor detections
- Single degenerate models
- Double degenerate models

Core-collapse (CC)SNe (Ib/c, II)

- Collapse of Fe core of a massive ($\sim 8 M_{\odot}$) star
- Limited progenitor detections (1999–2013: 18, Smartt 2015)
- Neutrino driven models
- Jet-driven models

Why type IIn SNe?

- Characterised by narrow hydrogen emission lines and blue continuum during the early evolution
- Features caused by interaction between the quickly moving SN ejecta and the CSM (Schlegel 1990)
- Different progenitor systems \Rightarrow heterogeneity in observables
- Less than 10 % of all CCSNe are of type IIn (Graur+ 2016)
- Together with so-called SN impostors¹ type IIn SNe are important tools for better understanding the late stages of the stellar evolution of the massive stars

¹E.g. Kankare+ 2015, Fraser+ 2015

Observations

- NOT, NTT (pessto.org), LT, LCOGT
- WHT, GTC, TNG, FTN, ...

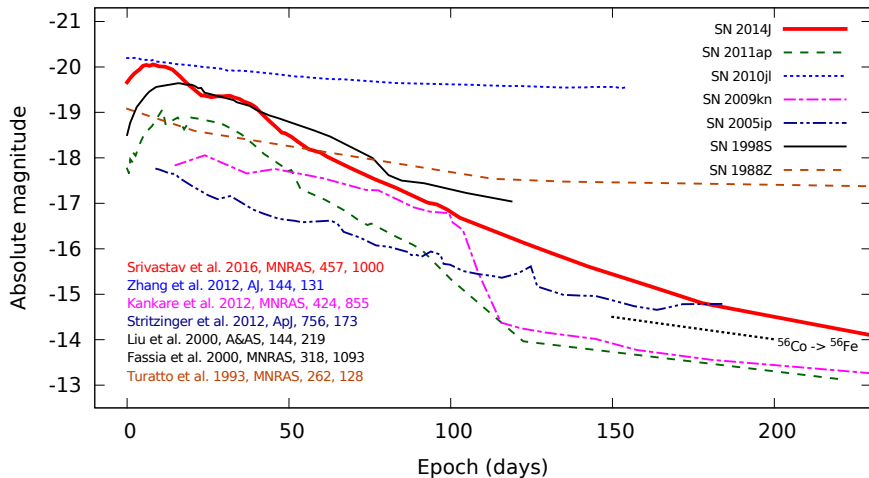
Methods

- Optical & near-IR PSF photometry with host template subtraction
- Optical long slit spectroscopy ($R \sim 10^2 - 10^3$)

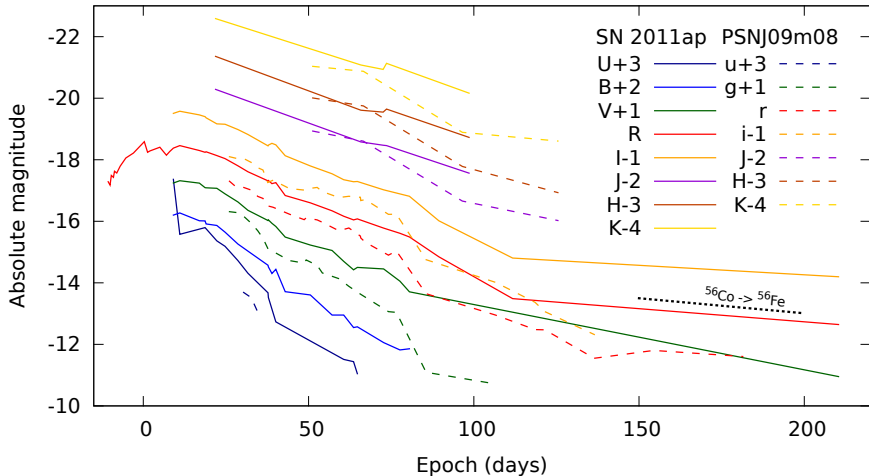
SNe

- SN 2011ap
 - ▶ Type IIIn at ~ 100 Mpc
 - ▶ Discovered: 21.2.2011
- PSN J09204691-0803340 (PSNJ09m08)
 - ▶ Type IIIn at ~ 85 Mpc
 - ▶ Discovered: 21.11.2014

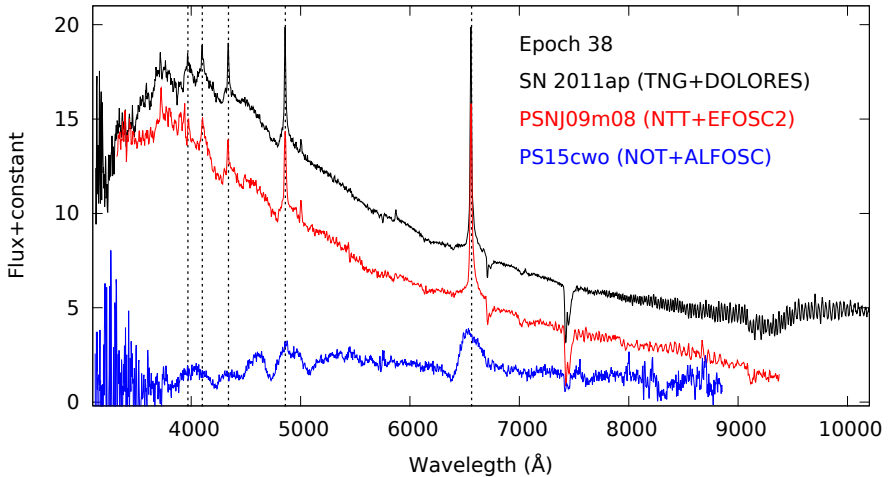
R-band light curve comparison



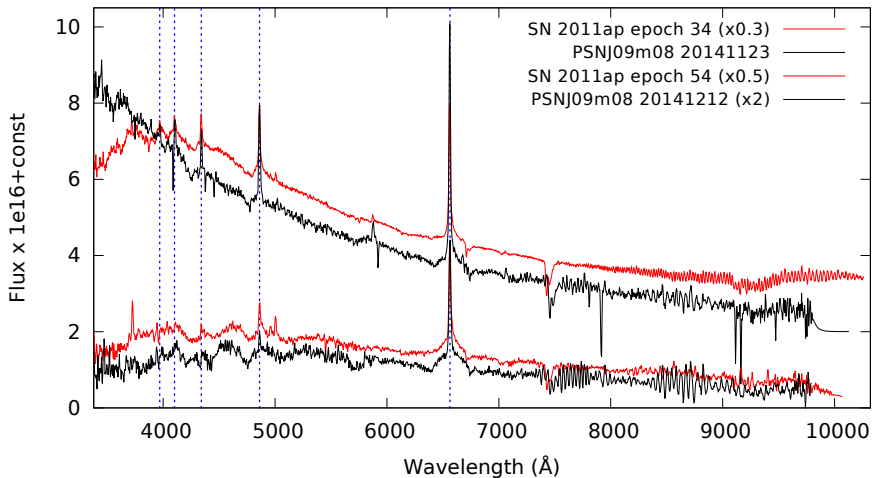
Light curve comparison



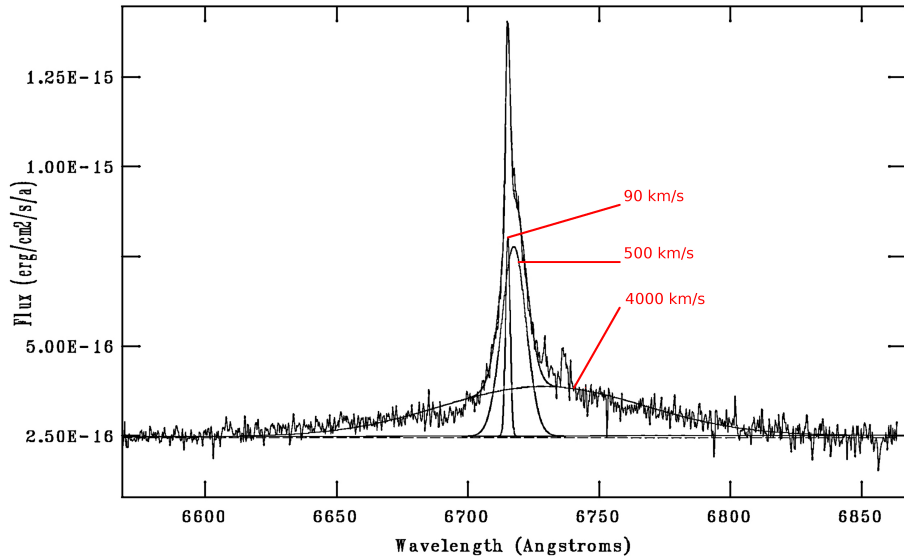
Spectral comparison (II/IIn)



Spectral comparison



High resolution $H\alpha$ profile (SN 2011ap, NOT+ALFOSC)



Conclusions

- Similar progenitor systems for SN 2011ap and PSNJ09m08
- Progenitor of SN 2011ap was probably a RSG

Thank you!

- D. Maoz+, ARA&A, 52, 107, 2014
- N. Langer, ARA&A , 50, 107, 2013
- S. Smartt, ARA&A, 47, 63, 2009