SN 2012aw
Type II-P Supernova

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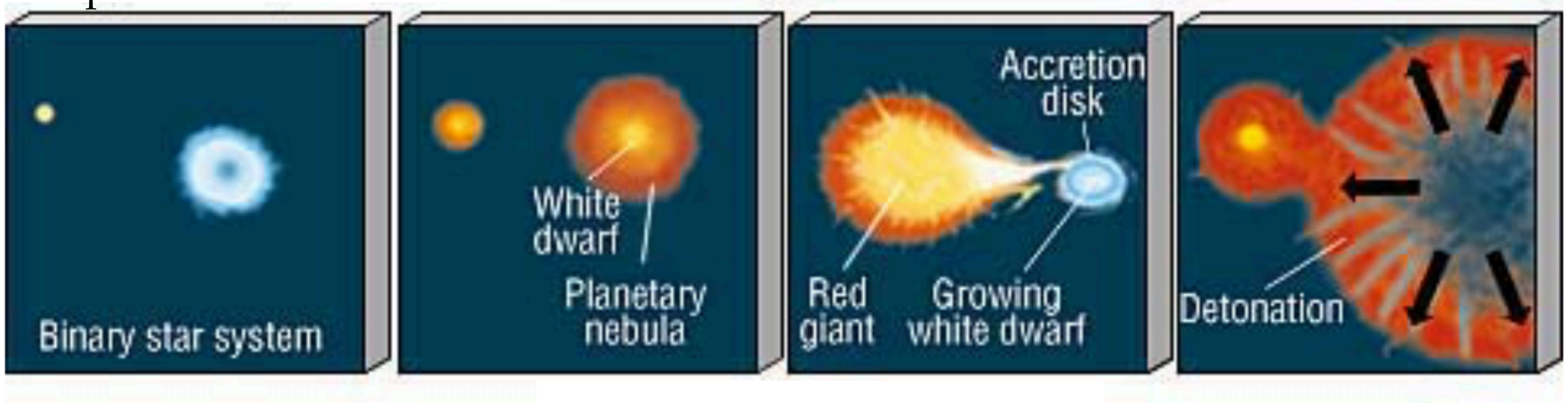
Outline

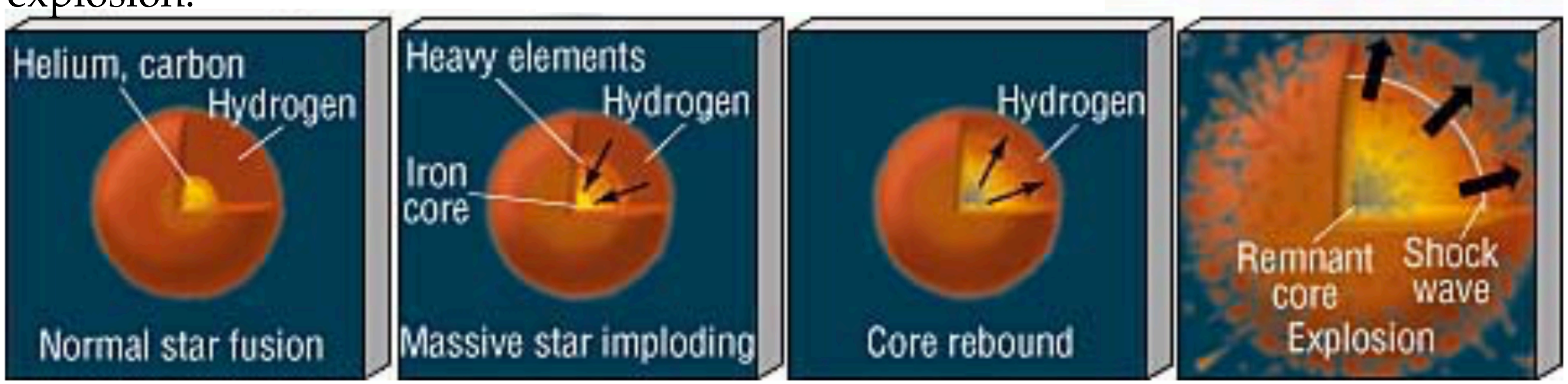
- General overview of Supernovae: classification, light curves, spectra, rates.
- SN 2012aw: type II-P Supernova
  - Photometric analysis;
  - Spectroscopic analysis.
- SNe IIP: maybe distance indicators?

General overview of Supernovae

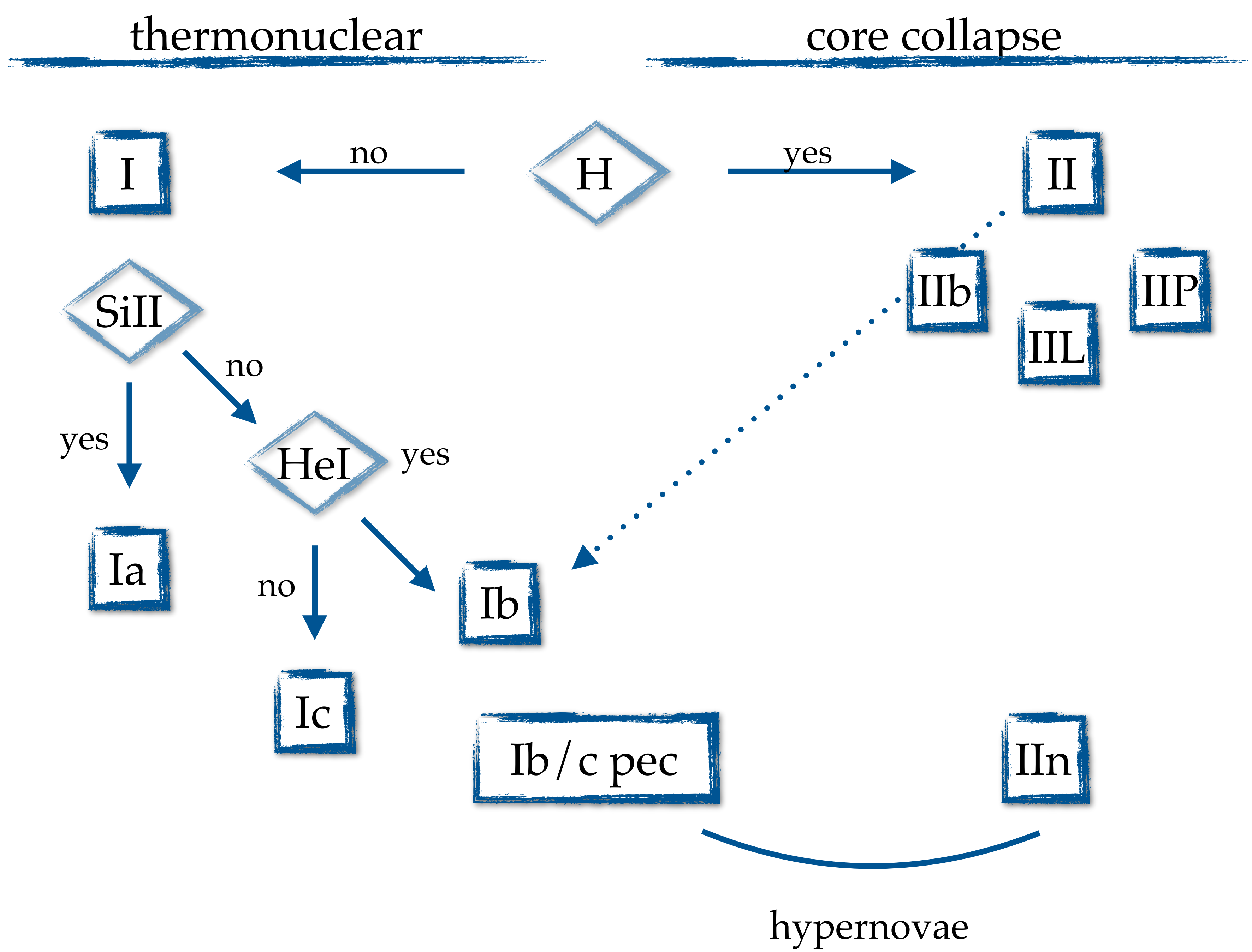
Type I SNe: a carbon-rich white dwarf pulls matter onto itself from a nearby red-giant companion.



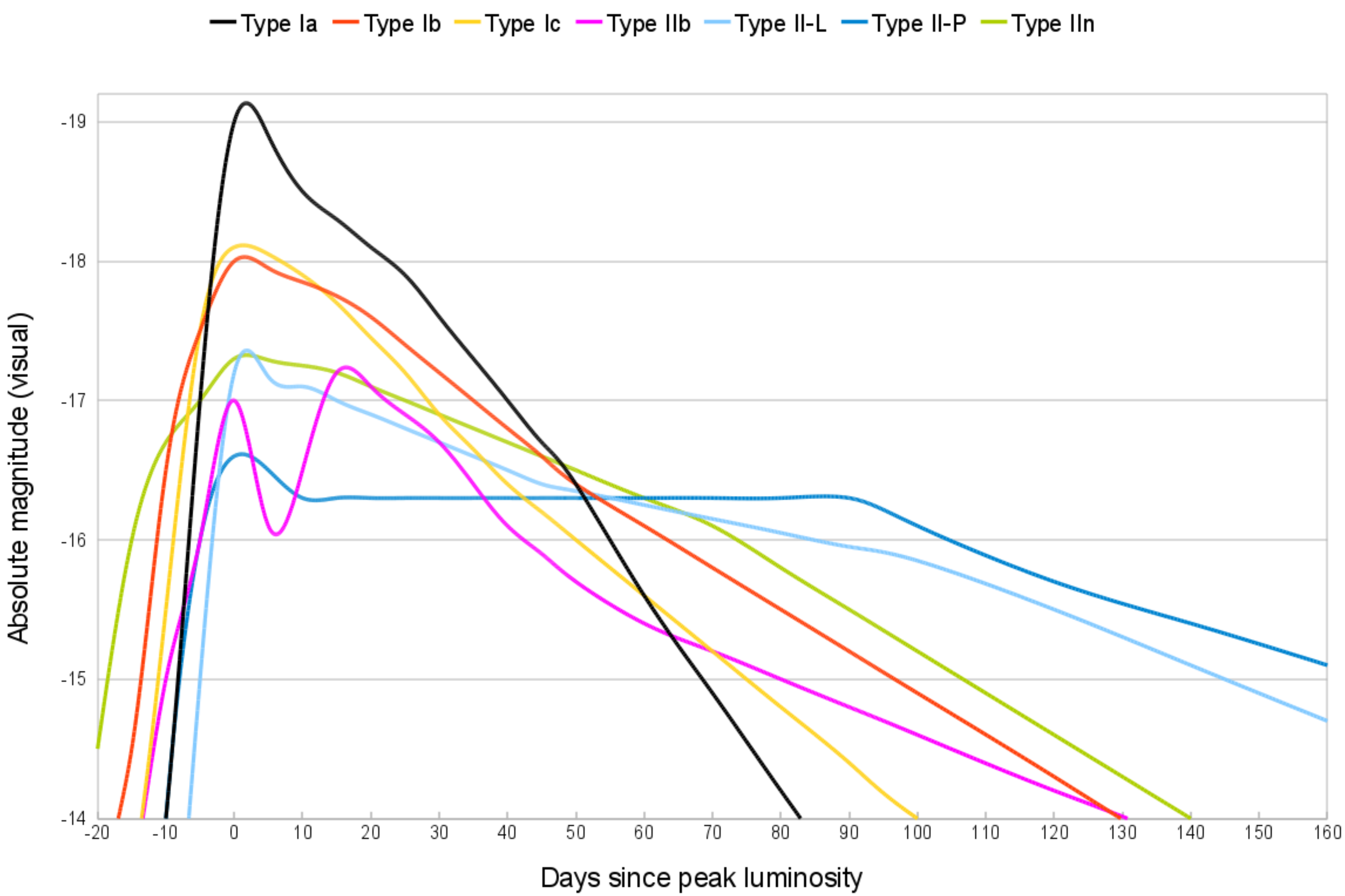
Type II SNe: the core of a more massive star collapses, then rebounds in a catastrophic explosion.



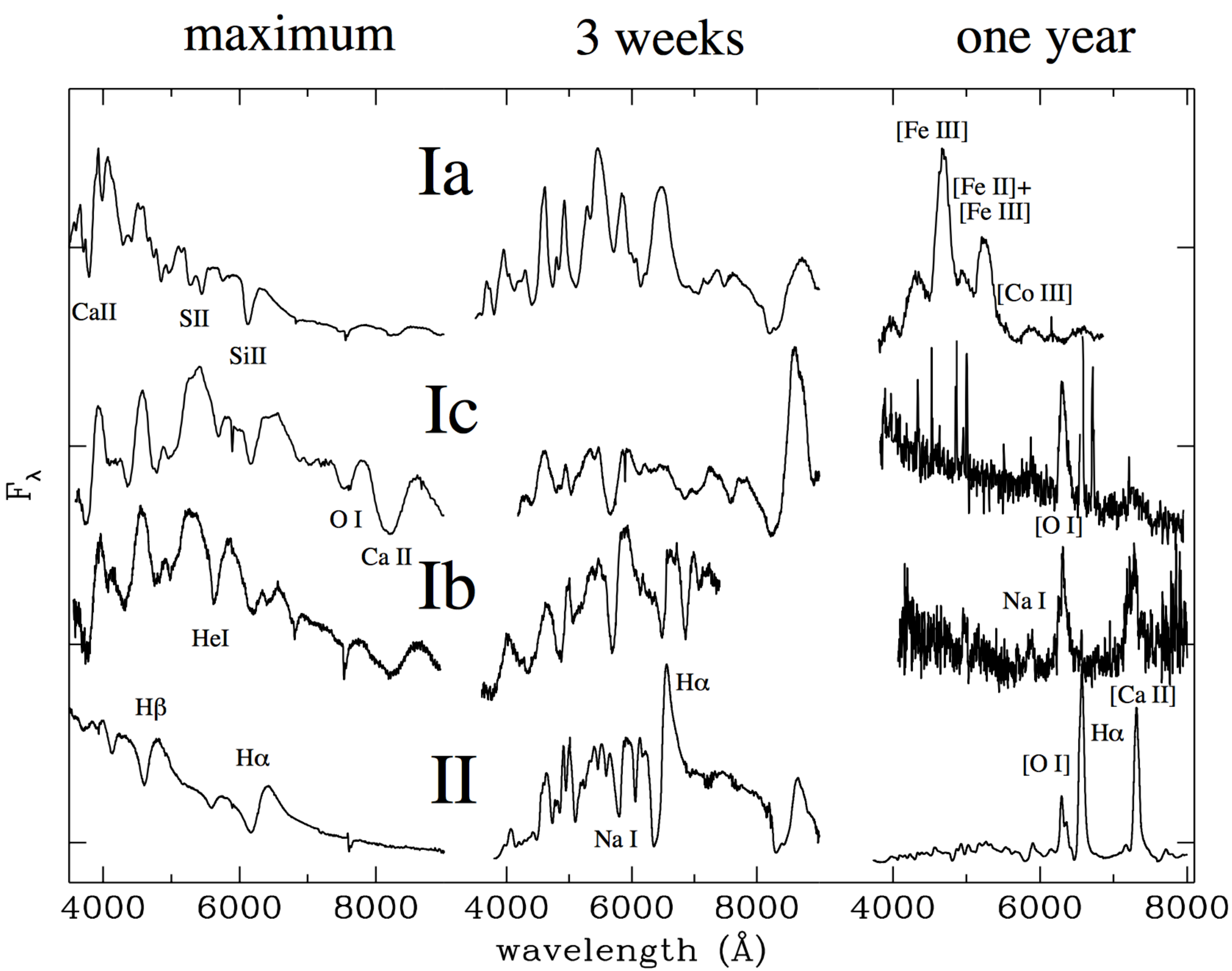
Classification



Light Curves

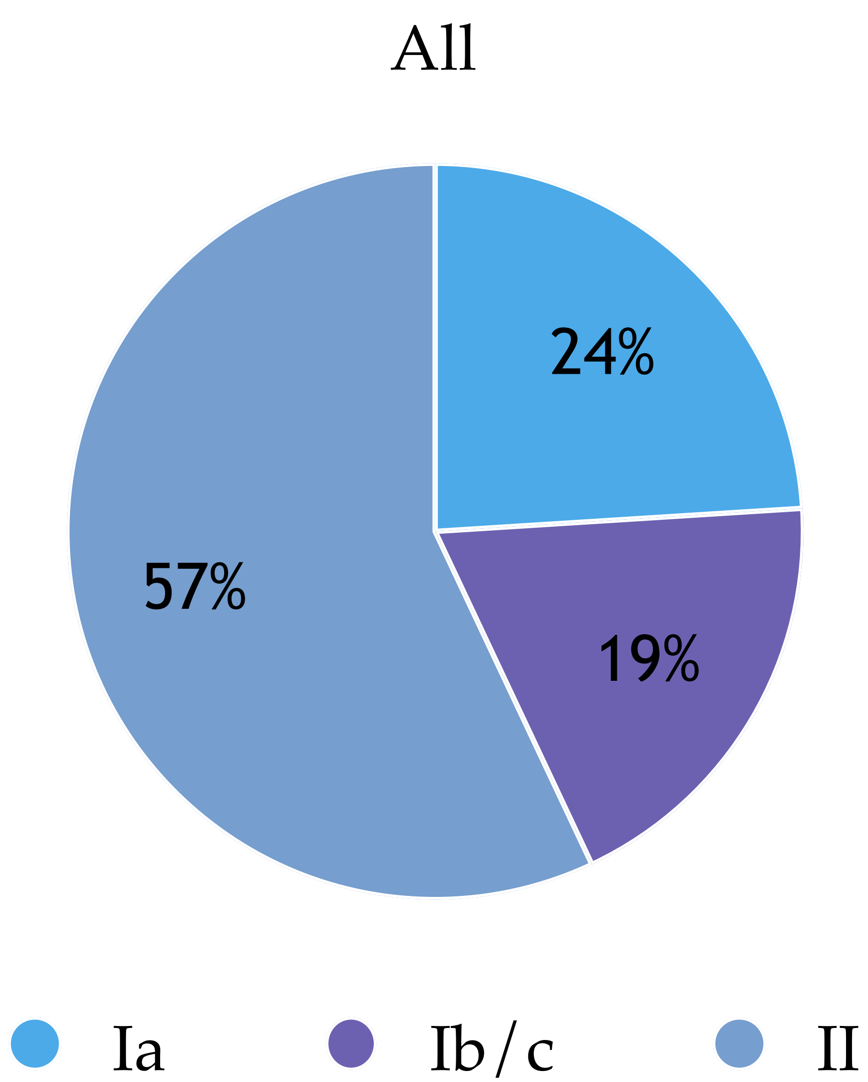


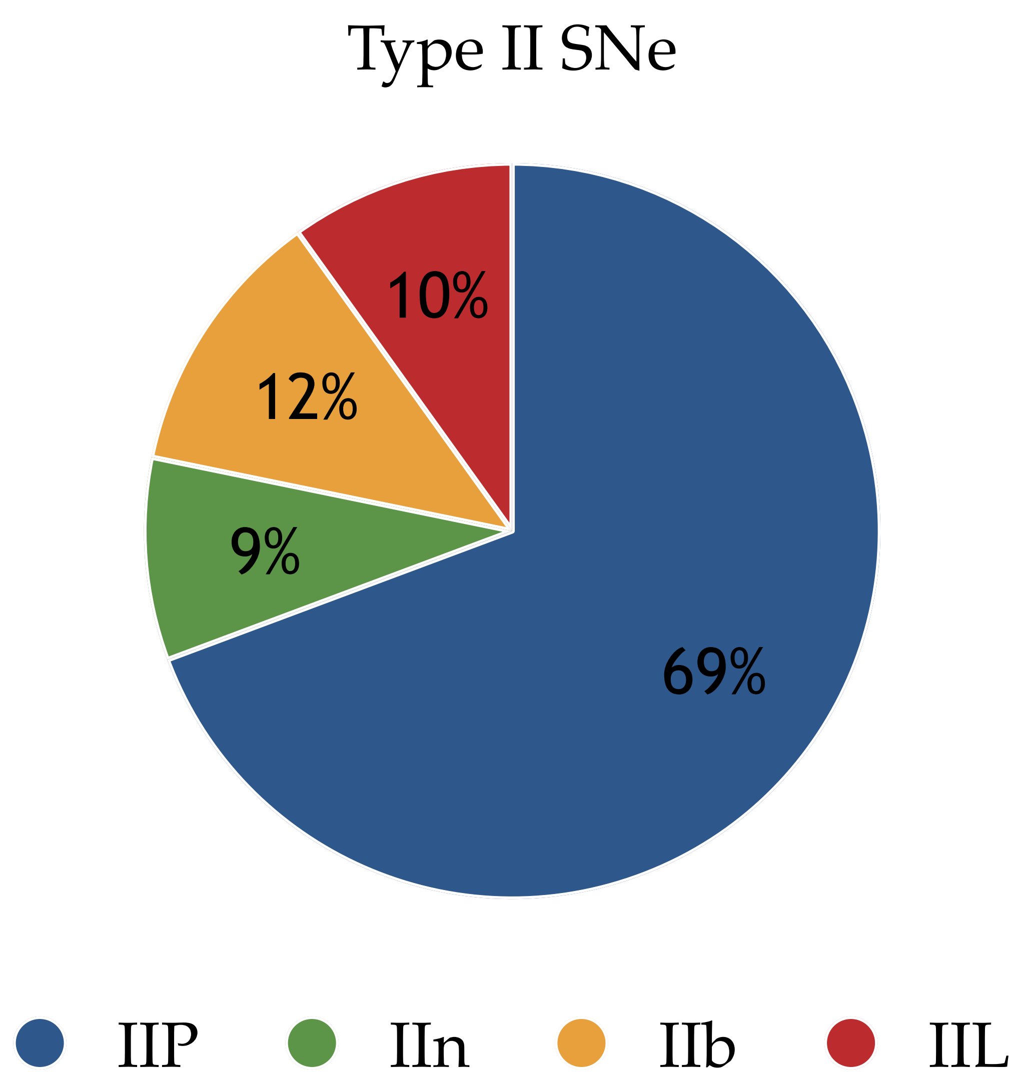
Spectra



Turatto M., 2003, arXiv:astro-ph/0301107v1.

Rates





Li W. et al., 2010, arXiv: 1006.4612v2.

SN 2012aw

Progenitor	PTF12bvh
Spectral Type	M 3
Luminosity Class	Red Supergiant
Radius	R ~ 3 x 10^{13} cm
Mass	20 M_{sun}
Host Galaxy	M 95 (NGC 3351)

RA (J2000)	α =10h 43m 53s. 73
DEC (J2000)	δ=+11° 40′ 17″. 9
Galactocentric location	58″ W, 115″ S
Deprojected radius	r_{SN} = 139″.1 (~6.75 kpc)
Time of explosion	16.1 March 2012 (UT) JD 2456002.59

Data, instruments and software

TACOR - Sapienza, University of Rome:

Celestron Telescope (C9.25), 23.5 cm, f/10, Schmidt-Cassegrain.

Bologna, Astronomical Observatory (Loiano):
Cassini Telescope, 152.4 cm, f/8.

INAF Osservatorio Astronomico di Bologna
Istituto Nazionale di Astrofisica

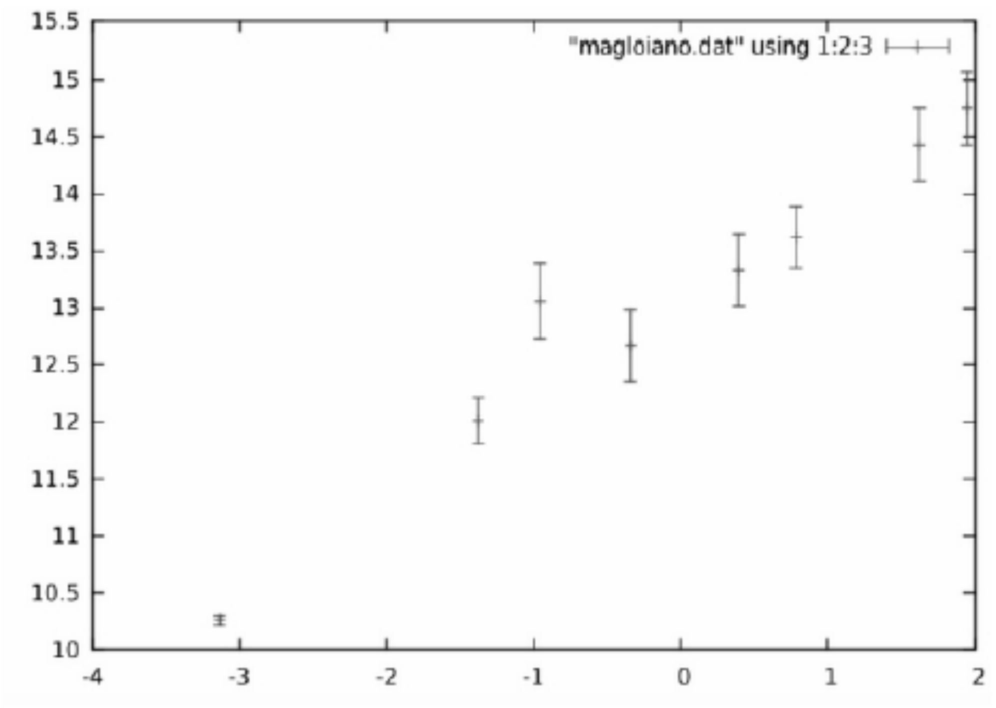
Galileo National Telescope:
Primary mirror 358 cm, f/11;
DOLORES (Device Optimized for the LOw RESolution), low resolution spectrograph.

Data reduction and analysis processed by IRAF[1]
(Image Reduction and Analysis Facility)

[1]ACRONYM OF IMAGE REDUCTION AND ANALYSIS FACILITY, IRAF IS DISTRIBUTED BY THE NATIONAL OPTICAL ASTRONOMY OBSERVATORIES, WHICH ARE OPERATED BY THE ASSOCIATION OF UNIVERSITIES FOR RESEARCH IN ASTRONOMY, INC., UNDER COOPERATIVE AGREEMENT WITH THE NATIONAL SCIENCE FOUNDATION.

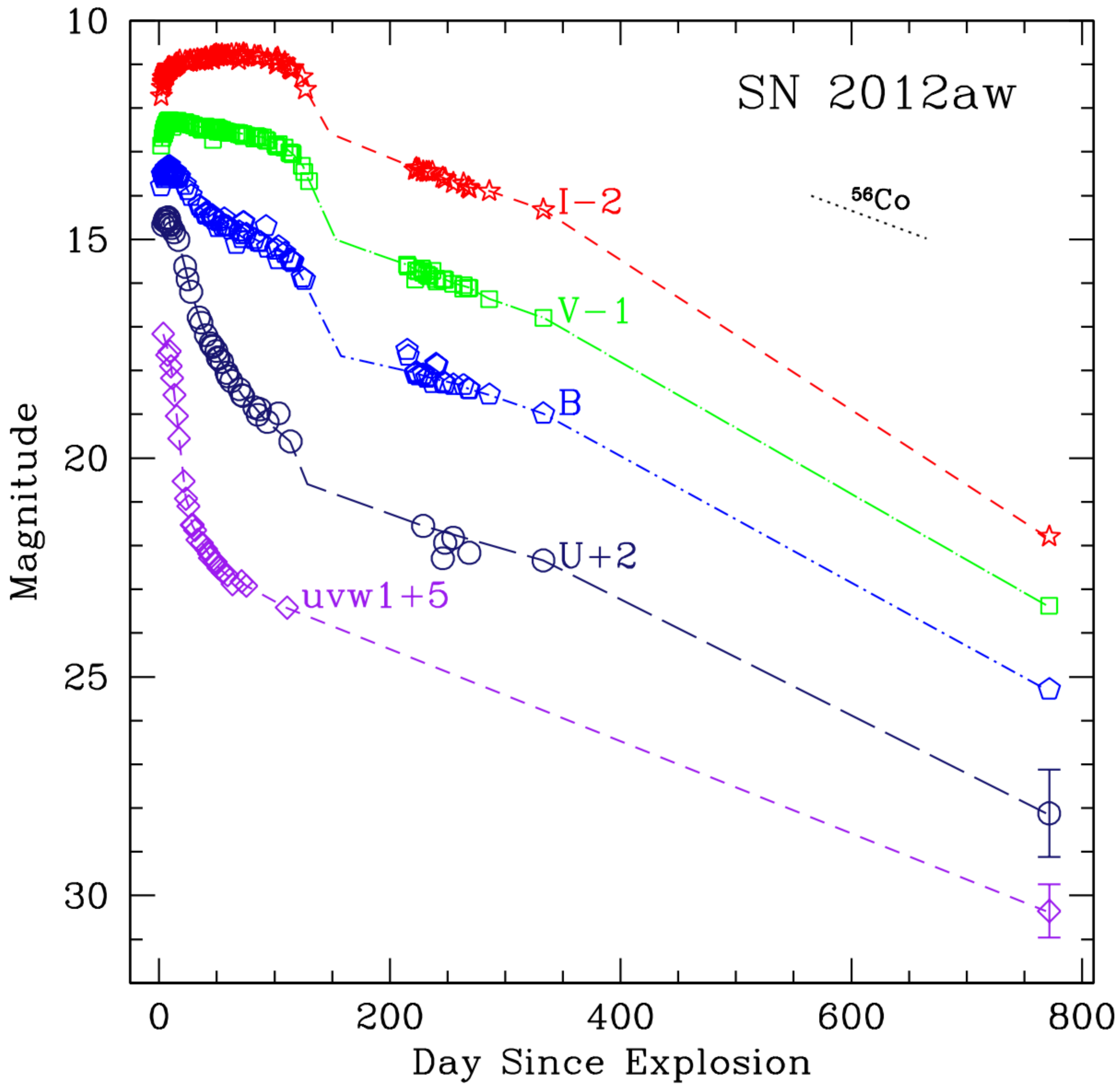
Example of photometric analysis

Loiano (BO) - March 27, 2012.



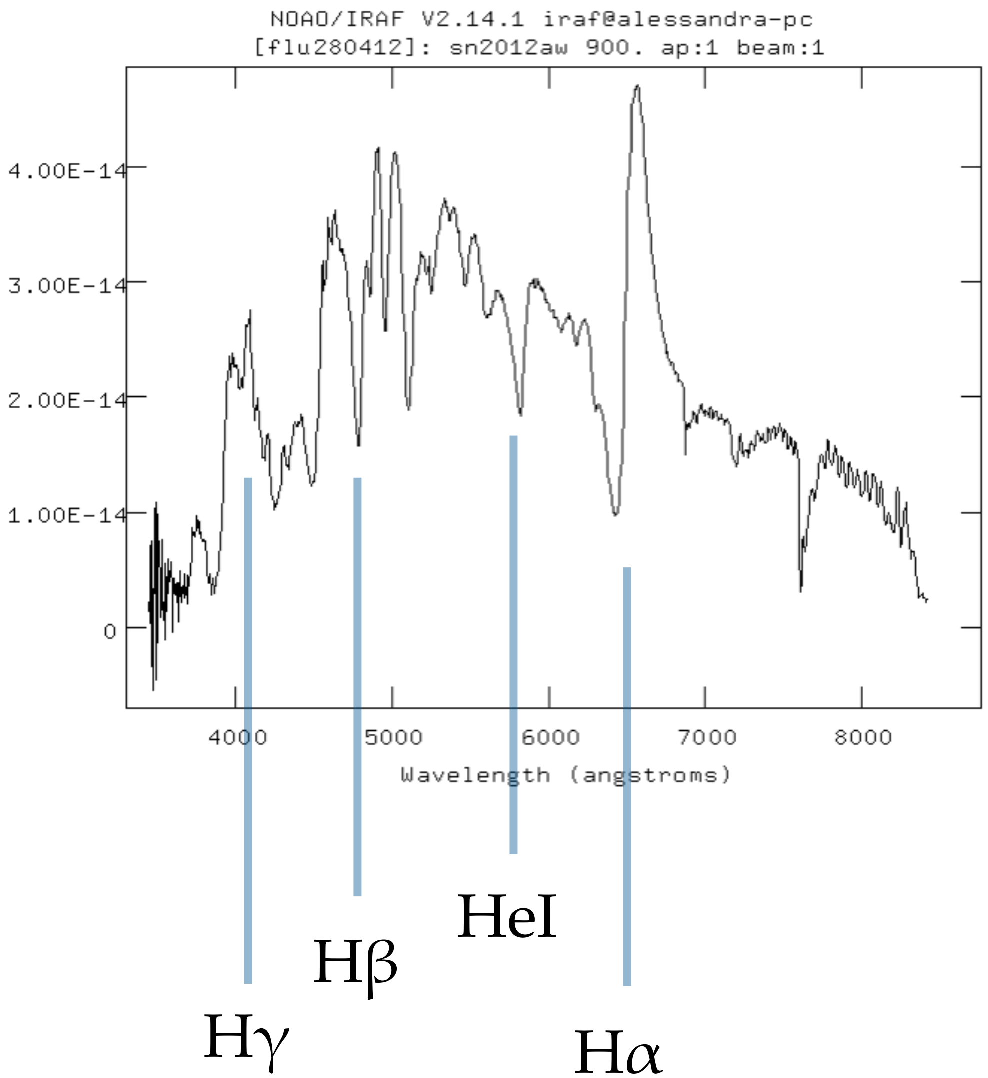
Filter	V
Apparent magnitude (mag)	13.90 ± 0.10

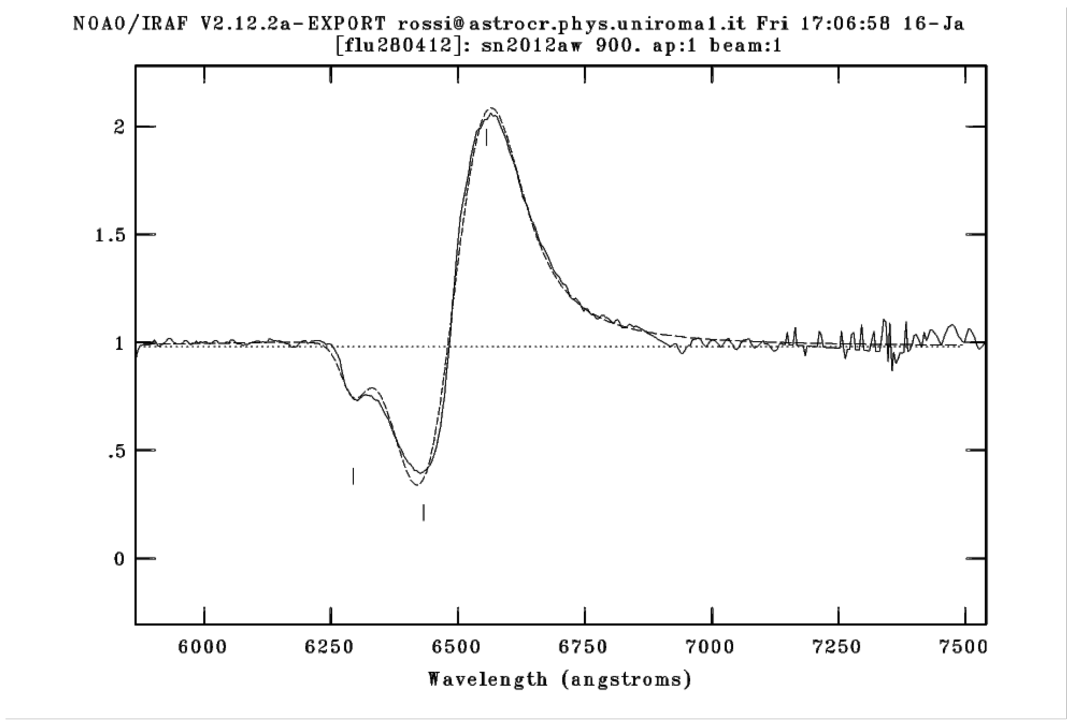
Observed light curves



Van Dick et al., 2015, arXiv: 1504.08323v1.

Example of spectroscopic analysis

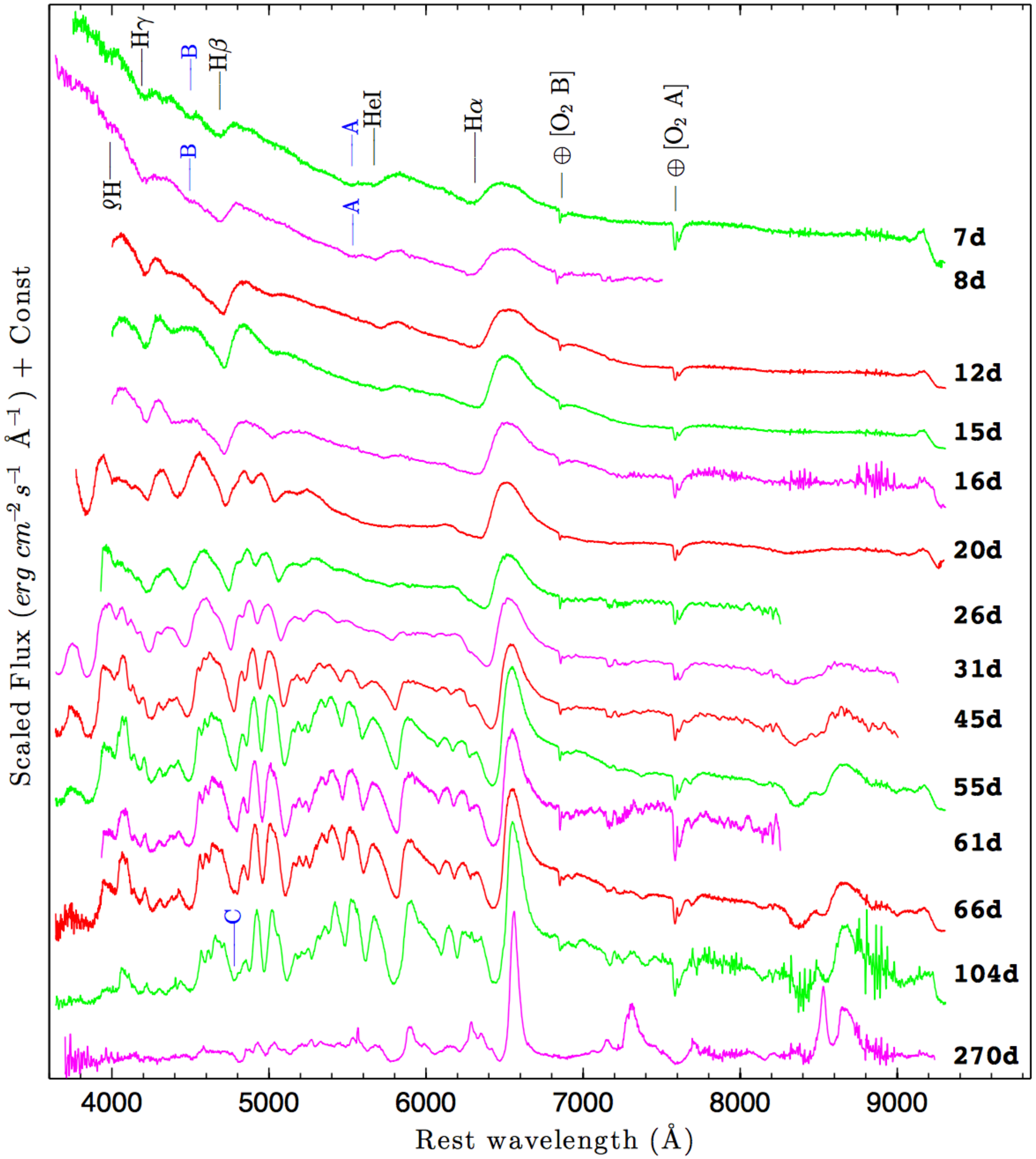




Date	$\mathbf{v_{max}}$ **(km · s^{-1})**
April 28, 2012	5728.19

Loiano (BO) - April 28, 2012.

Doppler corrected spectra

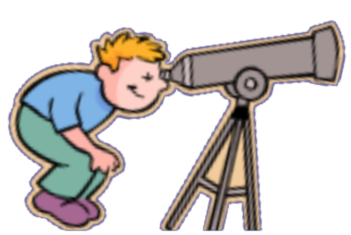


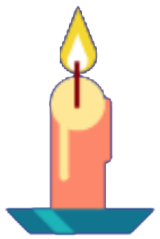
Bose et al., 2013, arXiv: 1305.3152v1.

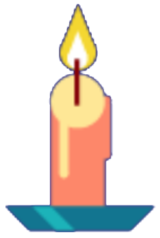
SNe IIP: maybe distance indicators?

- SNe II-P are less luminous than SNe Ia but significantly more common.
- SNe II-P luminosities cover more than an order of magnitude, but various methods can be used to standardize them.

- Correction for dust extinction remains a difficult issue for determining the distances to SNe II-P.

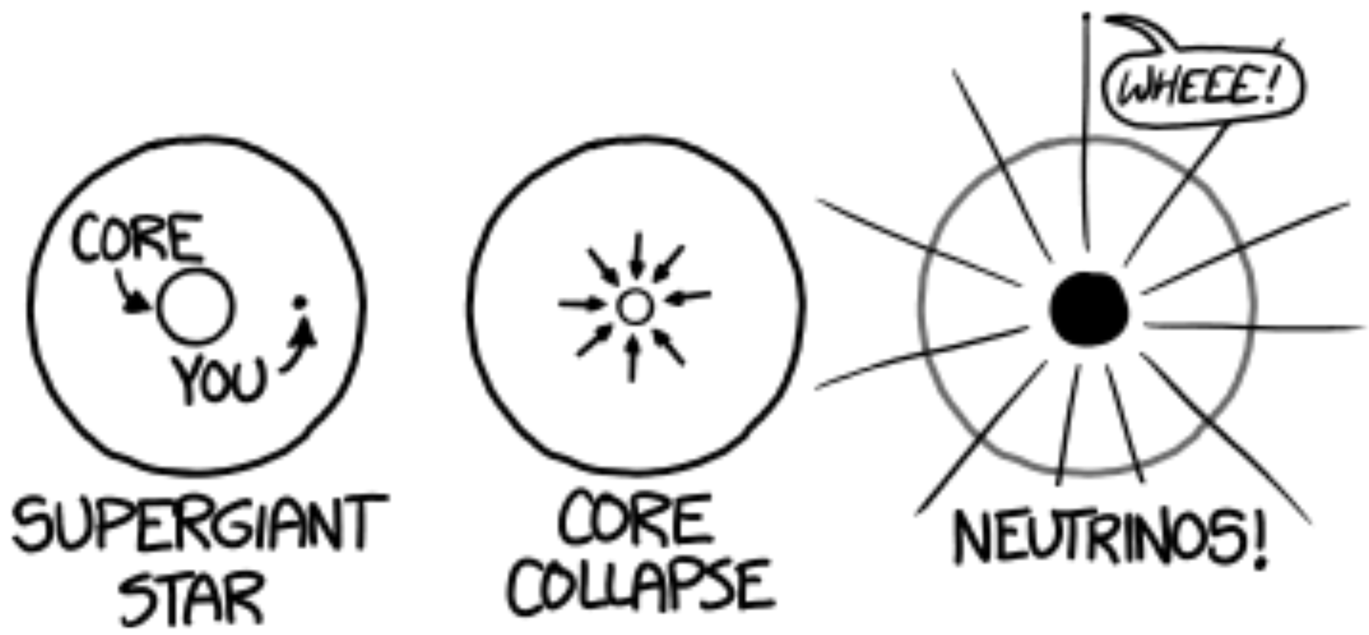






Summary

- Core-collapse SNe are the explosive deaths of massive stars that occur when their iron cores collapse to neutron stars or black holes;
- SN 2012aw shows the typical features of a Type IIP Supernova;
- Type Ia SNe produce consistent peak luminosity. The stability of this value allows these explosions to be used as standard candles in order to measure cosmological distances.



Thank you for your attention.