Catalog of theoretical models for fast and early identification of supernovae

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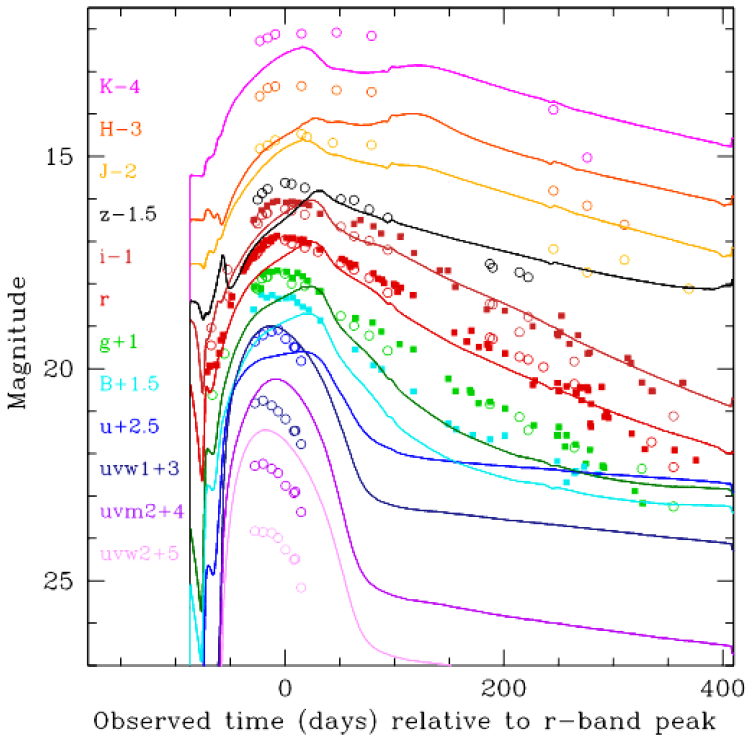
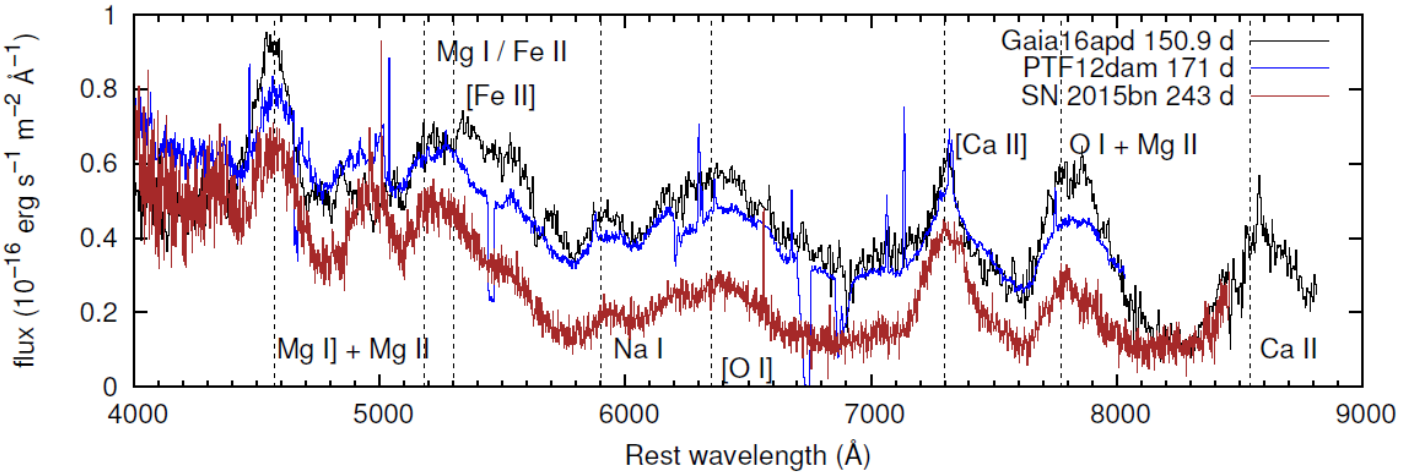
- Large supernova (SN) surveys require fast identification of the observed objects to make a prediction for follow-up observations.

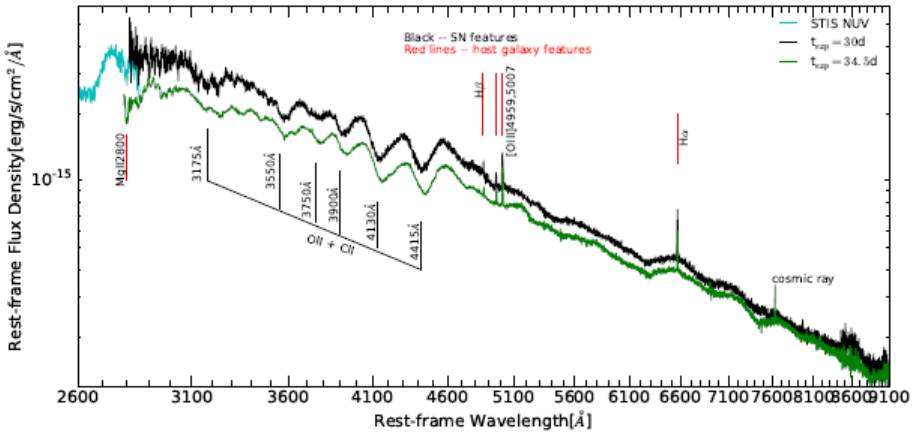
- Our catalog of theoretical models provides an easy-to-use instrument for fast and early identification of supernovae at any epoch from shock breakout to ^{56}Co decay.

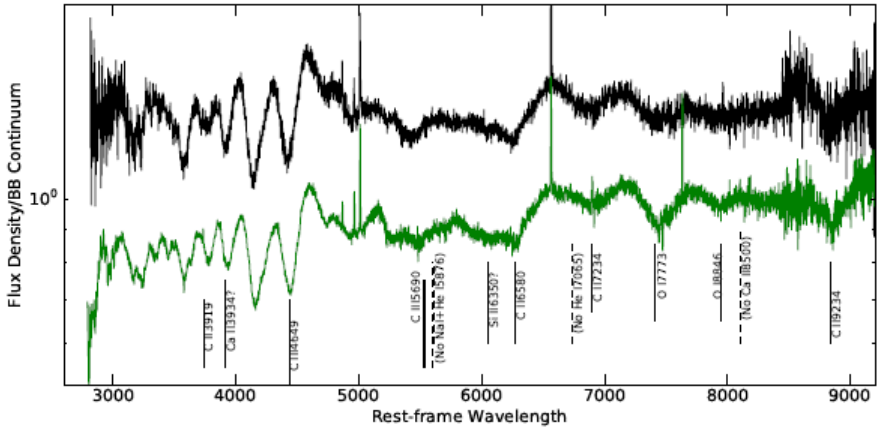
- It is planned to upgrade the catalog by about 1000 supernova models of different types: Ia, Ib/c, II-P, II-L, IIb, IIn, superluminous SNe, zero- and low-metallicity SNe. Online publishing is underway.



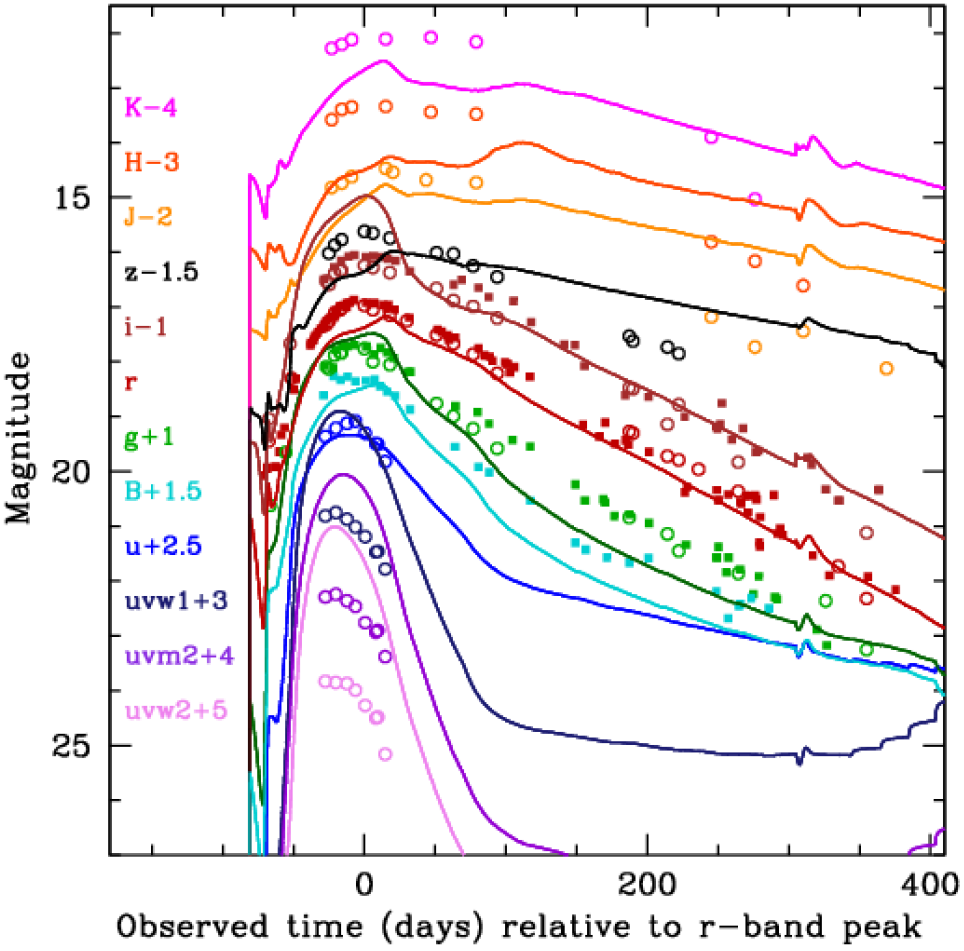
- Search result of the best model for superluminous supernova (SLSN) PTF12dam (from UV to NIR) among ~ 150 SLNS models.

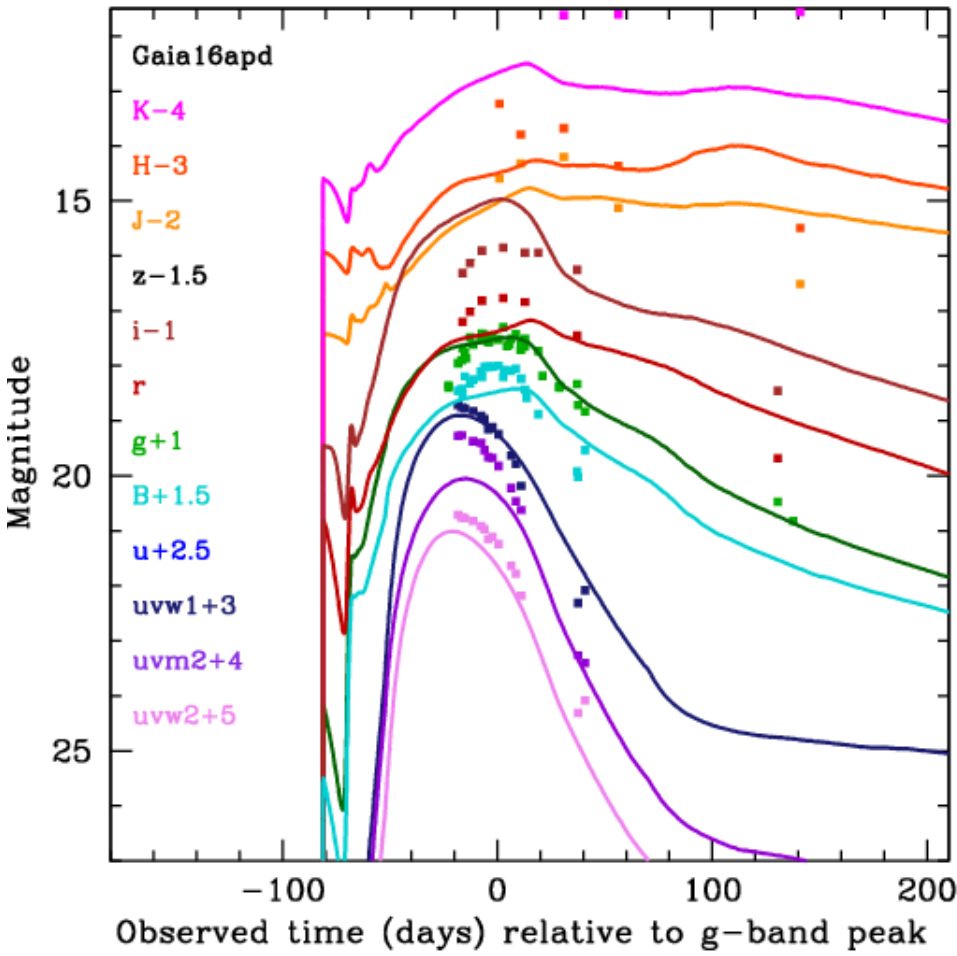

Gaia16apd 150.9 d
PTF12dam 171 d
SN 2015bn 243 d
Mg I / Fe II
[Fe II]
[Ca II]
O I + Mg II
Mg I] + Mg II
Na I
[O I]
Ca II
flux (10^{-16} erg s^{-1} m^{-2} Å^{-1})
Rest wavelength (Å)


Black -- SN features
Red lines -- host galaxy features
STIS NUV
Rest-frame Flux Density[erg/s/cm² /Å]
Rest-frame Wavelength[Å]
cosmic ray

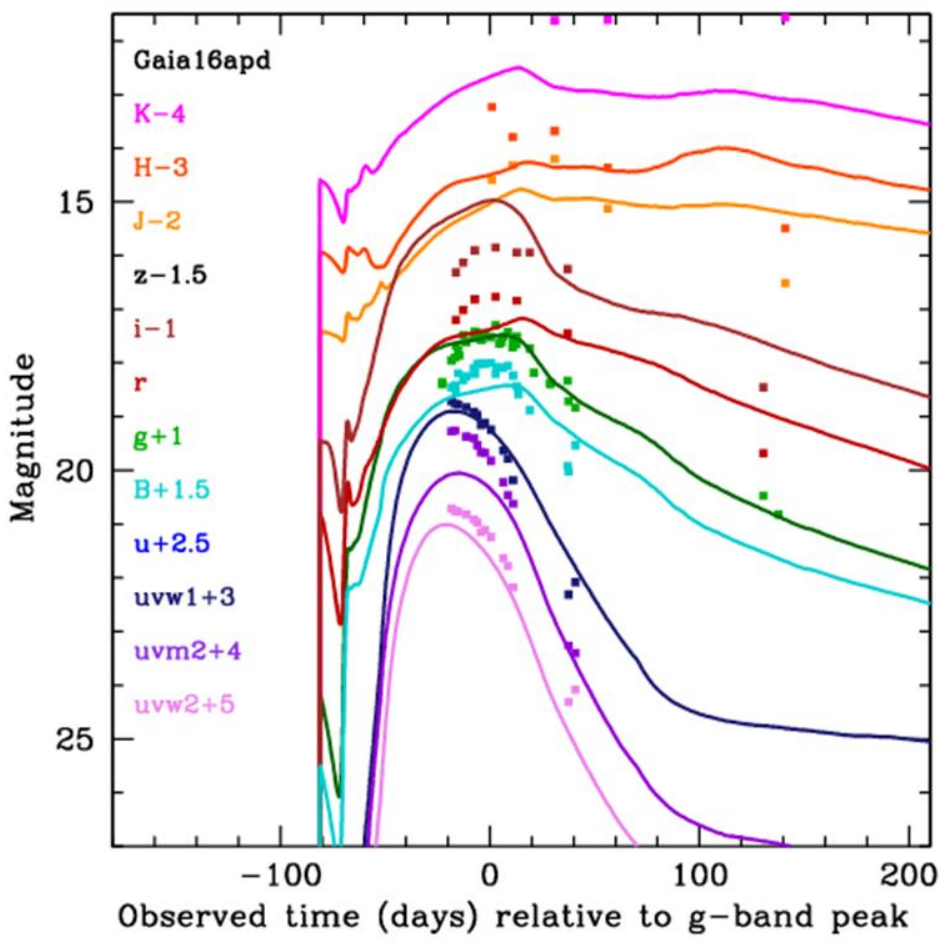

Flux Density/BB Continuum
Rest-frame Wavelength

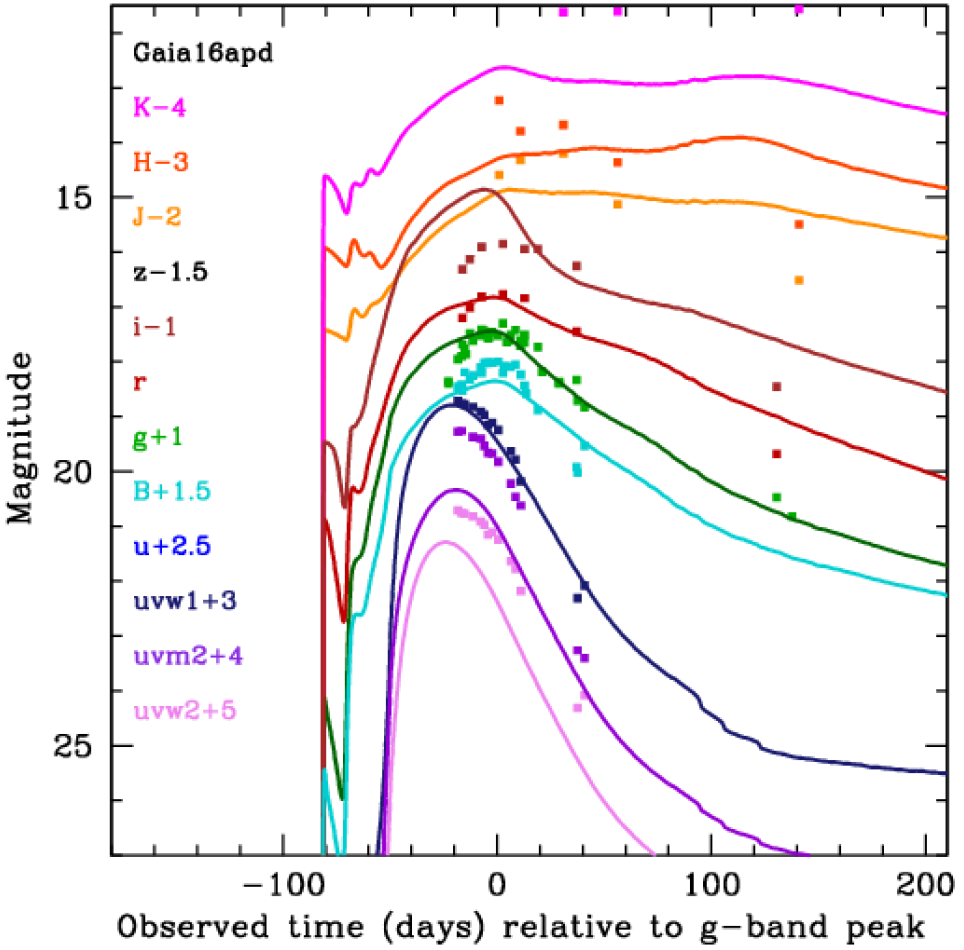
PTF12dam vs Gaia16apd. Light curves



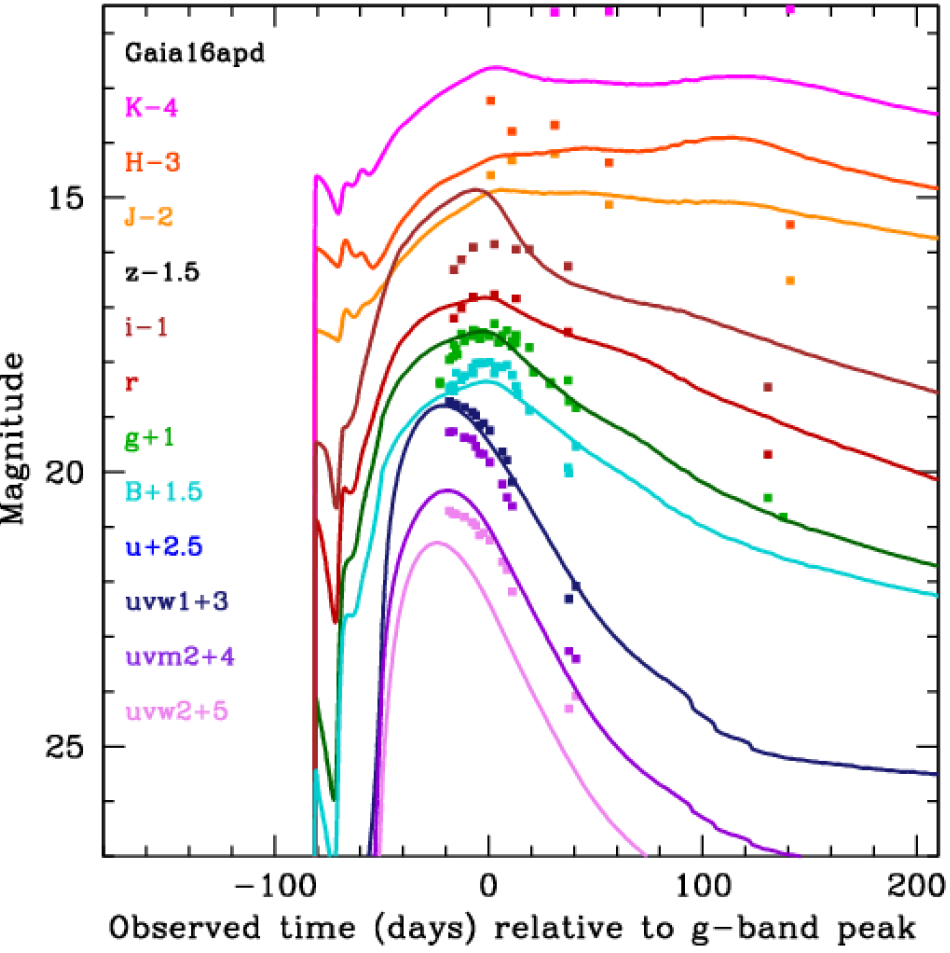


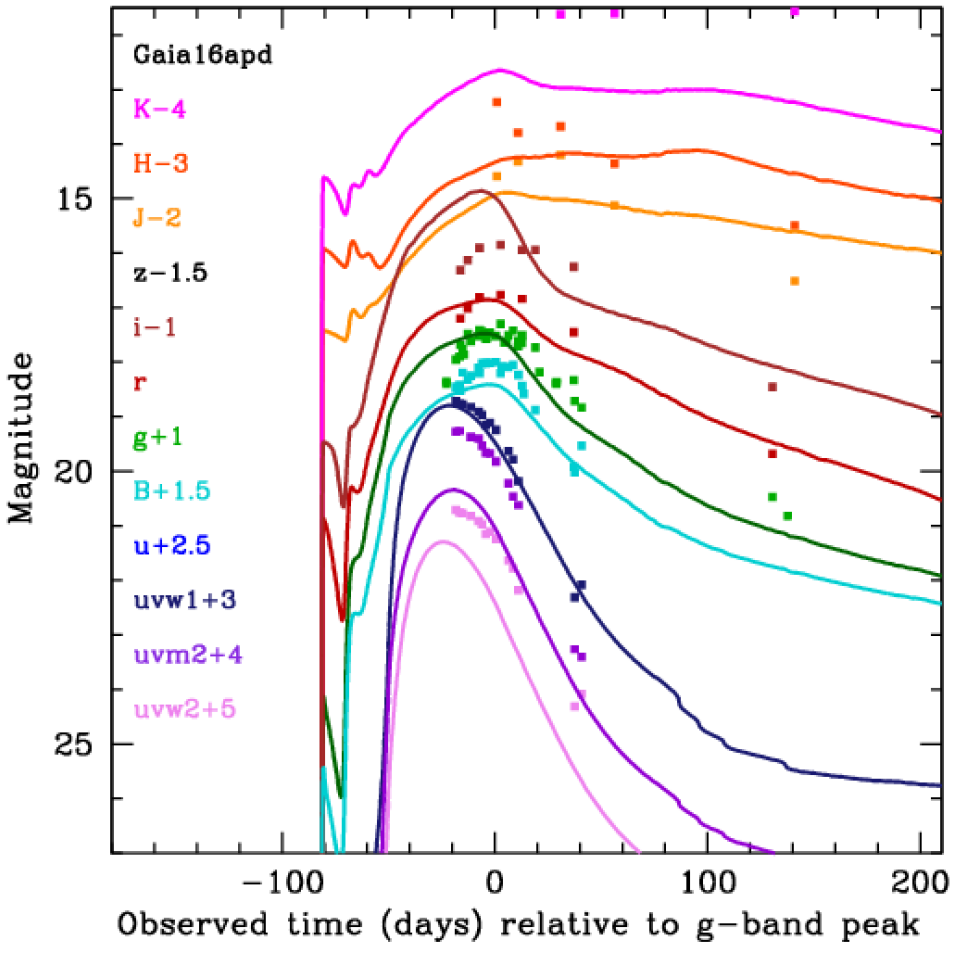
Gaia16apd. High-res vs Low-res



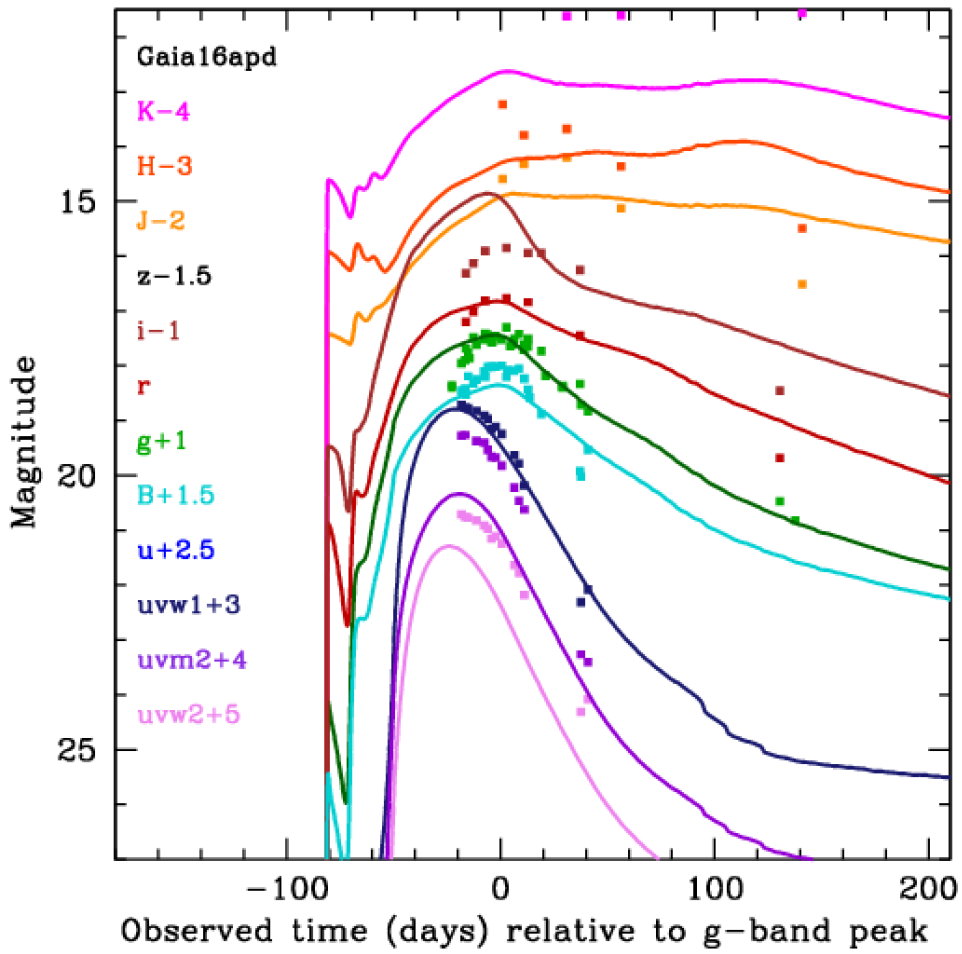


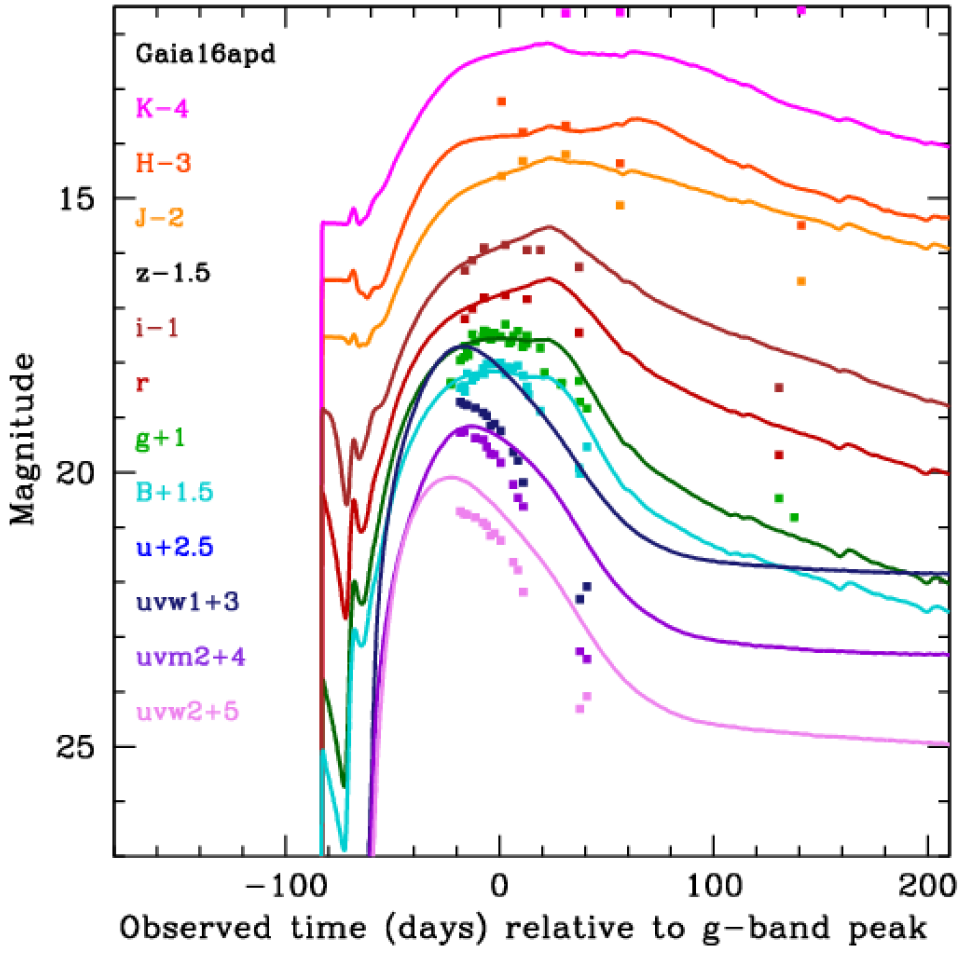
Gaia16apd. 56Ni



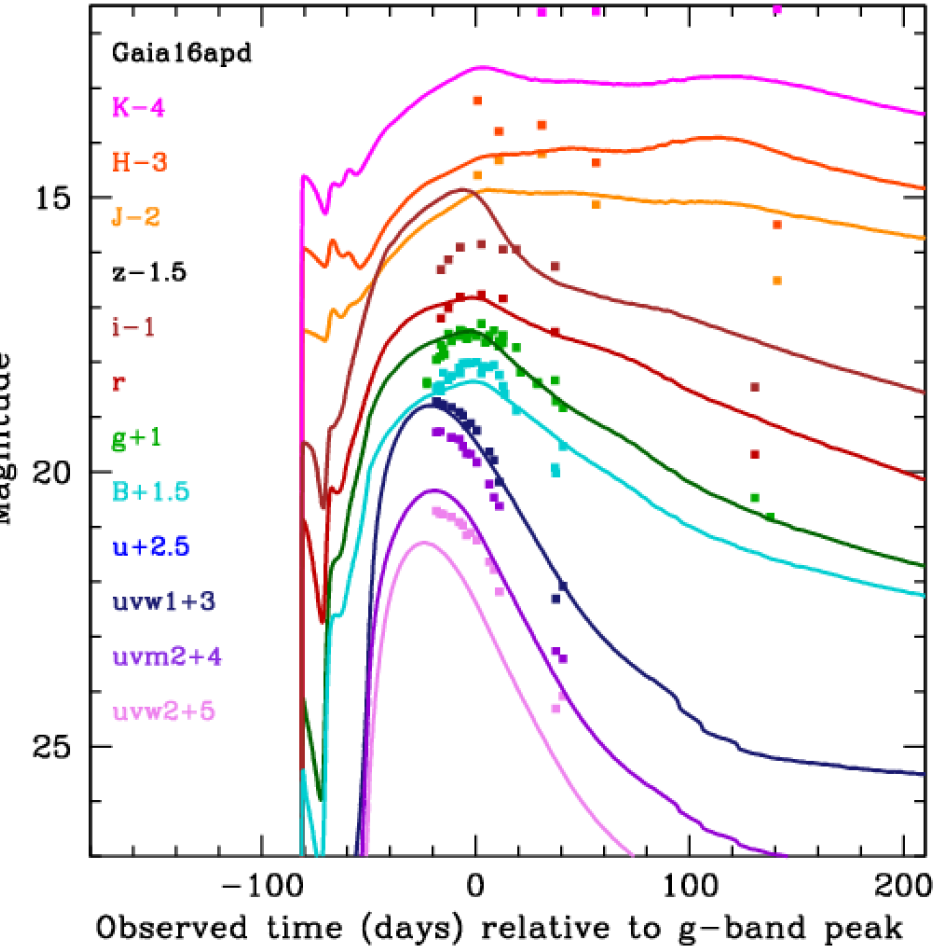


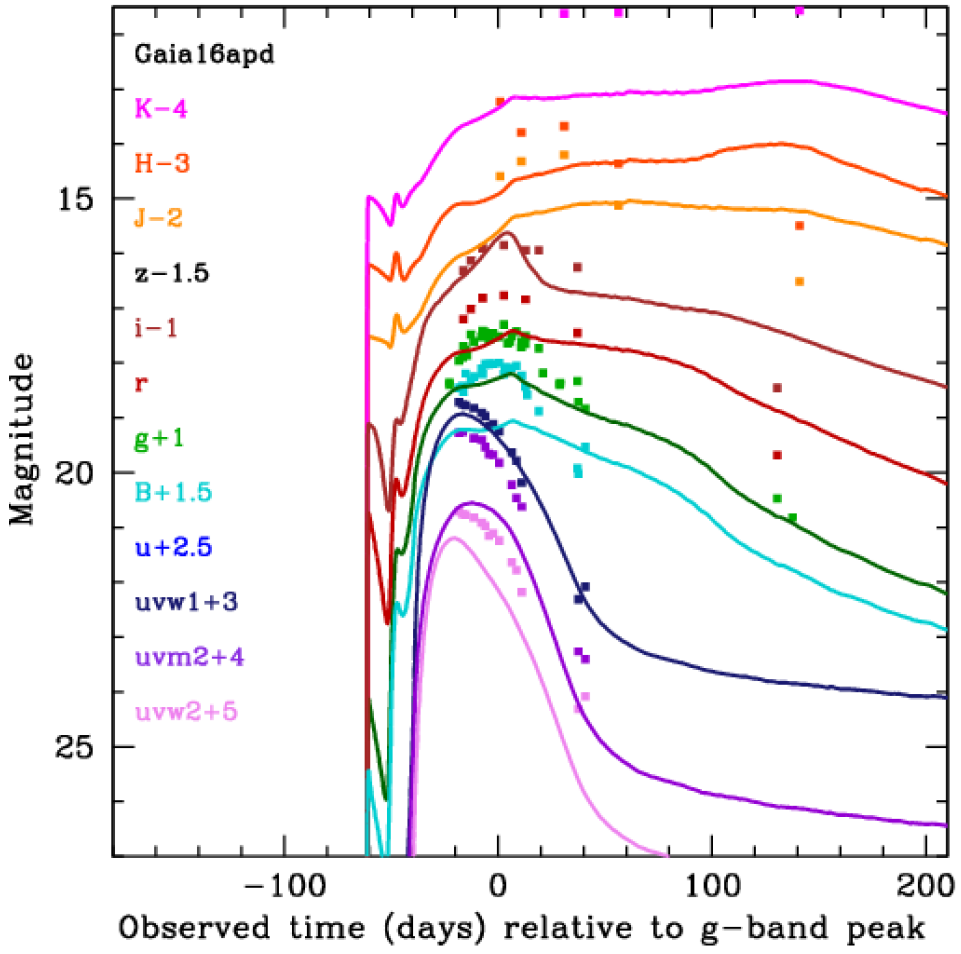
Gaia16apd. Energy



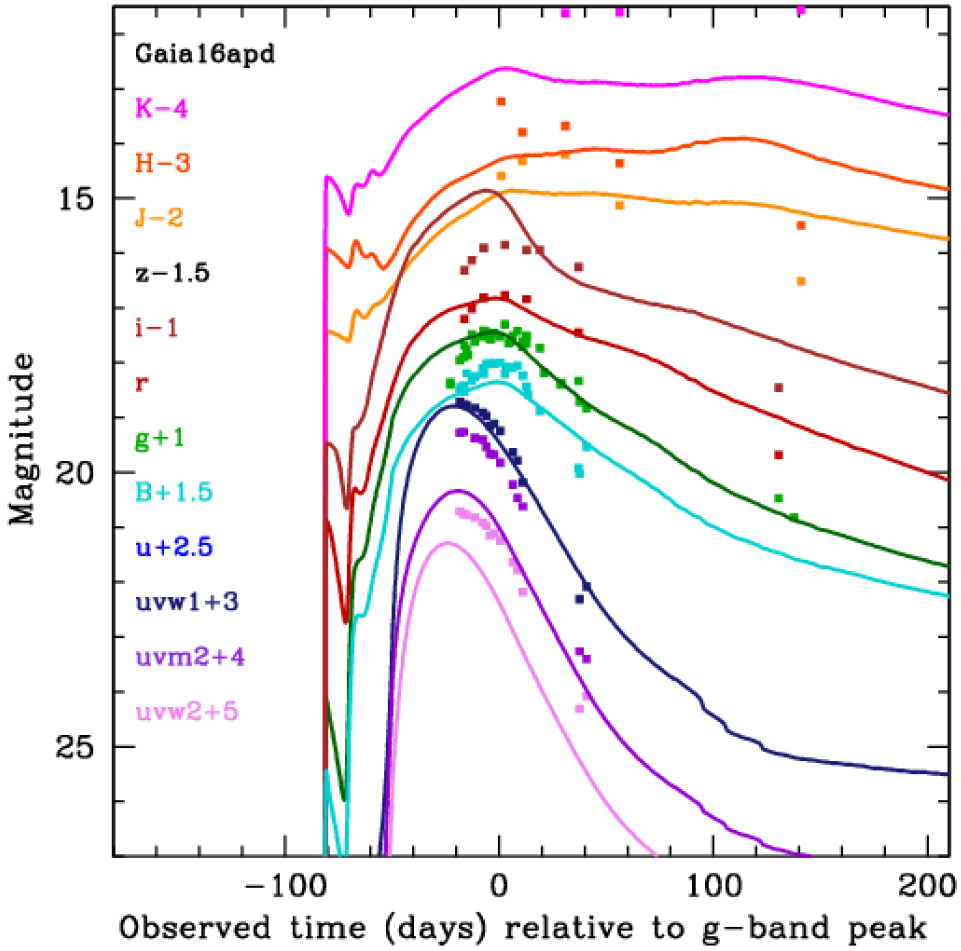


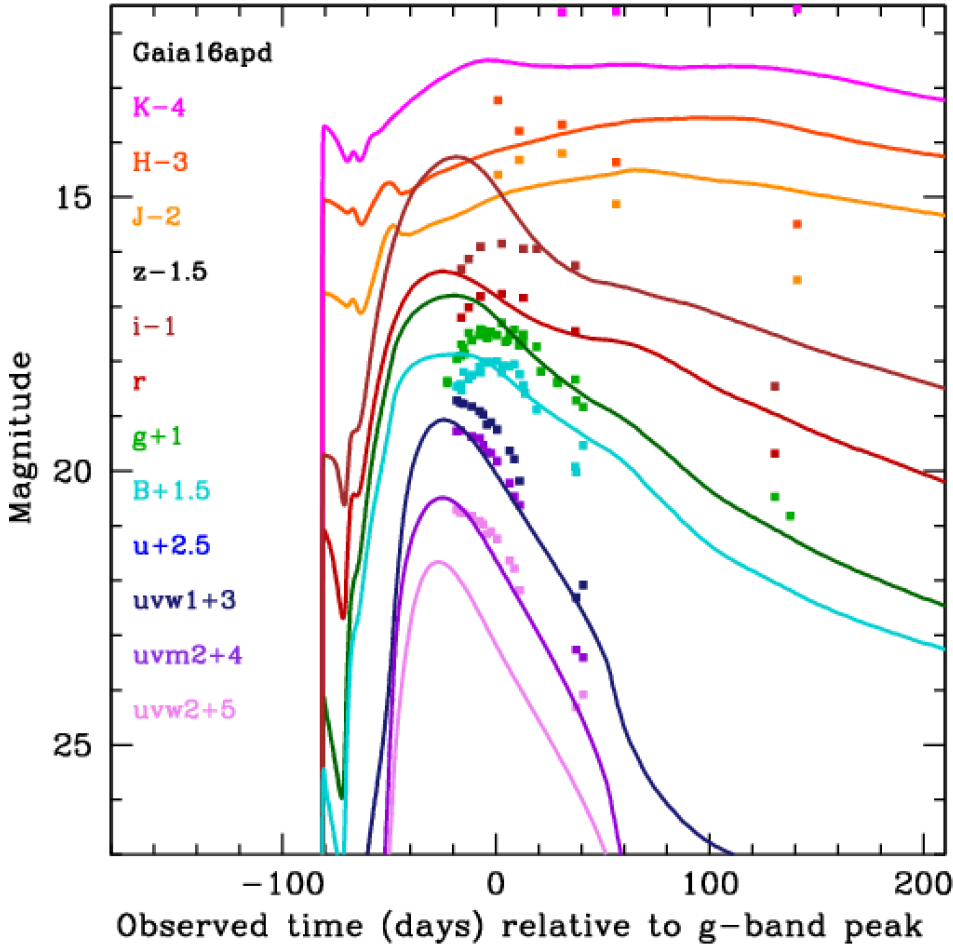
Gaia16apd. Low-density

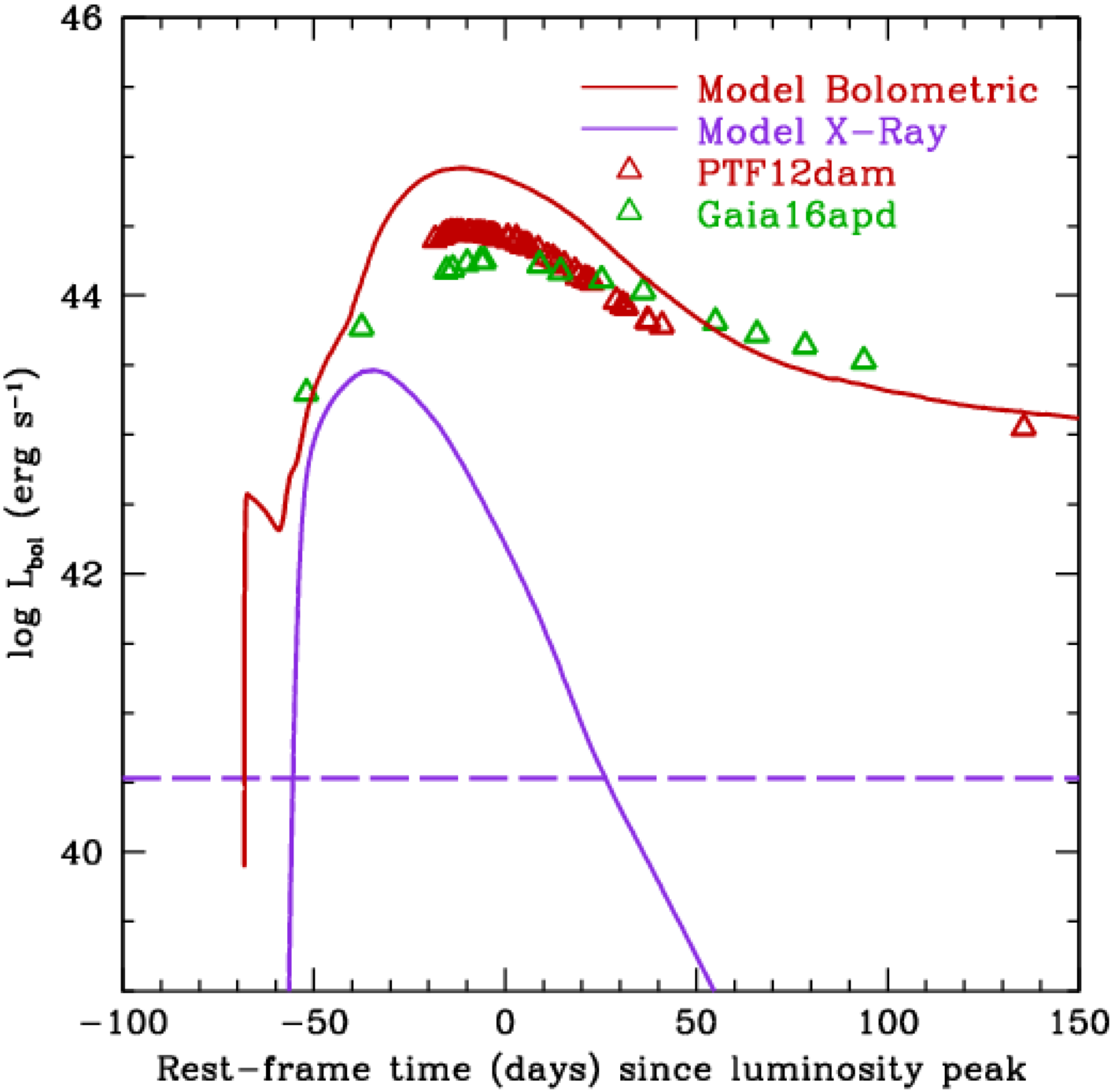




Gaia16apd. HeC -> CO

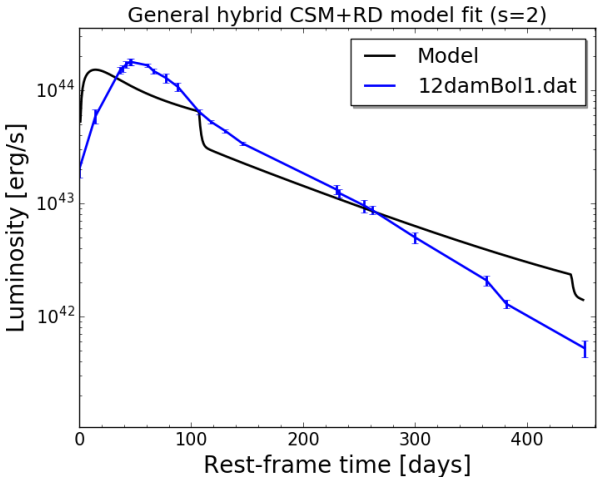


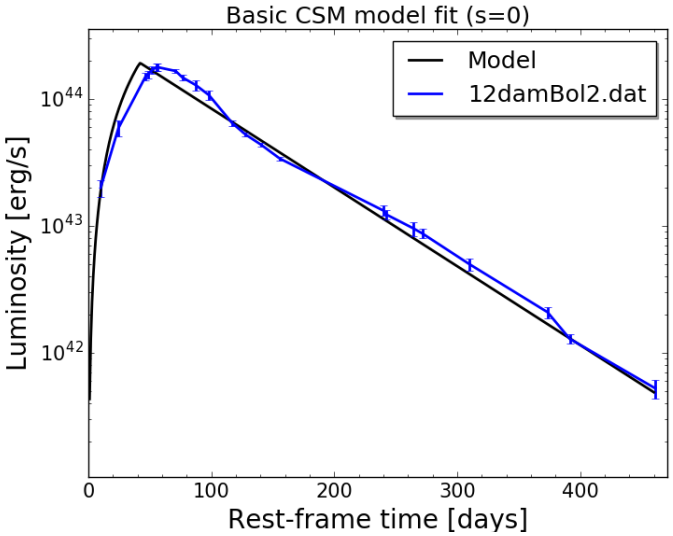



Model Bolometric
Model X-Ray
PTF12dam
Gaia16apd
log L_{bol} (erg s^{-1})
46
44
42
40
−100
−50
0
50
100
150
Rest−frame time (days) since luminosity peak

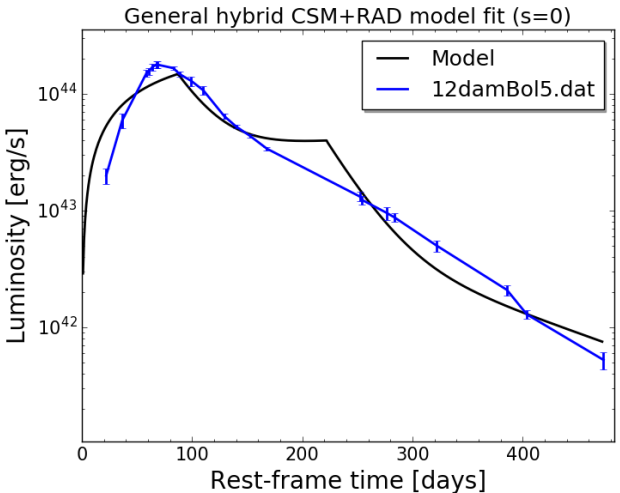
Analytic models

MCSM = 26 Msun and Mej = 15 Msun with MNi = 5 Msun , s=2





No Ni, Mej and Mcsm mass (about 10Msun for both), s=0



Mej = 42 Msun, Mcsm = 13 Msun, Mni =1Msun