Optical light curves of H-rich and H-poor Supernovae

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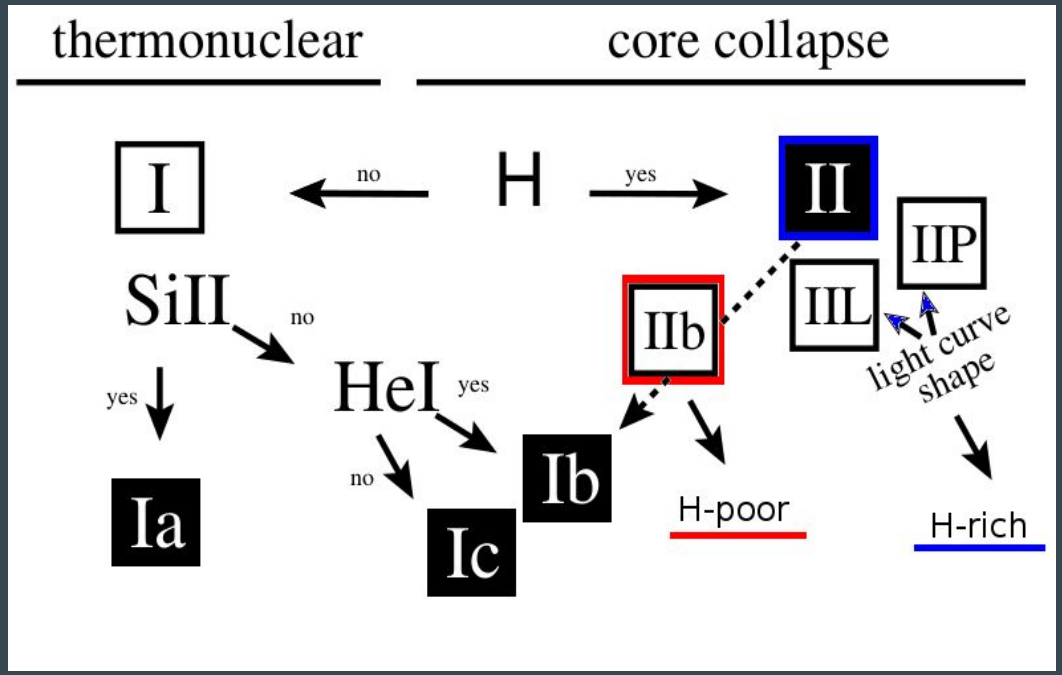
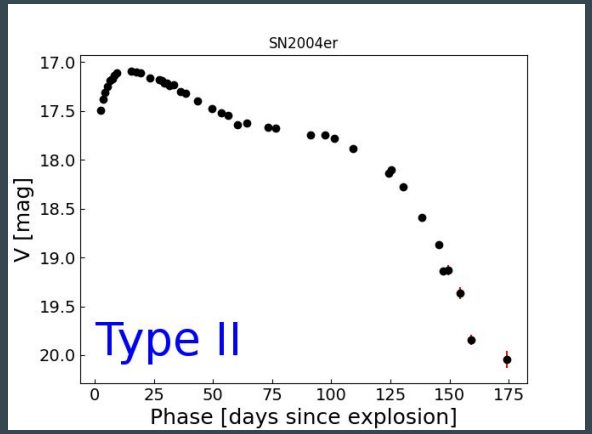
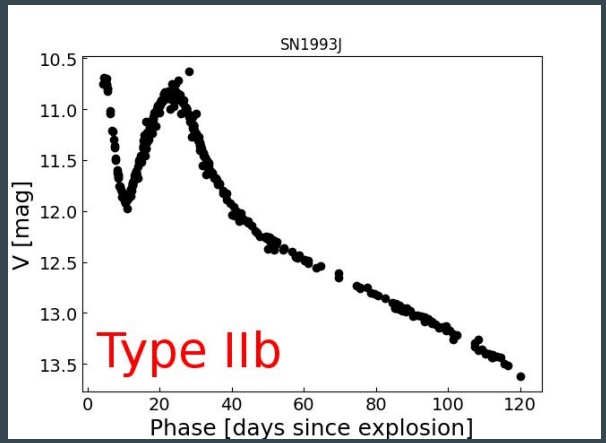
NidiaFest - Bariloche - 2018

SNe classification



Turatto03

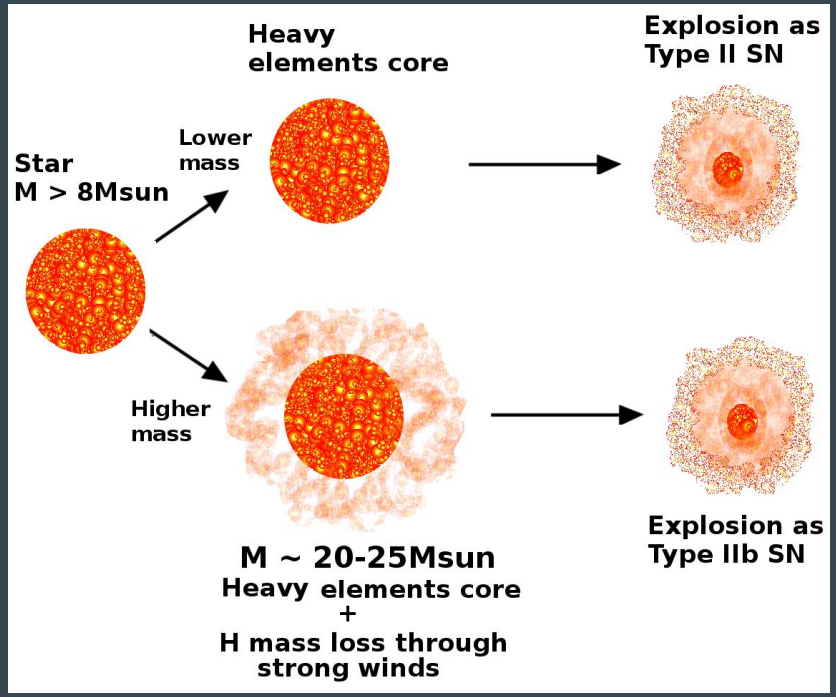




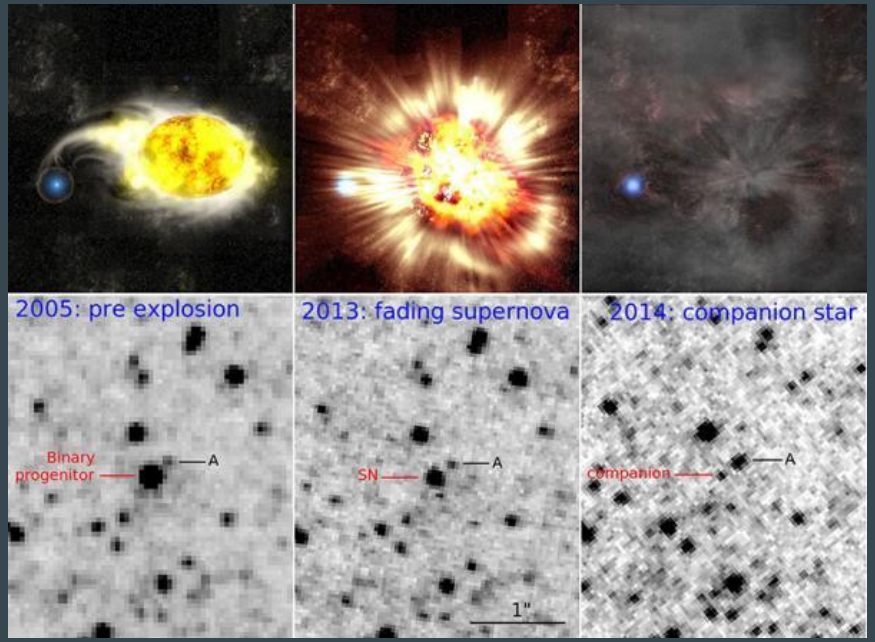
The core collapse progenitors question

Understanding progenitors of different SN types we can learn about how massive stars lose mass

Single progenitor scenario



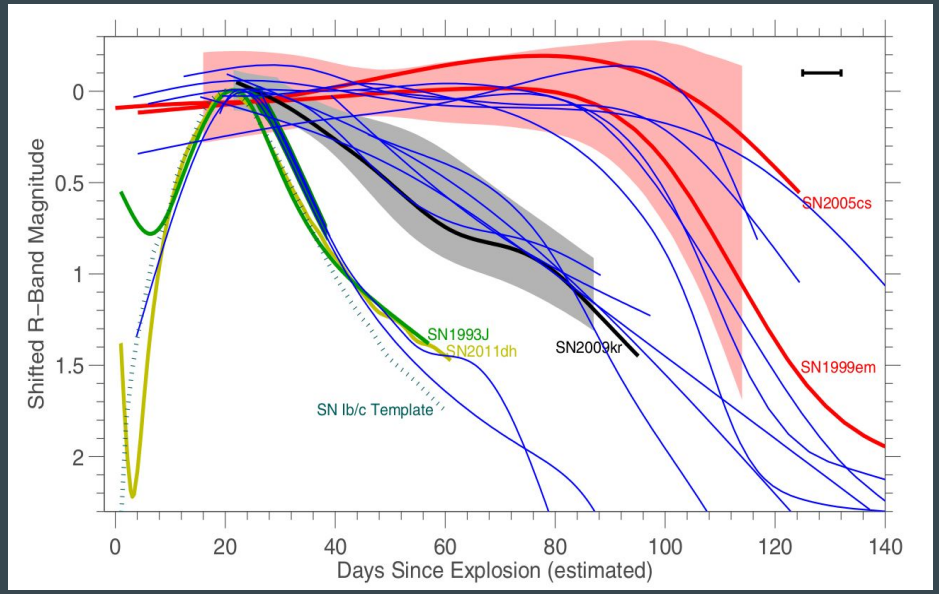
Progenitor in binary system scenario



Folatelli+14

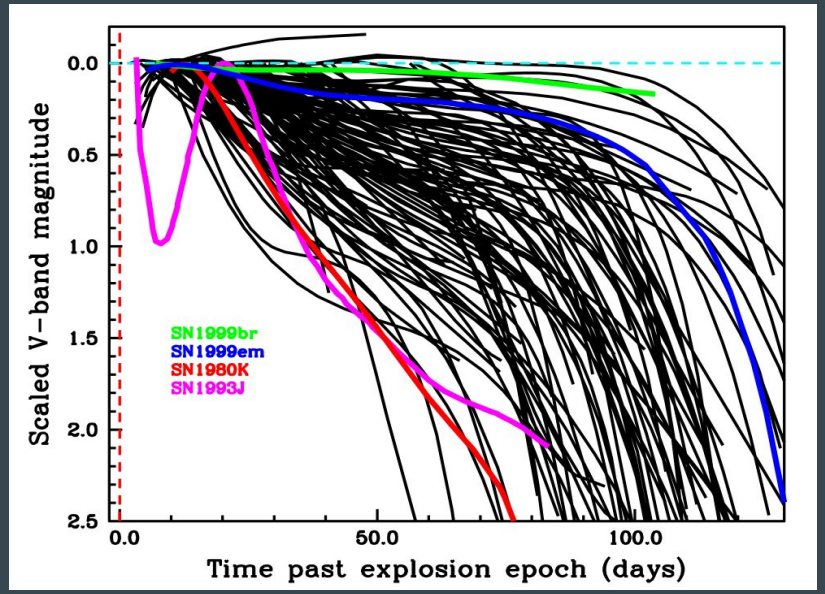
Previous studies

Arcavi+12



"... Type IIP, IIb, and IIL SNe might not be members of one continuous class..." (Sample: 21 SNe in R band)

Anderson+14



"A continuum of SN II V-band properties is observed in all measured parameters…" (Sample: 116 Type II SNe in V band).

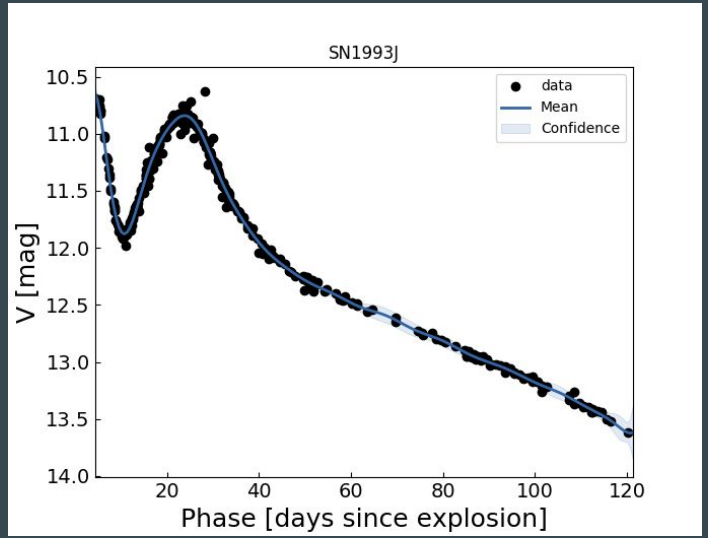
Our work

- **Goal:** Test the hypothesis of a continuum of physical properties between SNII and SNIIb by examining their observed properties.

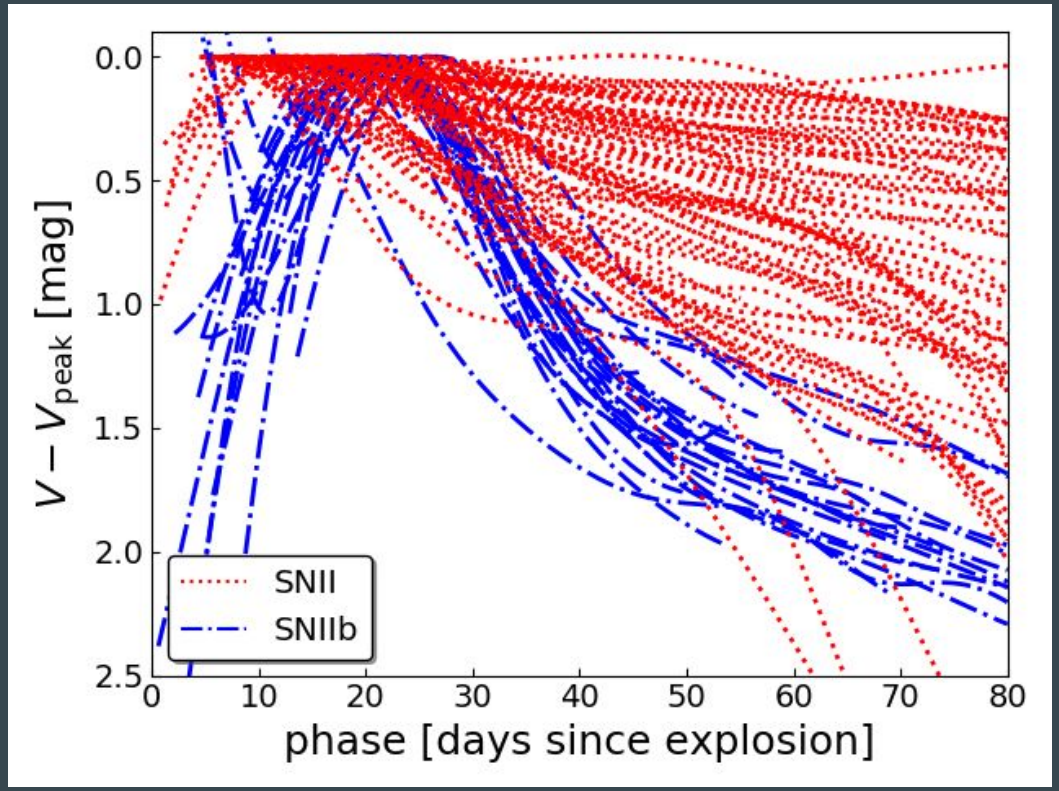
- **Strategy:** Resample the light curve of Type II and Type IIb SNe in order to be able to define parameters that describe the LC morphology to compare both families.

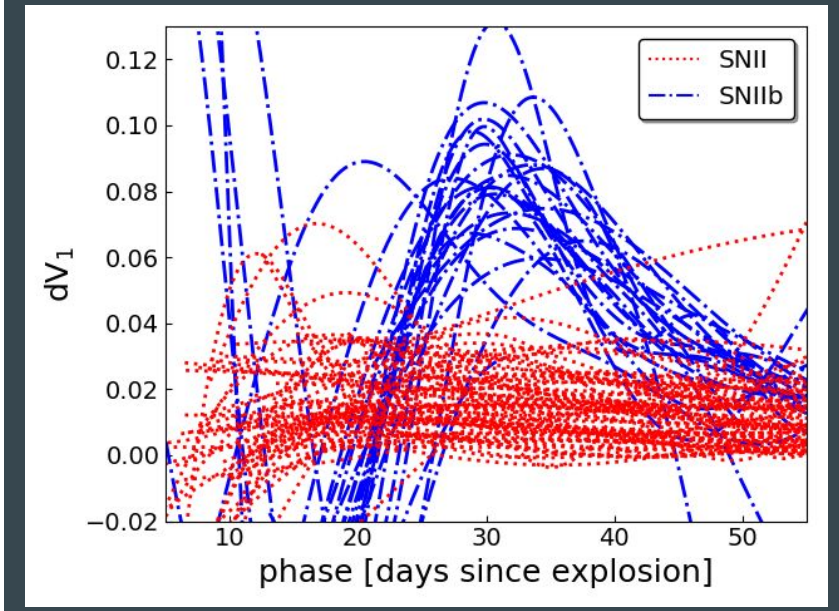
➔ **Data:** 73 SNII and 23 SNIIb.
B, V and r bands.
CSP+CATS+Others.

➔ **LC Resampling:** Gaussian process via implementation of the Python library GPy.



LC morphology



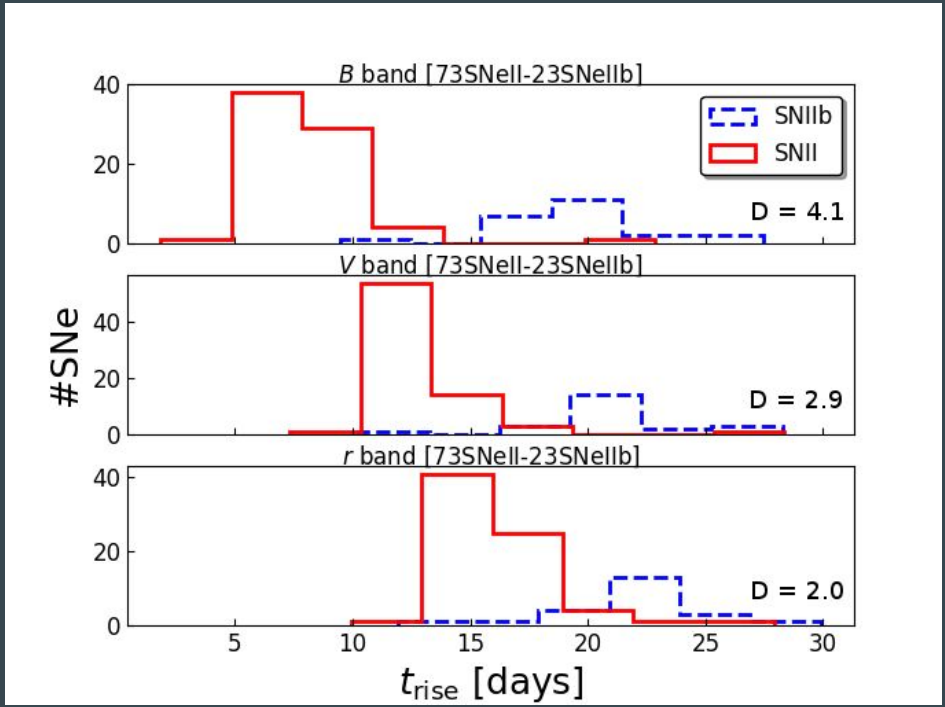


Parameters and results

- **Rise Time:** elapsed time between explosion and maximum light.

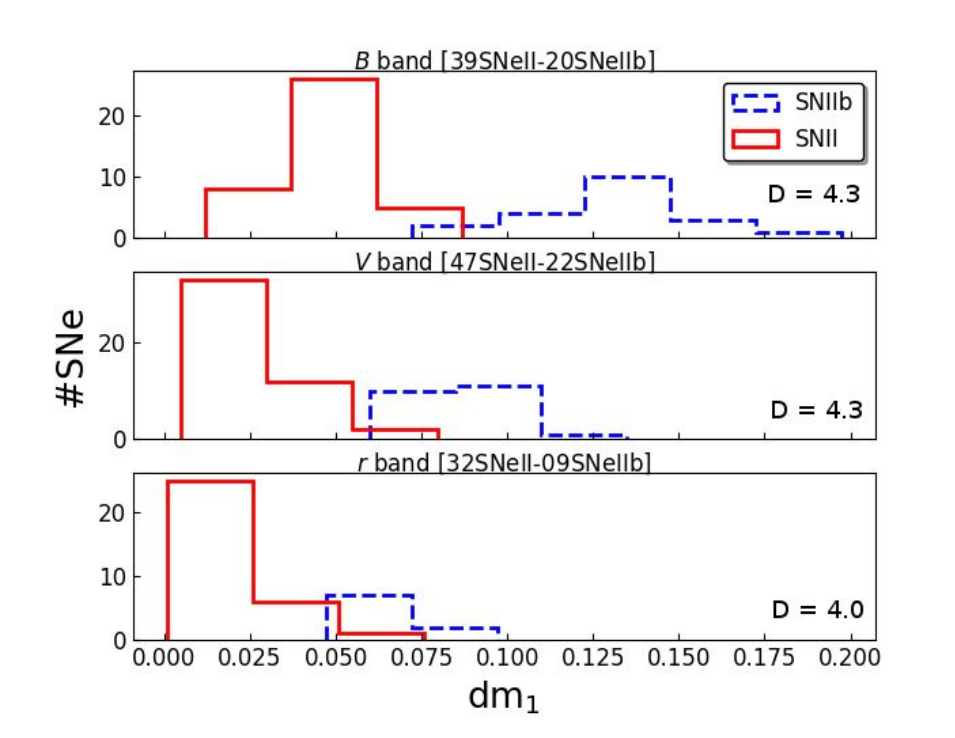
Weighted average of t_{rise} for every band.

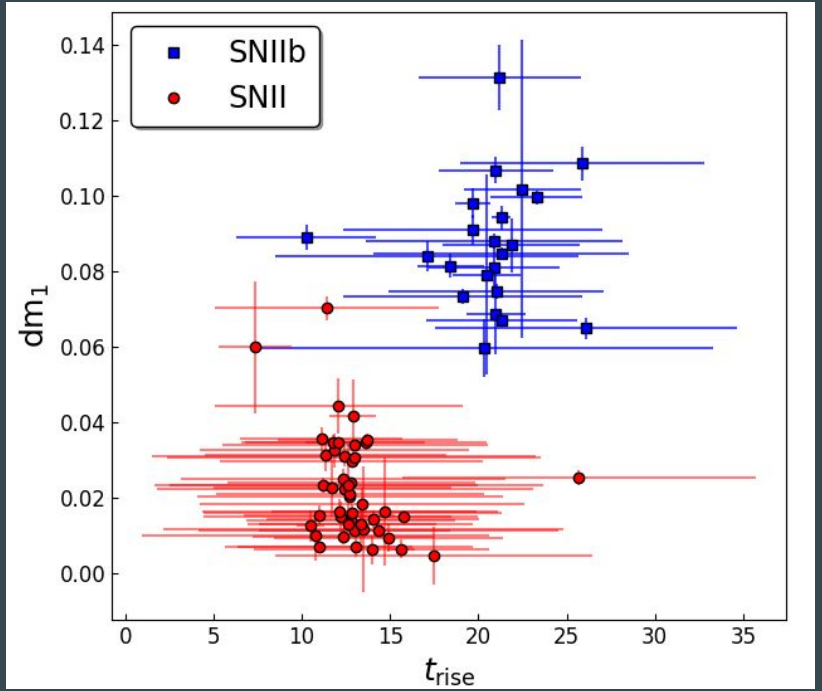
Type	Band	Weighted average
IIb	B	19.0 ± 1.8
	V	20.9 ± 1.6
	r	21.5 ± 2.1
II	B	8.3 ± 2.0
	V	12.8 ± 2.4
	r	16.0 ± 3.6



Parameters and results

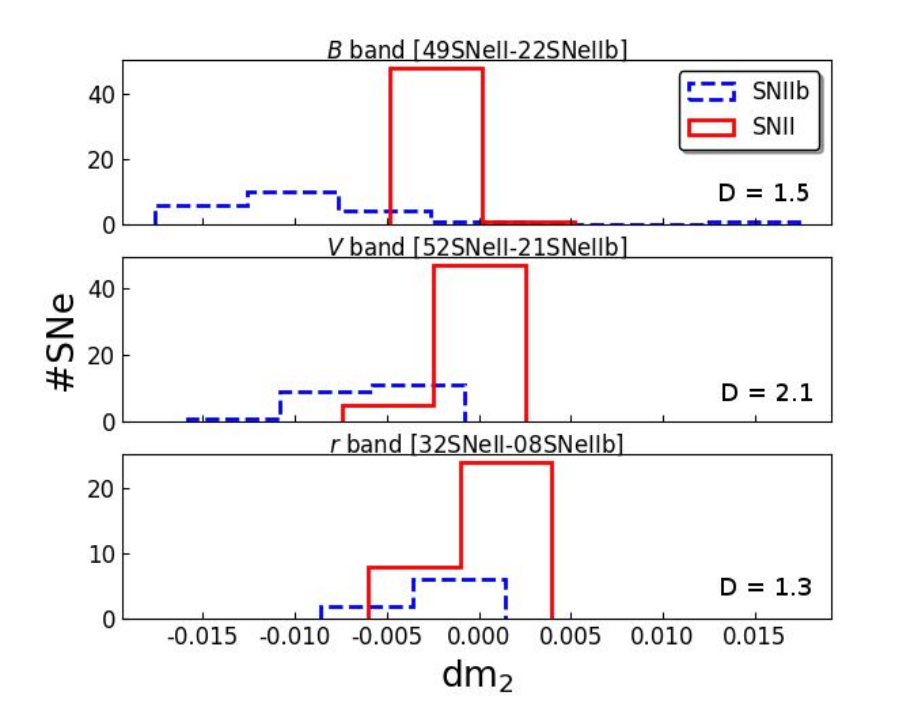
- **First maximum of the first derivative after peak:** accounts for the steepness of the LC.

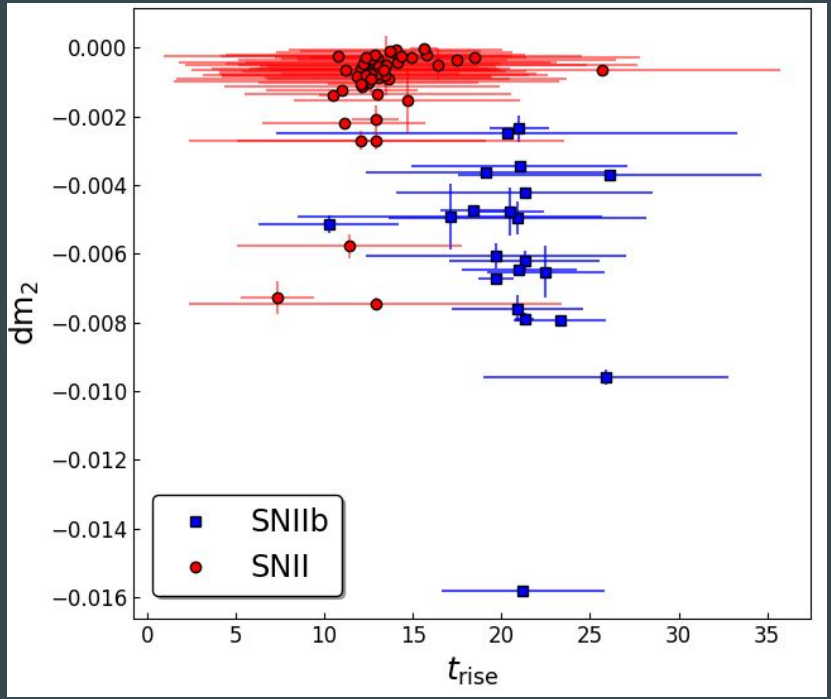




Parameters and results

- **First minimum of the second derivative after peak:** gives an idea of how much the curvature of the LC changes in the region where it changes the most.





Conclusions

- Overall we see both families well differentiated (in BVr), suggesting that there is no continuum of observed properties among SNII and SNIIb.

- We infer from the above that most likely the progenitor population is also not a continuum and both H-rich and H-poor SNe II might come from different progenitors.

- Our findings agree with the recent claims that SNe II form a single continuous family in terms of LC decline rate between what has been called II-P and II-L SNe.