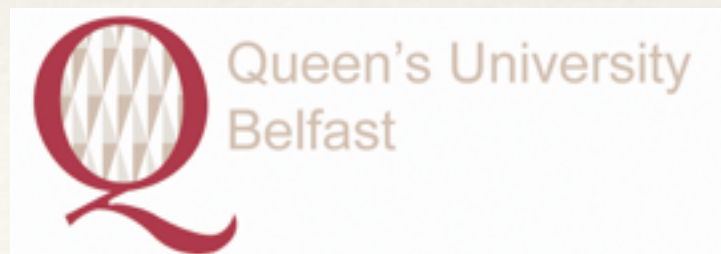


LSST SN science kick-off workshop

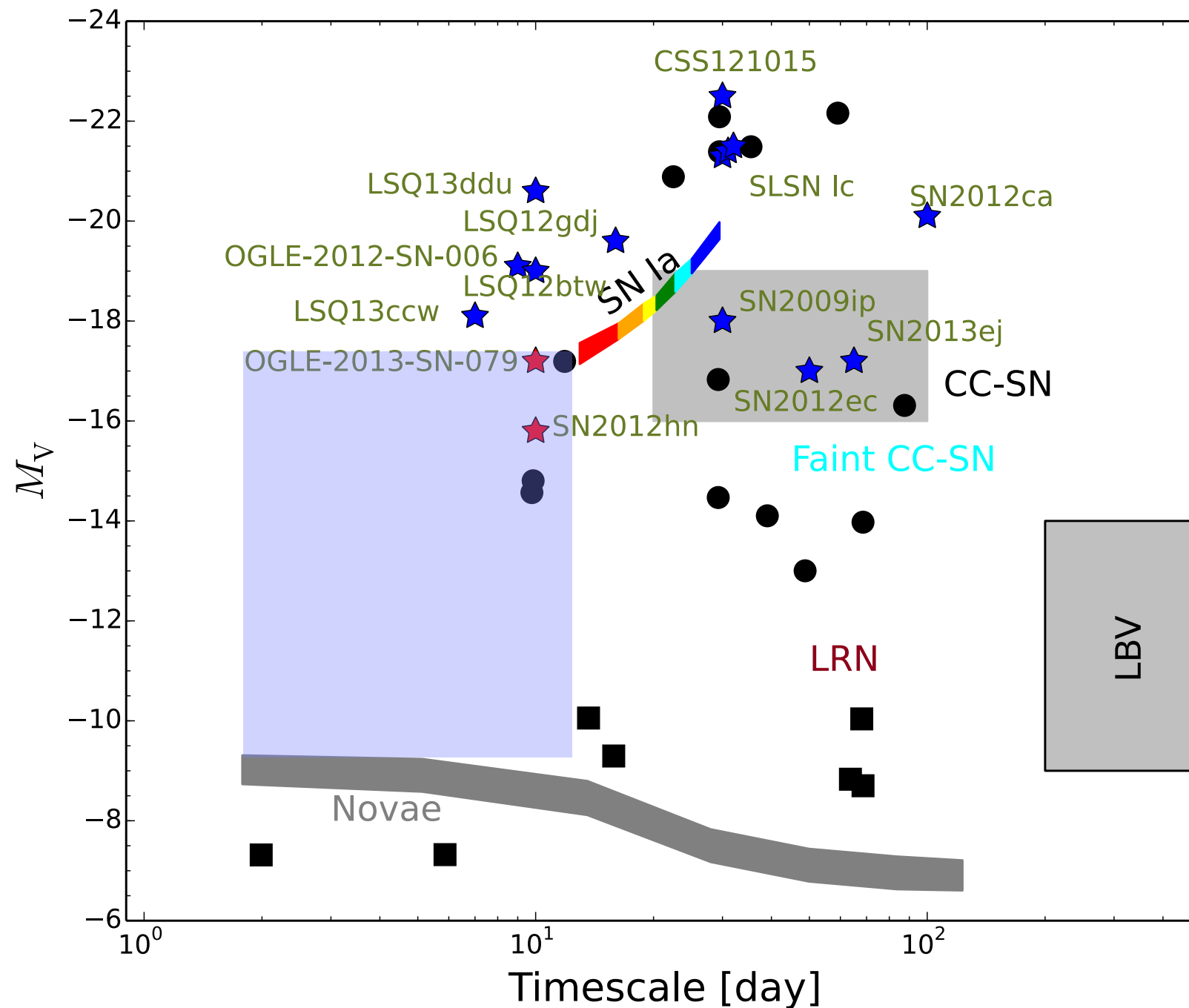
Faint and fast transients with LSST



Kate Maguire

STFC Ernest Rutherford Fellow,
Queen's University Belfast

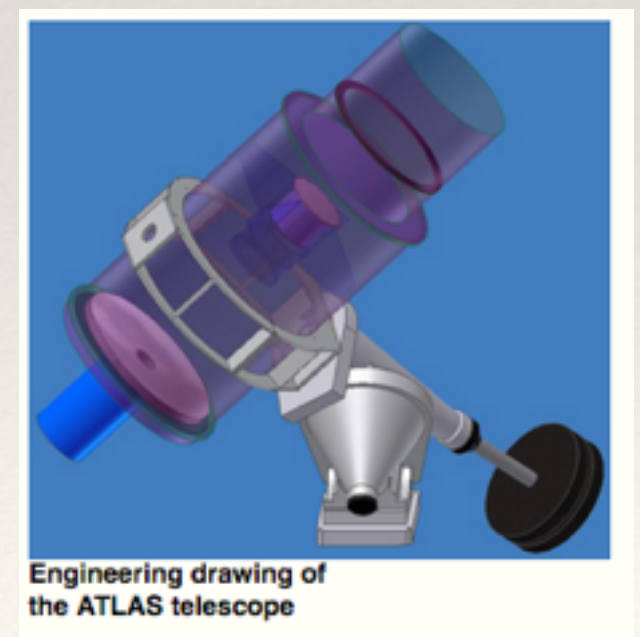
Extremes of explosion physics



Smartt et al.
(2015, updated
version of
Kasliwal &
Kulkarni)

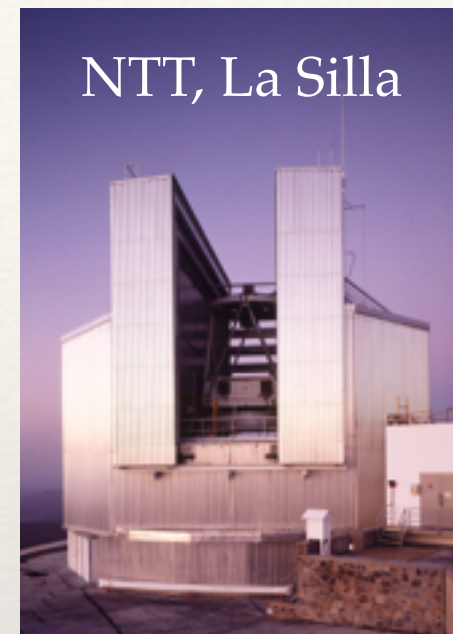
High-cadence surveys

- ❖ <1 day cadence
- ❖ Deep to increase volume surveyed ($\sim 20 - 21.5$ mag)



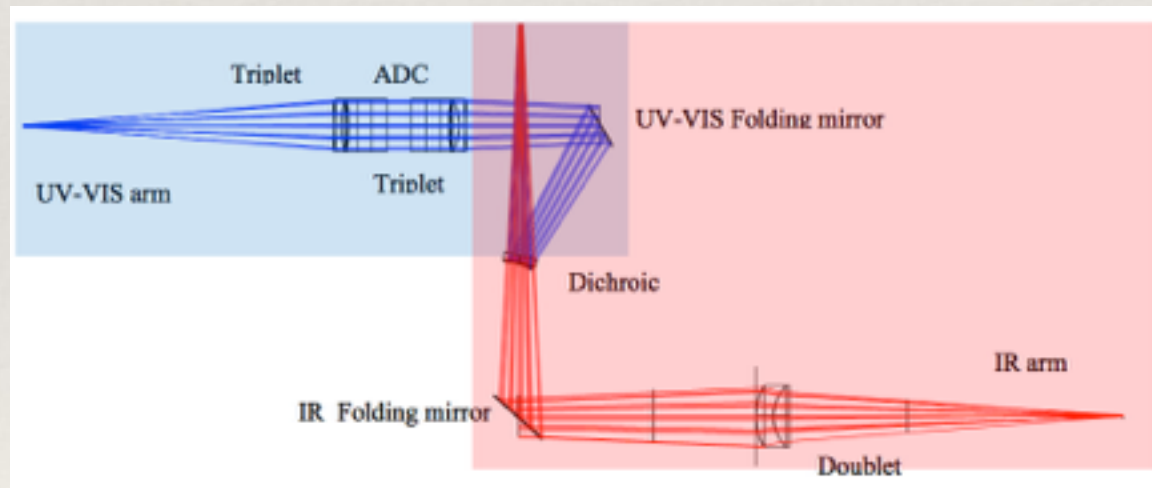
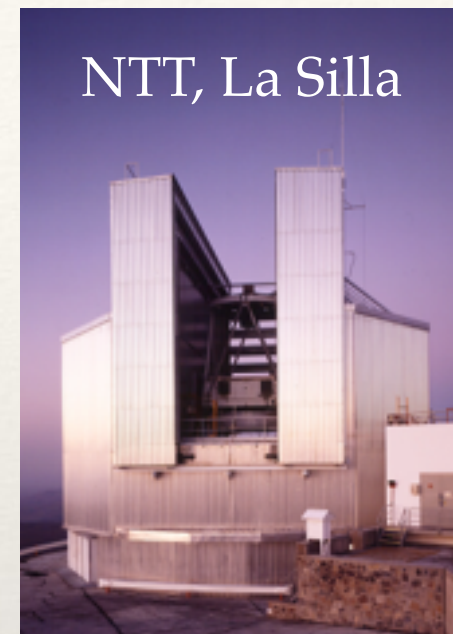
Rapid spectroscopic follow-up

- ❖ PESSTO / ePESSTO
 - ❖ 90 nights per year on NTT
 - ❖ Proposal submitted for further two years (until mid 2019)

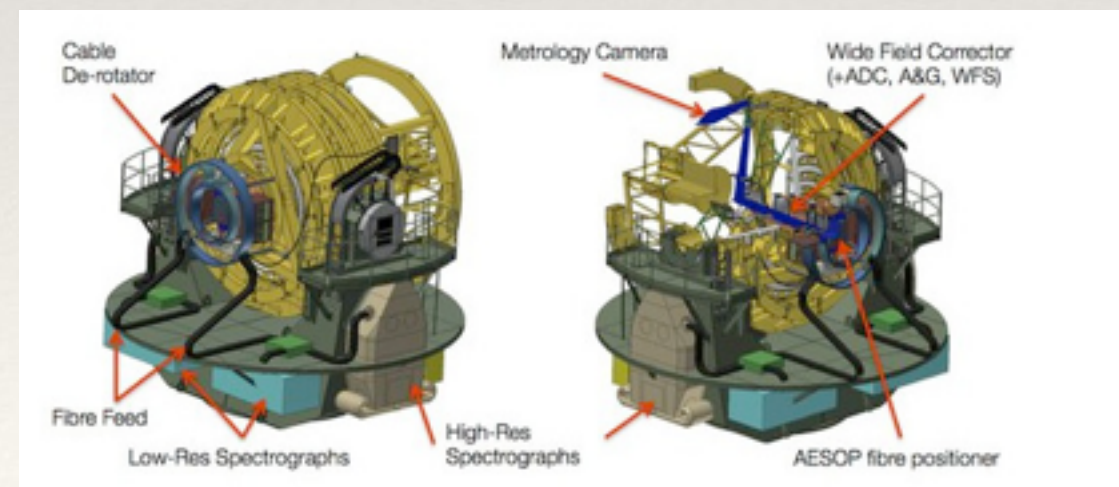


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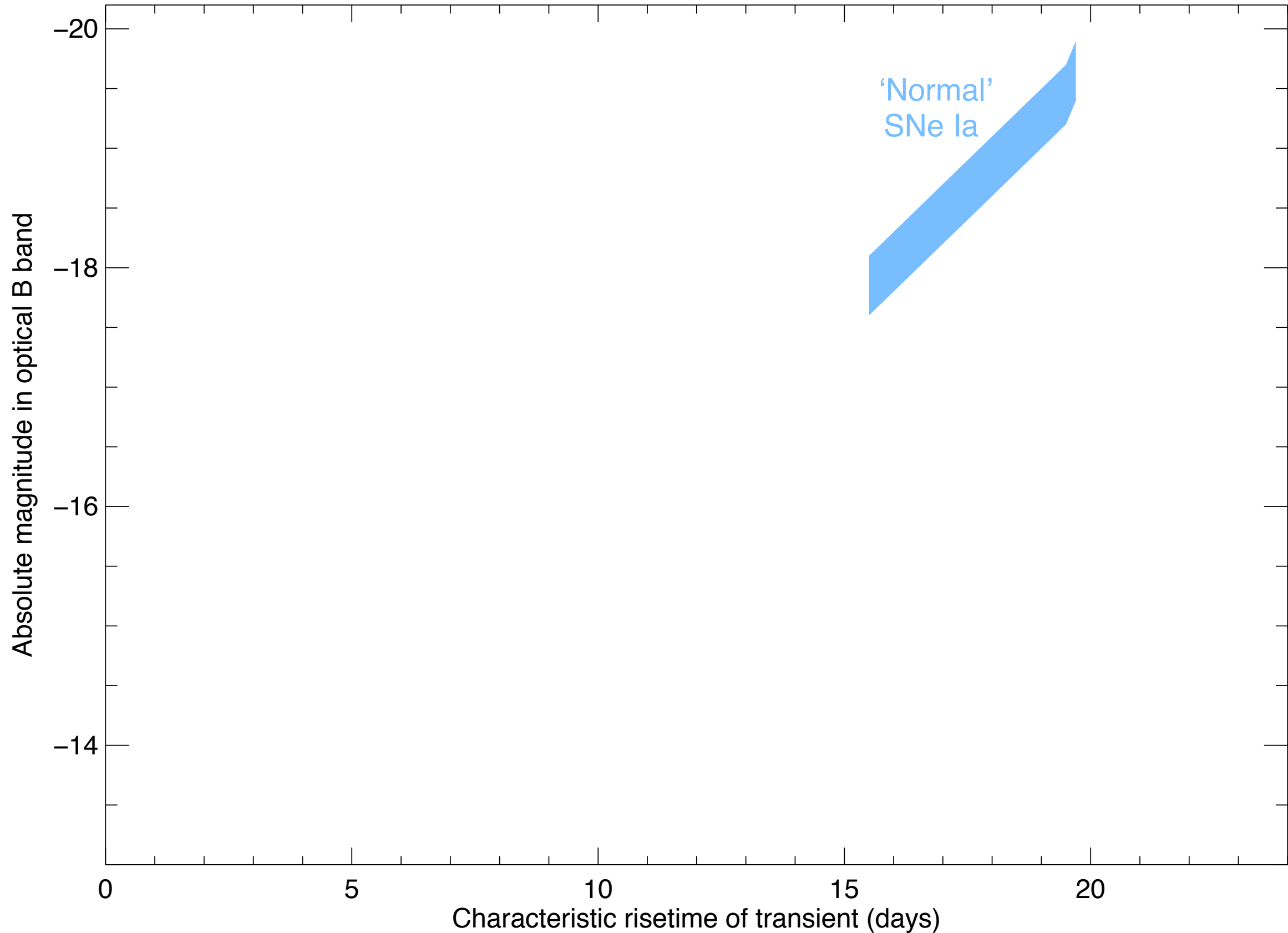


- ❖ SOXS on NTT- starting ~2020

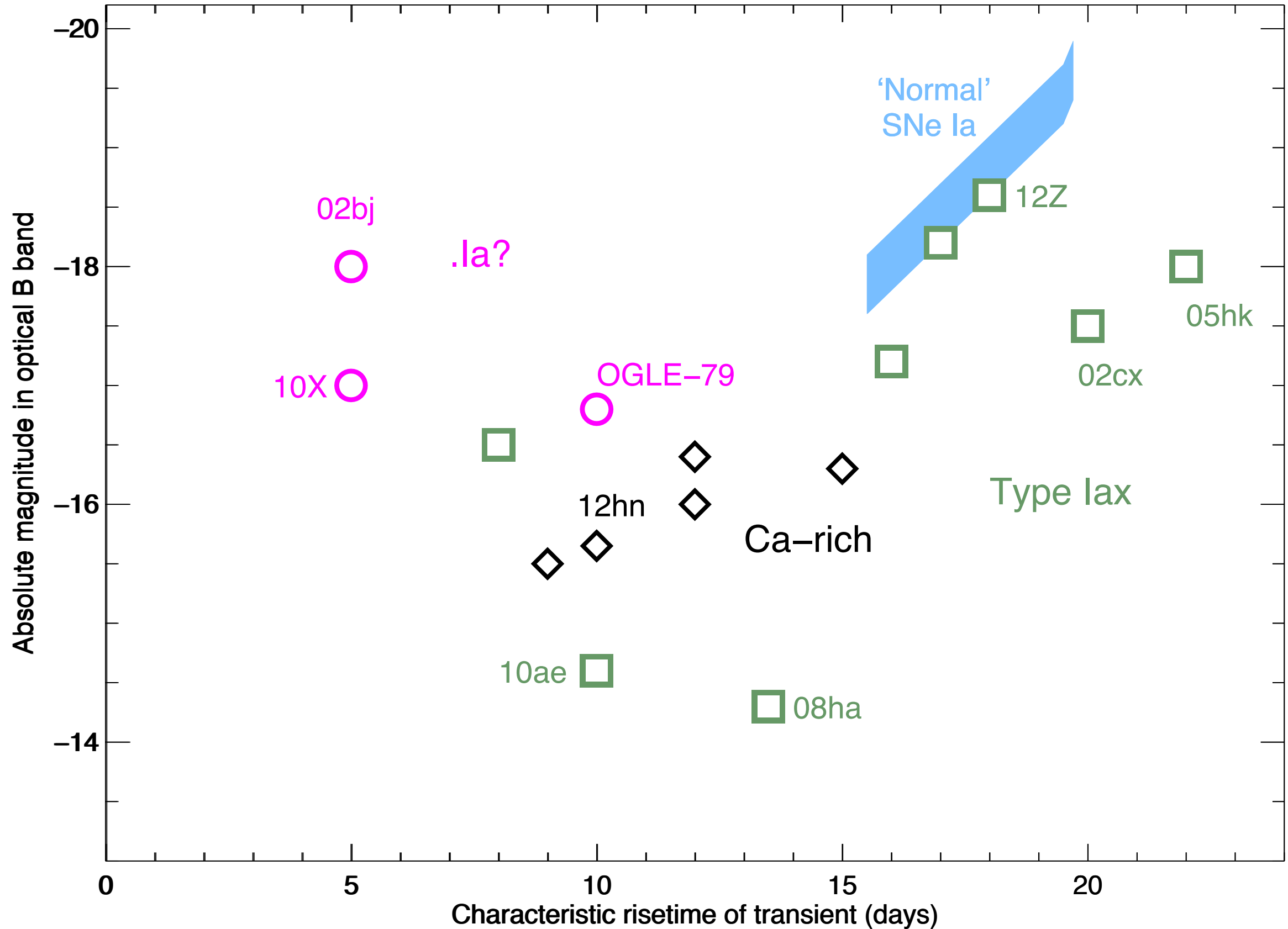


- ❖ 4MOST - 4 sq. deg. MOS on VISTA telescope

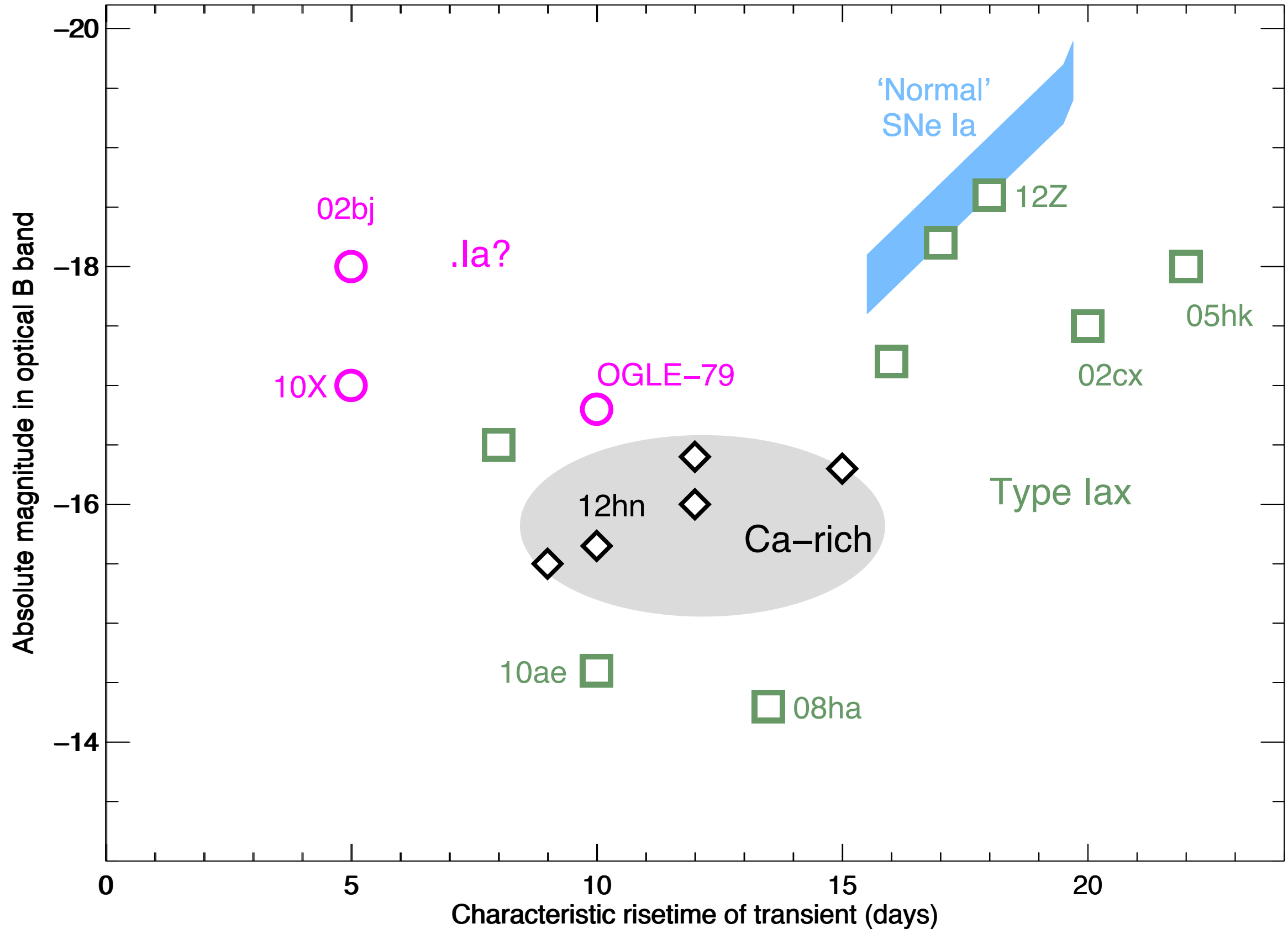
White dwarf transients



White dwarf transients

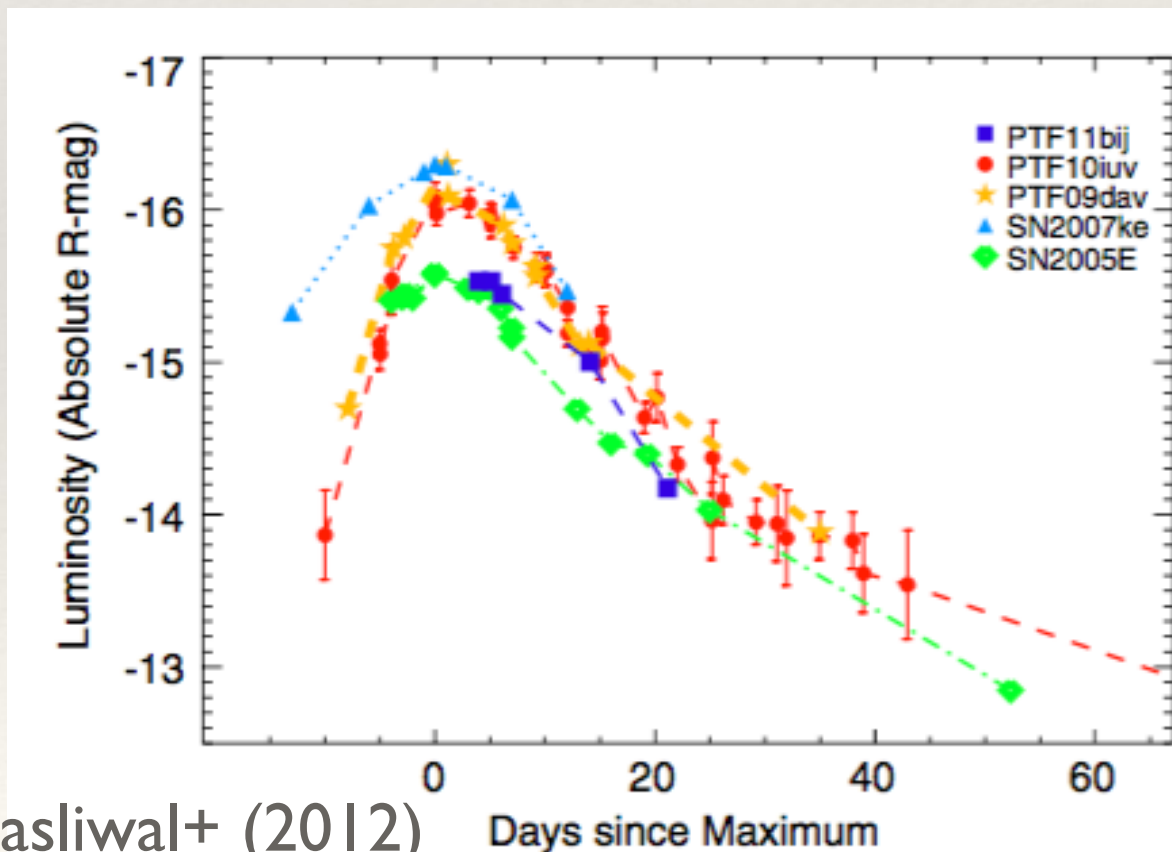


White dwarf transients



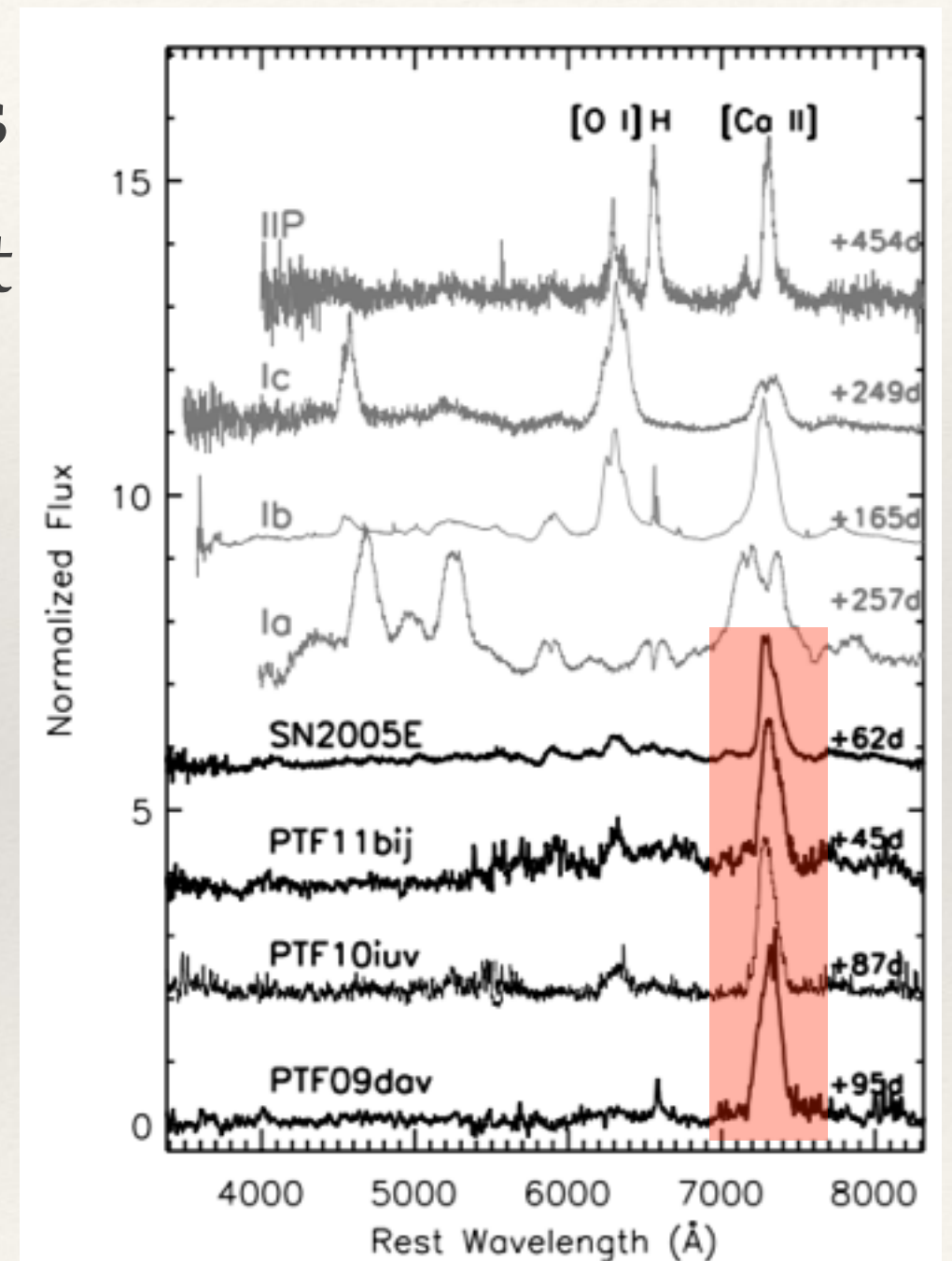
Ca-rich/Ca-strong transients

- Strong [Ca II] emission at late times
- Major contributor to Ca enrichment in the Universe?



Kasliwal+ (2012)

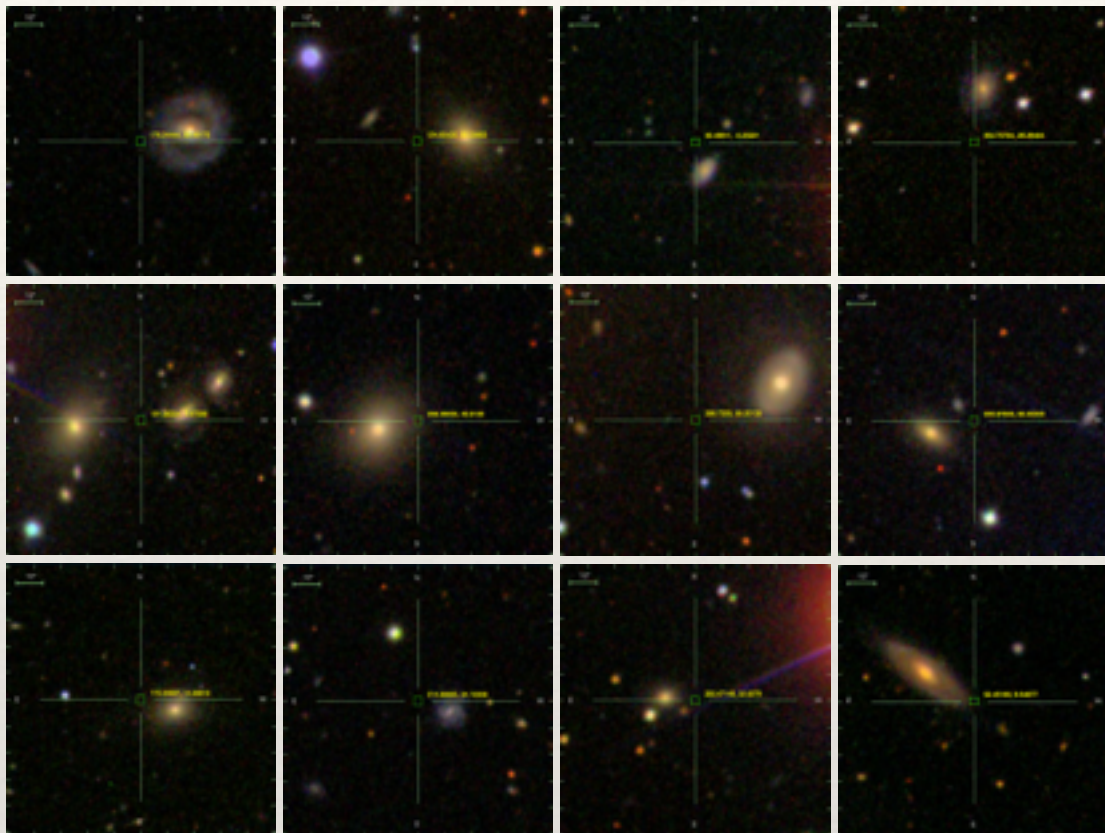
Kate Maguire



Kasliwal+ (2012)

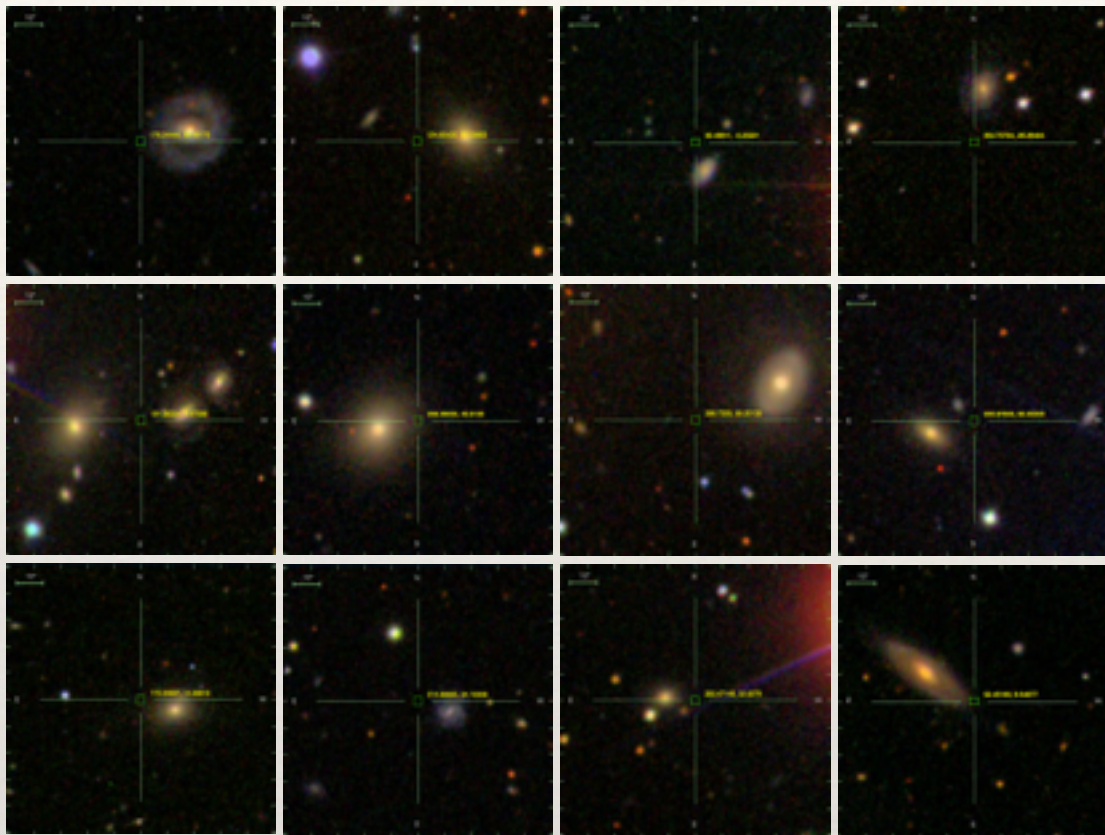
LSST Pittsburgh Nov. 2016

Remote locations preferred



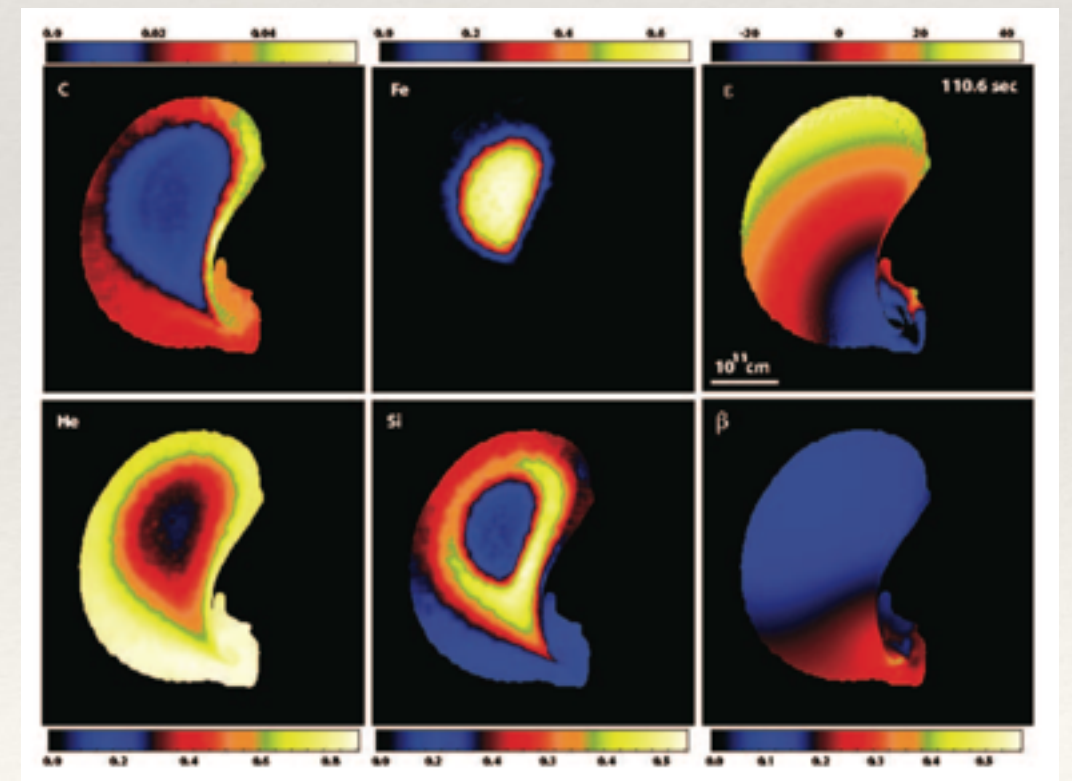
- Far from host centres (Yuan+ 2013)
- Strict limits on globular clusters in some cases (Lyman+ 2016)

Remote locations preferred

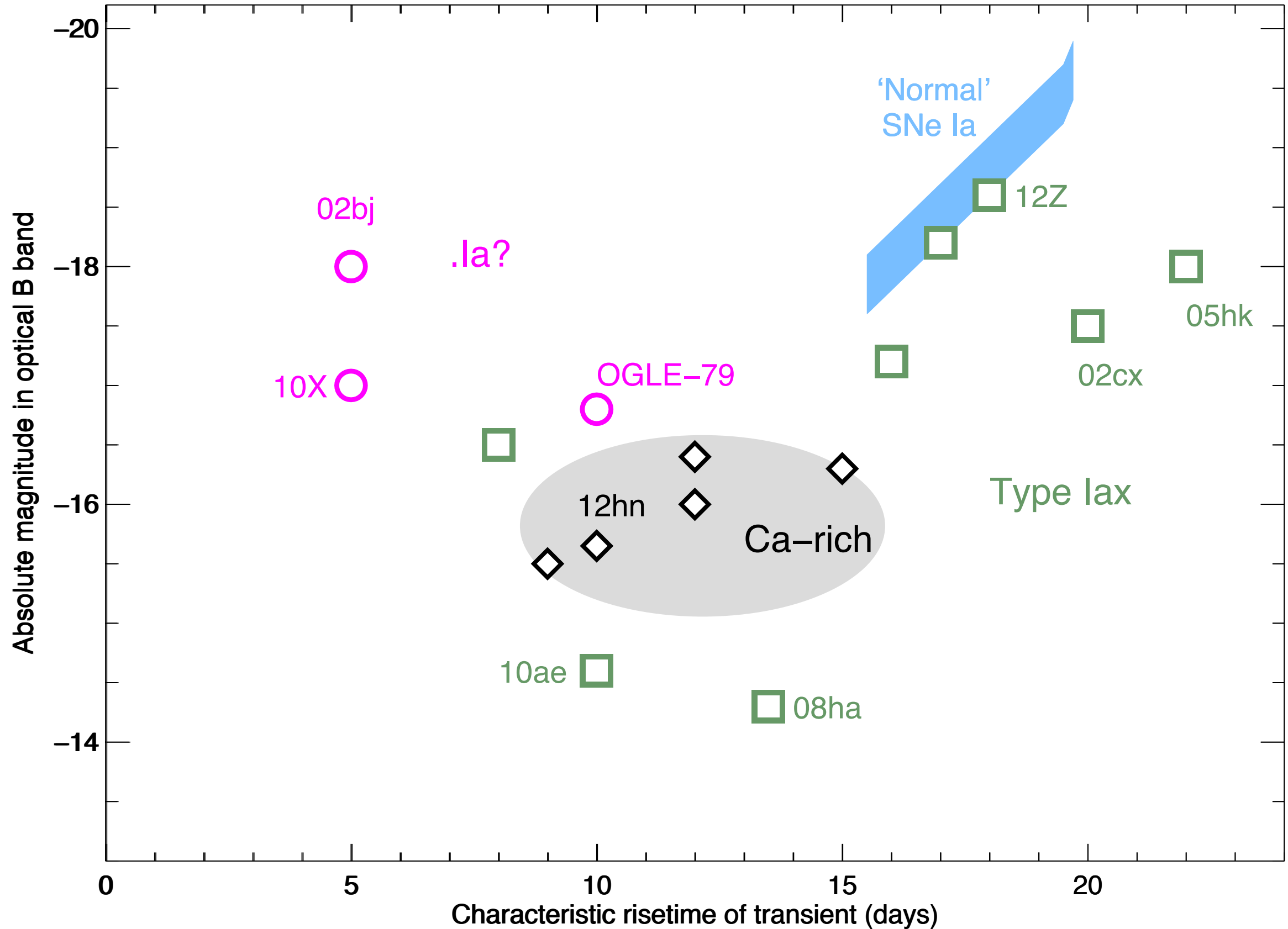


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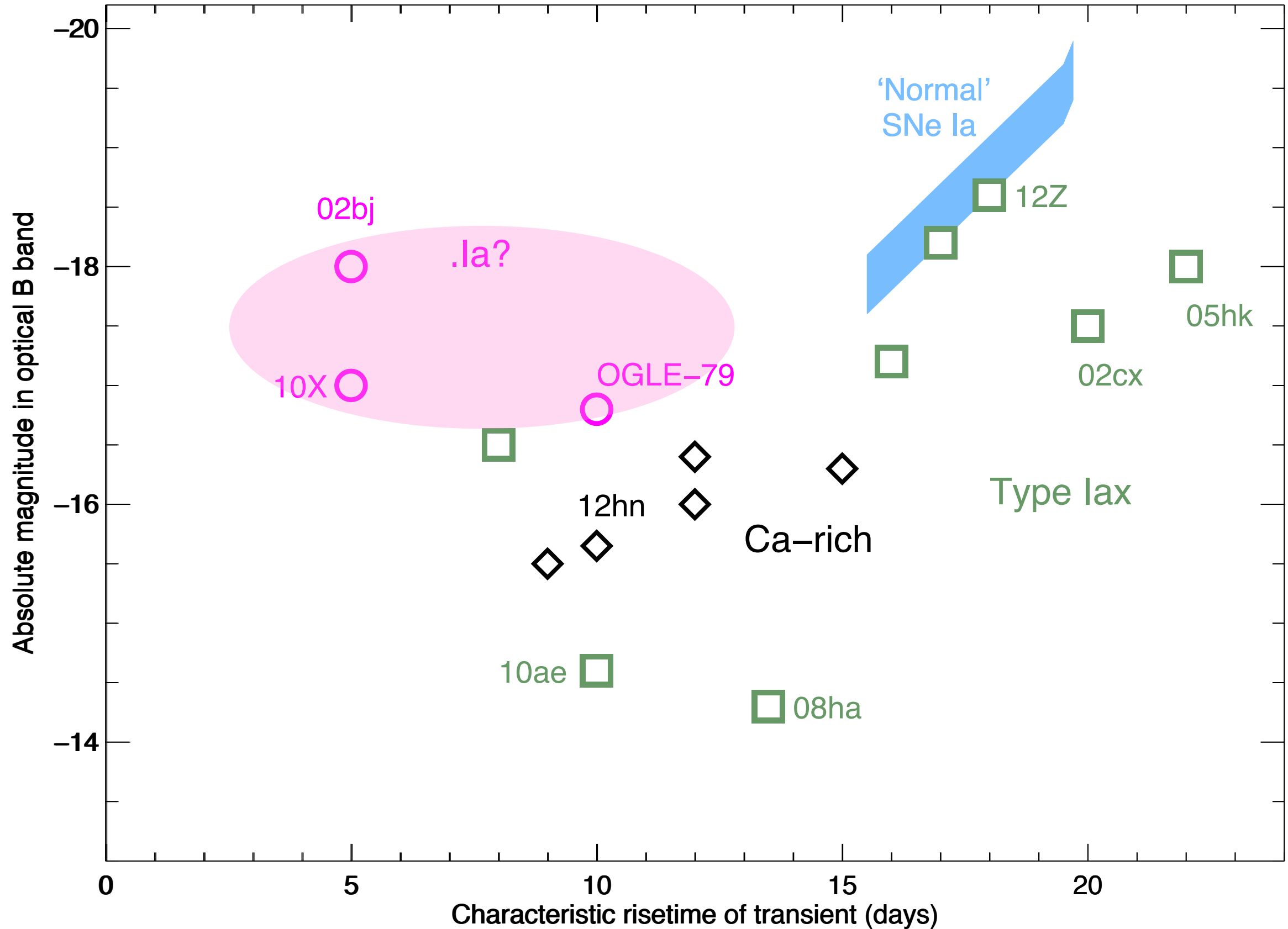
- Tidal disruption of white dwarf + IMBH?
- SN 2012hn - no X-ray detection (Sell+ 2015)



White dwarf transients

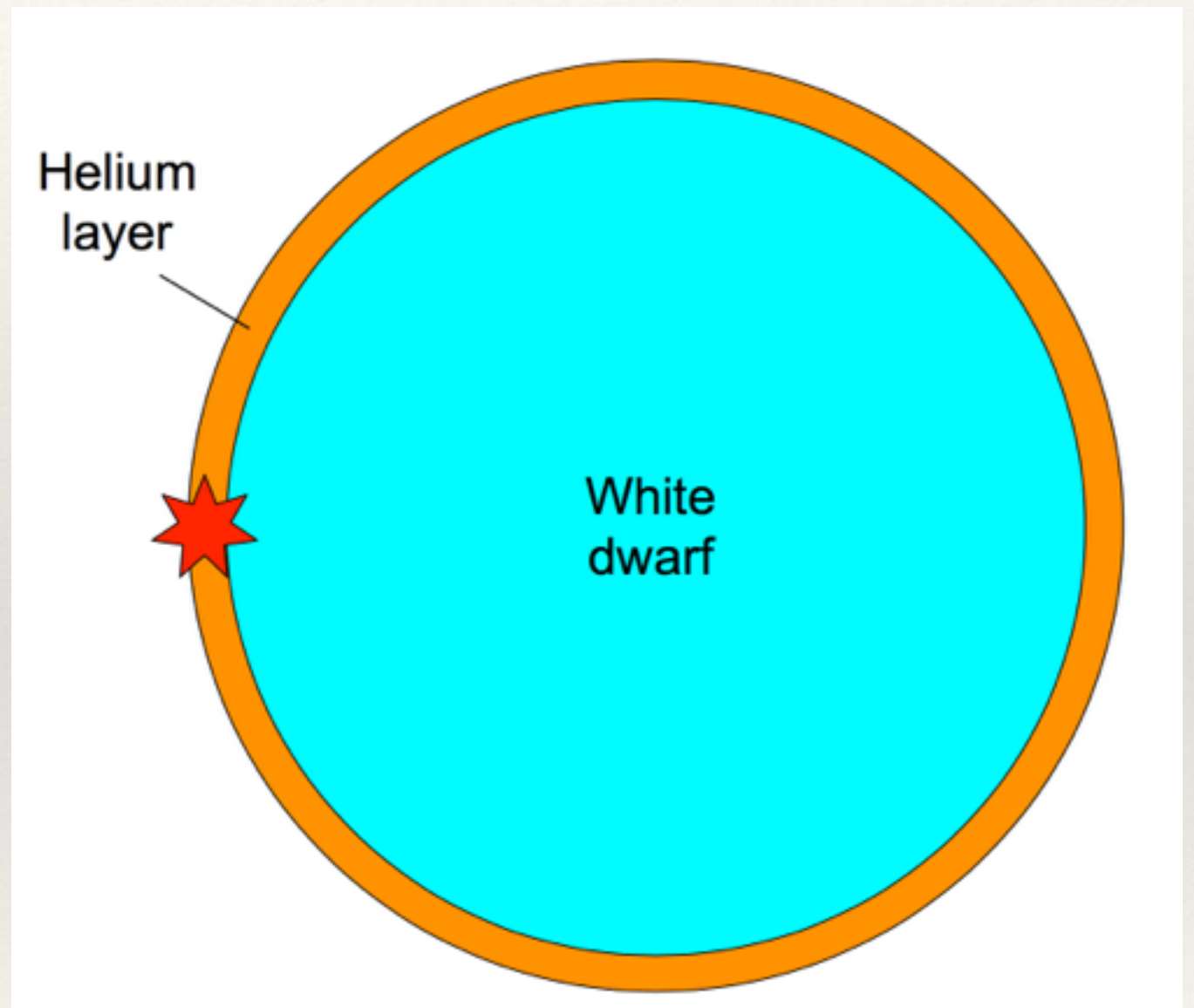


White dwarf transients

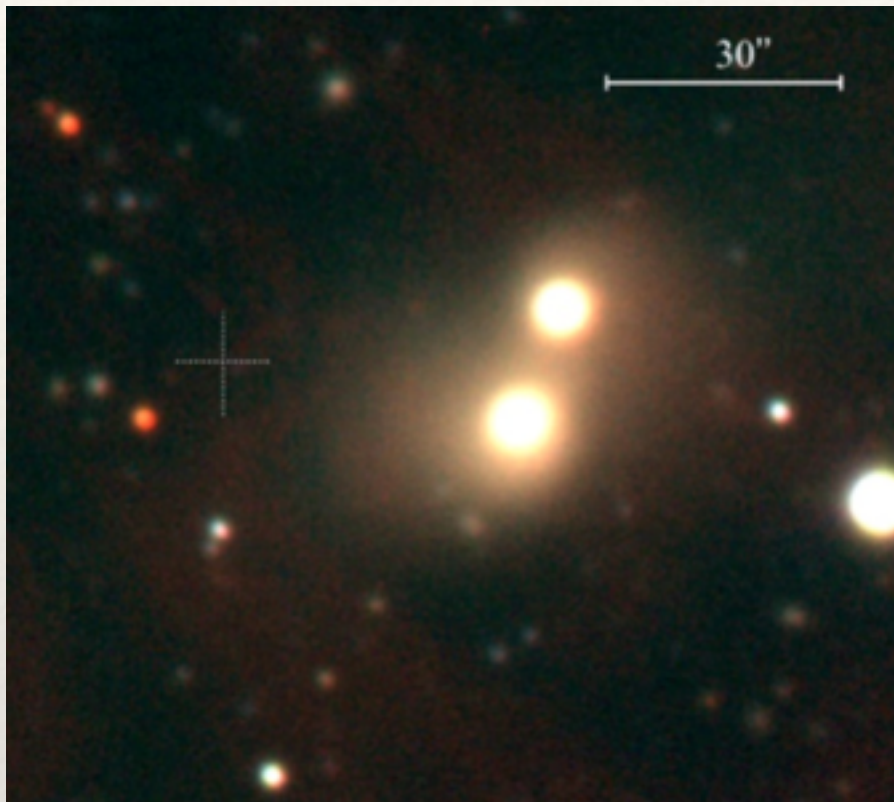


He-shell detonations on white dwarfs

- (point) .Ia SNe
- Bildsten+ (2007), Shen & Bildsten (2009), Shen & Moore (2014)
- Faint and fast transients with Titanium-rich spectra
- Helium not visible

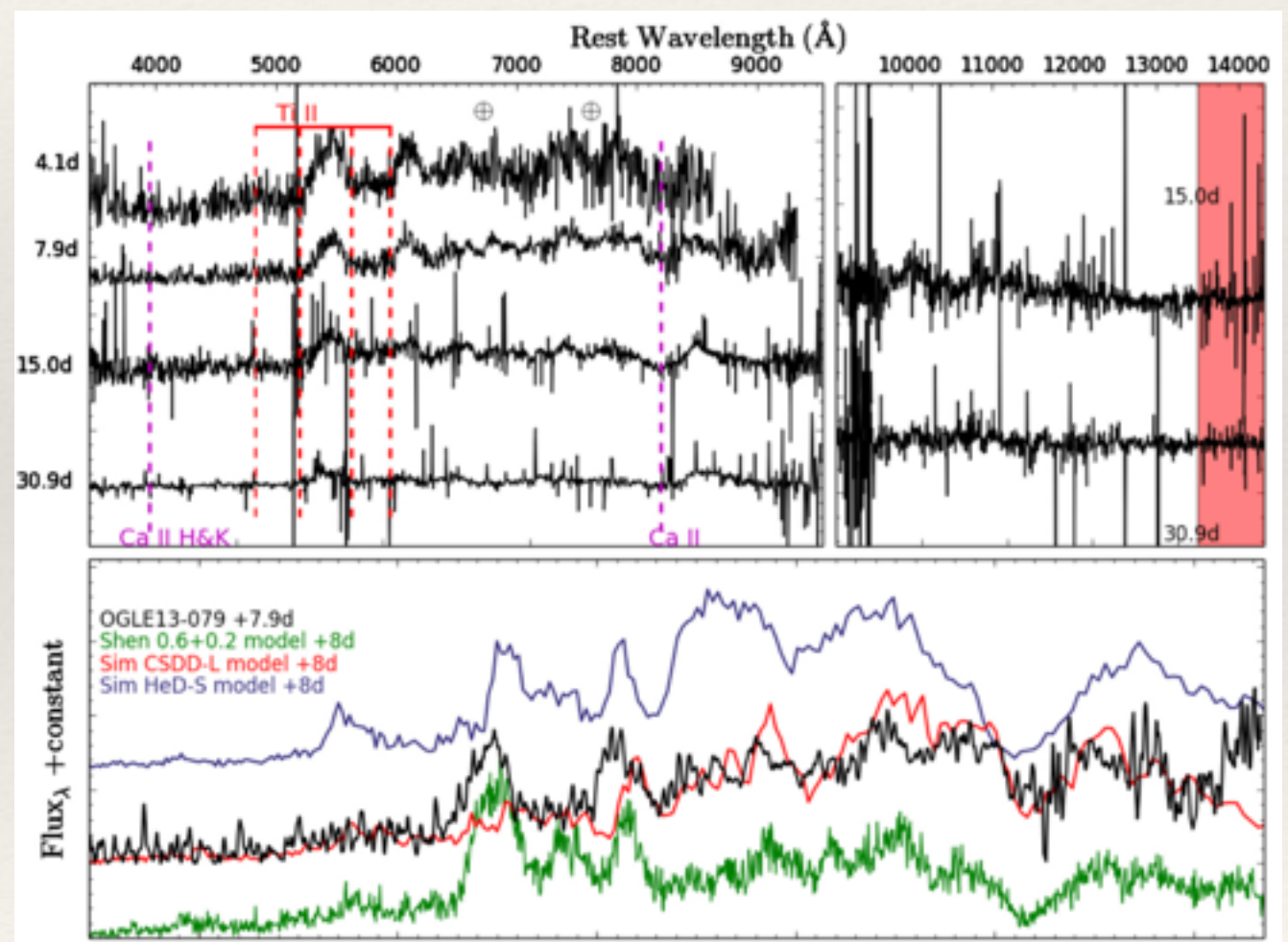


OGLE-2013-SN-079 - a .Ia?



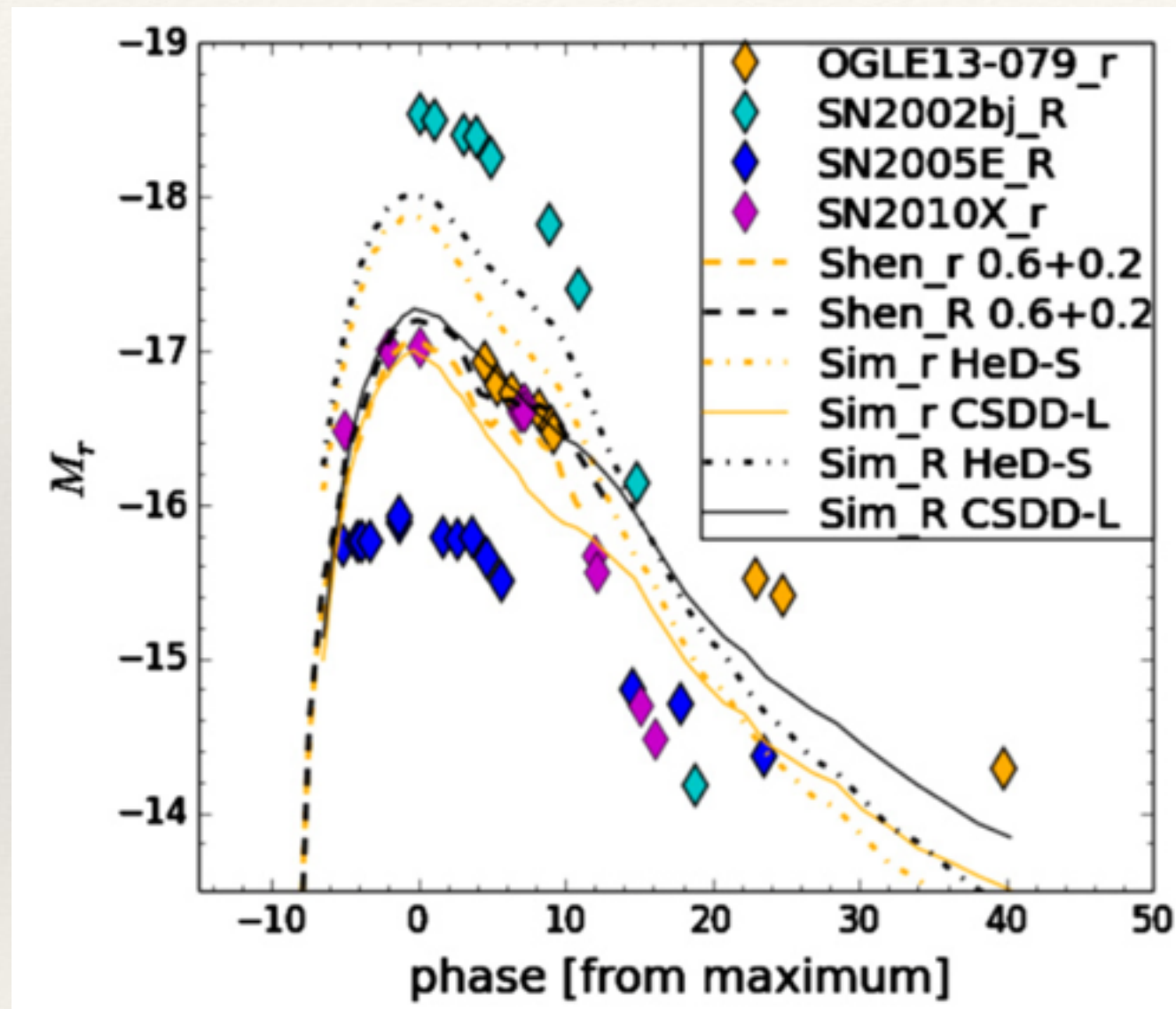
- Offset from $z=0.07$ elliptical galaxy

- Strong Titanium features
- Good match to Helium-shell detonations / double-detonations



Inserra+ (2015)

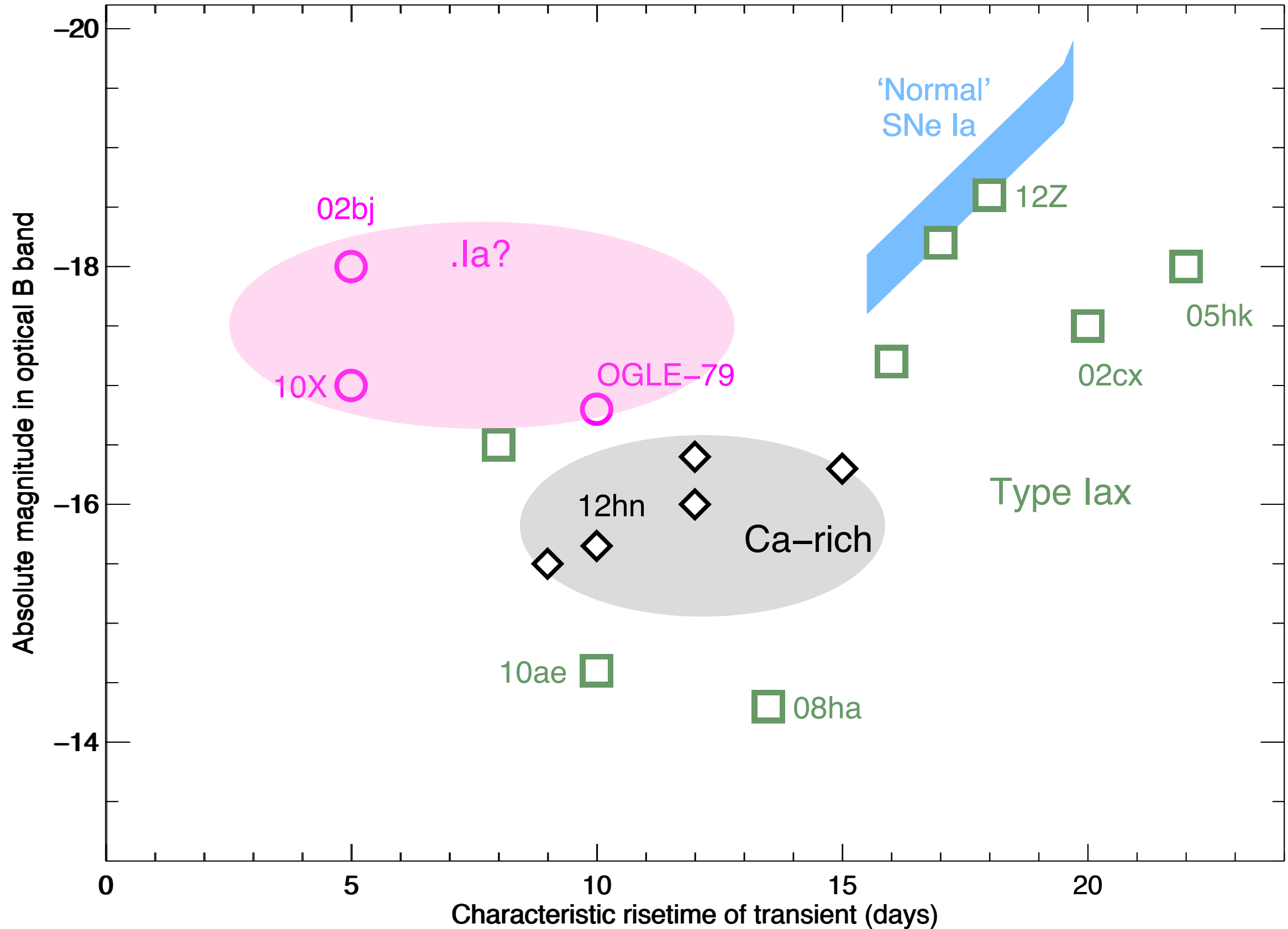
Even faster: 2010X, 2002bj



- Not as good matches to models
- Possible Helium signatures
- Could have massive star origin (Kleiser & Kasen 2014)

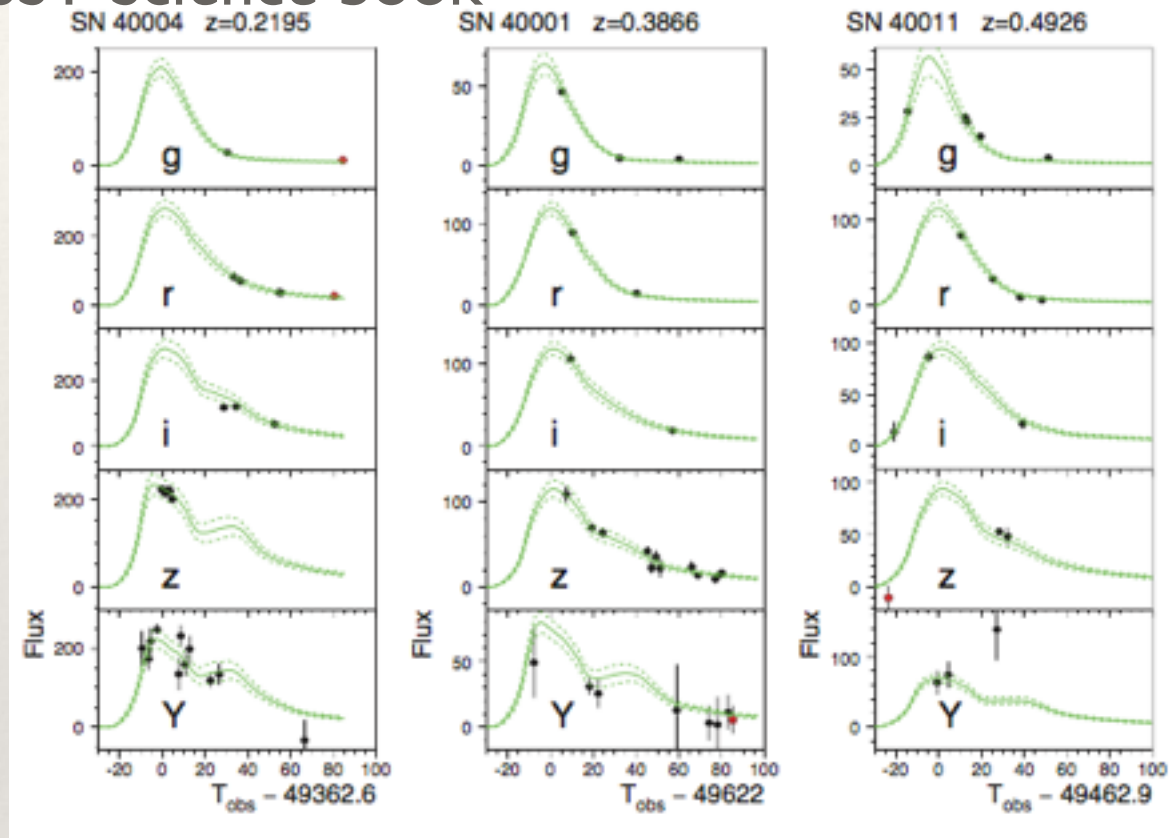
Inserra+ (2015)

White dwarf transients



Fast and faint with LSST

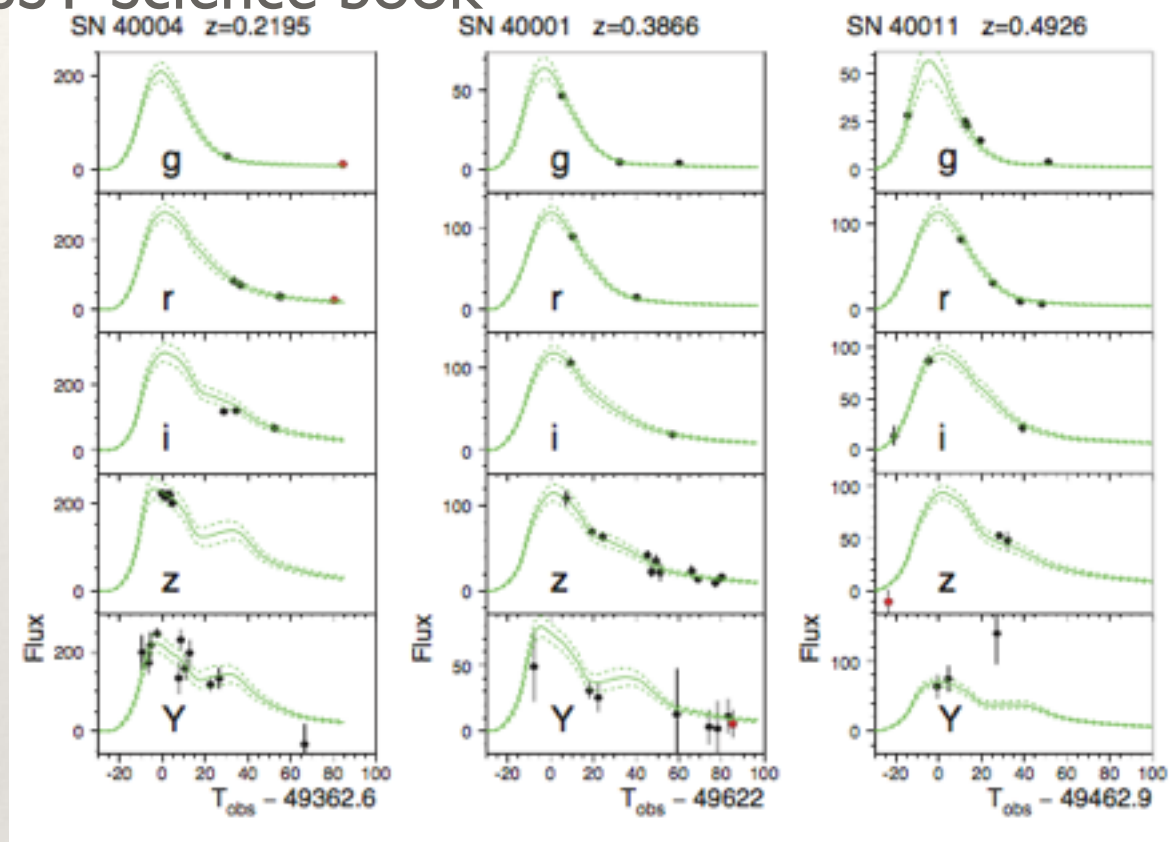
LSST Science book



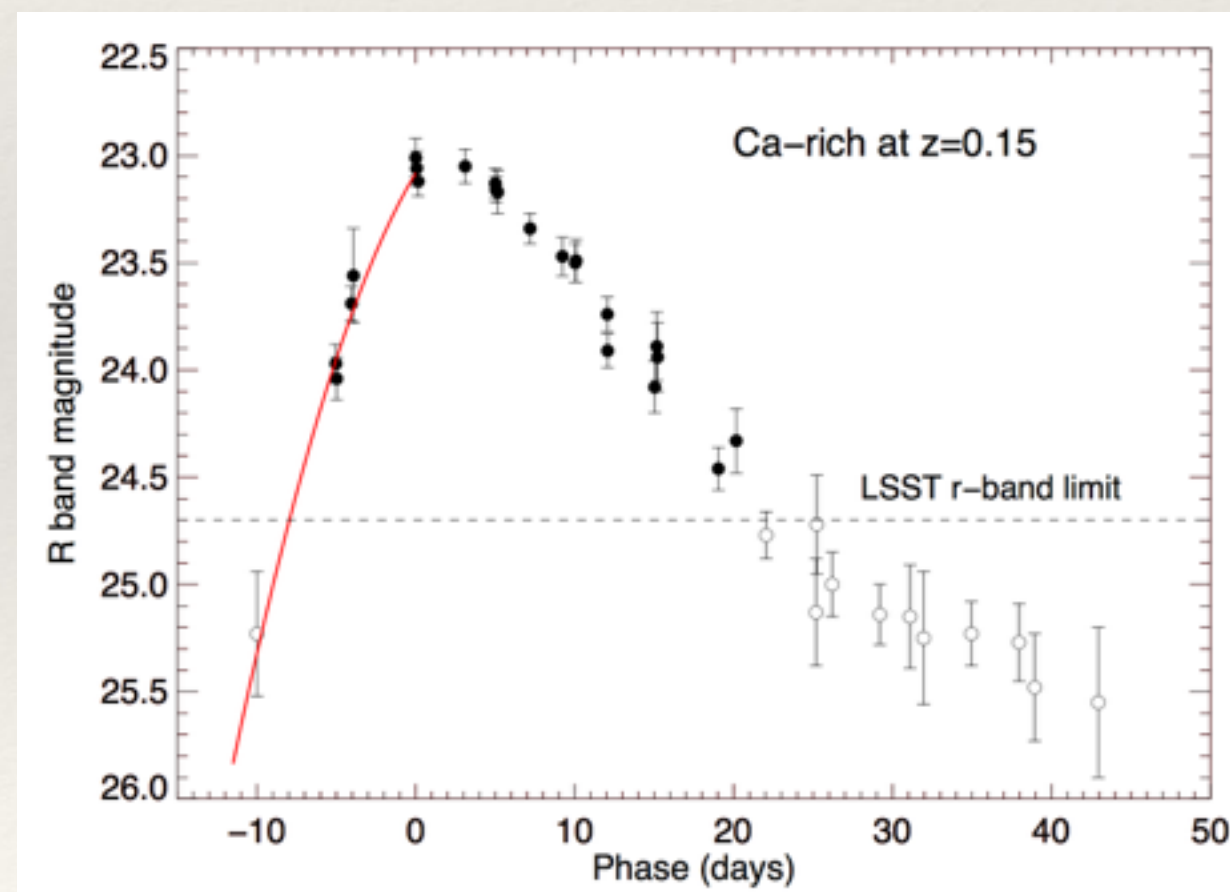
- Simulated baseline cadence light curves

Fast and faint with LSST

LSST Science book

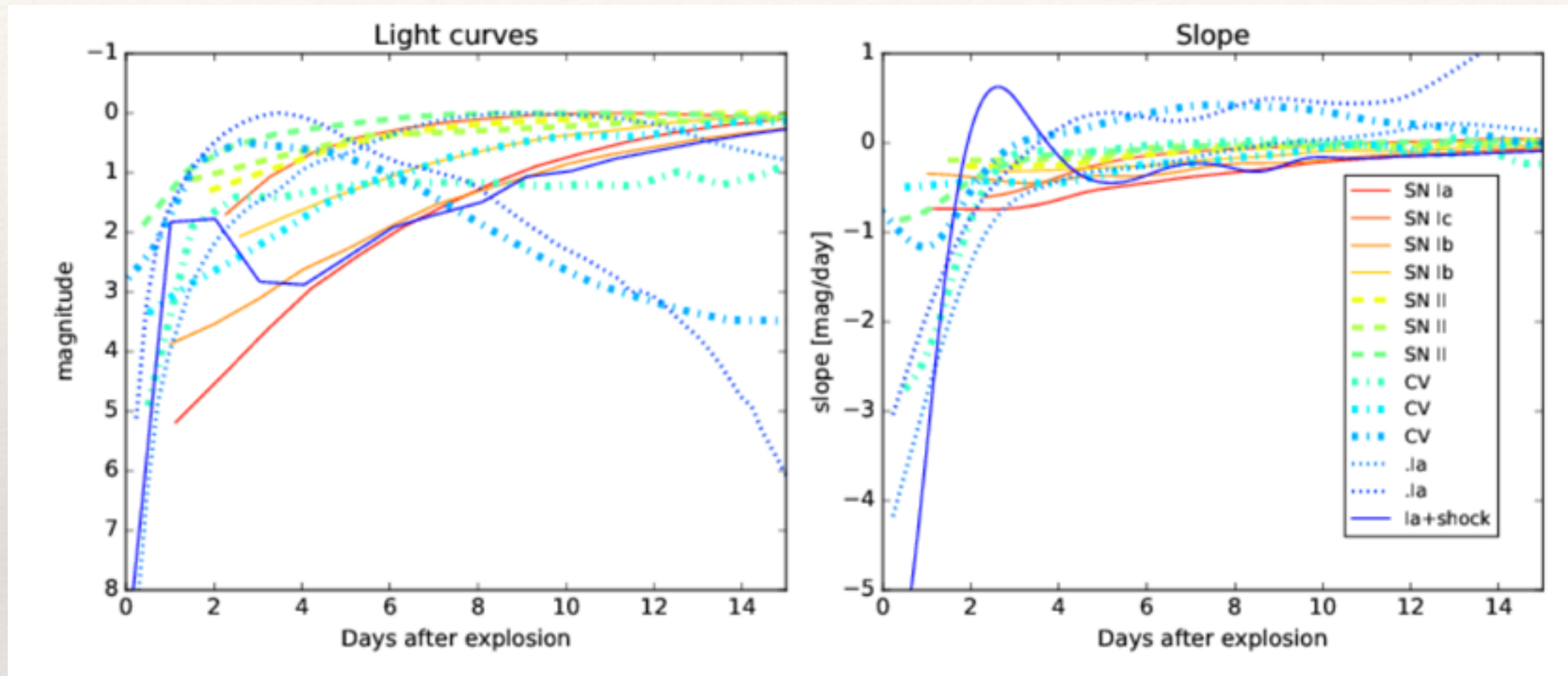


- Simulated baseline cadence light curves



- Average of -16 mag
- Volume surveyed out to $z=0.15$
- Spectroscopic classification
- Visible for 8 days on rise, 2-3 points

Fast and faint with LSST



LSST observing strategy white paper
- Valenti & Bianco

- Difficulty in distinguishing these transients
- Colour provides additional constraints

Summary & open questions

- LSST is ideal for faint events - single visit depth of ~25 mag in blue bands
- Baseline cadence is less ideal for fast transients
- Large volume surveyed
- Distinguishing light curves at early times essential