Carnegie Supernova Project II: Summary

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The Carnegie Supernova Project I (CSP I)

- Five 9-month campaigns between 2004-2009

- Follow-up optical (*ugriBV*) light curves obtained of 130 SNe Ia

- Near-IR (*YJH*) photometry obtained of 113 (87%) of these

- Light curves of 85 SNe Ia published to date

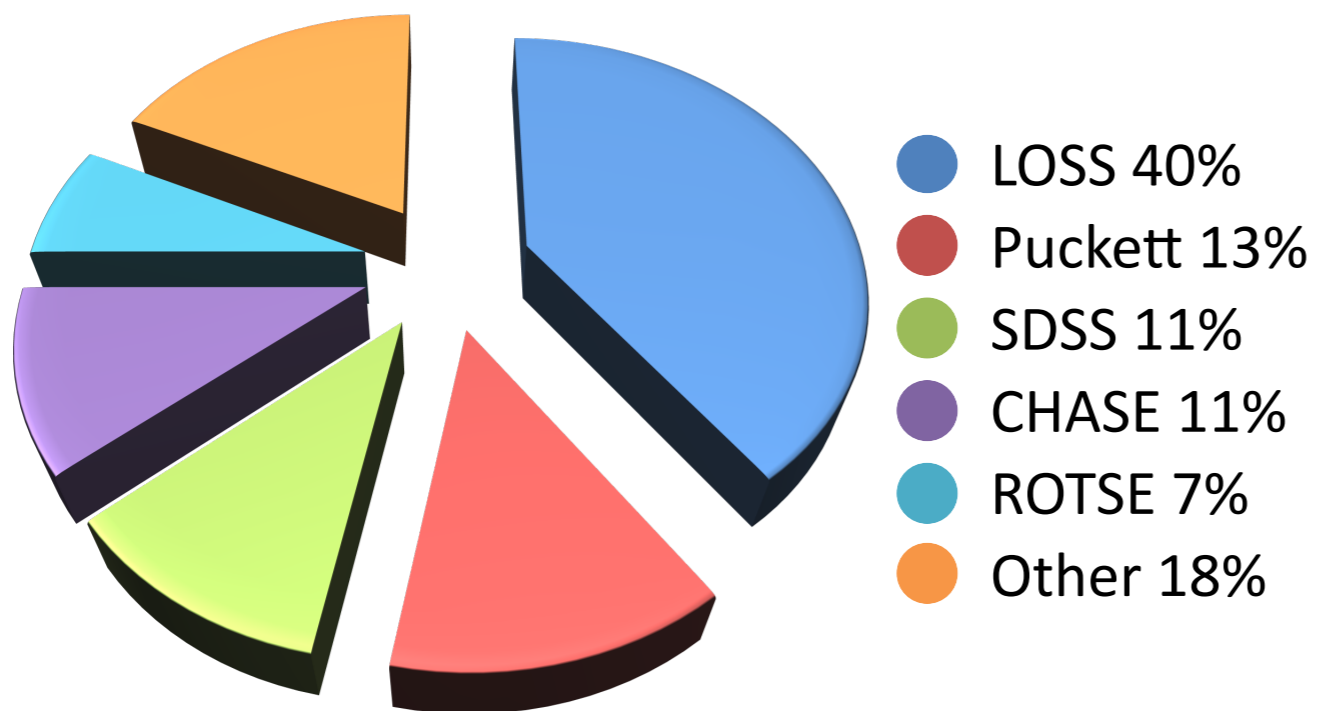- Light curves of remaining 45 SNe Ia to be submitted for publication by end of 2015
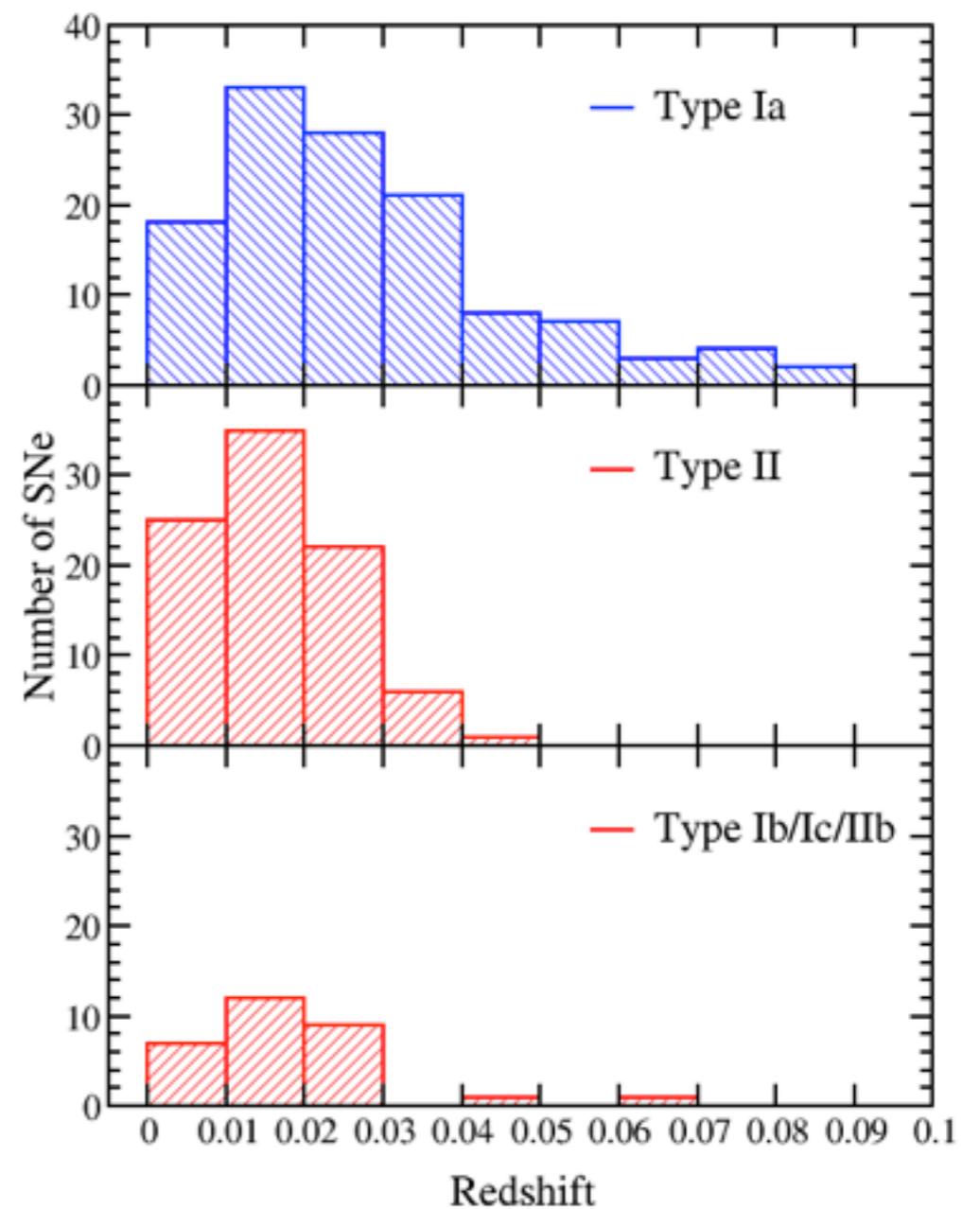

Swope 1-m

Du Pont 2.5-m

Magellan 6.5-m

CSP I Summary

# Observed	Ia	II	Ib/Ic/IIb	Total
	130	93	31	254

LOSS 40%
Puckett 13%
SDSS 11%
CHASE 11%
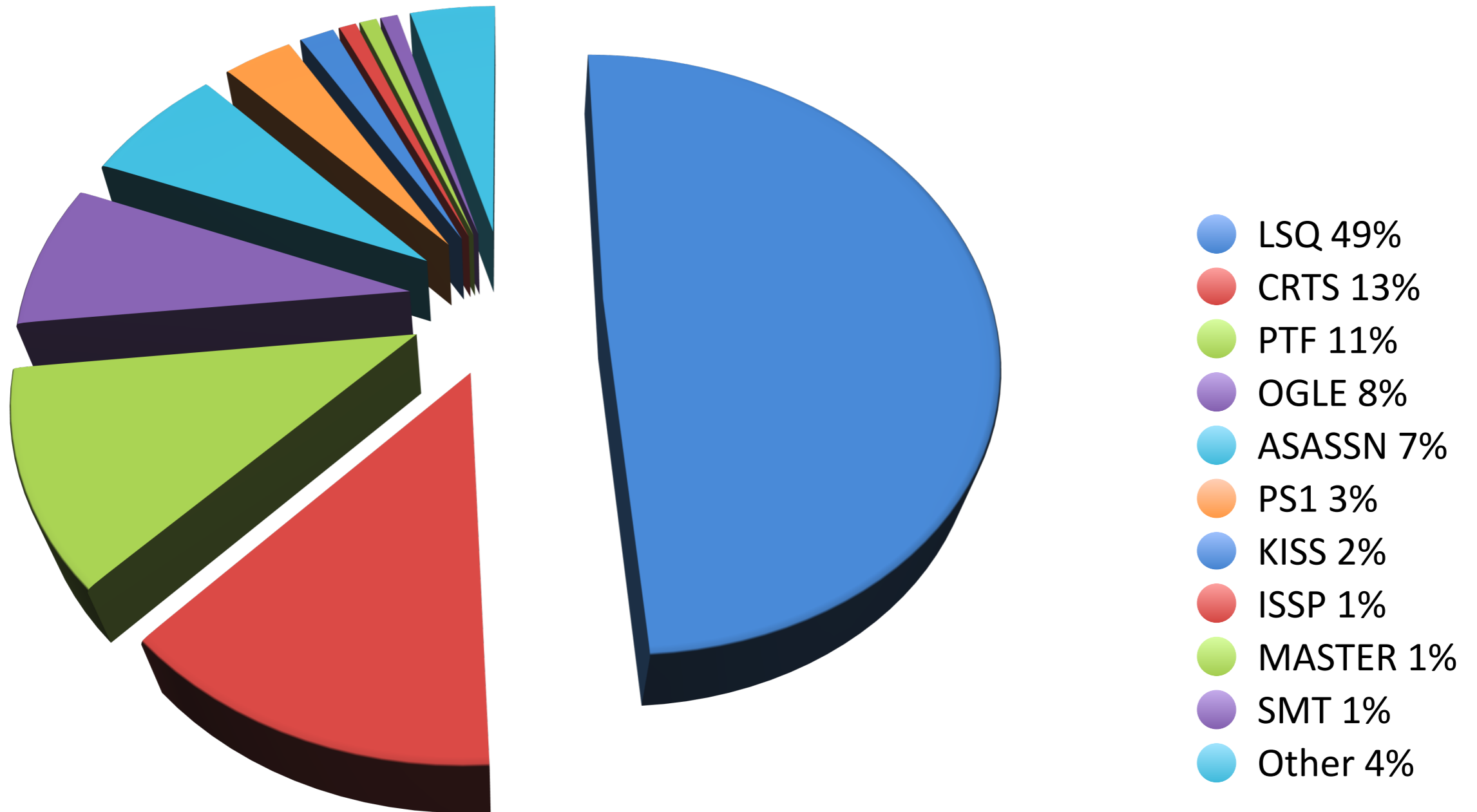ROTSE 7%
Other 18%

z_{median} of SNe Ia ~ 0.023

The Carnegie Supernova Project II (CSP II)

• In Nov 2011, we began a second stage of the CSP to obtain BV*riYJH* light curves of a sample of ~100 SNe Ia at $0.03 < z < 0.10$ using the du Pont 2.5 m and Swope 1.0 m telescopes

• The SNe were drawn from blind searches to minimize bias

• In a parallel effort, we also obtained near-IR spectroscopy of as many SNe Ia as possible; such data are crucial for minimizing errors due to K-corrections, and are also invaluable for insight into the explosion physics
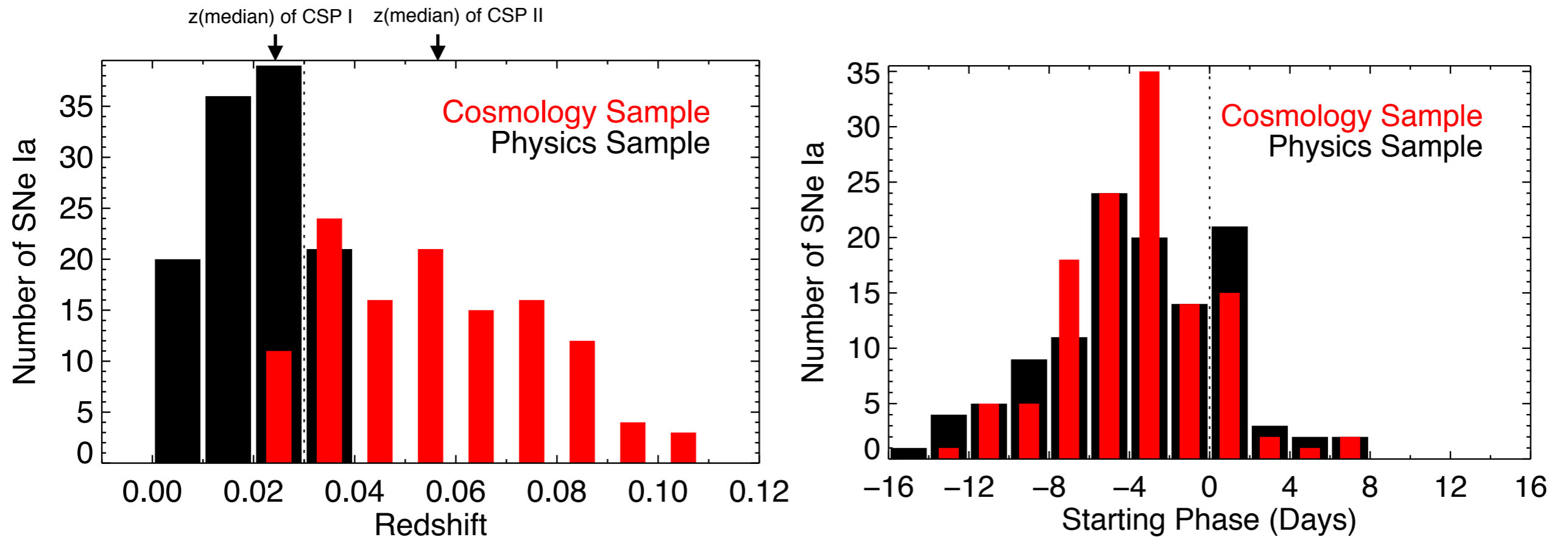

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The CSP II: SN Sources

- LSQ 49%
- CRTS 13%
- PTF 11%
- OGLE 8%
- ASASSN 7%
- PS1 3%
- KISS 2%
- ISSP 1%
- MASTER 1%
- SMT 1%
- Other 4%

96% from "blind" searches

# The CSP II: "Cosmology" and "Physics Samples

- "Cosmology" sample consists of 116 young SN Ia in the desired redshift range of 0.03 < z < 0.10

- z(median) = 0.056 for "Cosmology" sample → Peculiar velocities are 1-2% of recession velocity

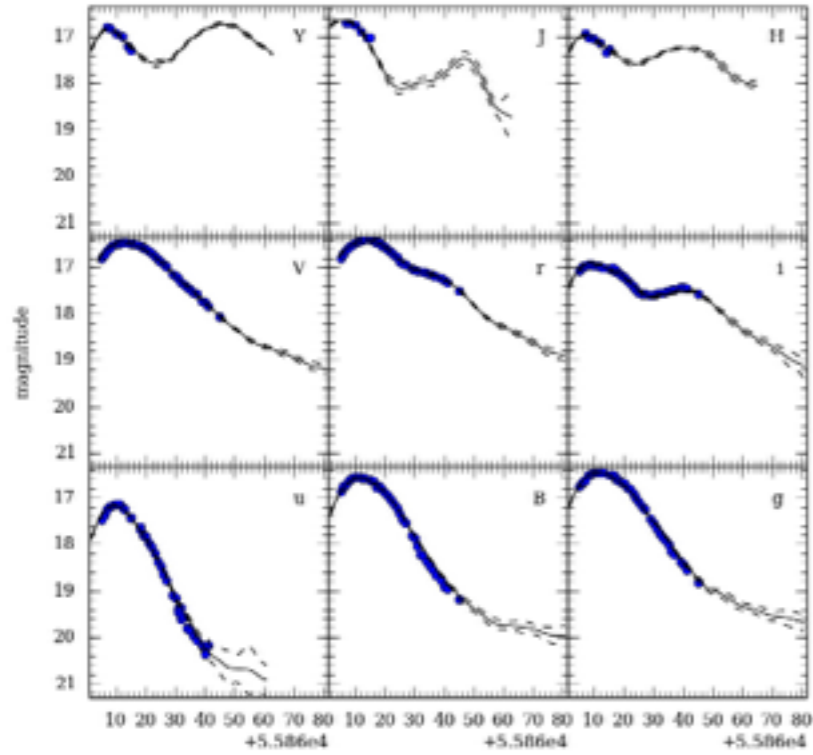- "Physics" sample composed of 111 nearby SNe Ia at z ≤ 0.04 for detailed NIR spectroscopic time-series observations

"Cosmology" Sample: Optical and Near-IR Coverage

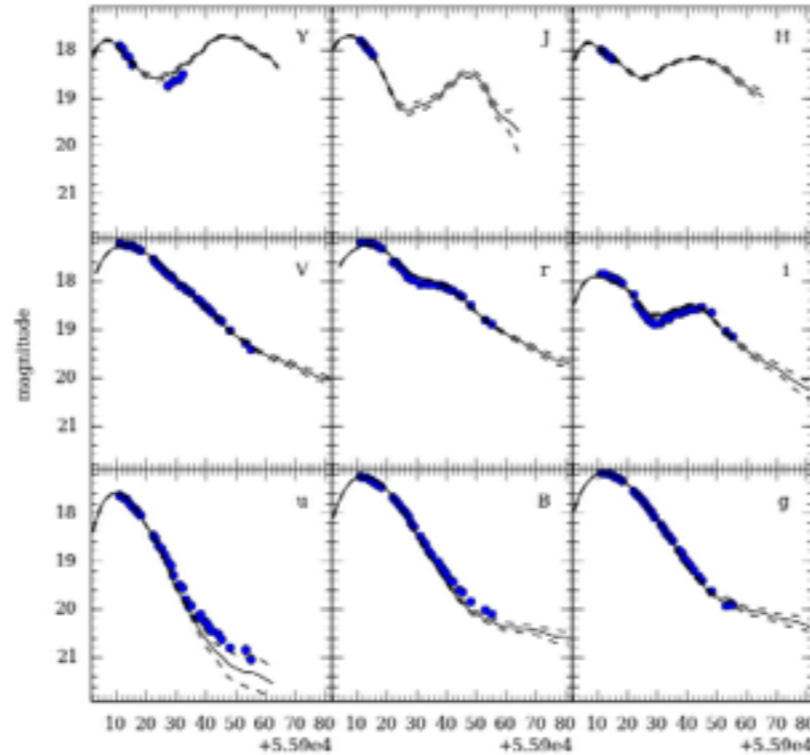|	Median
Optical Coverage	*-4 to +41*
Near-IR Coverage	*-2 to +10*

CSP-II: 116 SNe Ia
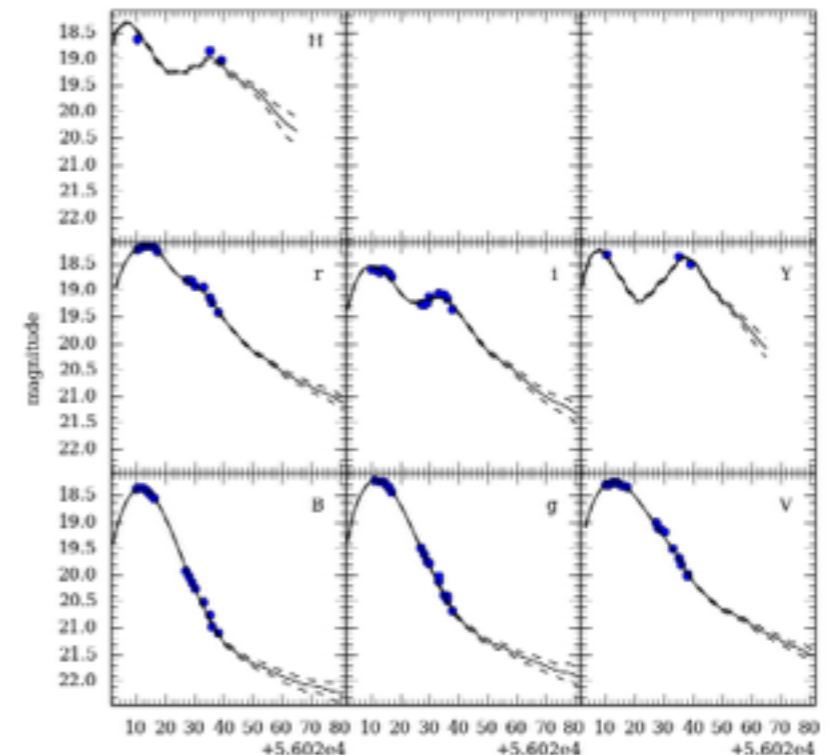
— Optical
■ Near-IR

$t - t_{B_{max}}$
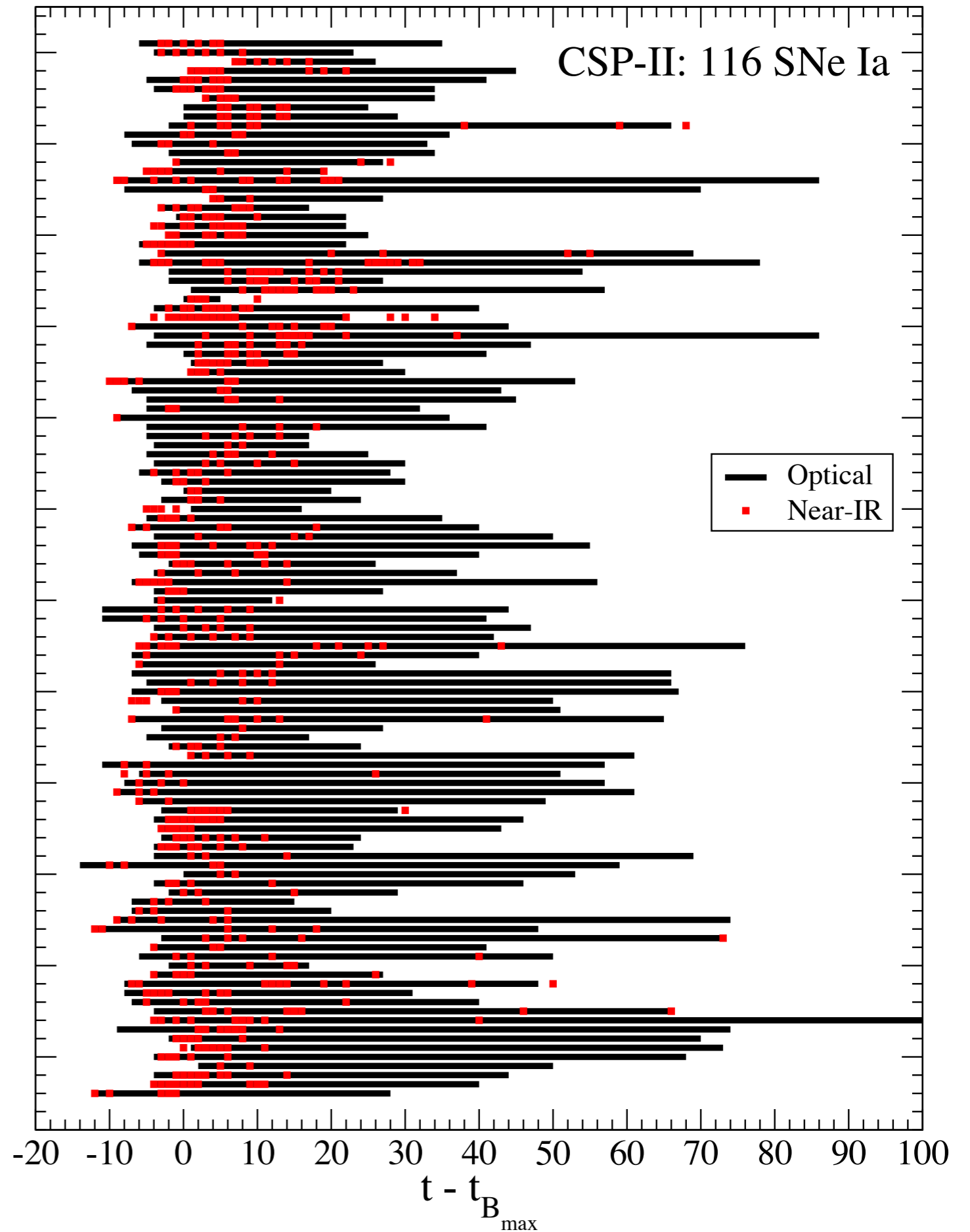
CSP II: Sample Light Curves

PTF11pbp (z = 0.028)
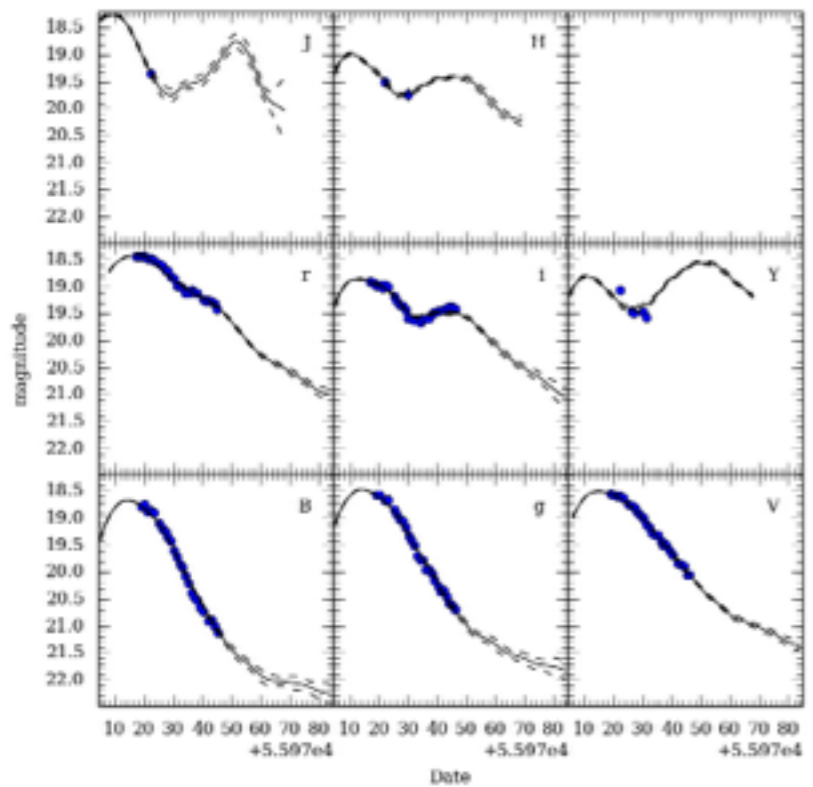
LSQ11bk (z = 0.040)
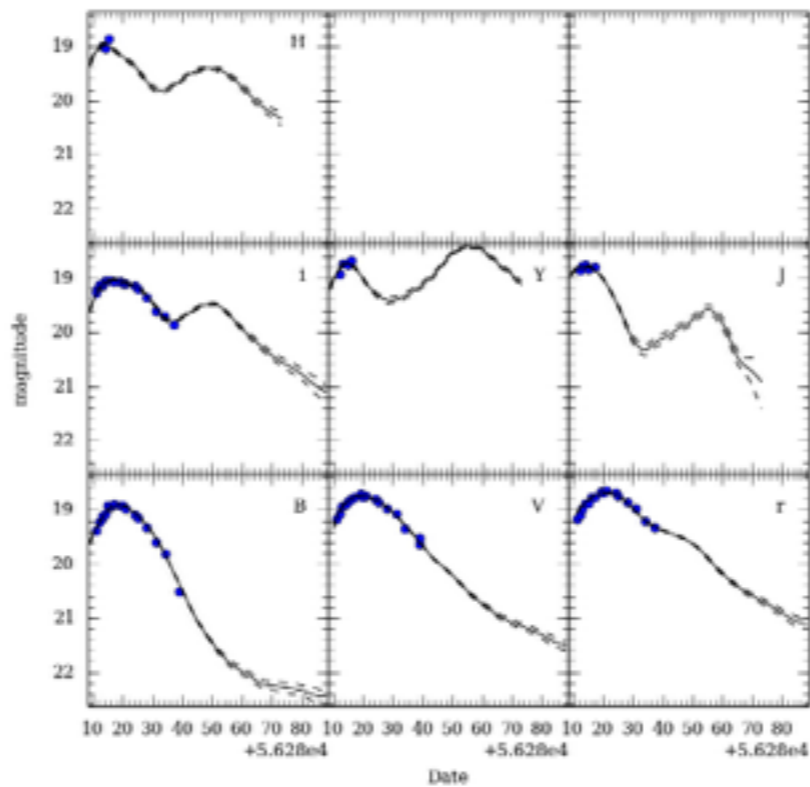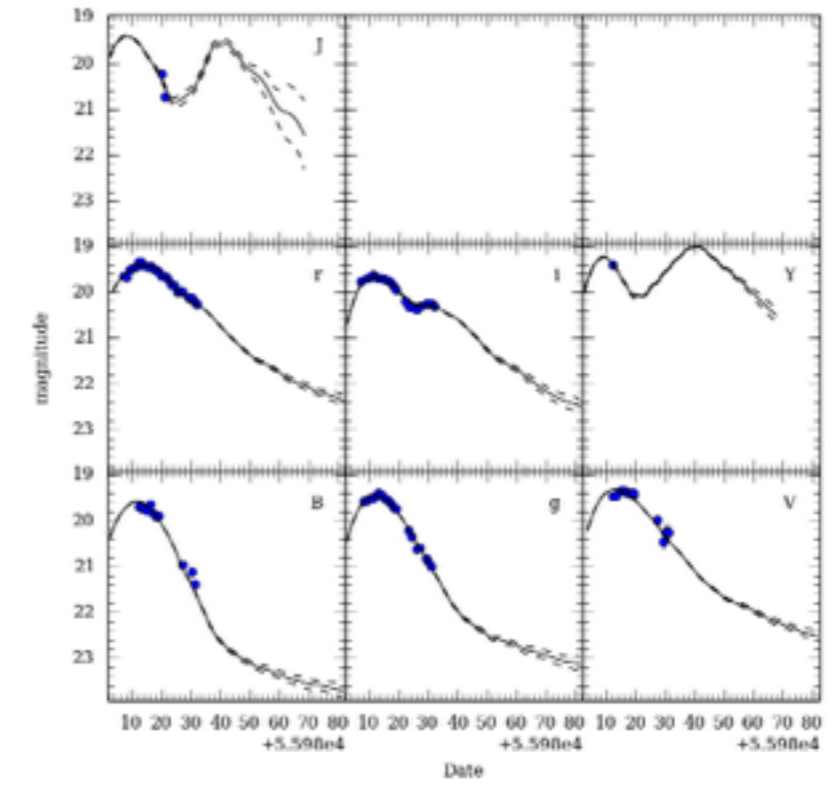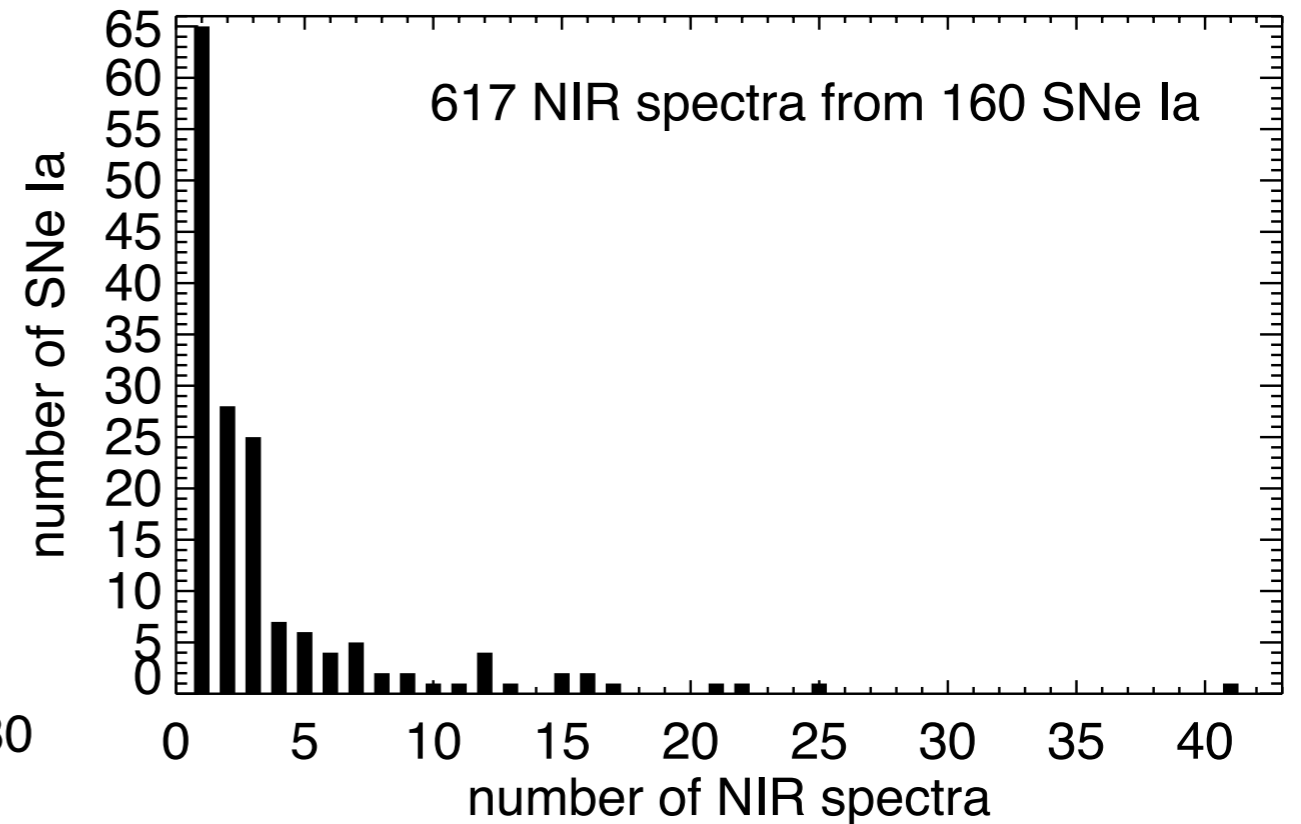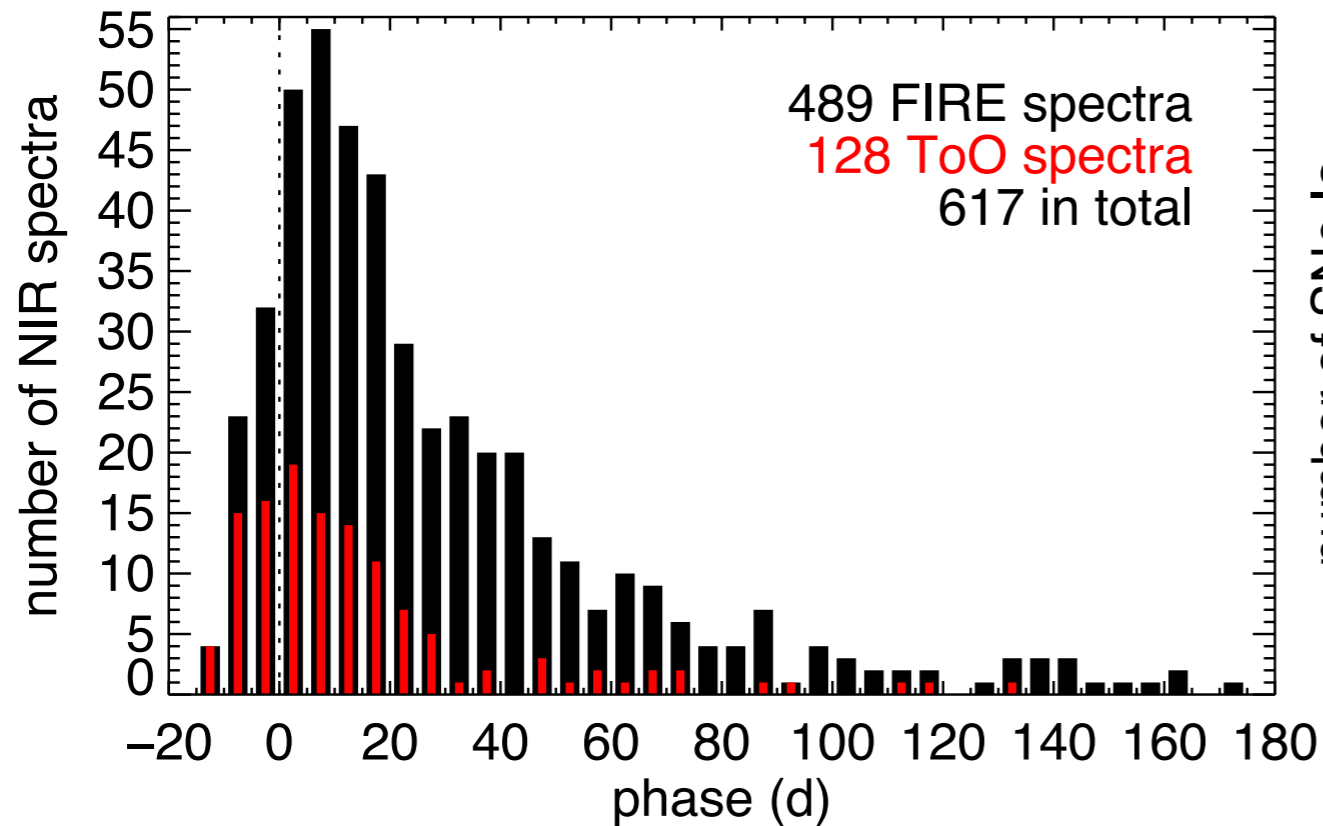
LSQ12btn (z = 0.055)

LSQ12agq (z = 0.065)

LSQ12hzs (z = 0.072)

LSQ12aor (z = 0.095)

# Near-IR Spectroscopy

489 FIRE spectra
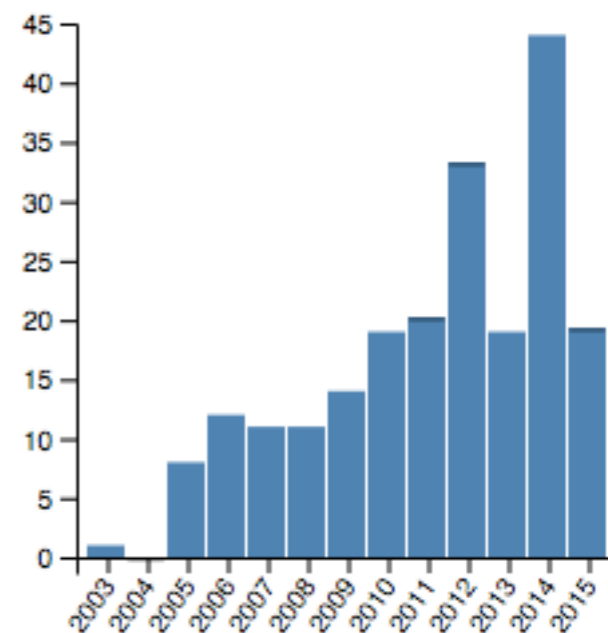128 ToO spectra
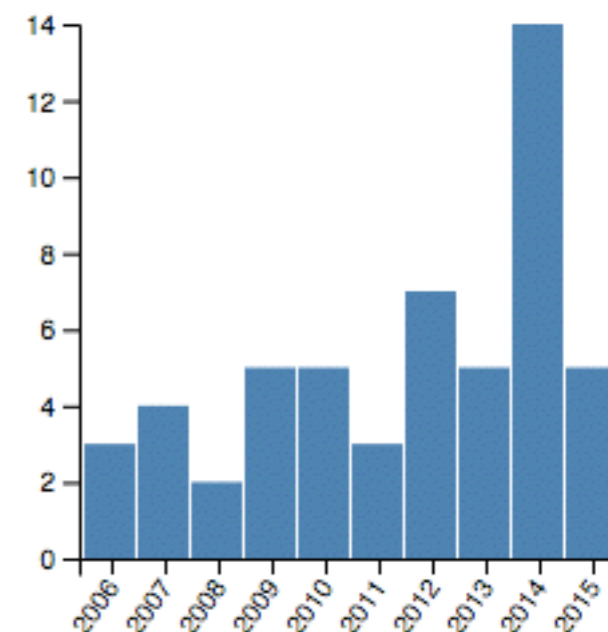617 in total

617 NIR spectra from 160 SNe Ia

• In collaboration with CfA group (Marion, Kirshner) and Dave Sand

• FIRE is the workhorse instrument, but ToO spectra obtained with IRTF and Gemini-N have helped to improve the statistics at maximum and pre-maximum

• Sample is 15 times larger than the previous largest sample from Marion et al. (2009)

Near-IR Spectroscopy

Hsiao et al. (2015)
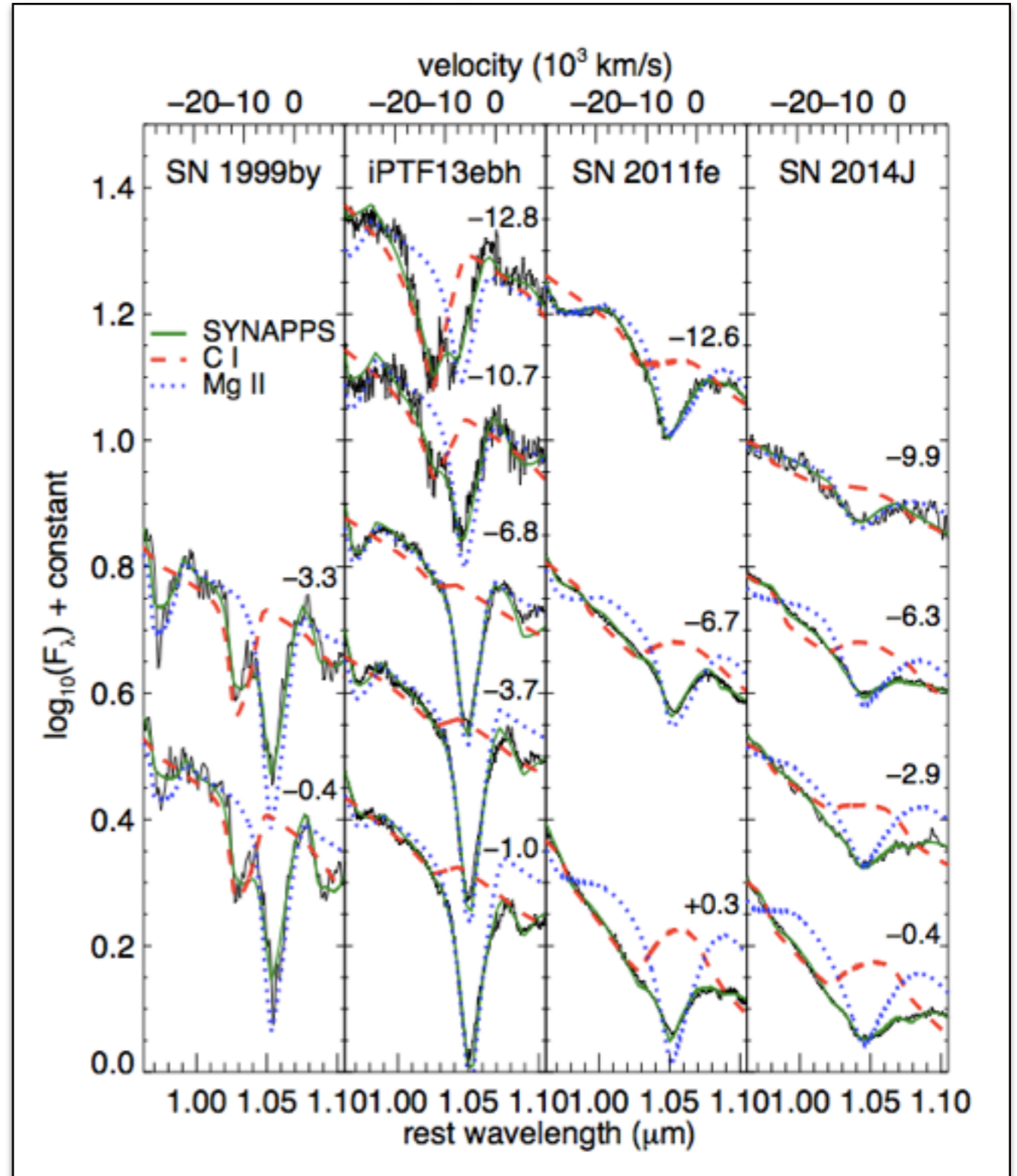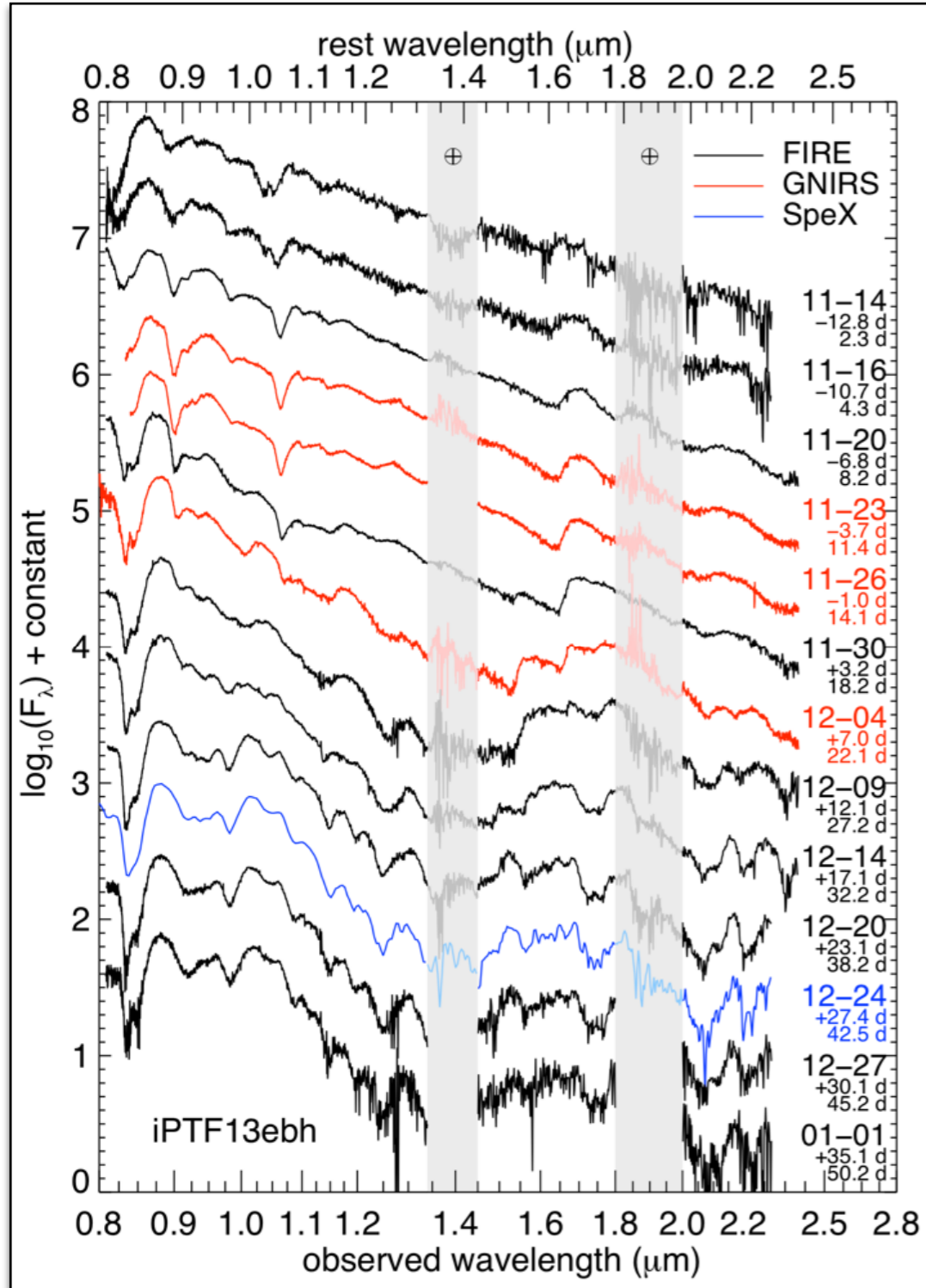
Publications

- ~53 papers generated by the CSP collaboration

- Most cited are:

  - Folatelli et al. (2010) "The Carnegie Supernova Project: Analysis of the First Sample of Low-Redshift Type-Ia Supernovae [148 citations]

  - Hamuy et al. (2006) "The Carnegie Supernova Project: The Low-Redshift Survey" [131 citations]

  - Hsiao et al. (2007) "K-Corrections and Spectral Templates of Type Ia Supernovae" [130 citations]

  - Phillips et al. (2007) "The Peculiar SN 2005hk: Do Some Type Ia Supernovae Explode as Deflagrations?" [119 citations]

  - Contreras et al. (2010) "The Carnegie Supernova Project: First Photometry Data Release of Low-Redshift Type Ia Supernovae" [105 citations]

- 211 publications mention explicitly the CSP

  - ~100 non-CSP collaboration publications make use of CSP data

Fin