Carnegie Supernova Project II

Carlos Contreras on behalf of CSP Team

CSP-II

‣ We started a second stage of the CSP with the goal of producing optical and NIR light curves of 100 SNe Ia in the redshift range $0.03<z<0.08$, thereby reducing the rms error due to peculiar motions to ± 2% in distance.
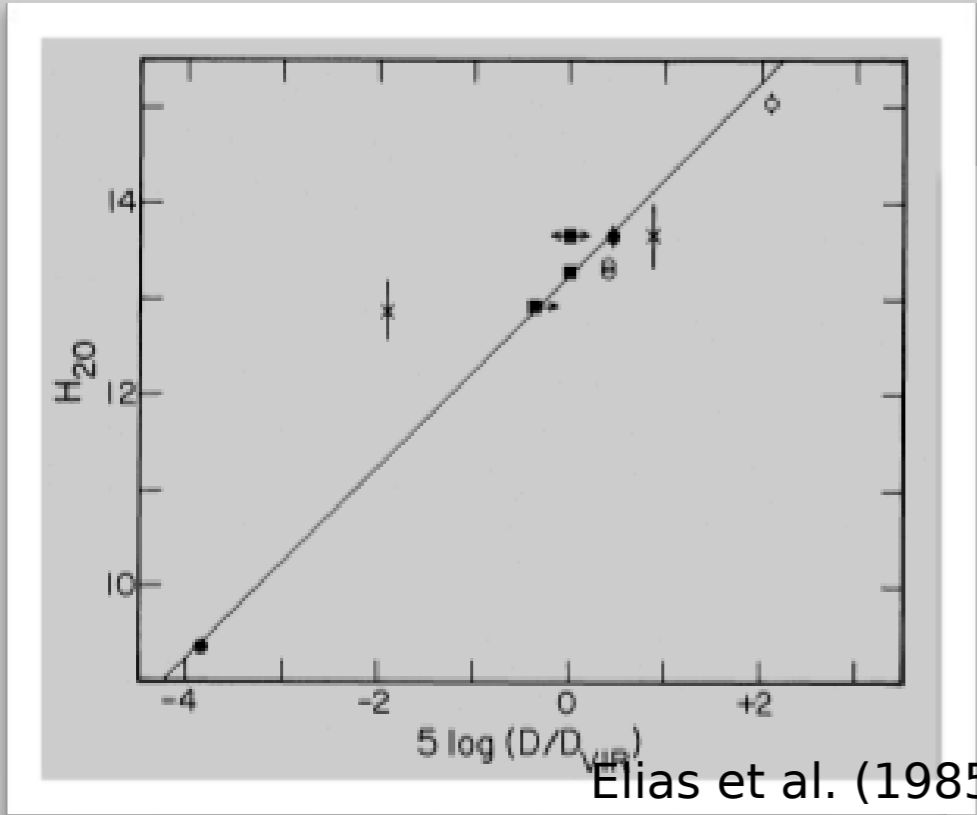
‣ NSF-funded for 5 years

Why NIR?

- ‣ cosmological utility
  - ‣ small dust/color corrections (~5x smaller)
  - ‣ small intrinsic dispersion (~0.1 mag)
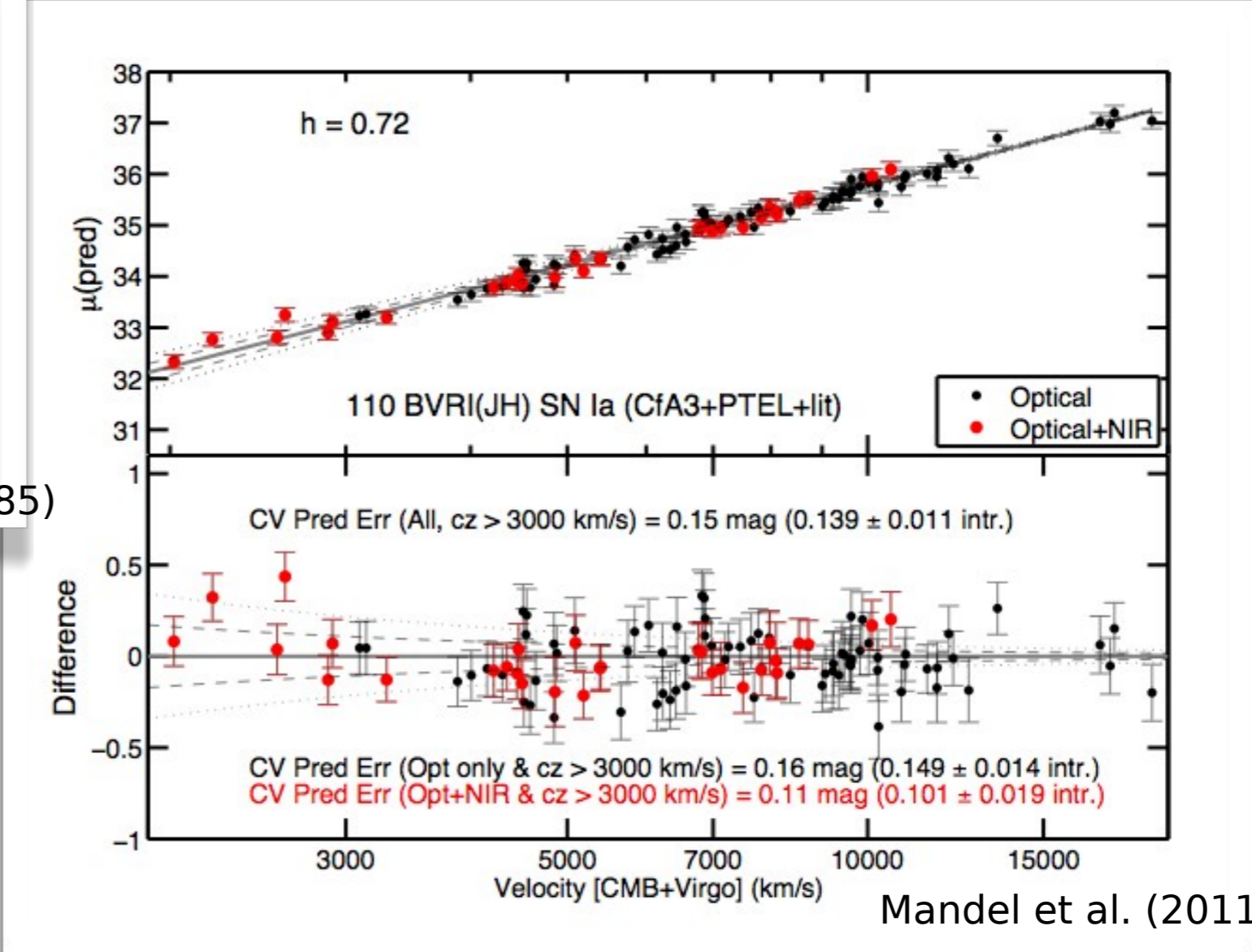- ‣ long baseline for host studies
- ‣ physical diagnostics

cosmological utility

Phillips (2005)

Kasen (2006)
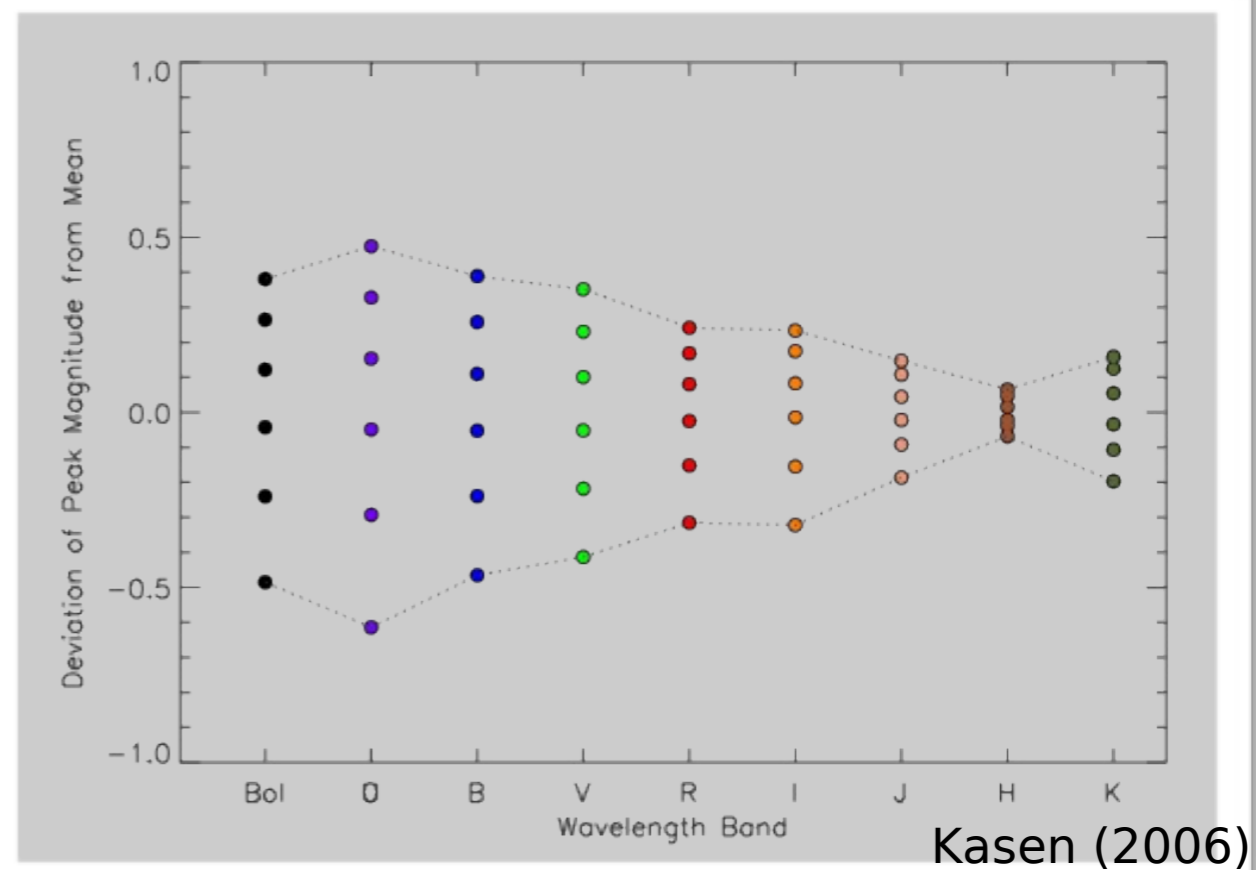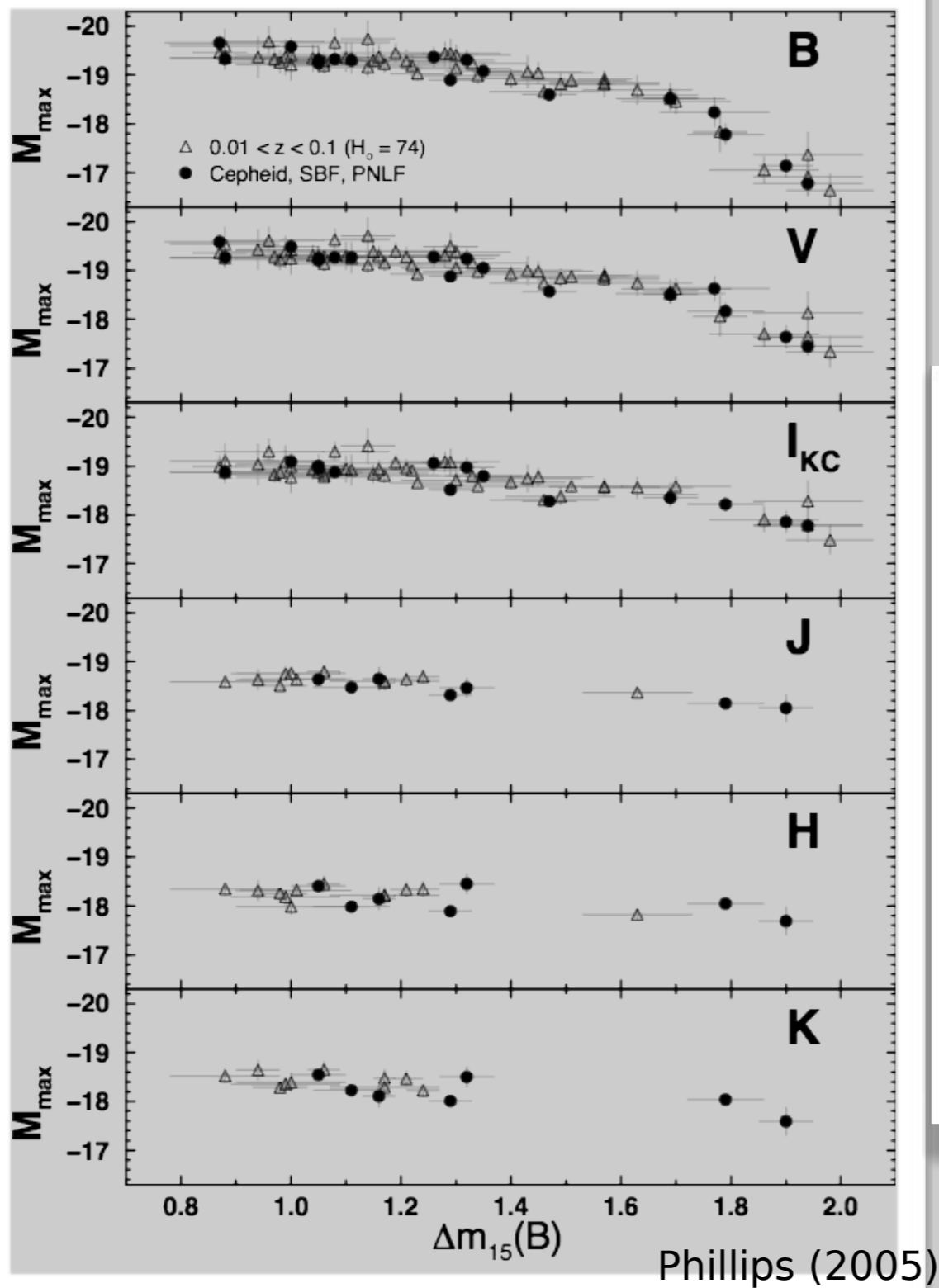
cosmological utility

Elias et al. (1985)

Mandel et al. (2011)

physical diagnostics

- ‣ i band/NIR secondary maximum
  - ‣ degree of Ni^{56} mixing
  - ‣ amount of iron-peak elements
  - ‣ metallicity effect on luminosity
  - ‣ ionization evolution
- ‣ NIR spectra
  - ‣ transition between deflagration/detonation
  - ‣ progenitor metallicity indicator
  - ‣ probe core of synthesized material
  - ‣ probe unburned material

what can we do better than CSP-I?

▸ democratic search

▸ routinely catch NIR primary maximum

▸ lower peculiar velocity error

▸ improve K-correction

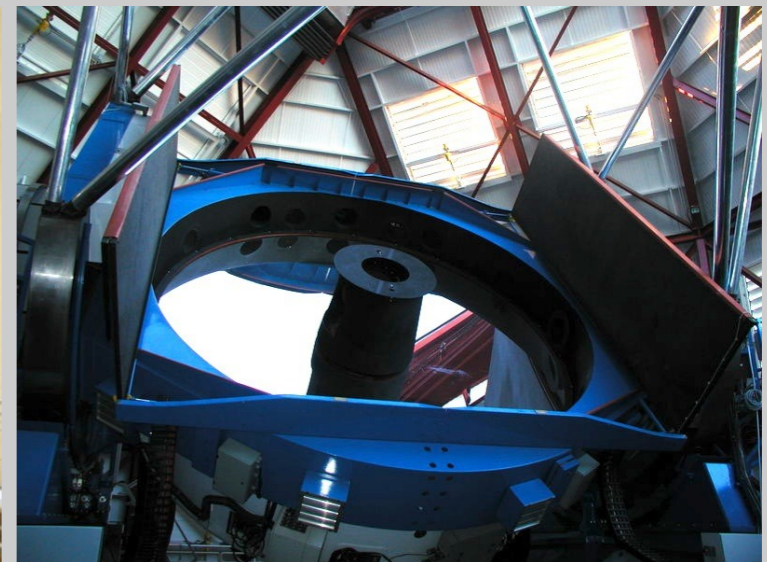▸ examine NIR dependence on host properties

observing strategy

- ‣ 5 years, ~150 SNe Ia in total, 5 SNe/month

- ‣ each year: 6 months centered on summer (75% photometric nights)

- ‣ each month at the end of dark run:

  - ‣ 1 night of spec screening
  - ‣ 6 nights YJH imaging: 2.5-m du Pont+RetroCam
  - ‣ nightly uBVgri imaging: 1-m Swope+e2v CCD
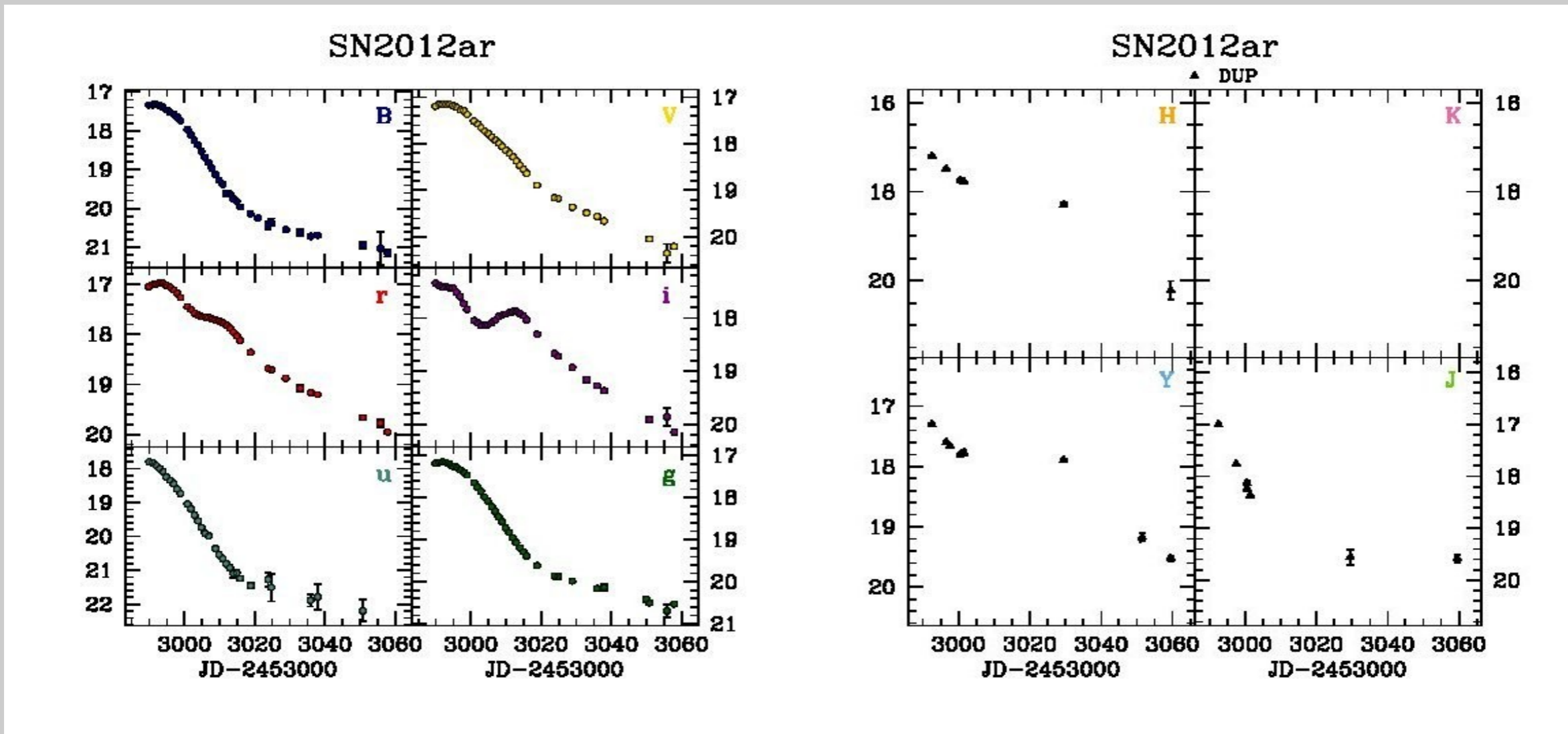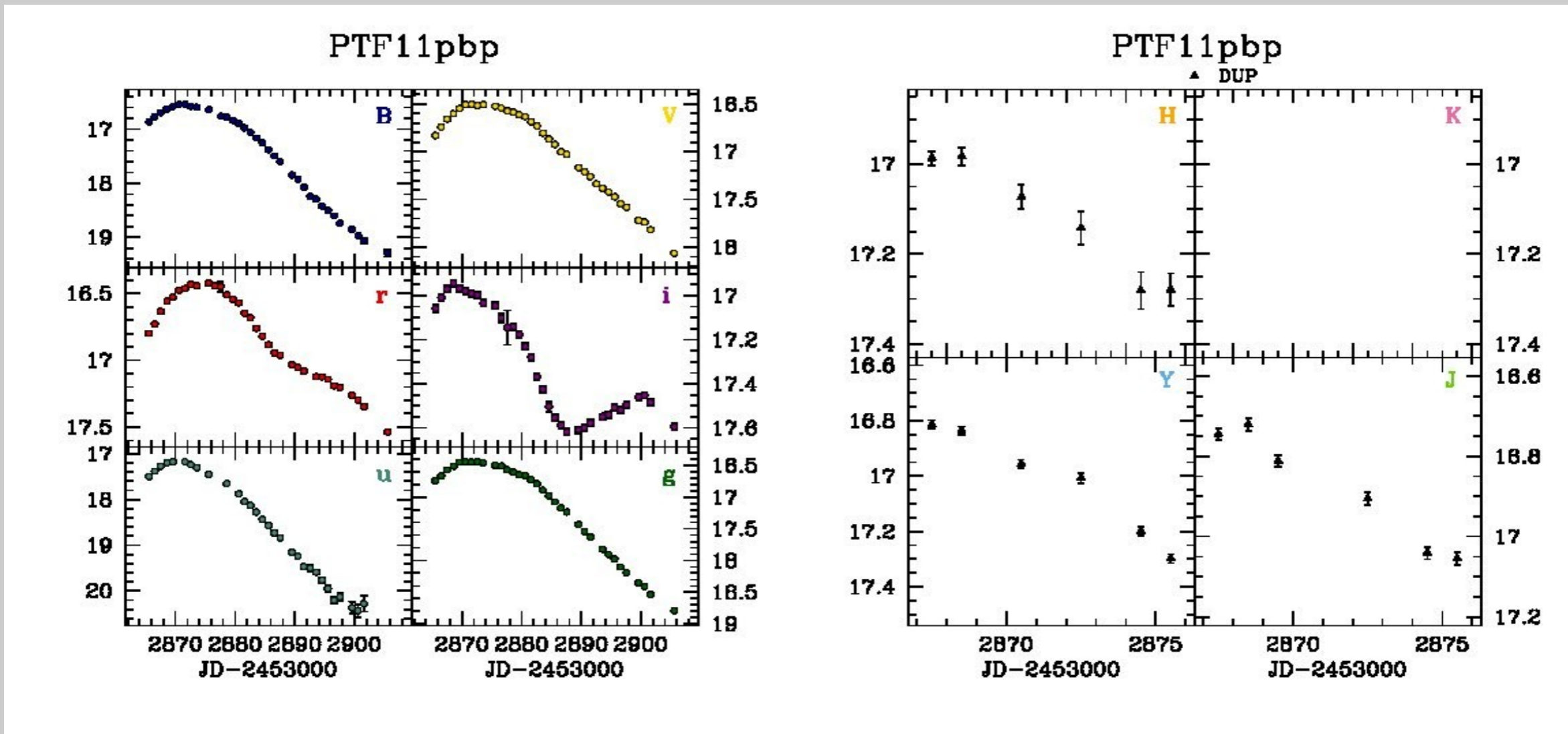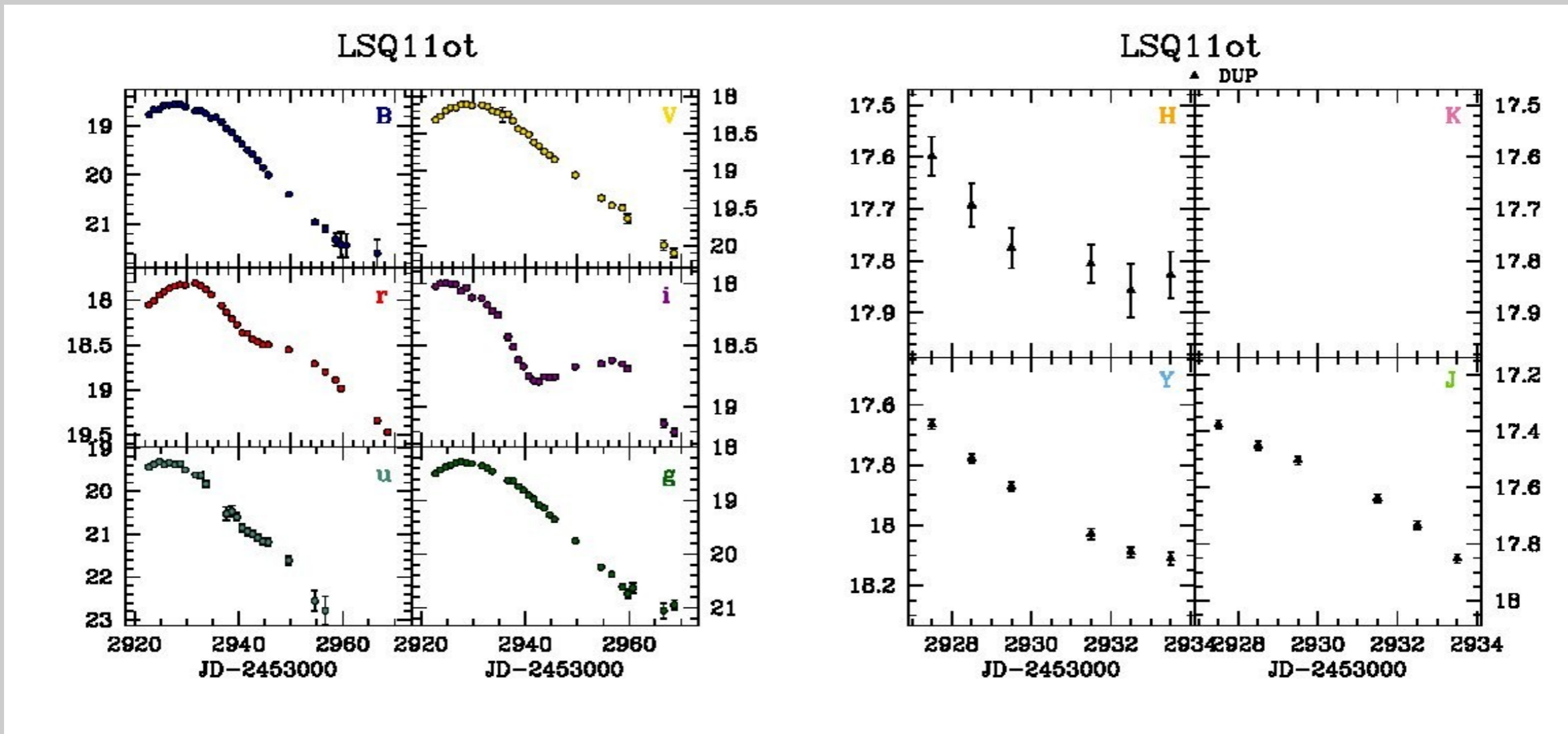 - ‣ >3 nights NIR spectroscopy
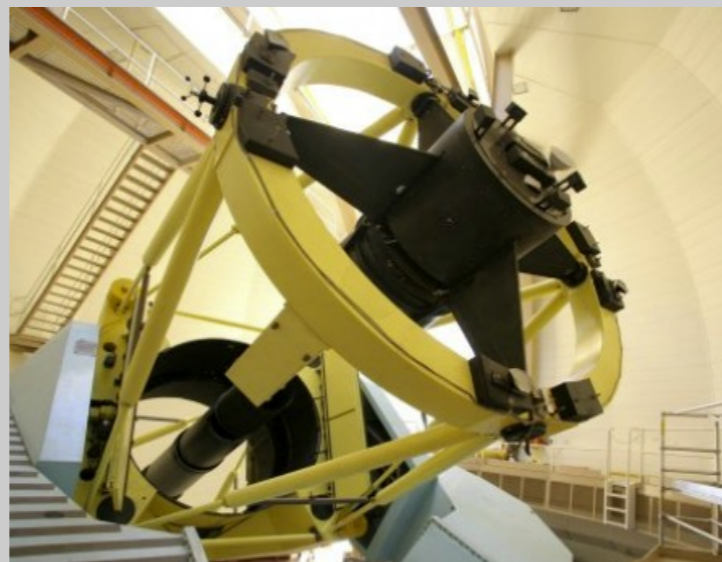
expected LC quality
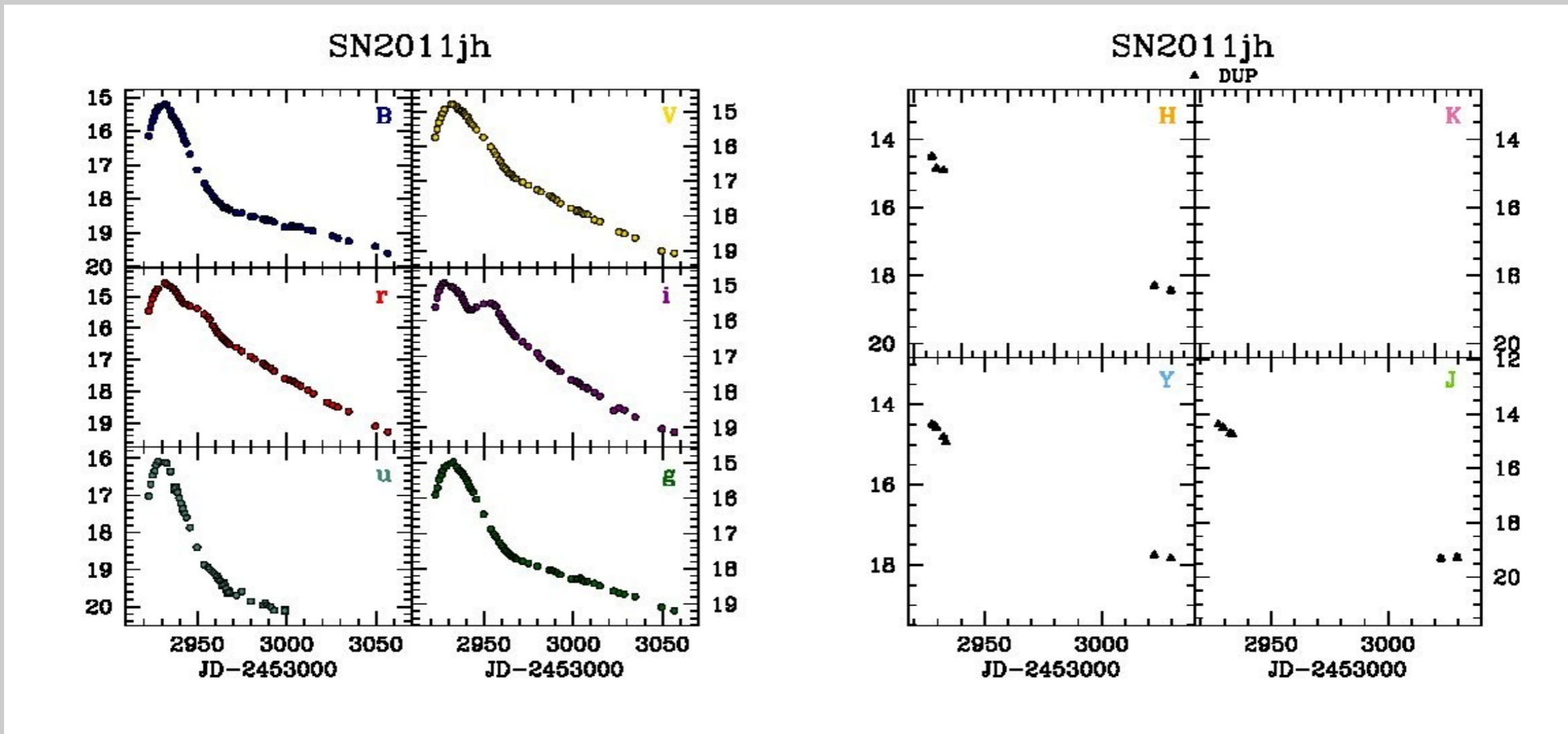

SN2012ar z=0.029

expected LC quality
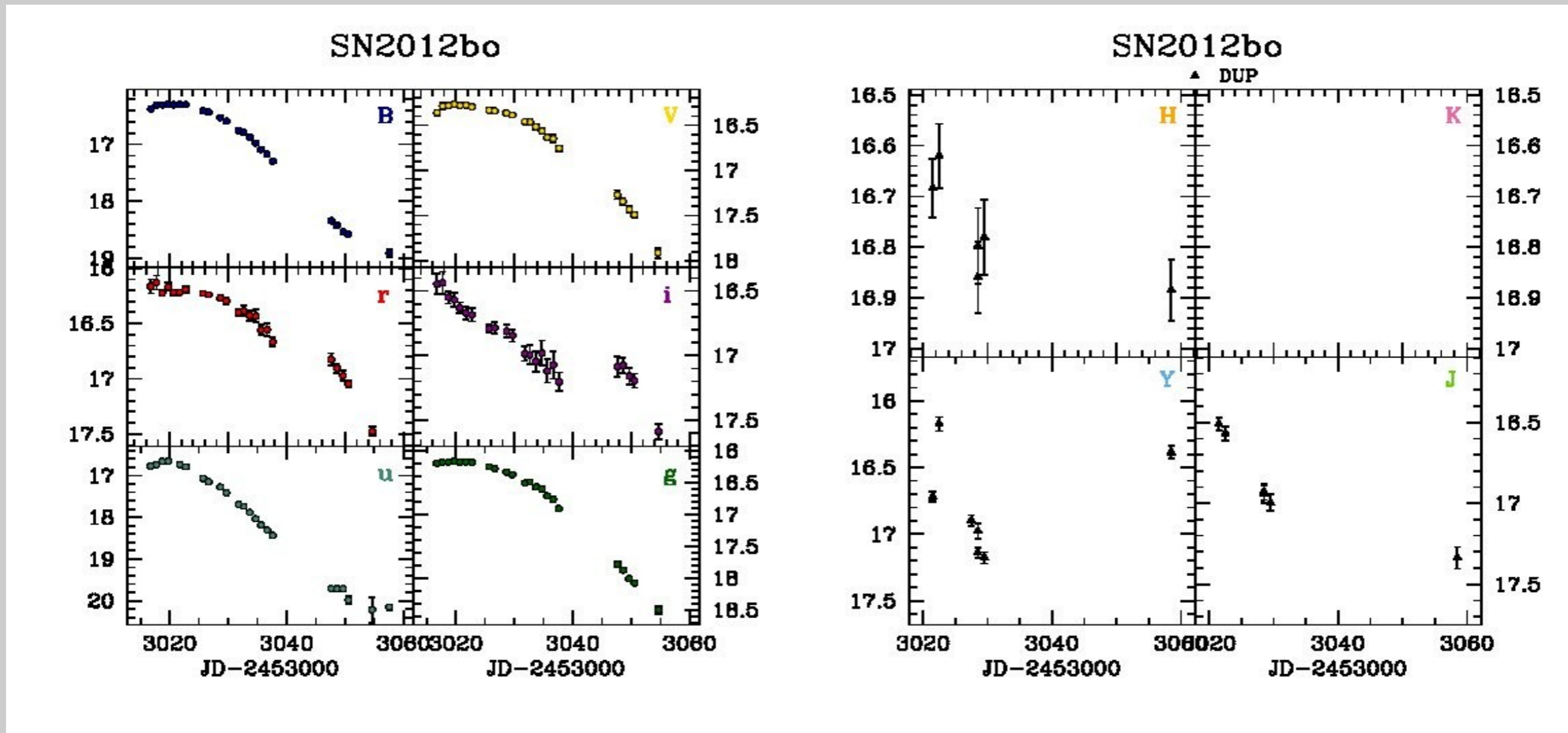

PTF11pbp z=0.028

expected LC quality
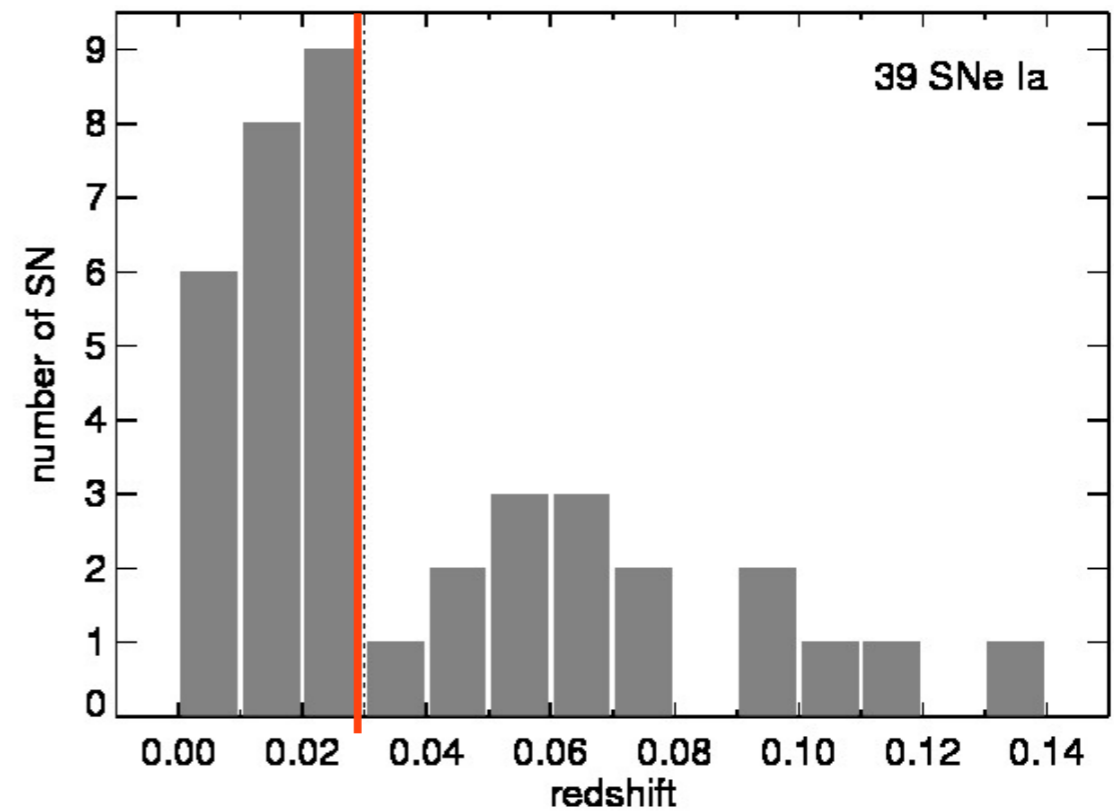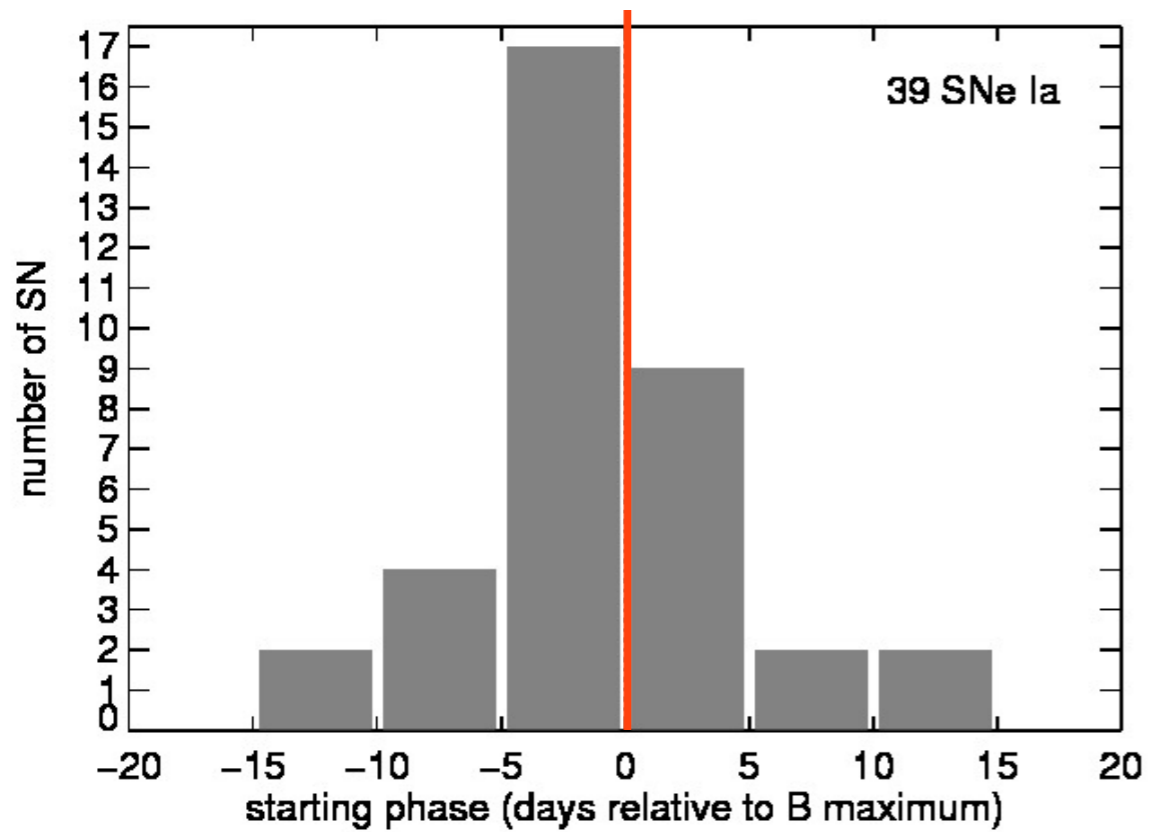

LSQ11ot z=0.027

expected LC quality
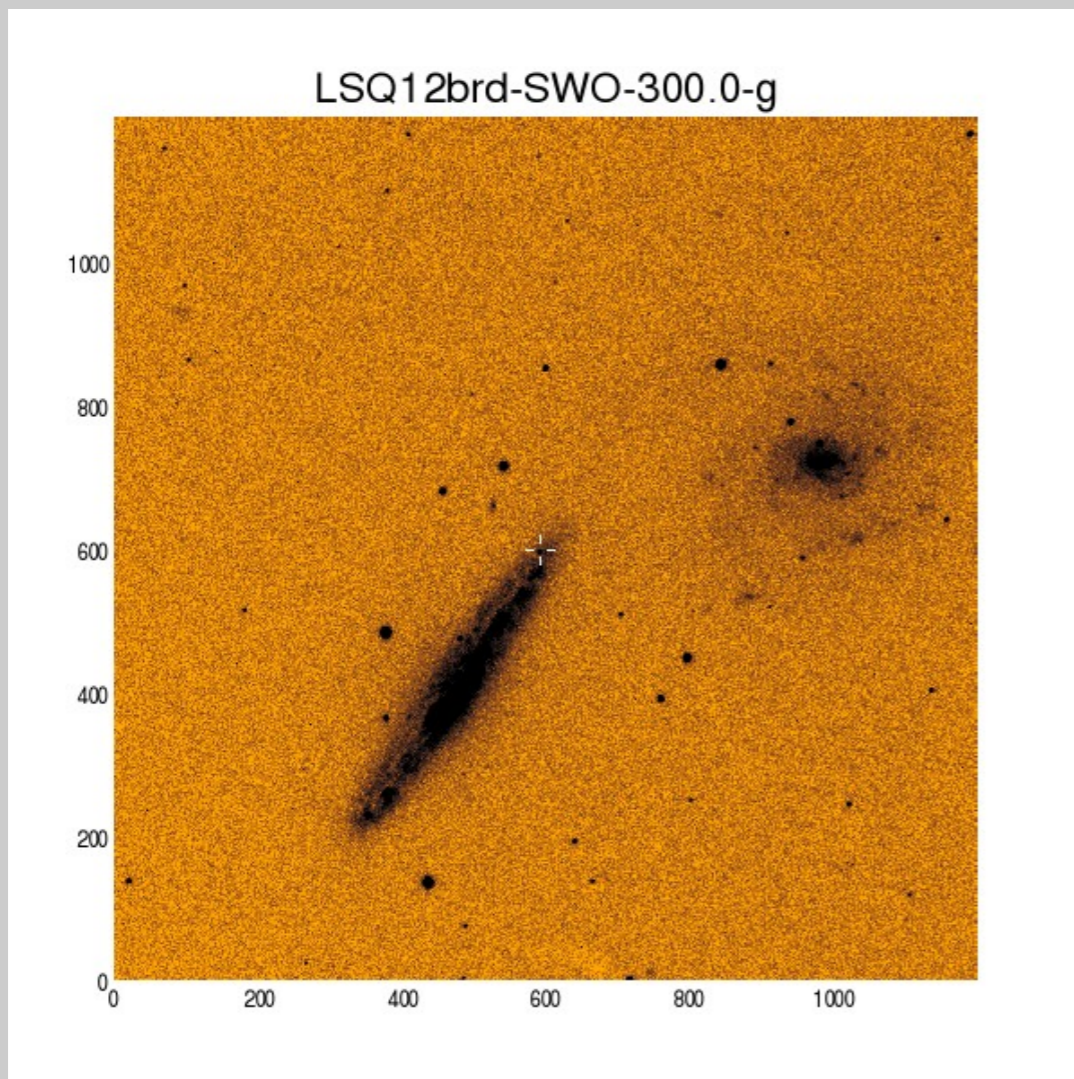

SN2011jh z=0.008

expected LC quality

SN2012bo z=0.025

results so far

hardware improvements

▸ Relocate RetroCam from 1-m Swope to 2.5-m du Pont.

▸ New e2v CCD on 1-m Swope: <u>soon.</u>
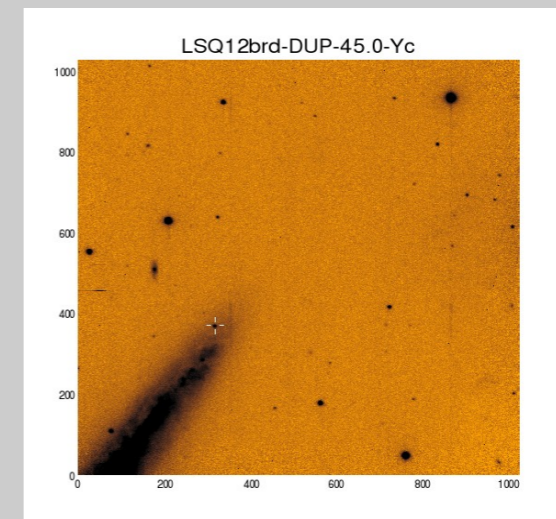
LSQ12brd-SWO-300.0-g

7'

LSQ12brd-DUP-45.0-Yc

3.5'

software improvements

▸ New Optical and NIR reduction pipelines (fast!).

▸ Astrometric solution code automatic.

Raw Data → Reduced Data → Stored Data

software improvements

CSP I and CSP II Calibrations

Share SN 'behaviour' with the community on Real Time

Check Data Quality on Real Time

software improvements

▸ New Optical and NIR reduction pipelines (fast!).

▸ Astrometric solution code automatic.

CSP Data Table

Raw Data

Reduced Data

Stored Data
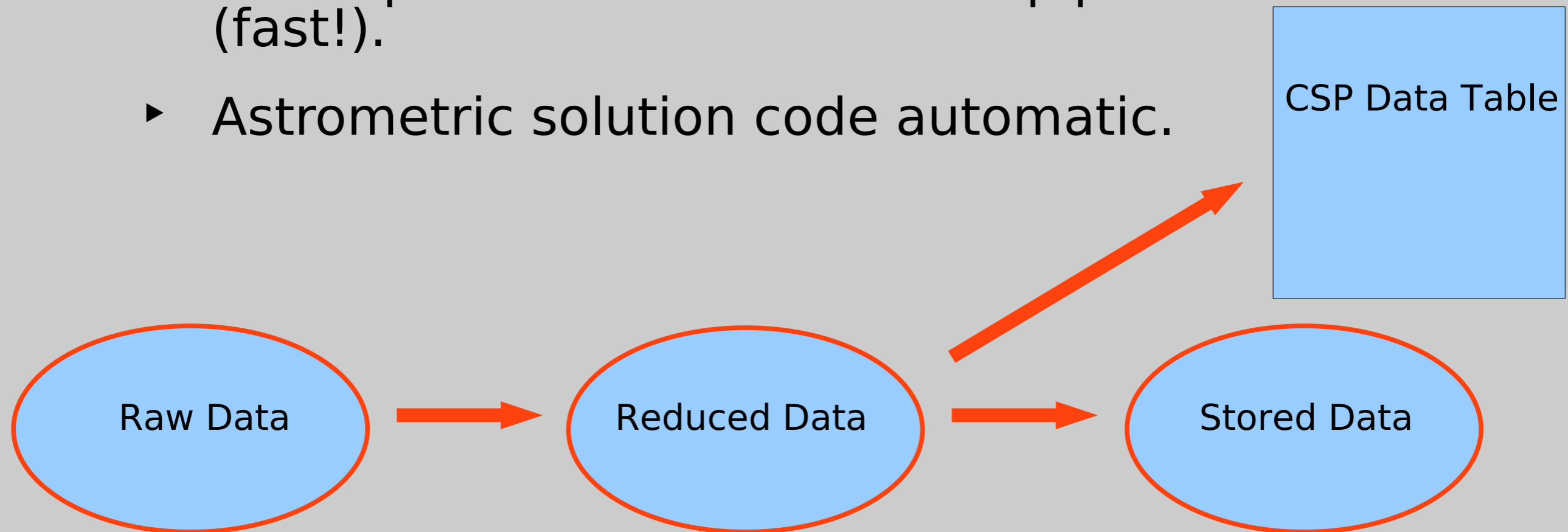
Swope "pre-screening"

‣ 1-m Swope can be used to photometrically "pre-screen" candidates

‣ uBVgri in 2 o 3 epochs to get colors and magnitudes.

‣ FCharts, LC fits on the fly (in development).