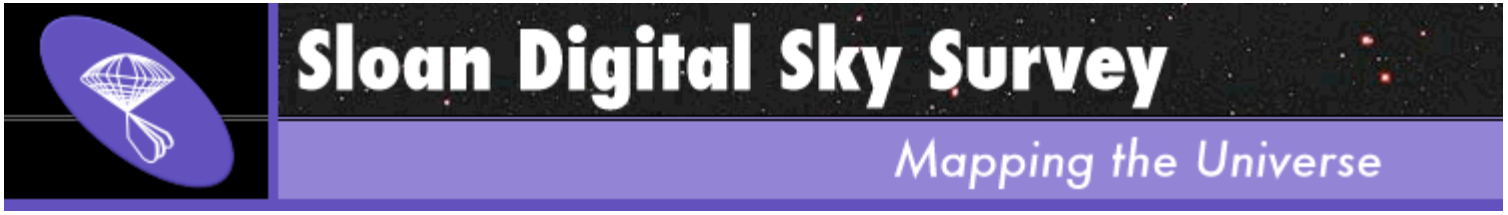

The CFA3 SN Sample: A Look With SNANA

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Fermi National Accelerator Laboratory
Batavia, IL U.S.A August 4, 2009

Outline

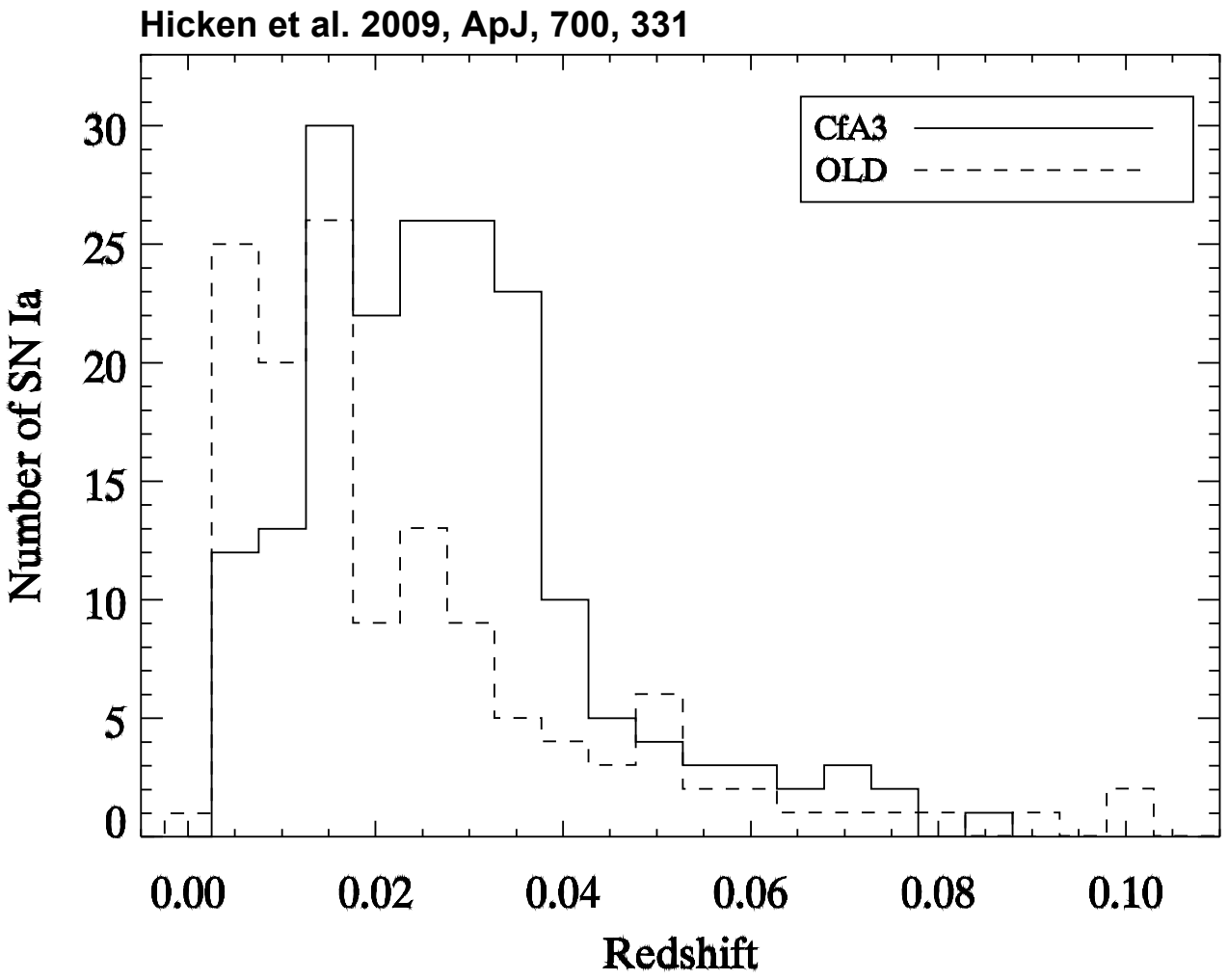
- Introduction to the CFA3 Sample
- Sample Homogeneity Analysis
- Sensitivity to SNANA Cuts
- Summary

CFA3 Supernova Sample

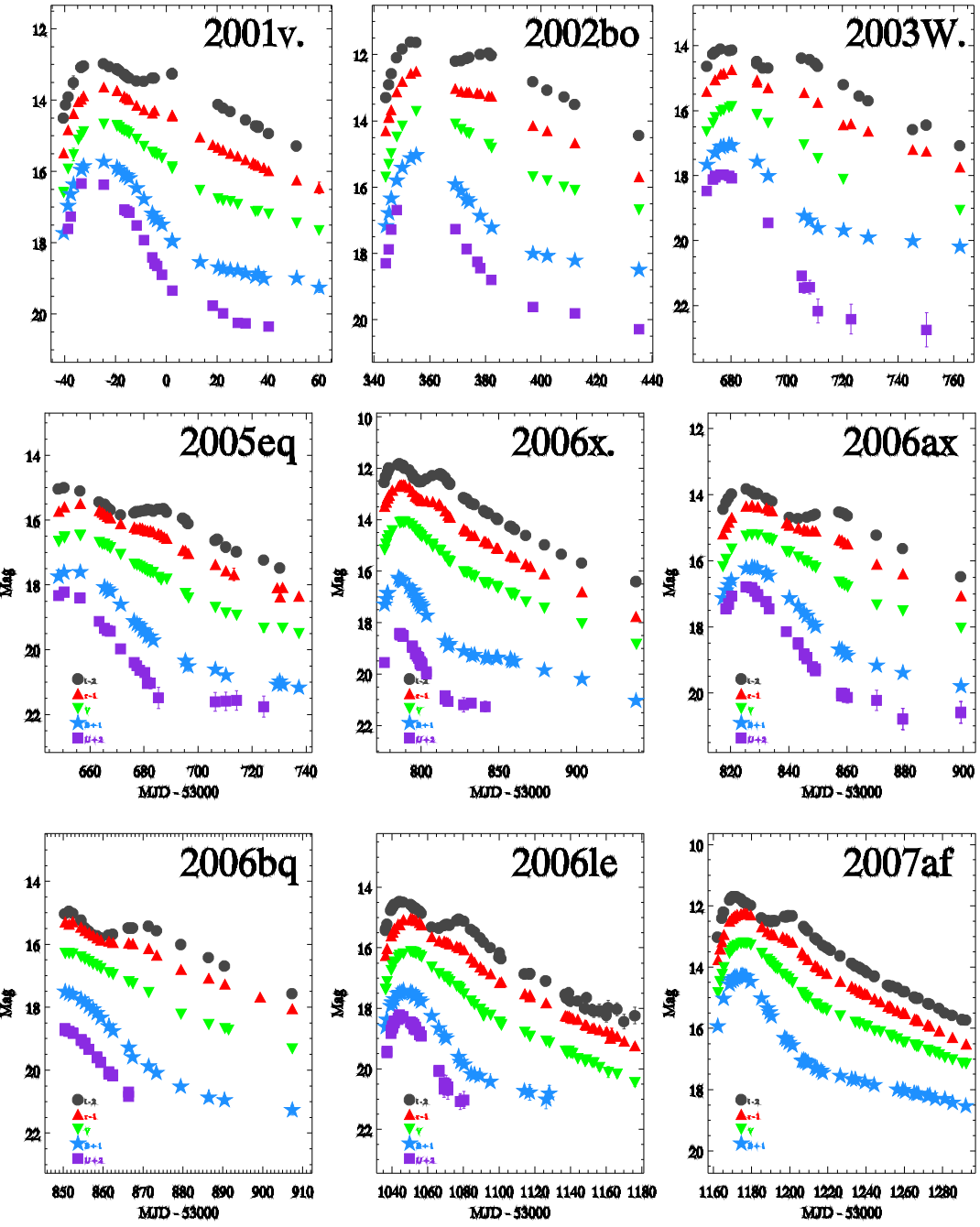
http://adsabs.harvard.edu/abs/2009ApJ...700..331H

- Hicken et al. 2009, ApJ, 700, 331
- Multi-band photometry of 185 SN Ia
- Acquired 2001– 08 at the Whipple Observatory
- Largest “homogenous” nearby sample (z<0.08)
  - more than doubles the nearby sample
  - brings SN Ia cosmology to the point where “svstematic uncertainties dominate”

CFA3 Redshift Distribution



CFA3 Sample Light Curves*



* “Nine of the better” ones

i-2

r-1

V

B+1

U+2

Hicken et al. 2009, ApJ, 700, 331

Not Exactly Homogeneous

http://adsabs.harvard.edu/abs/2009ApJ...700..331H

- Three instruments used
  - 4Shooter, Minicam, & Keplercam
- Two distinct sets of filters
  - Johnson UBV used on all three instruments
  - Krons-Cousins RI used on 4Shooter
  - SDSS r′i′ used on Minicam & Keplercam
- U filter issues
  - Broke in Jan. & replaced in June, 2007
  - Liquid leak discovered in the CuS04 cell Nov., 2007
  - Installed in Feb., 2008, after repair & testing
  - Accounts for missing U-band photometry in 2007–08

Two Homogeneous Subsamples

http://adsabs.harvard.edu/abs/2009ApJ...700..331H

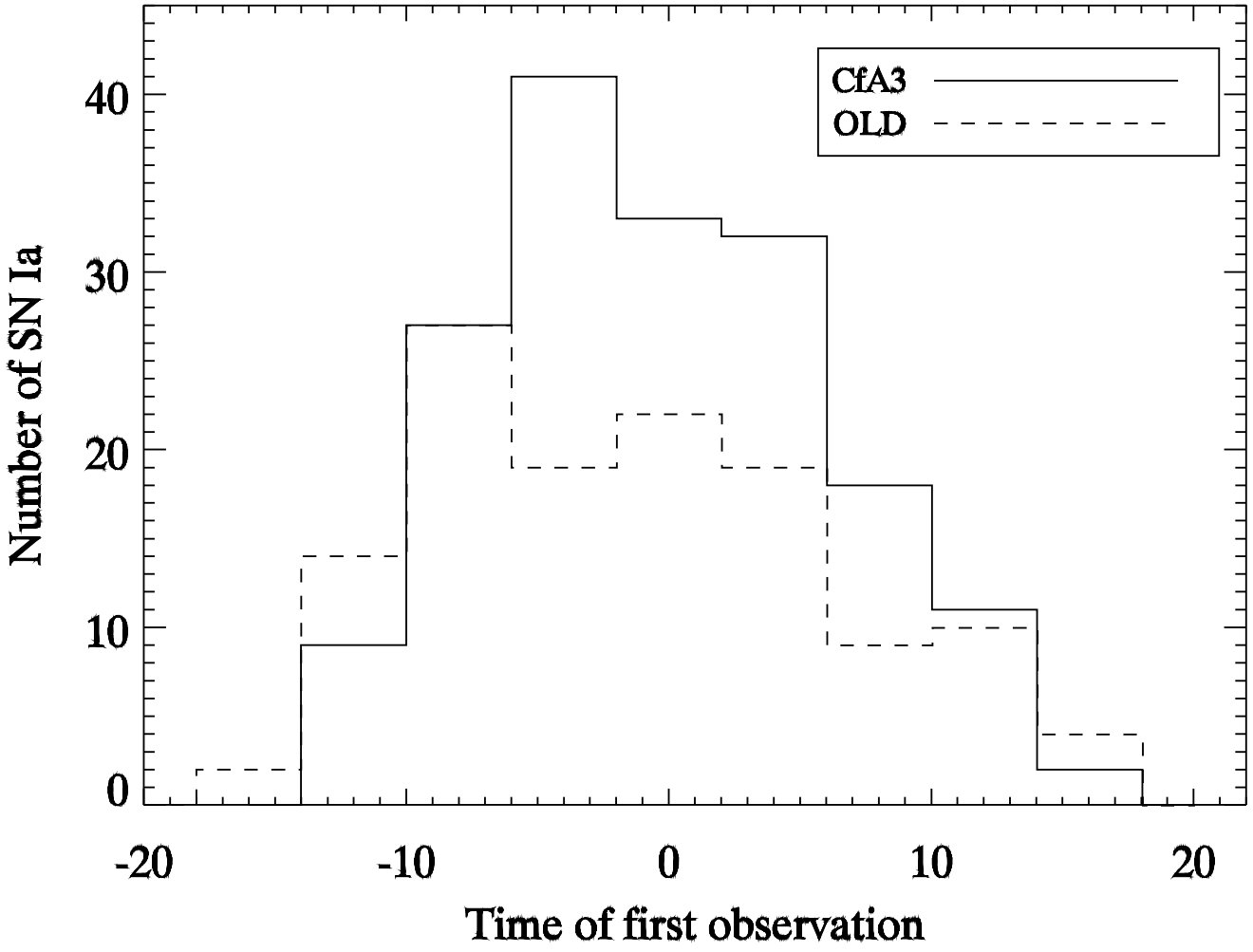
- 64 4Shooter objects: same camera/filters
  - 4Shooter/UBVRI
  - reduced with same pipeline
- 116 Keplercam objects: same camera/filters
  - Keplercam/UBVr′i′
  - also reduced with same pipleline
- 64 + 116 = 180? Minicam objects?
- Whole sample can be called quasi-homogeneous
  - UBV filters used for all (NB. U filter issues)
  - detector responses similar + same reduction pipeline

SNANA CFA3 Versions

- From Ben Dilday
  - version photometry LOWZ_CFA3
  - 185 dat files in lcmerge
- New version photometry entries made (not yet on dp47*)
  - LOWZ_CFA3_UBVRI: 64 dat files
  - LOWZ_CFA3_UBVri: 120 dat files (≠ 116!?*)
  - 64 + 120 ≠ 185: will investigate*
- Remainder of this talk
  - Investigate LOWZ_CFA3_UBVri version
  - Will look at UBVRI version soon
- NB: SNANA ntuple issue
  - code is case insensitive
  - causes confusion between RI & ri (for ntuple only)

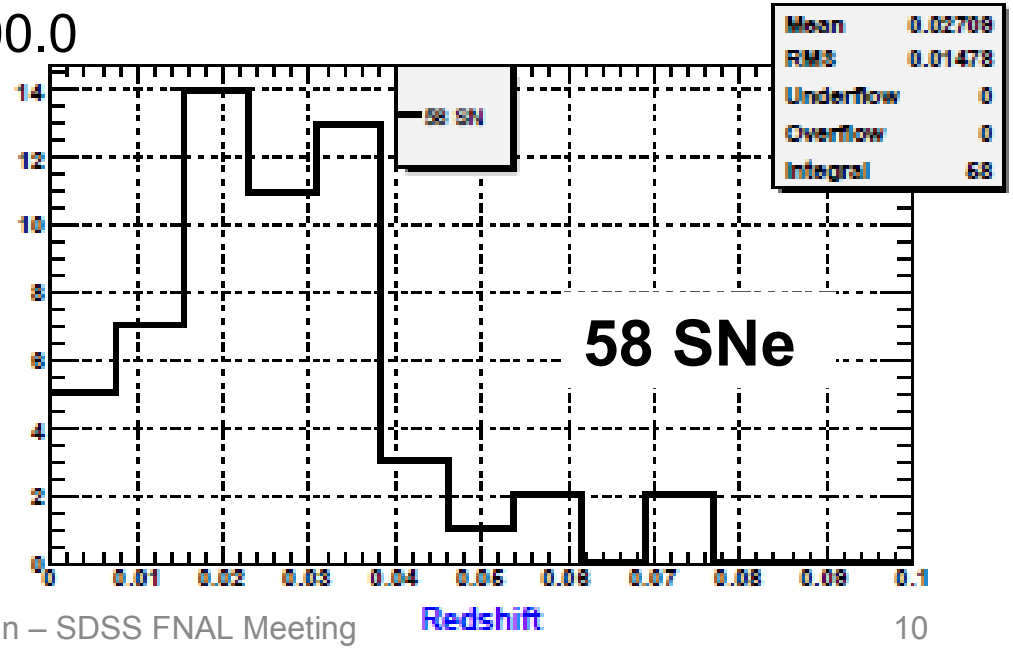
CFA3 Time of 1st Observation

Hicken et al. 2009, ApJ, 700, 331

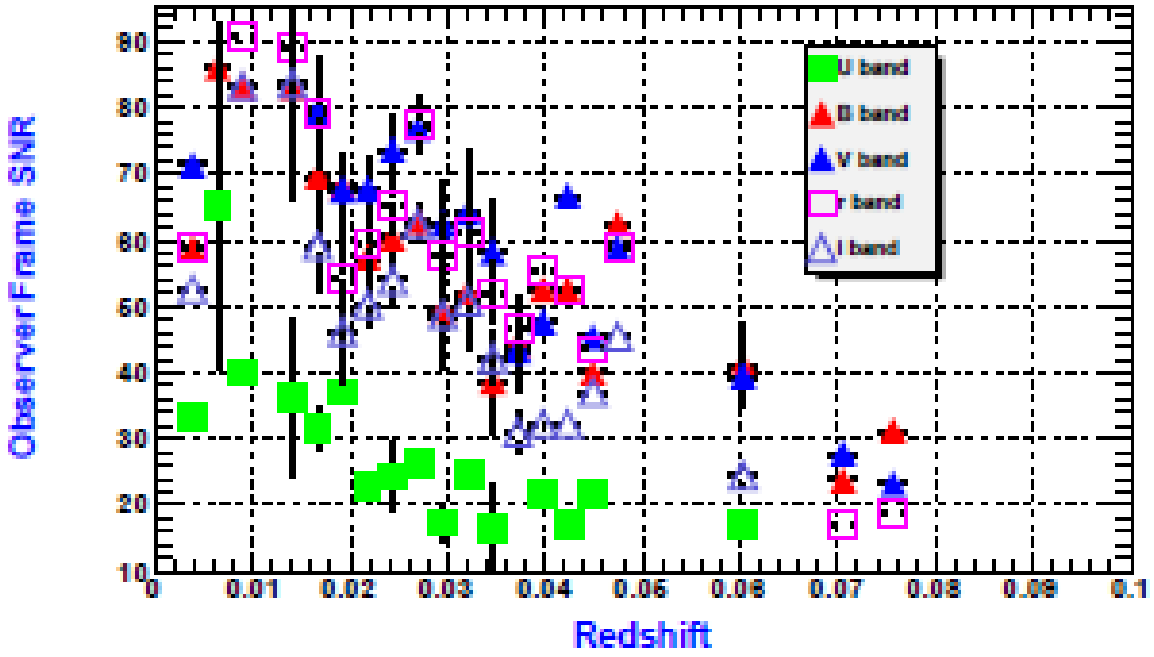


Default UVBri Subset

- Cuts
  - cutwin_Nepoch = 2
  - cutwin_redshift = 0.0, 0.2
  - cutwin_Trest = -20.0, 70.0
  - cutwin_Trestmin = -99.0, **0.0**
  - cutwin_Trestmax = 0.0, 200.0



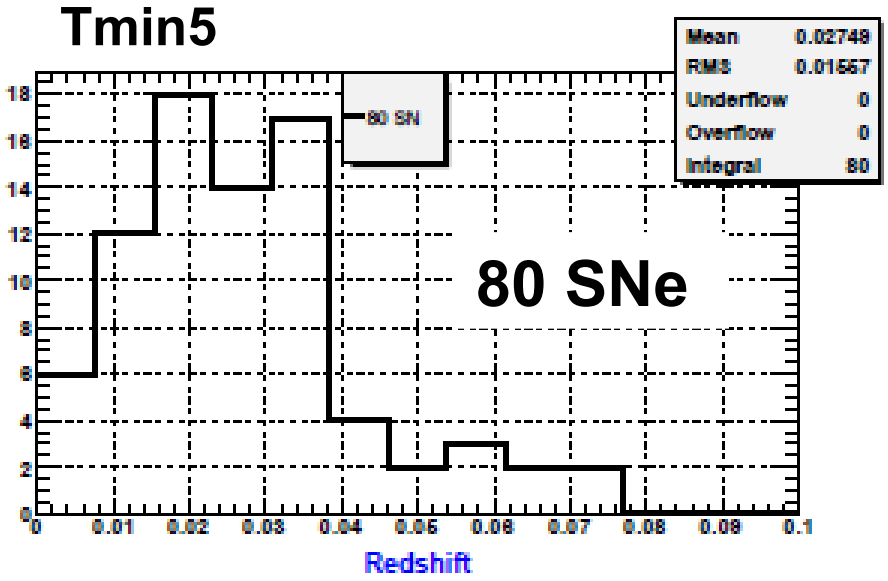
NO S/N Cuts Because. . .

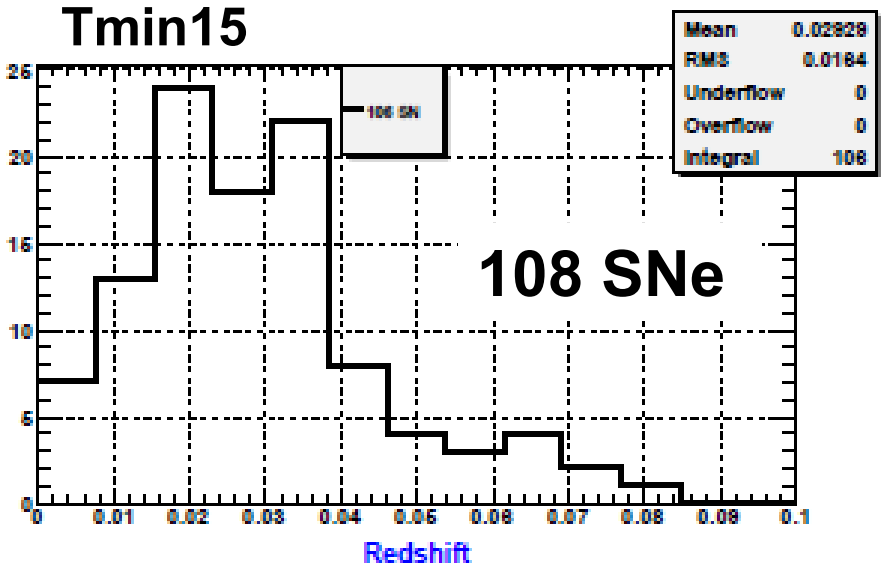


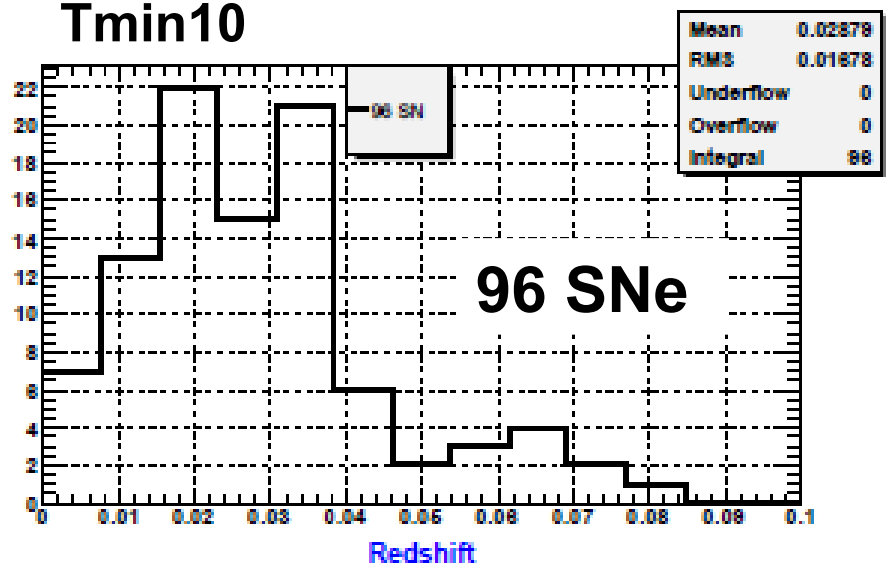
Time of 1st Observation Subsets

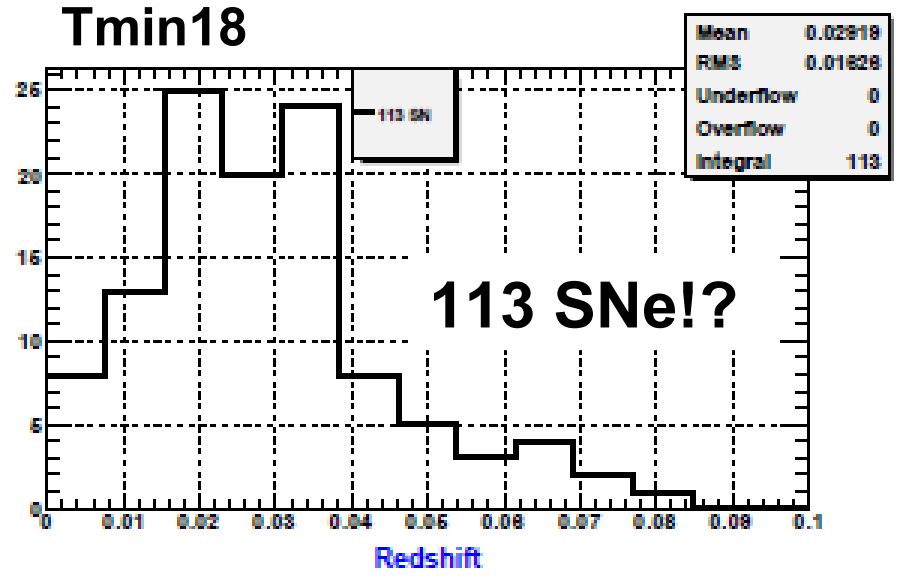
- tmin5 same default except
  - cutwin_Trestmin = -99.0, **5.0**
- tmin10 same default except
  - cutwin_Trestmin = -99.0, **10.0**
- tmin15 same default except
  - cutwin_Trestmin = -99.0, **15.0**
- tmin18 same default except
  - cutwin_Trestmin = -99.0, **18.0**

Redshift Distributions



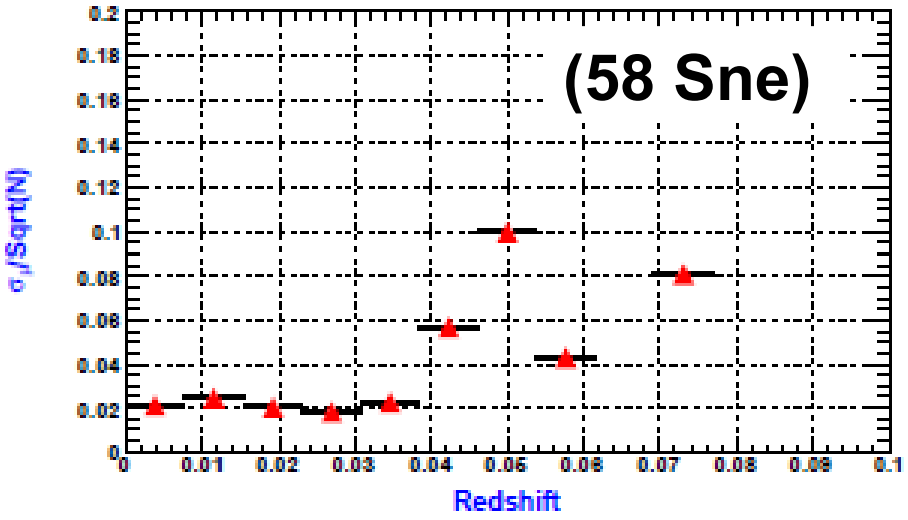




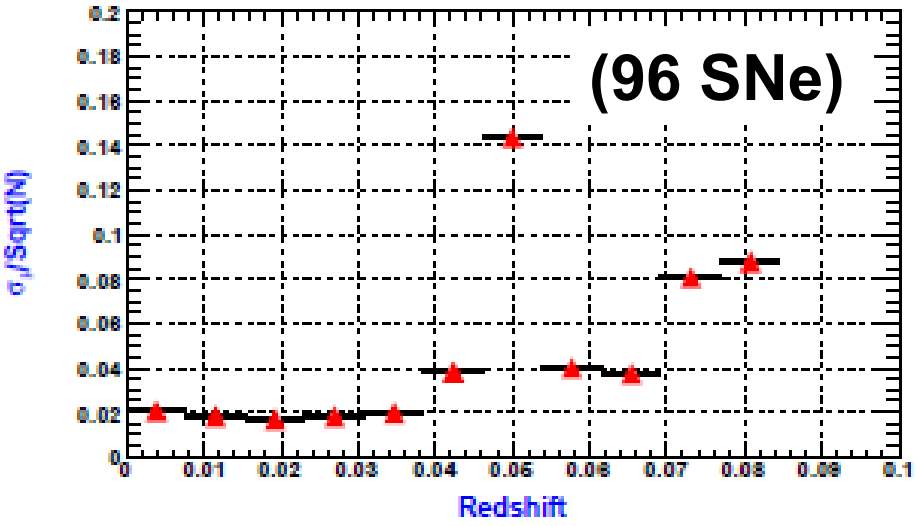


Error on Hubble Diagram

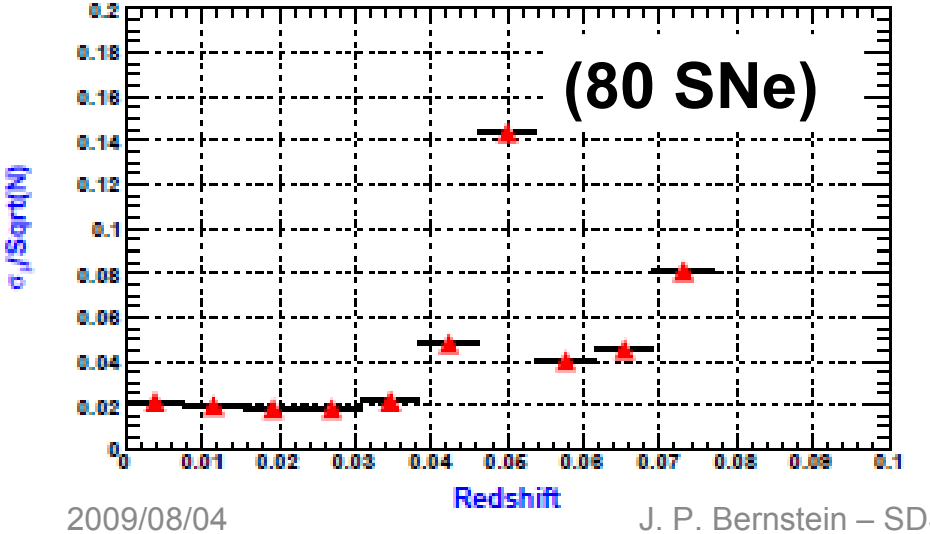
Tmin0 (default)



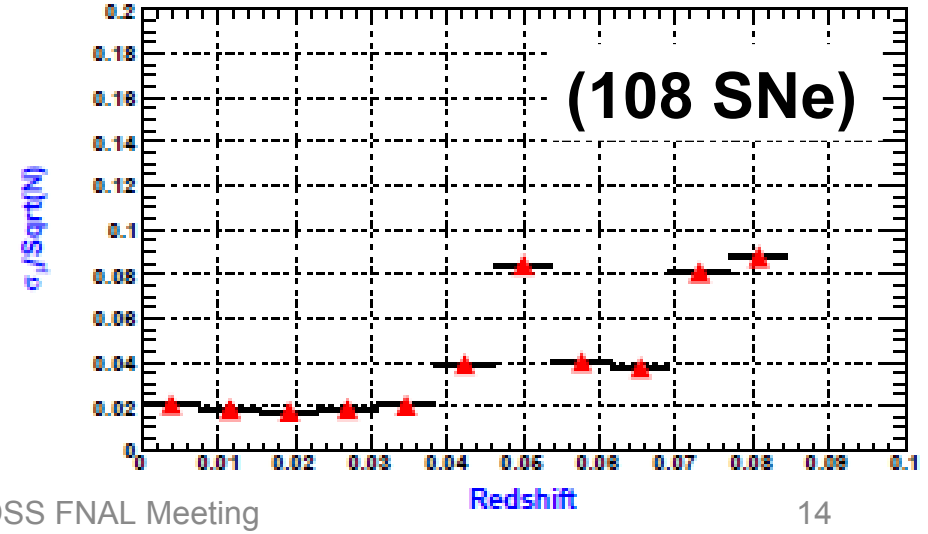
Tmin10



Tmin5



Tmin15



Initial WFIT Results
(for UBVRIr′i′ sample and Tmin = 5.3)

Dataset	***w***	***sig_w +***	***sig_w -***	***OM***	***sig_OM***
SDSS+SNLS+ESSENCE*	-0.711	0.088	0.082	0.319	0.025
Old LOWZ fits					
LOWZ+SDSS*	-0.915	0.133	0.122	0.273	0.028
SDSS+LOWZ+SNLS+ESSENCE*	-0.765	0.08	0.07	0.306	0.021
SDSS+LOWZ+SNLS+ESSENCE+HST*	-0.757	0.071	0.064	0.308	0.019
LOWZ+ESSENCE+SNLS*	-0.779	0.083	0.082	0.302	0.022
****Matches SNCOSMO09 paper***					
New low-z (CFA3) fits					
CFA3+SDSS	-0.845	0.11	0.105	0.287	0.026
SDSS+CFA3+SNLS+ESSENCE	-0.742	0.07	0.065	0.311	0.02
SDSS+CFA3+SNLS+ESSENCE+HST	-0.738	0.061	0.059	0.312	0.019
CFA3+ESSENCE+SNLS	-0.733	0.07	0.07	0.313	0.021

Summary

- CFA3 Low-z sample from Hicken et al. 2009: 185 SNe
- Quasi-homogeneous
  - 64 UBVRI (4Shooter) & 116 UBVr′i′ (Keplercam)
  - 120 UBVri dat files for LOWZ-CFA3 version?
- Time of 1st observation
  - t = 0 bisects distribution
  - Hubble diagram error sensitive to SNANA cutwin
  - More study needed
- Thoughts & suggestions?