

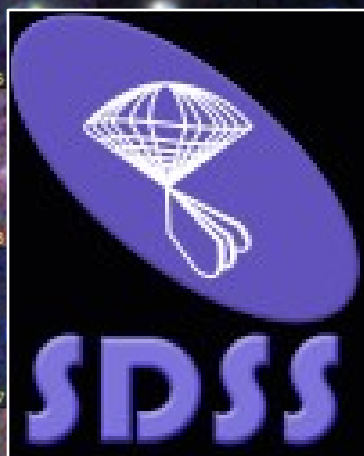
The Low-z Supernova rate from the SDSS-II Supernova Survey

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University of Chicago

AAS 208th meeting
June 8, 2006

Smith (Oral) Mon 2:30pm *Telus 105*
Zheng (Poster) Mon *Exhibit Hall DE*
Lampeitl (Oral) Wed 10:45am *Exhibit Hall C*

Special Session Thurs "*LSS in the SDSS*"

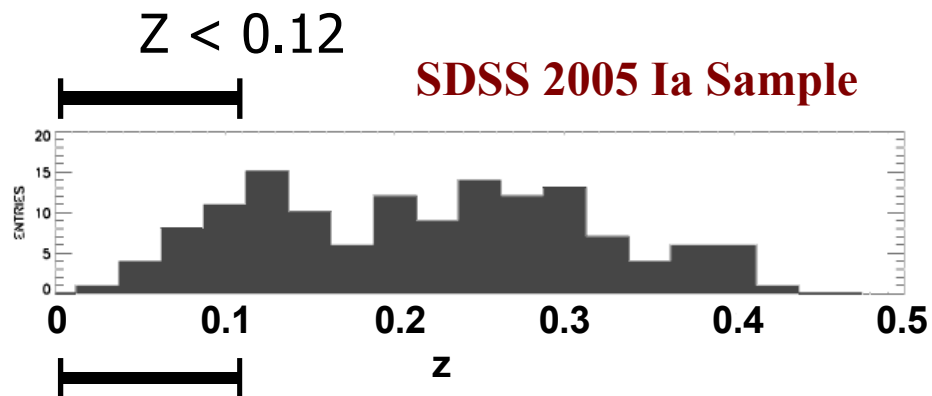


Summary of 2005 Campaign

Spectroscopic typing/redshift
from ARC, HET, WHT, MDM,
Subaru, Keck

- **129** spectroscopically confirmed SN Ia
- **15** spectroscopically probable SN Ia
- **31** photometric candidates with host galaxy redshifts
- **6** SN Ib/c, **11** SN II
- **~100** photometric candidates

**~ 300 sq degrees
every 2 nights**



Rate measured with this
low-z sample

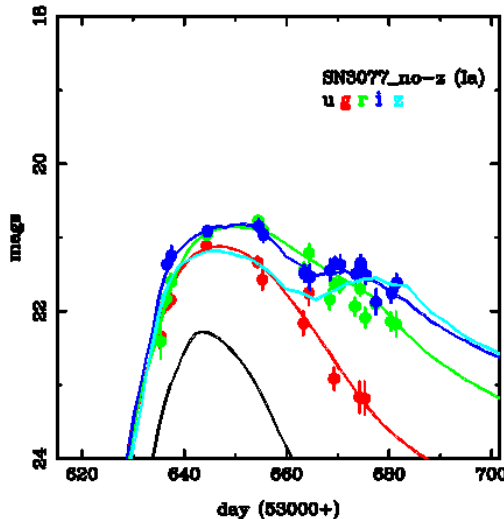
Low-z SN Ia Sample ($z < 0.12$)

Cuts applied to sample

- Well sampled light-curves
- Require at least one point at least 2 days before peak
- Require at least one point at least 15 days after peak

- **18** spectroscopically confirmed SN Ia
- **9** other possible SN Ia

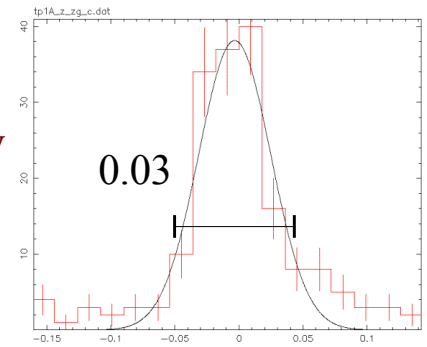
Plans to obtain host galaxy redshifts for photometric candidates (summer/fall 2006)



Example photometric candidate light-curve

Fit to SN Ia templates predicts $z \sim 0.14$ and high extinction

Photometric redshift accuracy (spectroscopic sample)



Testing Survey Efficiency with Simulated SNe (fakes)

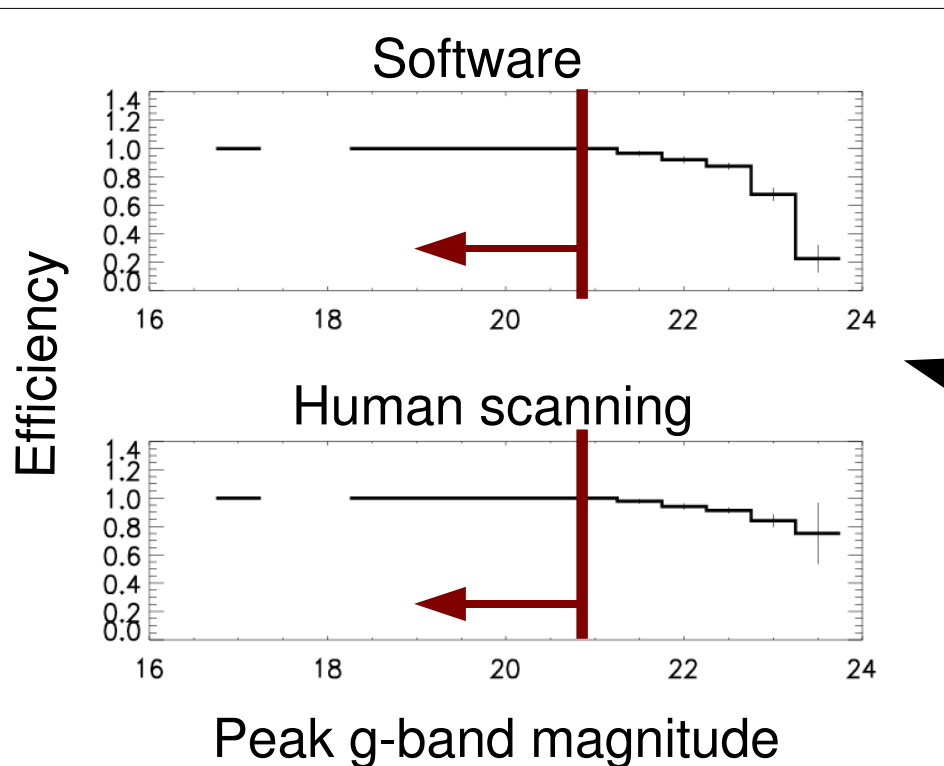
Insert fakes with realistic light-curves into the data stream to test software/human scanning efficiencies

PSF estimate from SDSS *photo* pipeline



Example fake SN

Fakes with peak Sept1-Nov30



High efficiency for typical low-z SNe

Testing for Systematics with Monte Carlo

Small Systematics

No galaxy background

No extinction

Stretch $\sigma = 0.1$

$$\epsilon = 0.87$$

Large Systematics

Mag ~ 16 galaxy core background

Wide extinction distribution

Stretch $\sigma = 0.2$

$$\epsilon = 0.85$$

Small effect at low redshift

Nominal Model

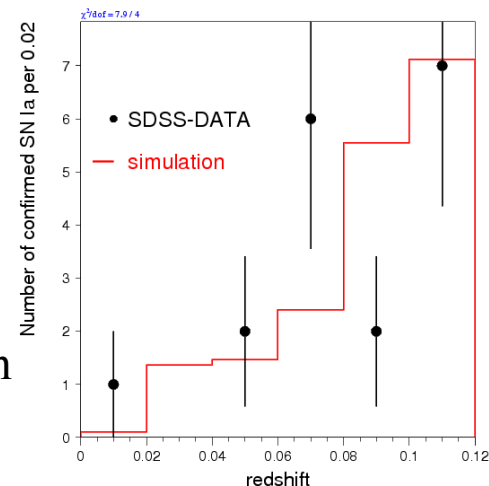
No galaxy Background

Stretch $\sigma = 0.1$

$$\epsilon = 0.87$$

$$\frac{dN}{dA_V} = \exp\left(\frac{-A_V}{0.2}\right)$$

Redshift distribution
for observed/
simulated SNe



PRELIMINARY

Low-z SN Ia Rate Estimate

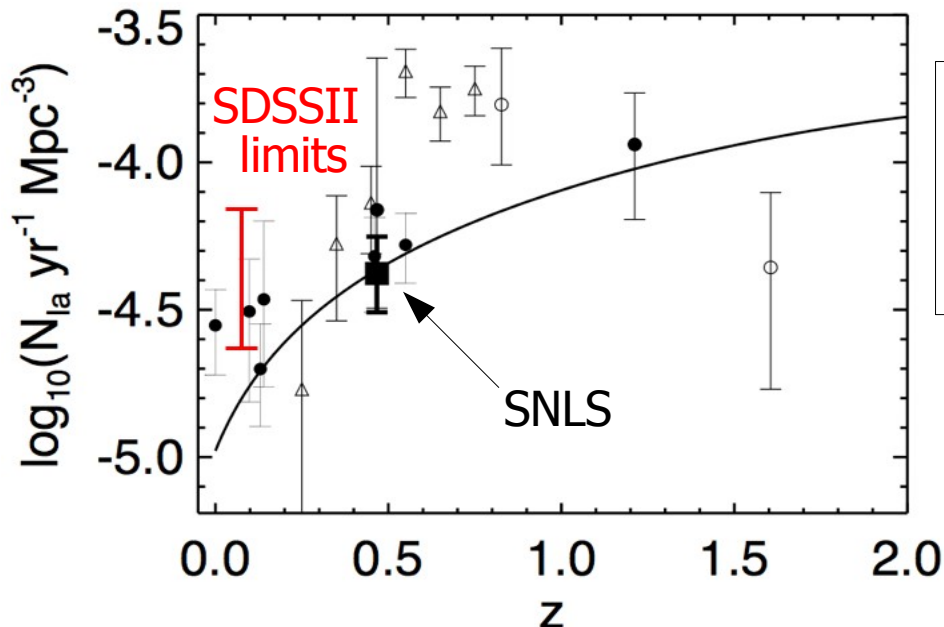
(effective redshift = 0.09)

RATE LOWER LIMIT
(spectroscopic sample)

$$(2.97 \pm 0.7) \times 10^{-5} (h_{70} / \text{Mpc})^3 / \text{yr}$$

RATE UPPER LIMIT
(spectroscopic+ sample)

$$(4.46 \pm 0.8) \times 10^{-5} (h_{70} / \text{Mpc})^3 / \text{yr}$$



When complete SDSS-II SN Survey will make a precise measurement of the low-mid z type Ia SN rate

Compilation of published SN rates
(Neill, J.D. et al. astro-ph/0605148)