

**Kavli Institute
for Cosmological Physics**
AT THE UNIVERSITY OF CHICAGO

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SDSS-II Supernova Survey

Ben Dilday, University of Chicago (UC) ;

SDSS II Supernova Program

Goal is to obtain densely sampled, multi-band light curves and spectral typing for ~200 Type Ia SNe in the redshift range $z \sim 0.05-0.35$

- Improve constraints on Dark Energy
- Improve understanding of SN Ia as standard candles
- Provide rest frame u-band templates for high-z surveys
- Determine SNe rates

Imaging along the celestial equator, Sept-Nov of 2005-2007

- 300 sq. deg total coverage ($2.5 \text{ deg} \times 120 \text{ deg}$)
- imaging alternates between ~150 sq deg section every other night
- dense light curves
- large volume allows for study of rare/peculiar SNe

Multi-Telescope Follow-up/Spectroscopy

Spectroscopic follow-up for SN typing, redshift determination, and multi-epoch spectrophotometry is done using:

- HET 9.2m, ARC 3.5m, MDM 2.4m, Subaru 8m, WHT 4.2m, Keck 10m

Additional imaging to reduce edge effects and follow SNe lightcurves below SDSS flux limit

- NMSU 1m, ARC 3.5m, MDM 2.4m, VATT, WIYN, UH88in, LT, INT

Limited coordinated follow-up in near IR from Carnegie SN Project

Monitoring Efficiencies: Simulated SNe

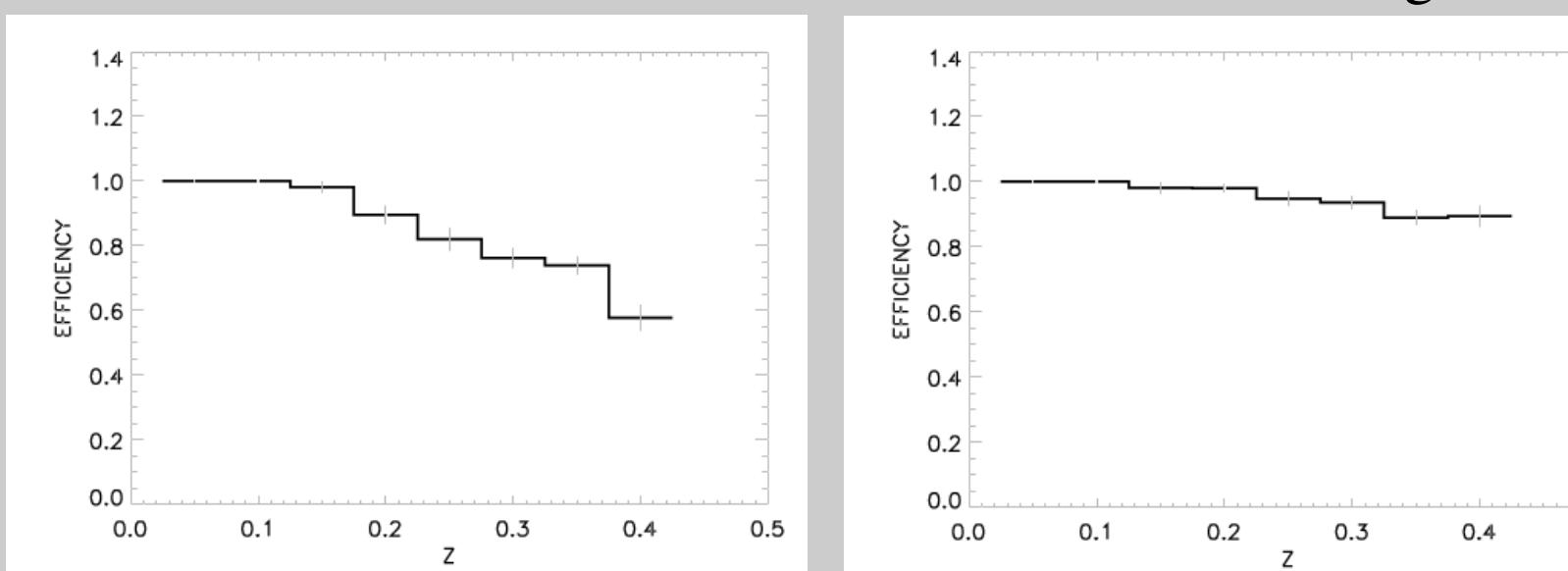
1000 simulated type Ia SNe inserted into data stream in real time

--> quantify pipeline/human scanning efficiencies

- realistic lightcurves
- pre-compiled catalog of positions; proximity to known galaxies (with photometric redshift)
- specify redshift, luminosity, MJD at peak for each "fake"
- real time calculation of magnitudes by convolving redshifted spectral templates (A. Riess) with SDSS filter curves

SDSS SNe detection efficiencies as a function of redshift from simulated SNe

Software

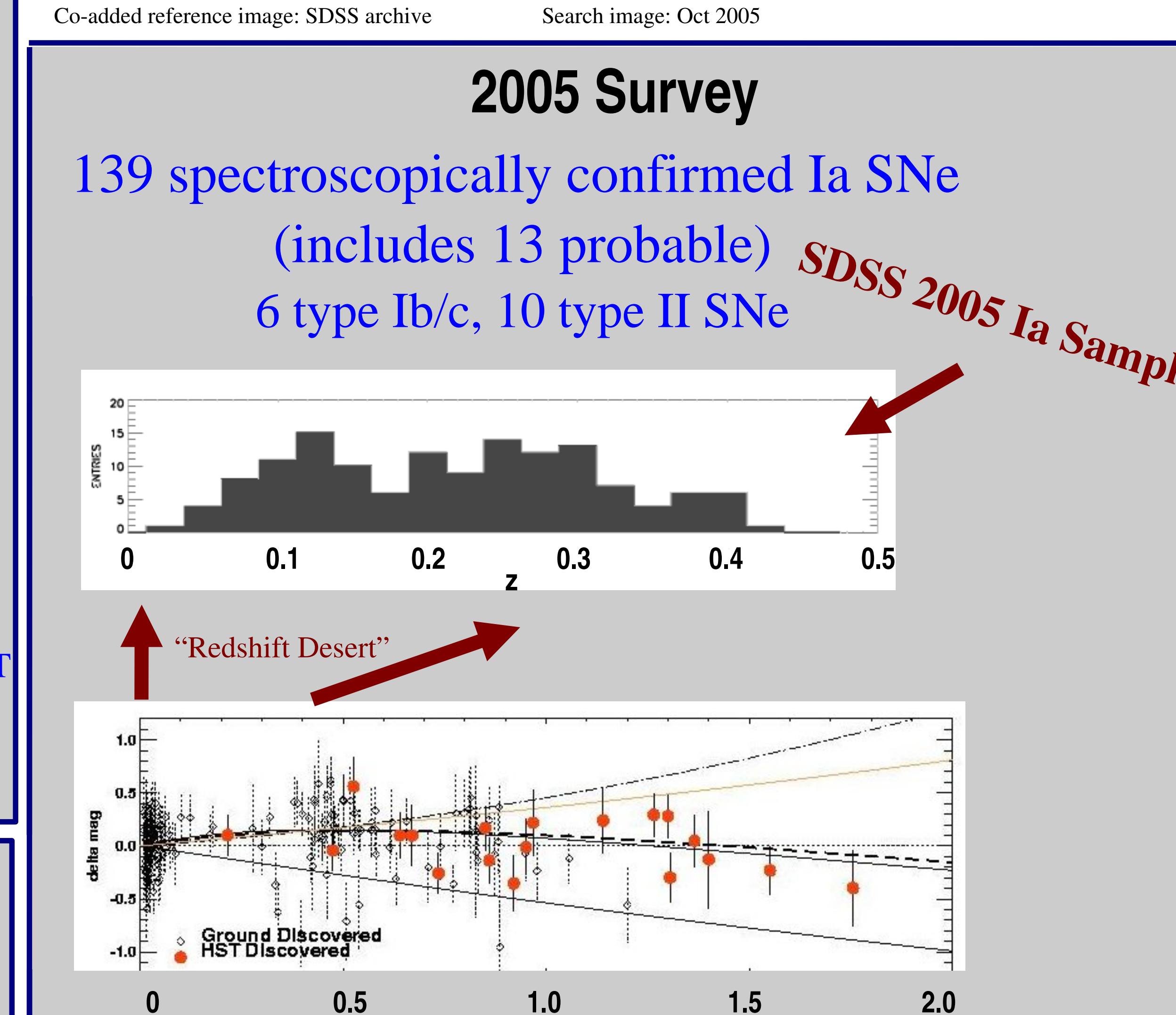


The National Science Foundation



2005hc
@ $z = 0.0459$

Discovered by SDSS Oct. 2005
Multi-epoch spectroscopy
Also imaged by MDM, UH88, VATT (opportunity for cross-calibration)

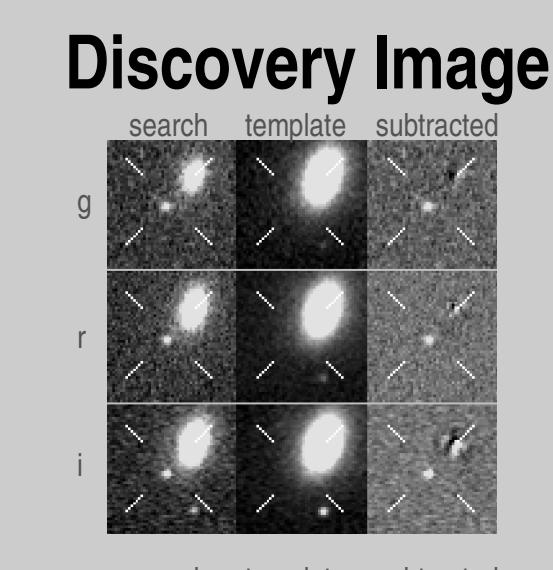


SDSS 2005 Ia Sample
139 spectroscopically confirmed Ia SNe
(includes 13 probable)
6 type Ib/c, 10 type II SNe

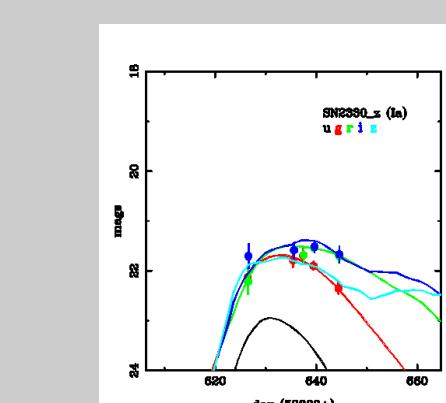
Examples of SN Ia discovered by SDSS

Low-z
2005js @ $z = 0.079$

Mid-z
2005fp @ $z = 0.210$

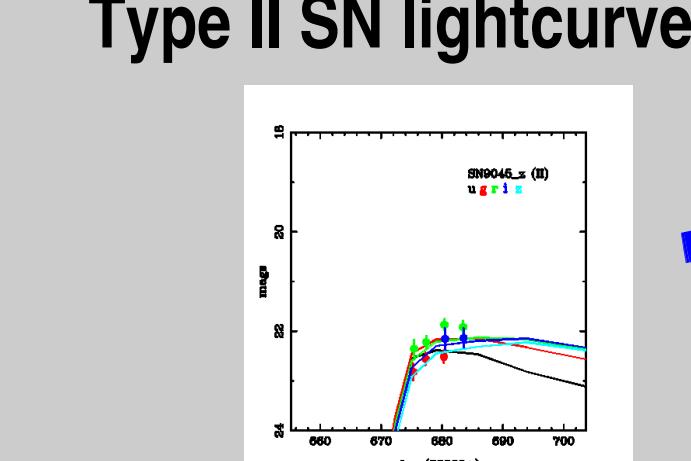


Type Ia SN
lightcurve fit



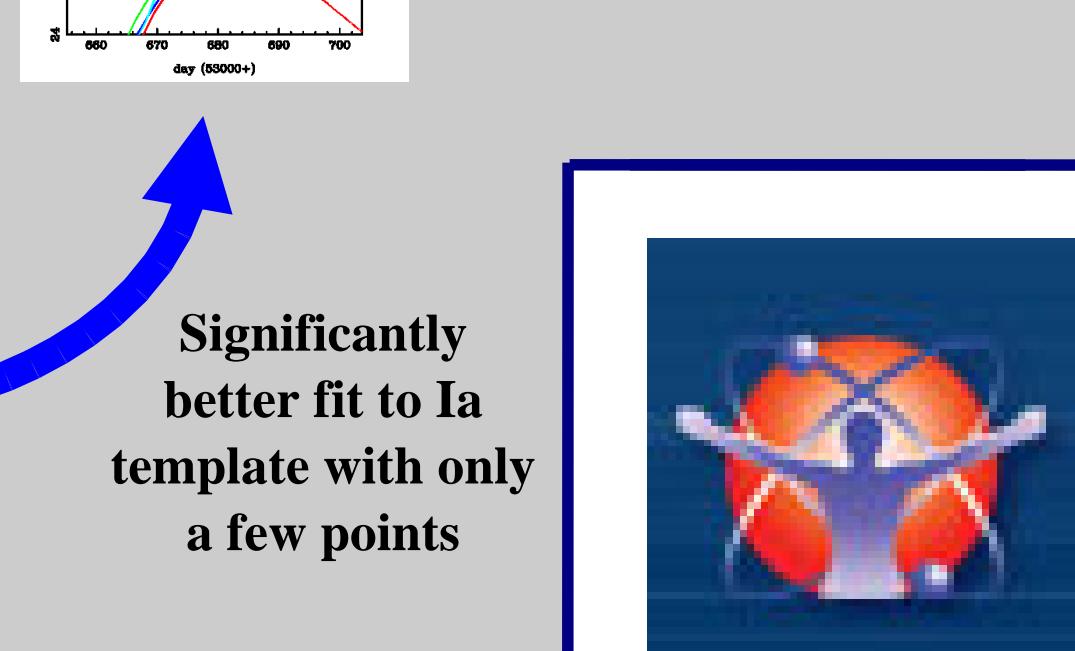
High-z
2005kq @ $z = 0.391$

Type Ia SN
lightcurve fit



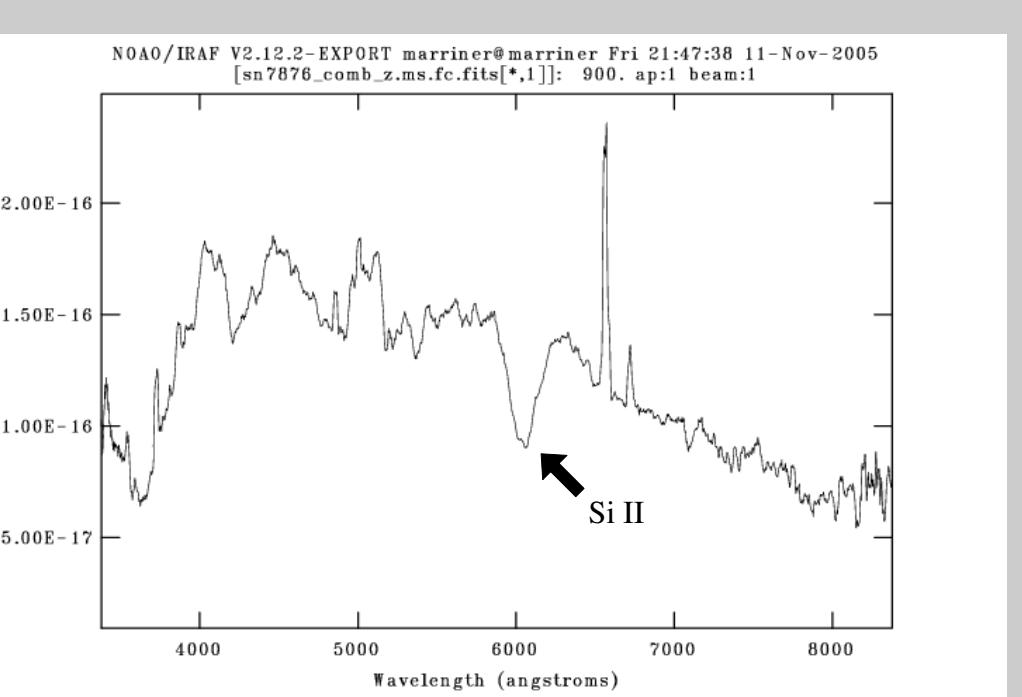
Type II SN lightcurve fit

Significantly better fit to Ia template with only a few points



Difference imaging/ forced photometry in u-band for SN candidates
- distinguish types Ia/II

Spectroscopy



Spectrum of 2005ir taken with ARC 3.5m

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