

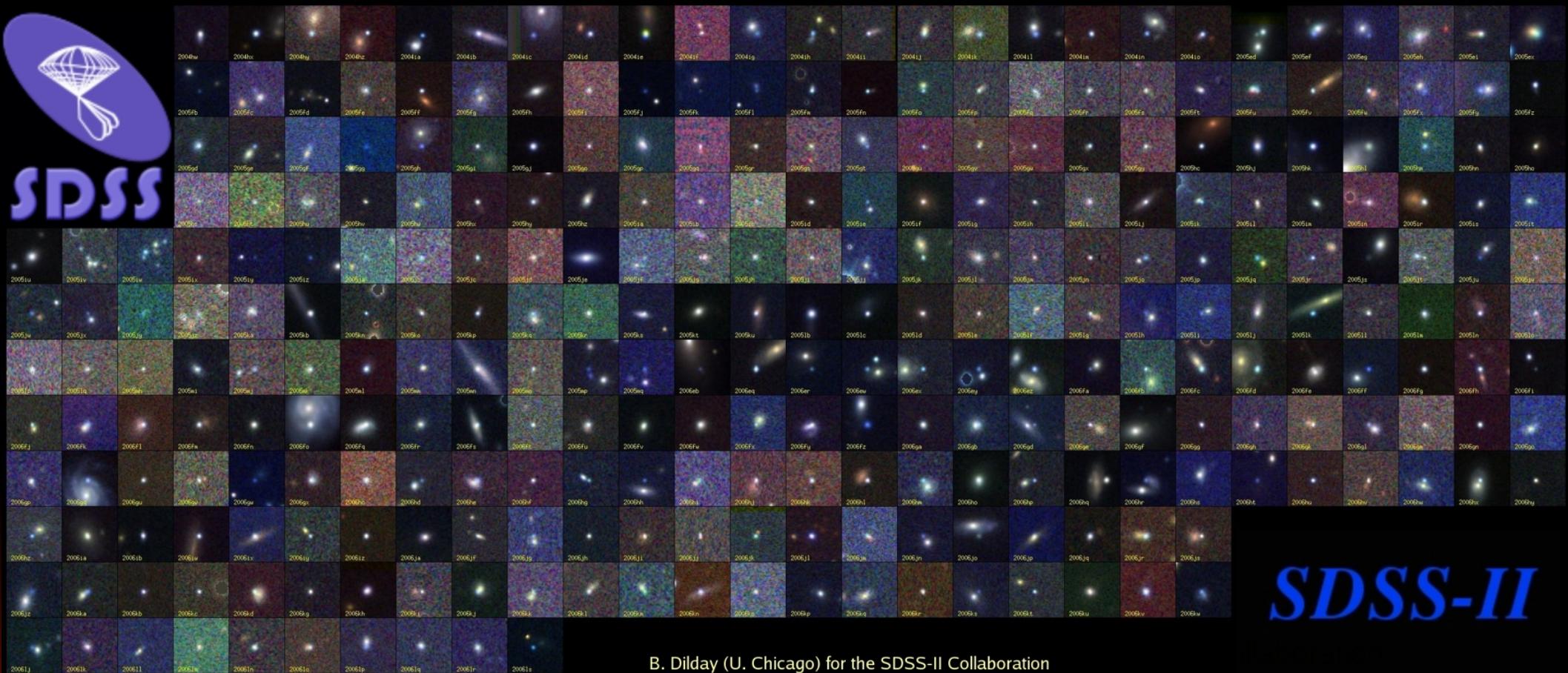
Overview of the SDSS-II Supernova Survey : The First Two Seasons

Andrew Becker
U. Washington

For the SDSS-II Supernova Survey
and Spectroscopic Followup Teams

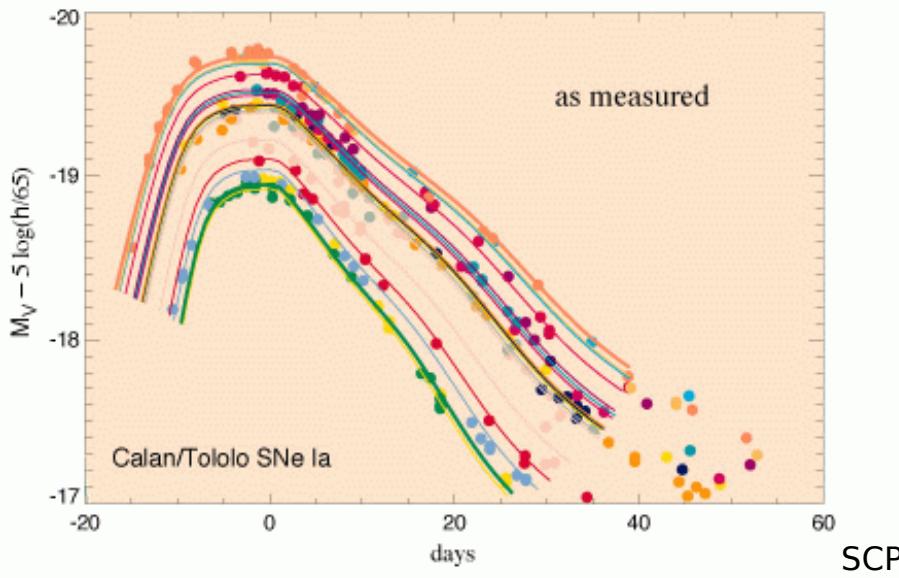


SDSS



B. Dilday (U. Chicago) for the SDSS-II Collaboration

V Band

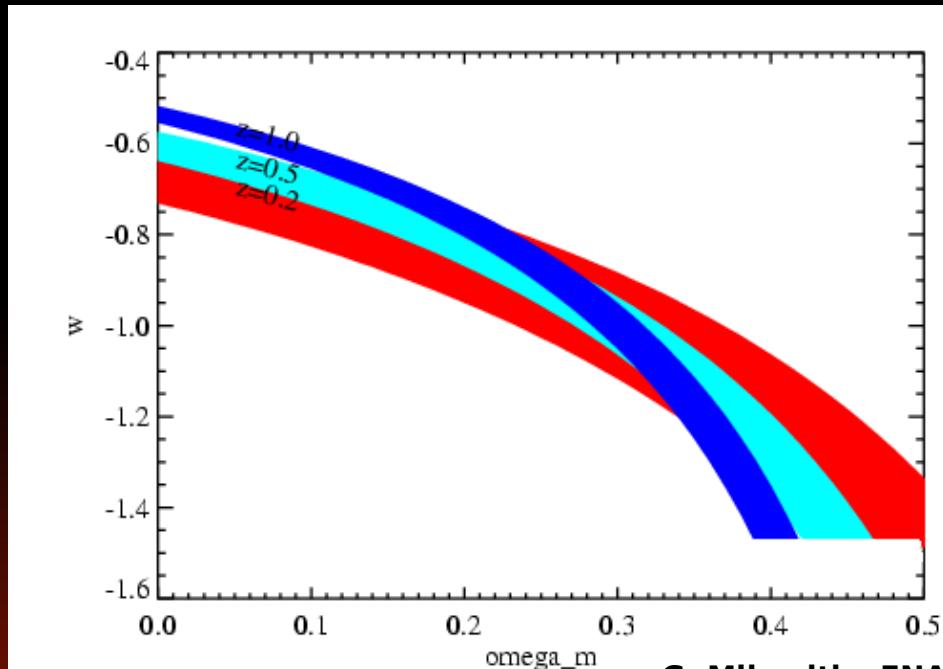


SN Ia As Standardizable Candles

- Lightcurve shape → absolute brightness

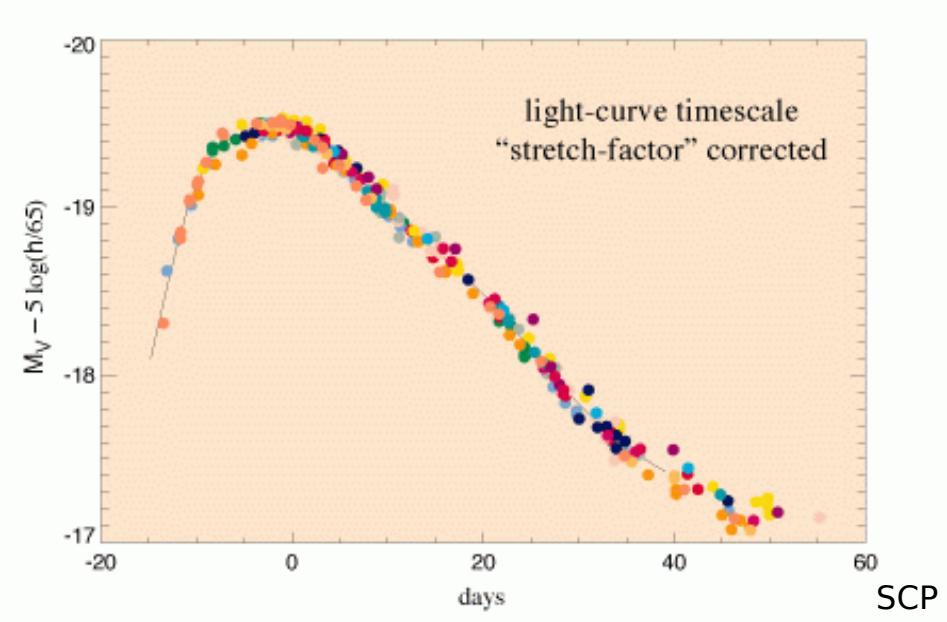
$$D_l(z) = c \frac{(1+z)}{H_0} \int_0^z \frac{dz'}{\sqrt{\Omega_m(1+z')^3 + \Omega_\Lambda(1+z')^{3(1+w)}}}$$

- Ensemble of distance modulus measurements constrains cosmology



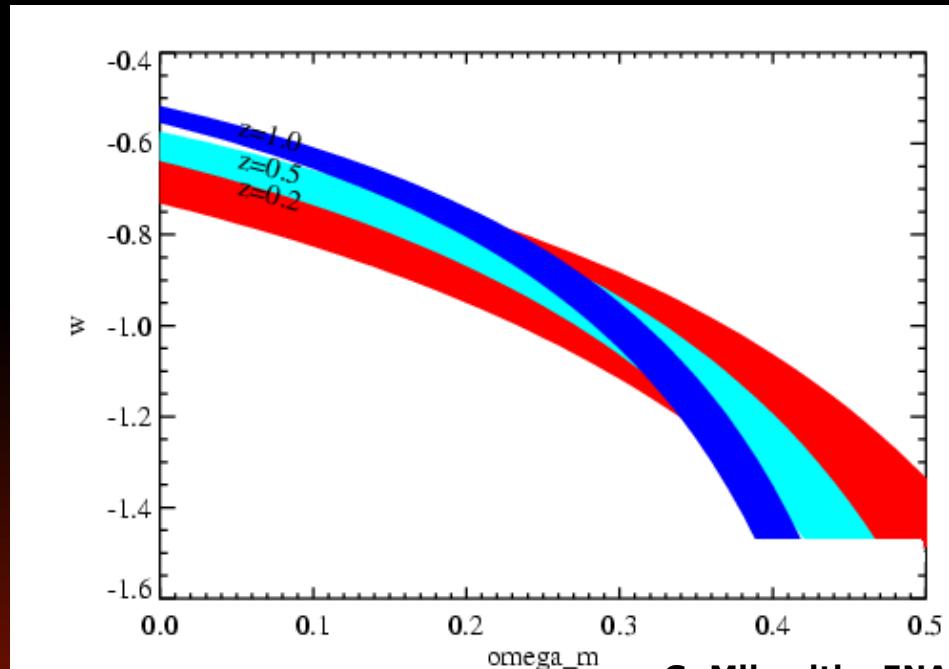
SN Ia As Standardizable Candles

- Lightcurve shape → absolute brightness



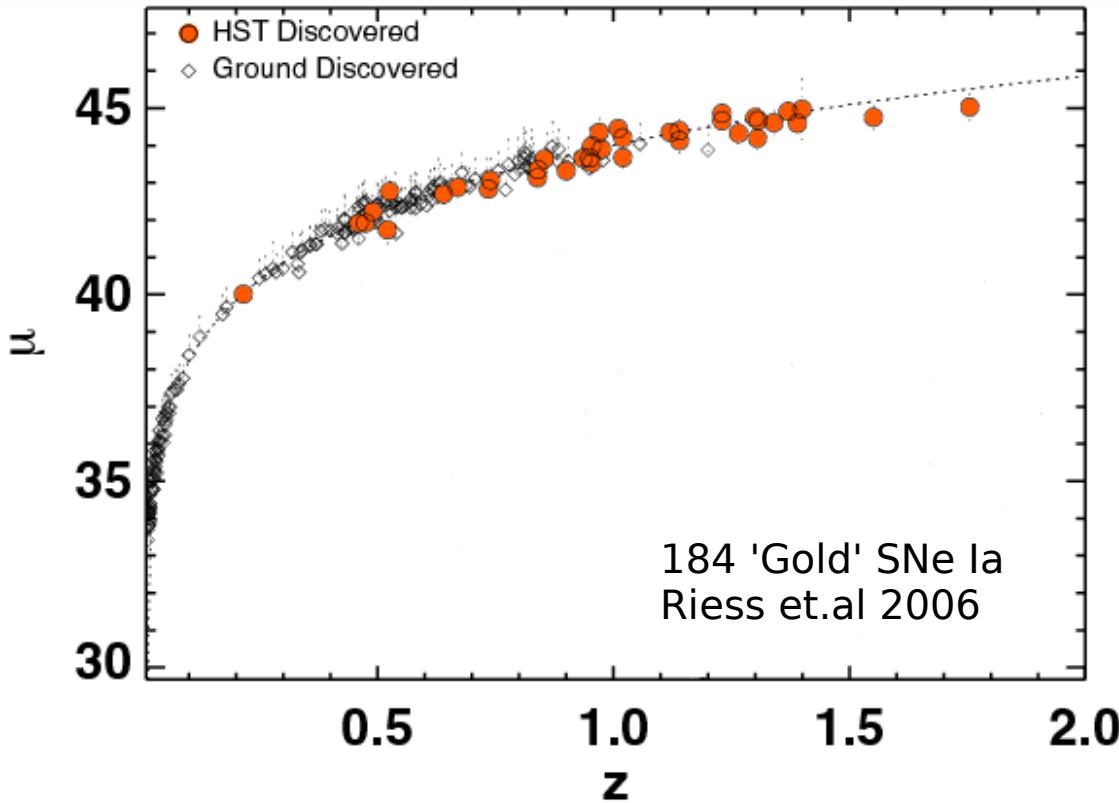
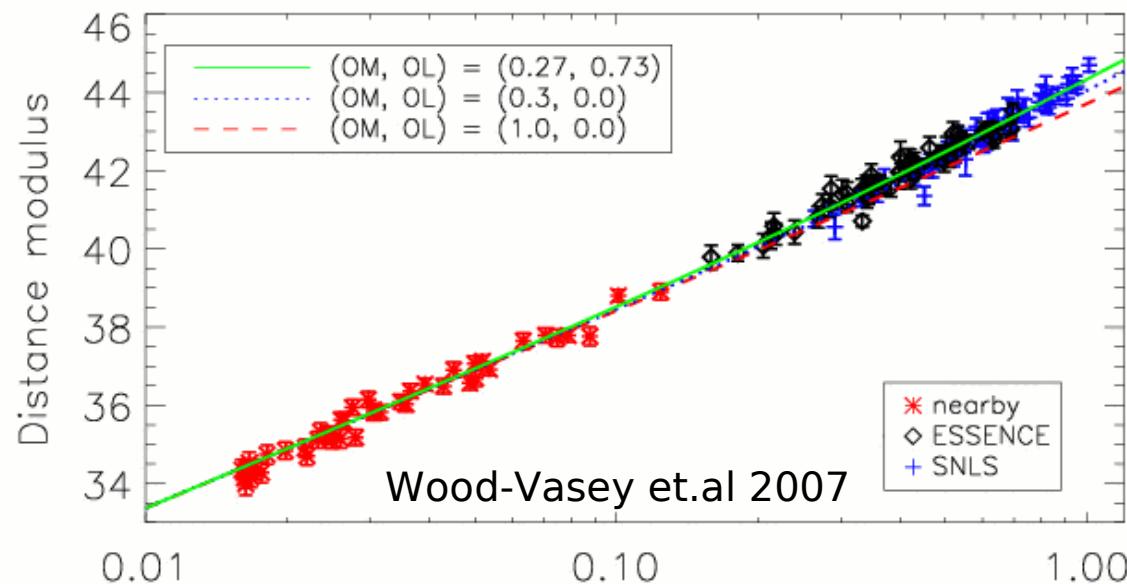
$$D_l(z) = c \frac{(1+z)}{H_0} \int_0^z \frac{dz'}{\sqrt{\Omega_m(1+z')^3 + \Omega_\Lambda(1+z')^{3(1+w)}}}$$

- Ensemble of distance modulus measurements constrains cosmology



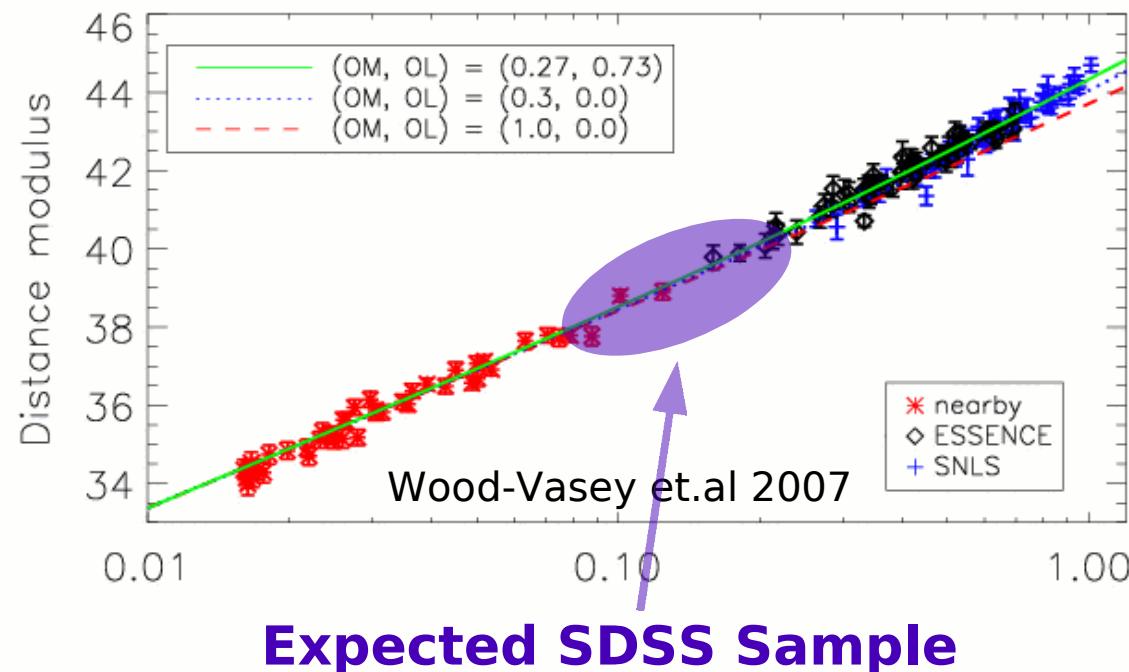
SN Ia Hubble Diagram

- “Redshift desert” at $z \sim 0.1$
 - Need a sample to connect low- z with high- z
 - Recent evolution of w
 - Reduce systematics of comparing samples

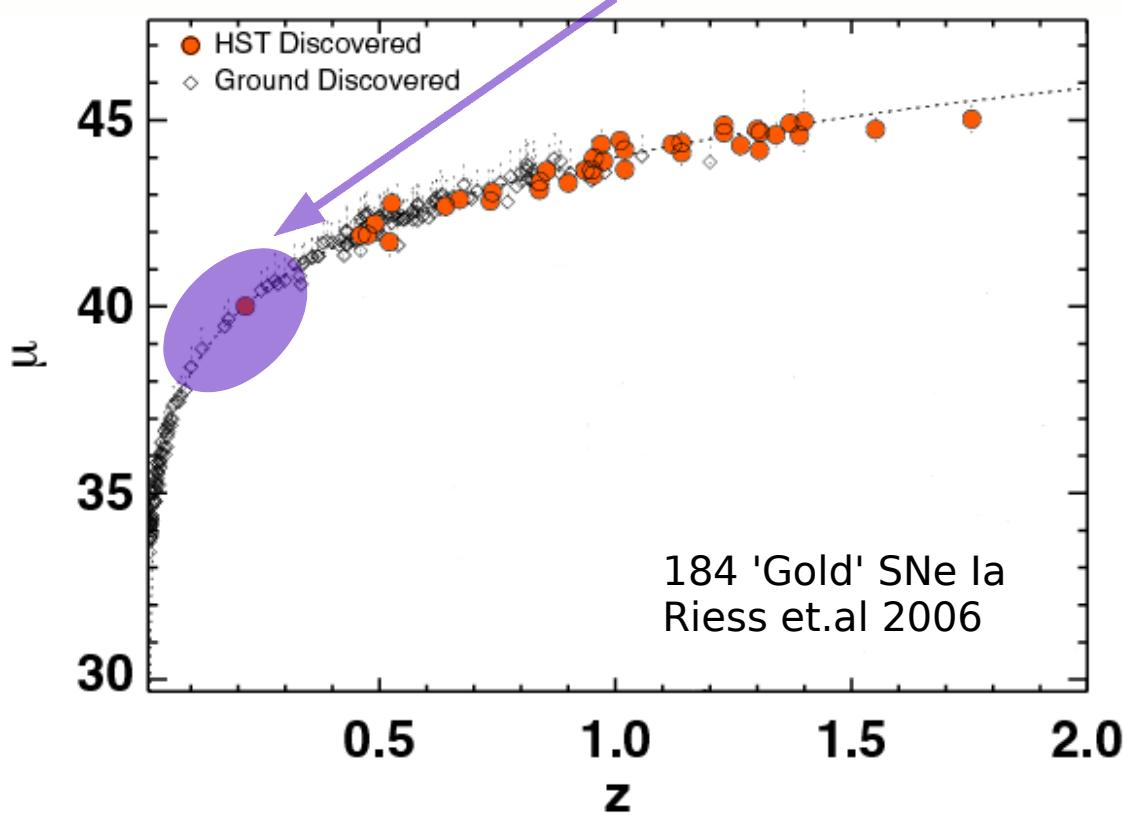


SN Ia Hubble Diagram

- “Redshift desert” at $z \sim 0.1$
 - Need a sample to connect low- z with high- z
 - Recent evolution of w
 - Reduce systematics of comparing samples



Expected SDSS Sample

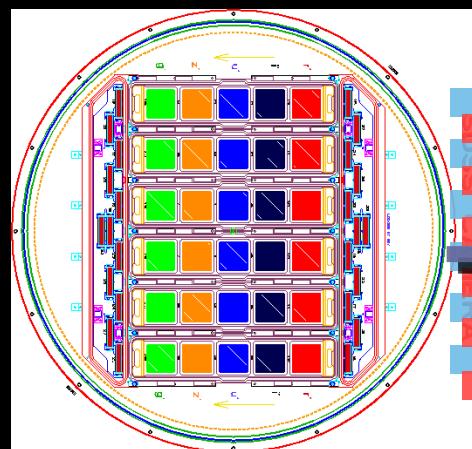


184 'Gold' SNe Ia
Riess et.al 2006

SDSS Supernova Survey



- Sept-Nov 2005-2007
- 300 square degrees, every 2 nights
- 5-band photometry
- Spectroscopic followup



SDSS Stripe 82 N S

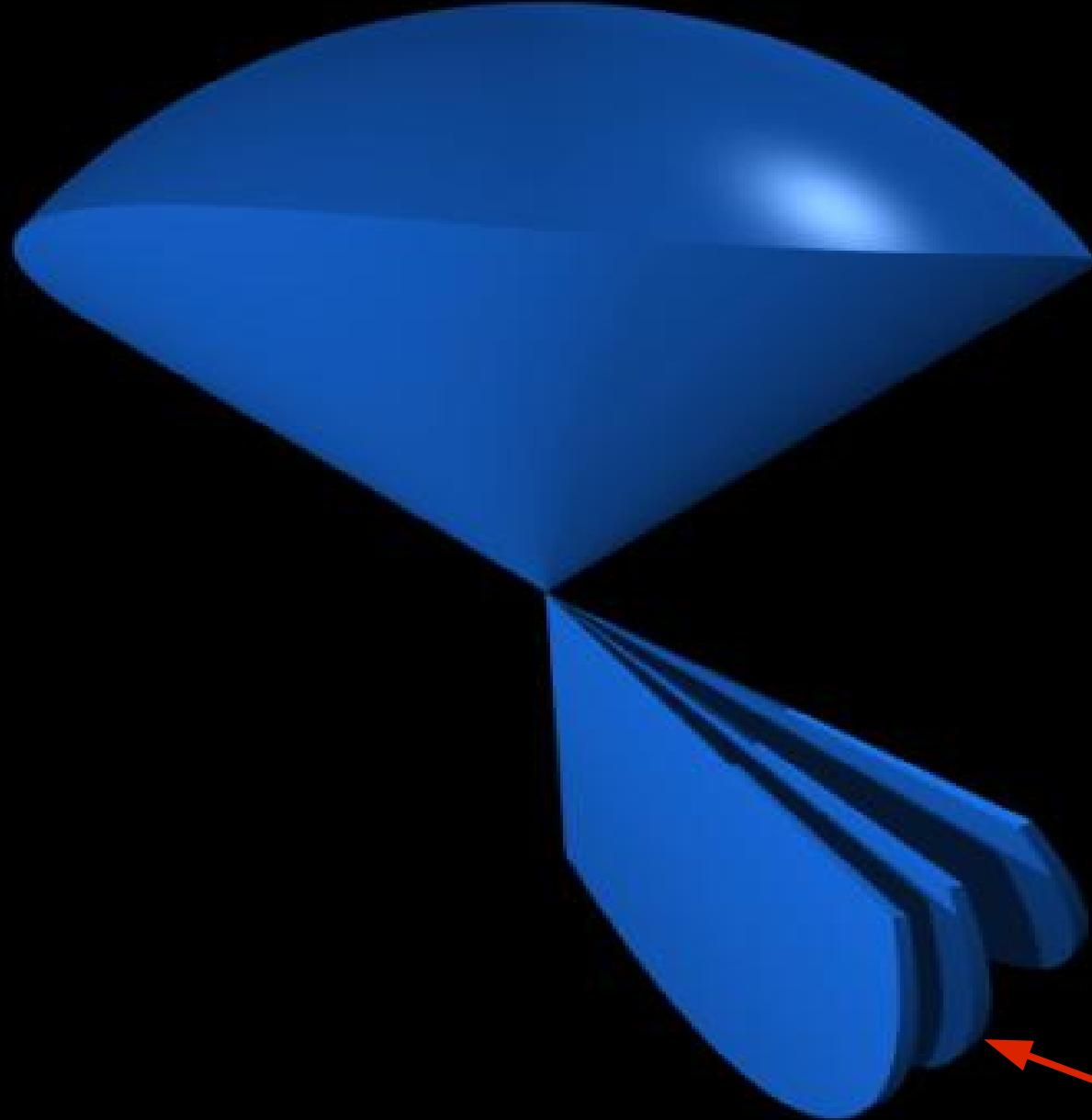
RA = 20 hr

← 120° →

$\delta = +1.25^\circ$
↑

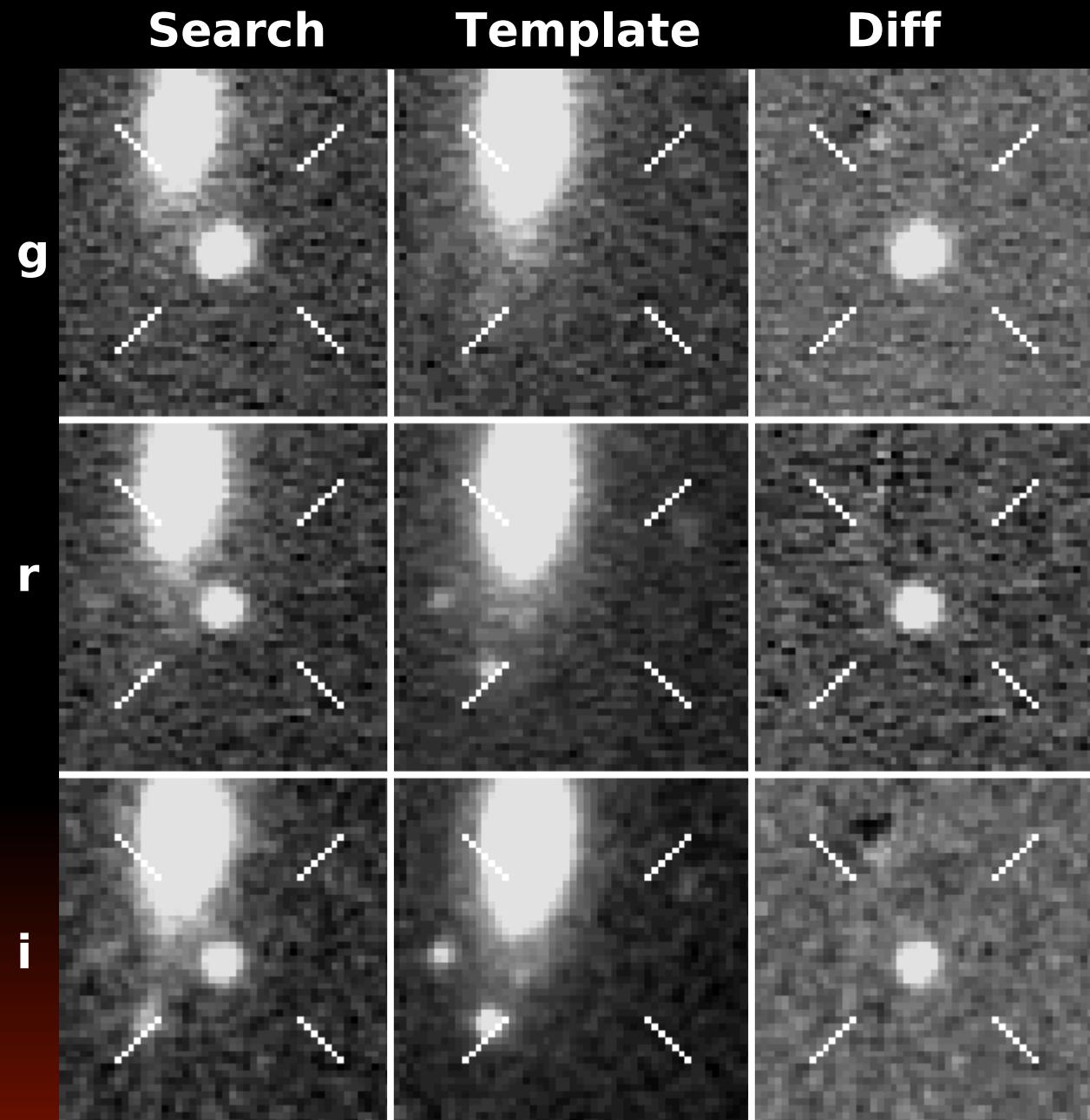
 2.5°
↓
 $\delta = -1.25^\circ$
RA = 4hr

- Initial goal : Spectroscopically confirm and measure 200 high quality SN Ia lightcurves with $0.05 < z < 0.4$
- u-band templates; rates; peculiar SNe



Stripe 82

Searching For Supernova



- 2005
 - **190,020** objects scanned
 - **11,385** unique candidates
 - **129** confirmed Ia
- 2006
 - **14,441** objects scanned
 - **3,694** unique candidates
 - **193** confirmed Ia

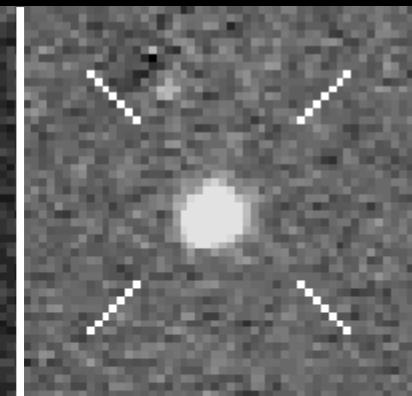
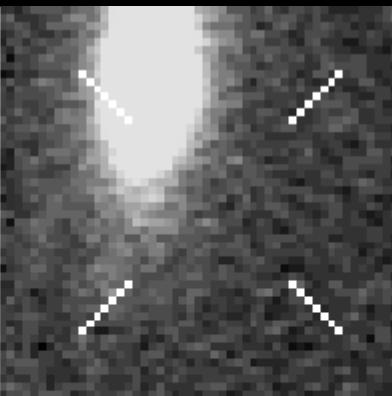
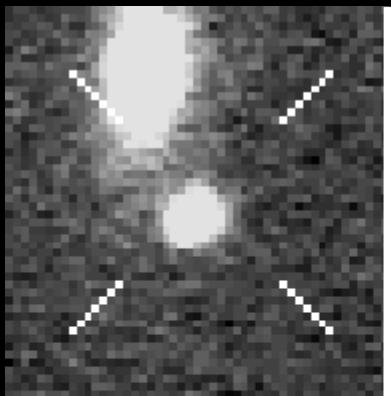
Searching For Supernova

Search

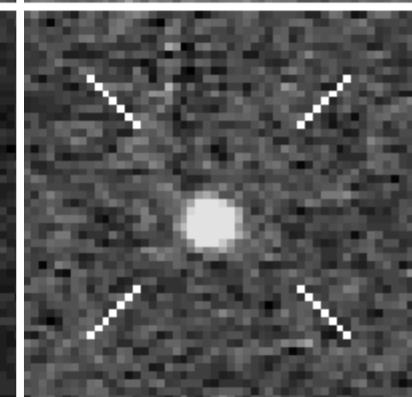
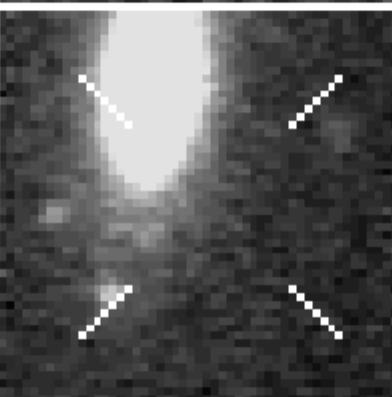
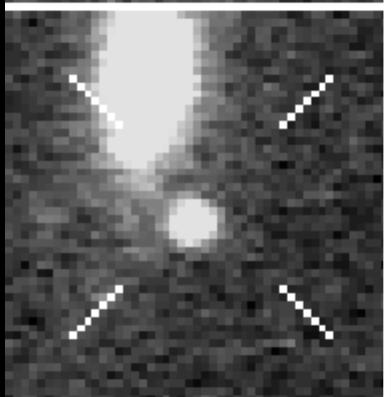
Template

Diff

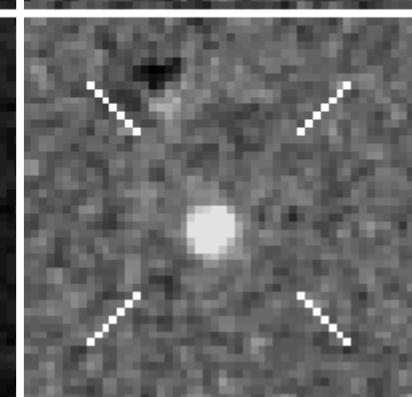
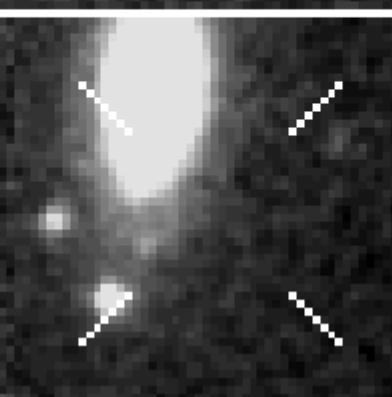
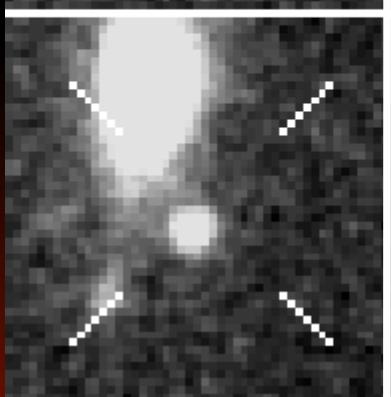
g



r



i



- 2005



s

la

- 2006

- 14,441 objects scanned
- 3,694 unique candidates
- 193 confirmed la

VOEvents

<http://voeventnet.caltech.edu/SDSS.shtml>

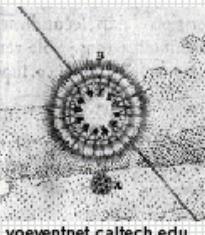
VOEventNet: Real-Time Astronomy with a Rapid-Response Telescope Grid

VOEvents from the SDSS Supernova Search

- This page is generated automatically as incoming SDSS events are received and was last updated at **Thursday, 30-Nov-2006 02:00:25 PST**
- Additional information about SDSS Supernovae that are available [here](#).
- Information on subscribing to receive SDSS Supernovae and other VOEvents in **real time** is here: 
- A near real time feed is available here: [XML](#) [RSS](#)
- This table contains information about Supernovae obtained from SDSS ([Table Help](#)).

**3075 VOEvents
Submitted in 2006**

SDSS Supernovae Events											
ID	Alert Time	Event Time	RA (deg)	Dec (deg)	Error (")	r	i	g	Data Link	DataScope	
sdssss200617141	2006-11-30T10:00:13	2006-11-23T07:07:27.61	21.313546	0.850865	0.101	22.1	21.6	21.7	sdssss200617141	View data	
sdssss200617140	2006-11-30T08:00:25	2006-11-23T07:05:52.14	21.067679	0.611670	0.101	21.6	21.3	21.3	sdssss200617140	View data	
sdssss200617139	2006-11-30T08:00:12	2006-11-23T06:39:00.03	14.346947	0.497037	0.101	21.6	21.8	21.5	sdssss200617139	View data	
sdssss200617136	2006-11-30T00:00:14	2006-11-22T01:59:49.00	-57.552240	-1.166110	0.101	20.9	21.3	21.1	sdssss200617136	View data	
sdssss200617131	2006-11-26T22:01:01	2006-11-21T09:44:14.11	54.389719	1.239540	0.101	21.6	21.5	21.6	sdssss200617131	View data	
sdssss200617130	2006-11-26T22:00:50	2006-10-31T09:15:03.59	53.008080	1.176395	0.101	21.4	21.1	21.9	sdssss200617130	View data	
sdssss200617129	2006-11-26T22:00:38	2006-10-01T09:39:35.20	52.743860	1.211420	0.101	22.3	n/a	22.7	sdssss200617129	View data	
sdssss200617128	2006-11-26T22:00:28	2006-10-21T10:09:15.98	33.714041	1.172145	0.101	21.5	20.4	22.8	sdssss200617128	View data	
sdssss200617127	2006-11-26T22:00:13	2006-10-03T10:51:37.75	47.561650	0.748905	0.101	22.1	n/a	22.9	sdssss200617127	View data	
sdssss200617126	2006-11-26T12:04:34	2006-10-29T08:56:14.48	50.907910	-0.221420	0.101	22.7	n/a	22.9	sdssss200617126	View data	
sdssss200617124	2006-11-26T12:04:22	2006-11-23T08:26:52.44	41.290080	-0.395650	0.101	22.5	n/a	22.7	sdssss200617124	View data	
sdssss200617122	2006-11-26T12:04:10	2006-11-23T08:00:12.28	34.734748	-0.358690	0.101	21.9	22.3	21.8	sdssss200617122	View data	
sdssss200617121	2006-11-26T12:03:58	2006-11-23T07:52:50.44	32.818535	-0.363915	0.101	22.0	22.3	22.9	sdssss200617121	View data	
sdssss200617120	2006-11-26T12:03:46	2006-11-20T07:34:29.66	30.312250	-0.273495	0.101	22.1	22.2	n/a	sdssss200617120	View data	
sdssss200617119	2006-11-26T12:03:34	2006-11-23T09:11:15.46	52.442173	-0.789217	0.101	21.7	22.0	22.4	sdssss200617119	View data	
sdssss200617118	2006-11-26T12:03:22	2006-11-23T09:02:41.98	50.268915	-0.843675	0.101	22.3	n/a	22.2	sdssss200617118	View data	
sdssss200617117	2006-11-26T12:03:10	2006-11-23T08:23:53.38	40.600300	-0.796530	0.101	22.1	21.8	22.0	sdssss200617117	View data	



- Home
- Project Description
- Personnel
- GCN VOEvent Information
- SDSS Supernovae
- OGLE Microlensing
- Transients in the Griffith Park "Big Picture"
- IVOA VOEvent pages
- Search the Nexus
- Subscribe
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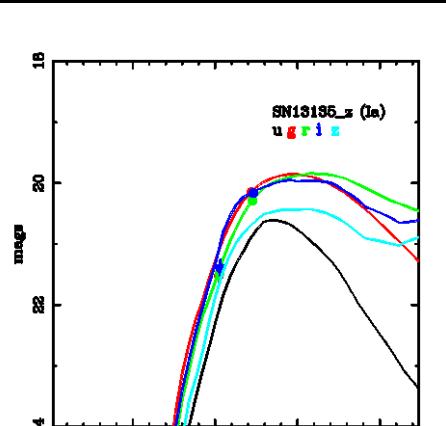


VOEventNet is sponsored by
NSF Grant No.
CNS-0540369 and includes
collaborators at
California Institute of
Technology,
University of California
Berkeley,
Los Alamos National
Laboratory, and National
Optical Astronomy
Observatory

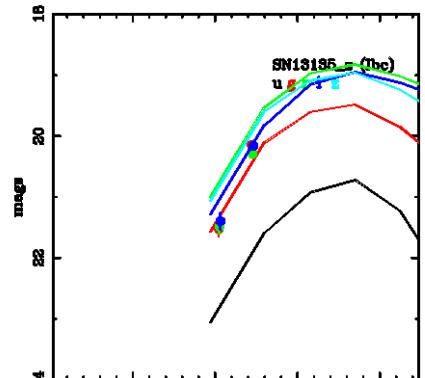
Feeding the Followup

2 Epochs

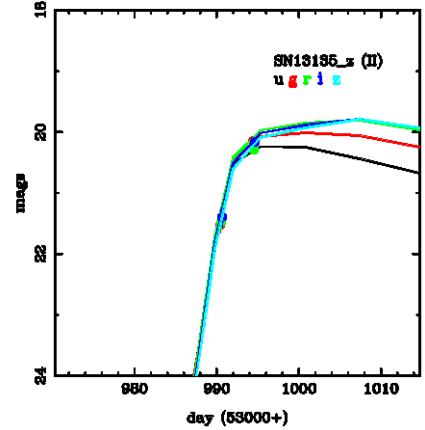
SN Ia Fit
 $\chi^2 = 1.8$



SN Ibc Fit
 $\chi^2 = 39$

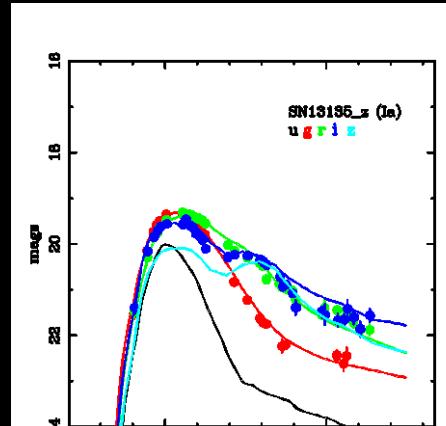


SN II Fit
 $\chi^2 = 6.6$

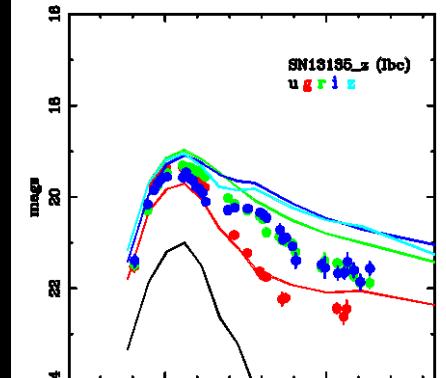


31 Epochs

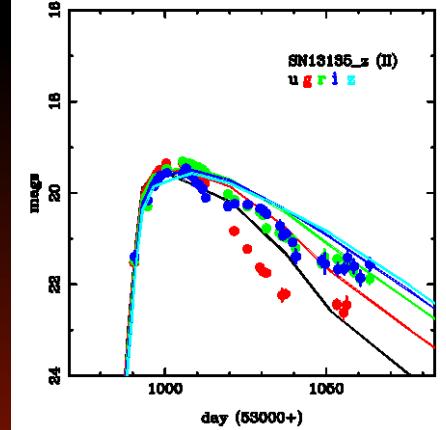
SN Ia Fit
 $\chi^2 = 8.8$



SN Ibc Fit
 $\chi^2 = 352$



SN II Fit
 $\chi^2 = 57$



Classification
95%
accurate
based
upon
spectra!

SN Spectroscopy



MDM 2.4m

NOT 2.6m

APO 3.5m

NTT 3.6m

KPNO 4m

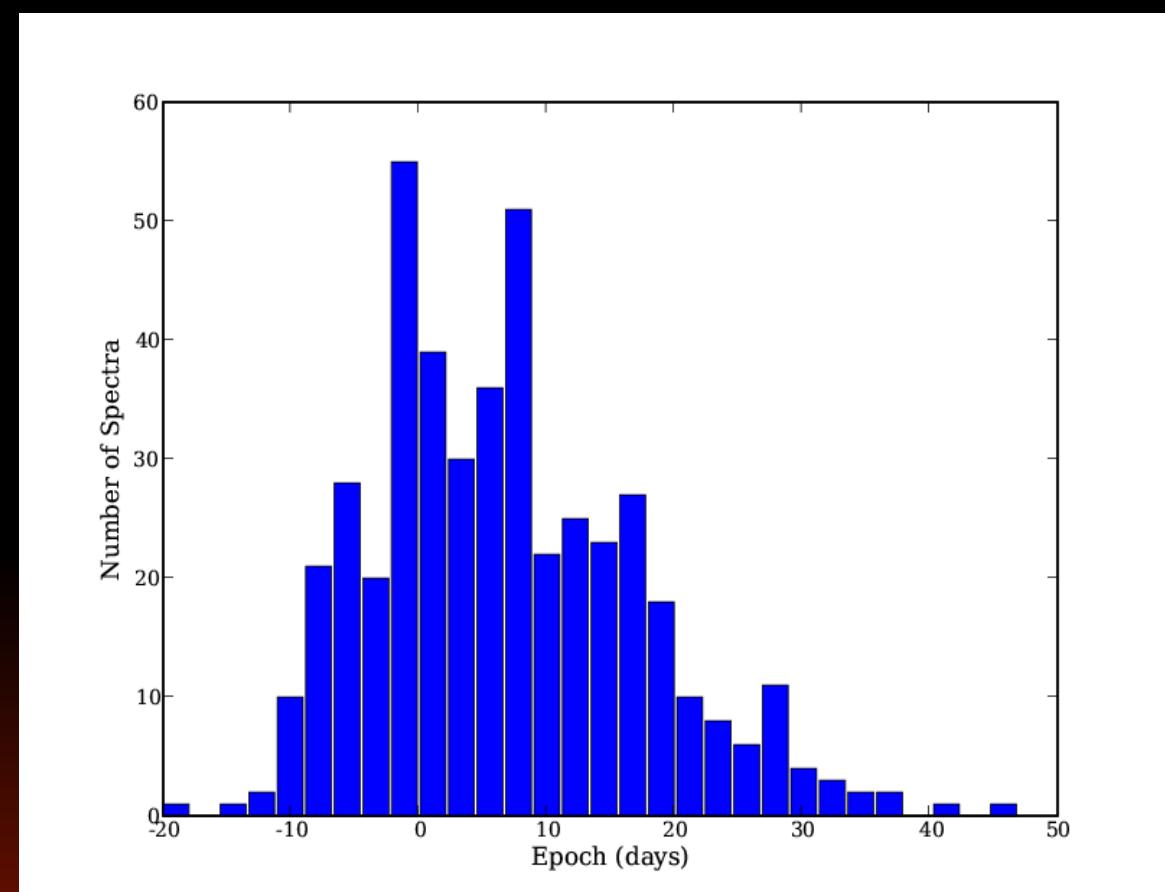
WHT 4.2m

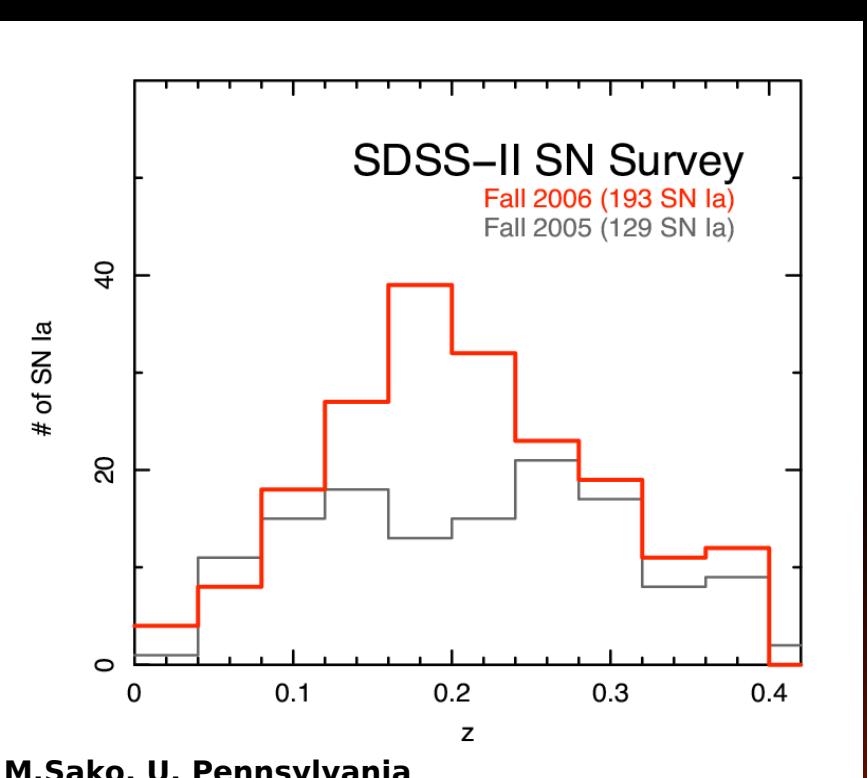
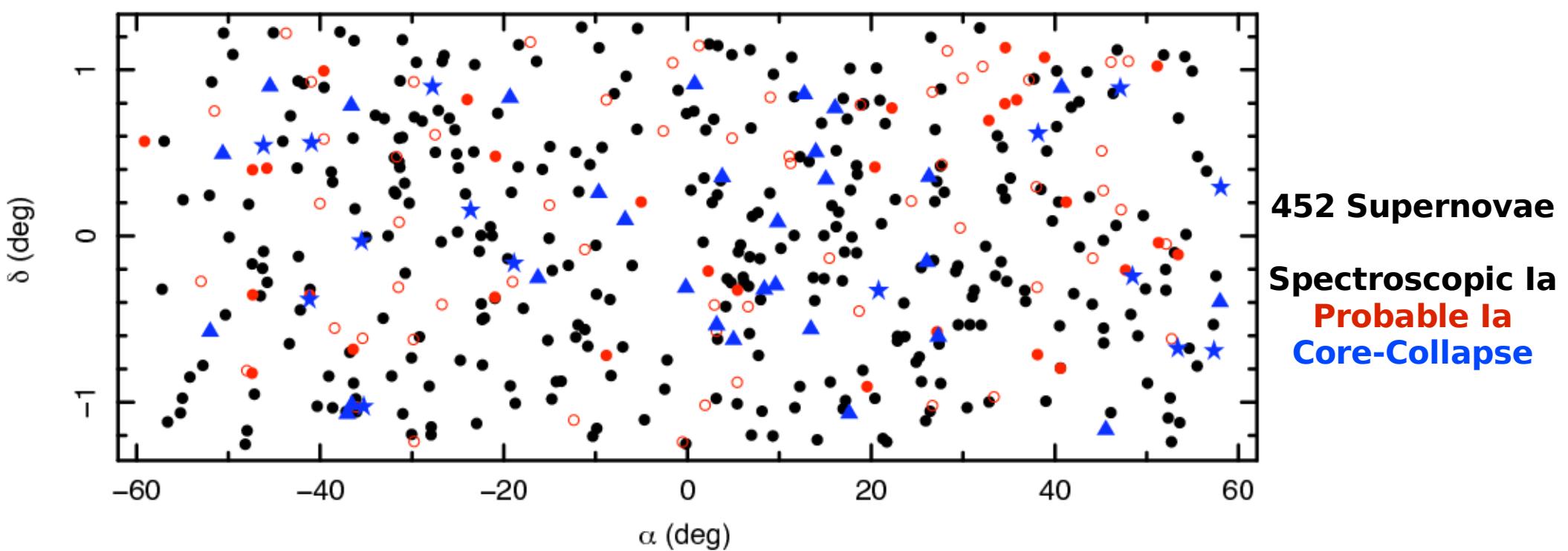
Subaru 8.2m

HET 9.2m

Keck 10m

SALT 10m



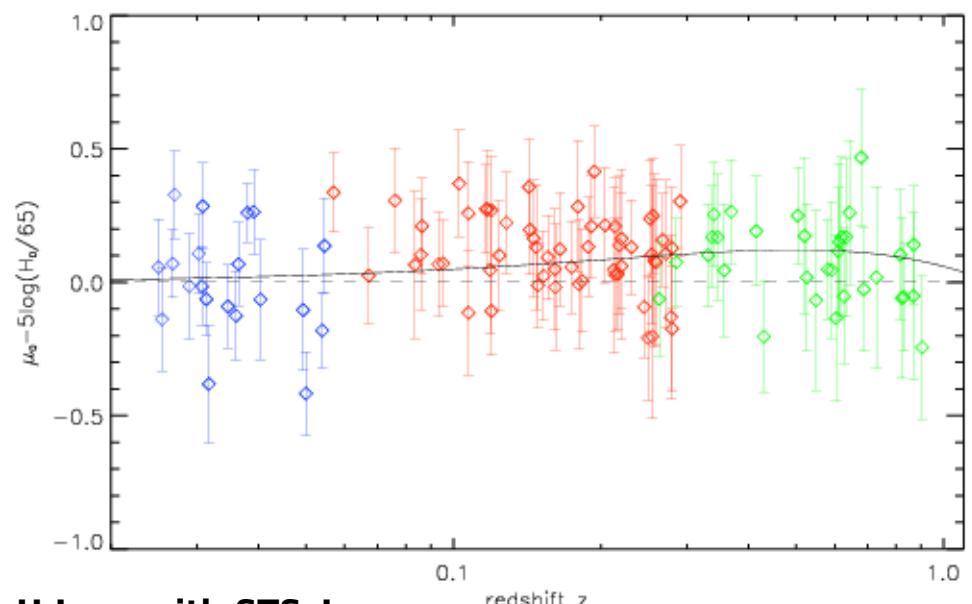
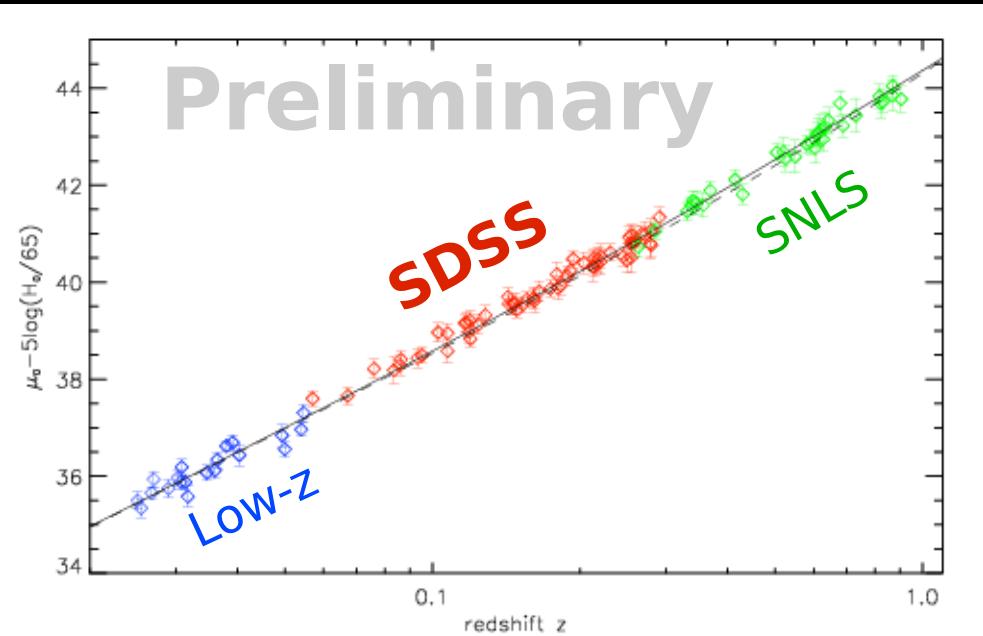


**322 spectroscopically confirmed
SN Ia in 2005/2006**

**Analysis of 129 SN Ia from 2005
nearly complete**

- **Scene modeling photometry**
 - J Holtzman (028.02)
- **Photometric calibration**
- **Rates, spectra, systematics**
 - R Kessler (032.03)
- **Light-curve fitting and distances**

SDSS-II Hubble Diagram



- **2005 Data**
 - **129 Ia Total**
 - **74 after cuts**
- **MLCS2k2 Distances**
 - **Results in 15 min!**
 - H. Lampeitl (032.02)
 - **Lowest redshift measurement of w**
- **2007 – Change strategy to find more low-z Ia?**

Self-Contained Cosmology Analysis

