

CSP vs SDSS: the final chapter?



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Motivation

Confirm that two carefully calibrated observing programs get photometry measurements that agree, on average.

- CSP:
 - ▶ Follow-up survey
 - ▶ Las Campanas Observatory, Chile
 - ▶ 5 9-month long observing seasons
 - ▶ $uBVgriYJHK$ filters
- SDSS:
 - ▶ Rolling Search
 - ▶ Apache Point Observatory
 - ▶ 3 3-month long observing seasons
- **10+** SNe in common

How to compare photometry

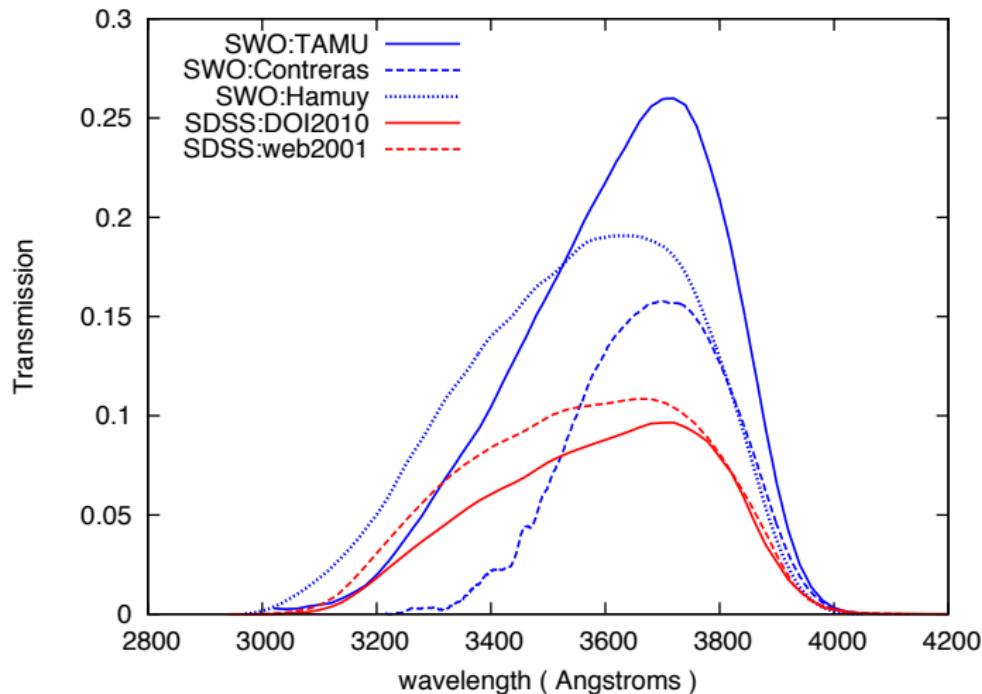
In General

- $\Delta m_x = m_{x,SDSS} - m_{x,CSP}$
- Interpolate to account for different observation dates
- S-Correct to account for different photometric systems
- If all is as it should be,
 $\langle \Delta m_x \rangle \geq 0$

Specifics

- use MLCS to interpolate
- use Hsiao templates as base SEDS for s-correction
- must know both photometric systems (filters, ZP's)

Changes to *u* filter response function



CSP Calibration

Update: CSP Color terms updated

	<i>u</i>	<i>g</i>	<i>r</i>	<i>i</i>
BD+17 Standard Magnitude				
	10.56	9.64	9.35	9.25
Native CSP Magnitude				
	10.516	9.645	9.352	9.251
Synthetic AB Magnitude				
HAMUY	10.5396	9.6294	9.3480	9.2533
CONTRERAS	10.4057	9.6346	9.3485	9.2537
TAMU	10.4659	9.6279	9.3469	9.2532
AB offsets				
HAMUY	0.024	-0.016	-0.004	0.002
CONTRERAS	-0.110	-0.010	-0.003	0.003
TAMU	-0.050	-0.017	-0.005	0.002
Corresponding zeropoints				
HAMUY	12.974	14.432	14.136	13.673
CONTRERAS	12.396	14.430	14.137	13.674
TAMU	13.113	15.164	14.941	14.565
Published CSP zeropoints				
CONTRERAS	12.400	14.432	14.136	13.687

Overlap SN Sample

Update: CSP photometry updated, SN18890 added to sample

SDSS-II ID	SN IAU name	z ^a	Δm_{15}	CSP phot. version	peculiar
4524	2005gj	0.0616	-	Prieto et al.	yes ^b
5944	2005hc	0.0459	0.85	Contreras et al.	
6558	2005hj	0.0574	0.72	Stritzinger et al.	yes ^c
7876	2005ir	0.0764	0.84	Contreras et al.	
8151	2005hk	0.0131	-	Phillips et al.	yes ^d
10805	2006ku	0.0455	1.02	Stritzinger et al.	
12898	2006fw	0.0835	1.65	Stritzinger et al.	
17784	2007jg	0.0371	1.17	Stritzinger et al.	
17886	2007jh	0.0401	1.77	Stritzinger et al.	yes ^e
18890	2007mm	0.0664	1.91	Stritzinger et al.	probably ^e

^aRedshifts are in heliocentric frame.

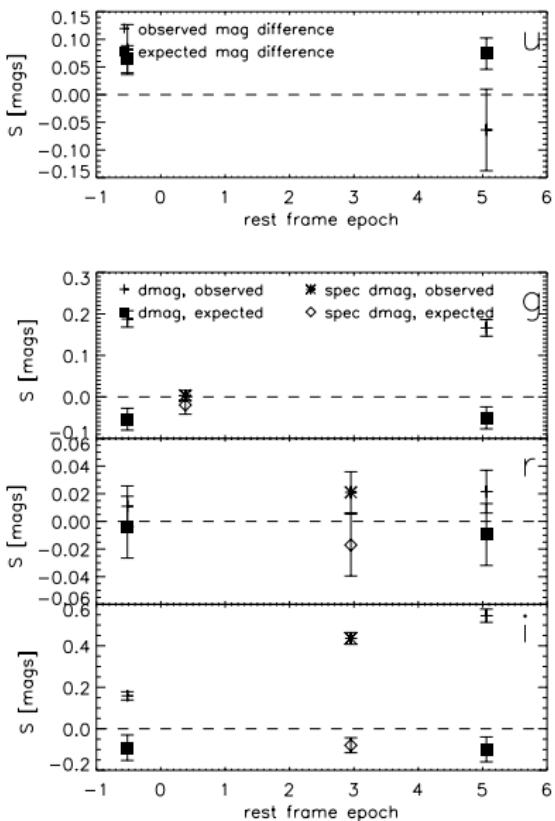
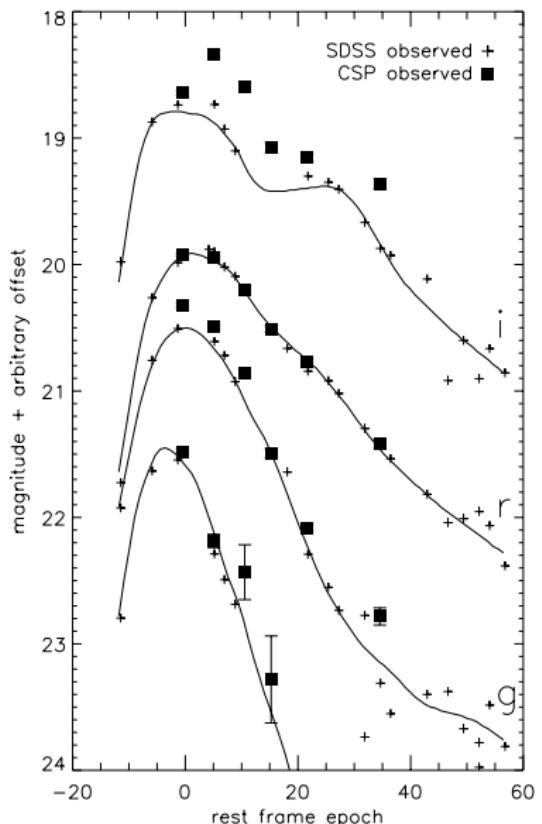
^b2002ic-like

^c2005-hj like

^d2002cx-like

^e1991-bg like

Problem with SN12898 photometry



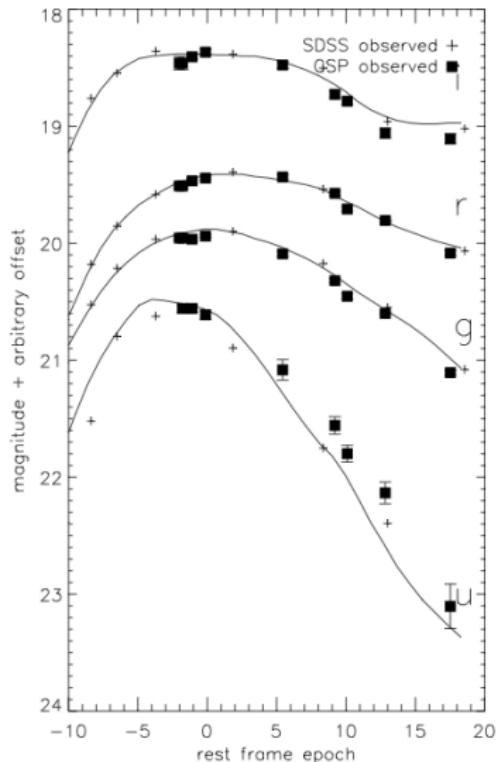
Δm results (excluding 2006fw, most peculiars)

Update: Updated CSP photometric system; most recent photometry.

band	Δm		$\frac{\Delta m}{d\Delta m}$		N	$adj.\delta m$
	mean	rms	mean	rms		
<i>u</i>	-0.013 ± 0.010	0.094	-0.30	1.72	32	0.017
<i>g</i>	0.017 ± 0.006	0.044	0.38	0.99	57	0.006
<i>r</i>	0.003 ± 0.005	0.044	-0.03	1.25	59	0.006
<i>i</i>	0.003 ± 0.008	0.083	0.04	1.37	57	0.011

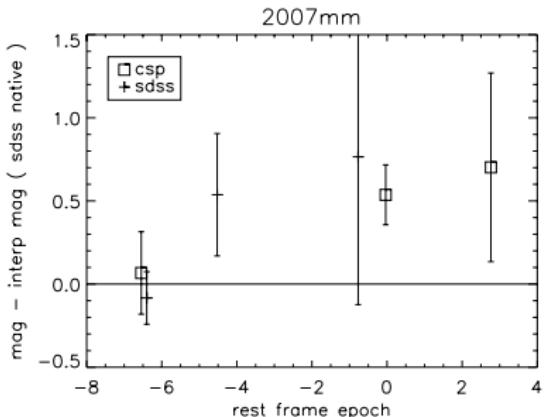
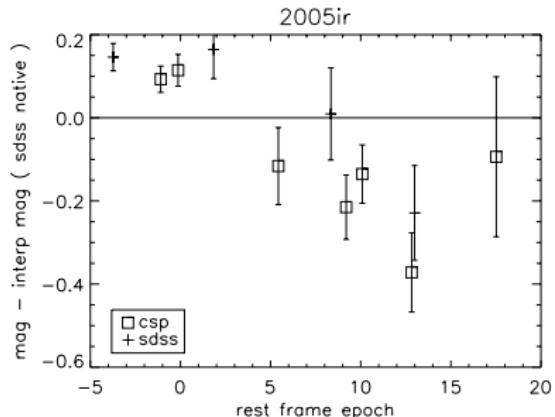
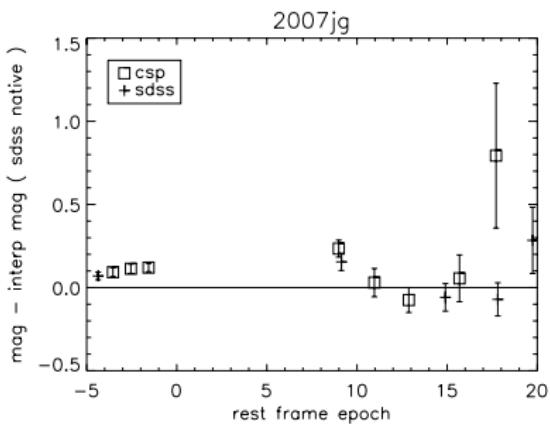
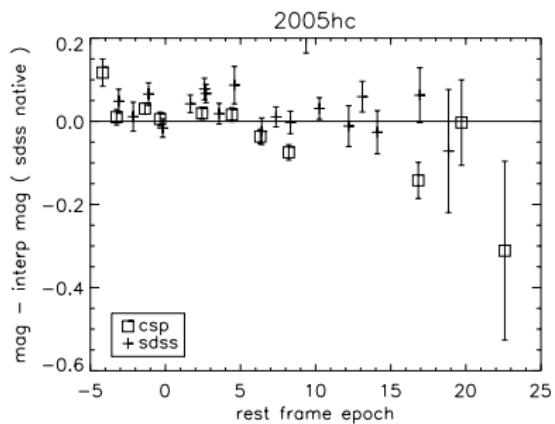
Problem with u interpolation

ex: SN7876/2005ir



- fits to u are tilted
- examine Ic residuals
 - ▶ S-correct CSP to SDSS photometric system
 - ▶ subtract SDSS u fit from both CSP, SDSS data
 - ▶ look for biases

plots of u lc residuals



Implications for u agreement

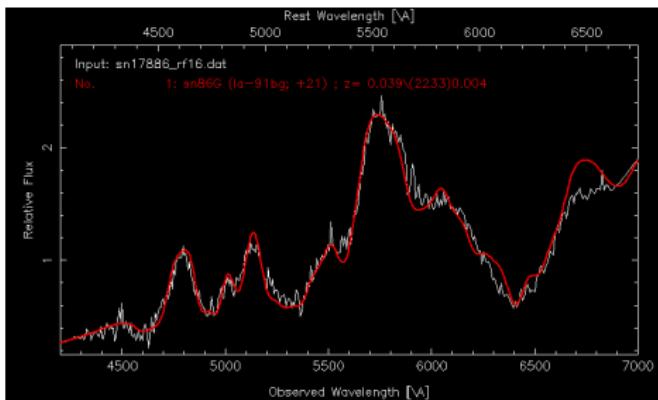
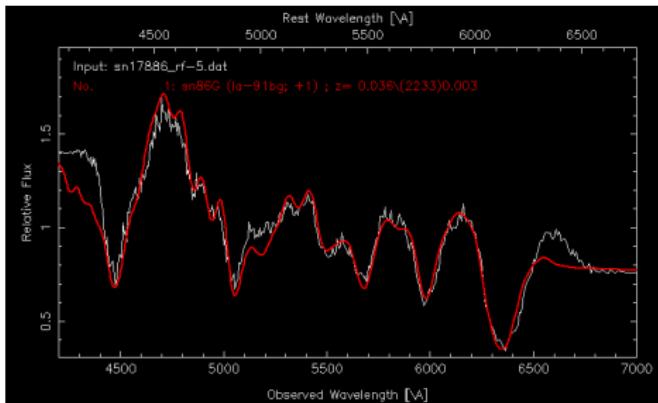
Update: comparing u results for mlcs fit, interpolation

u version	Δm		$\frac{\Delta m}{d\Delta m}$		N	$adj.\delta m$
	mean	rms	mean	rms		
original	-0.013 ± 0.010	0.094	-0.30	1.72	32	0.017
alt. interp	-0.017 ± 0.008	0.088	-0.41	1.804	33	-
alt. nn	0.020 ± 0.007	0.0895	0.309	2.278	33	-

- Consider alt.nn result an upper limit for u agreement.
- CSP, SDSS u agree at 2% flux level.

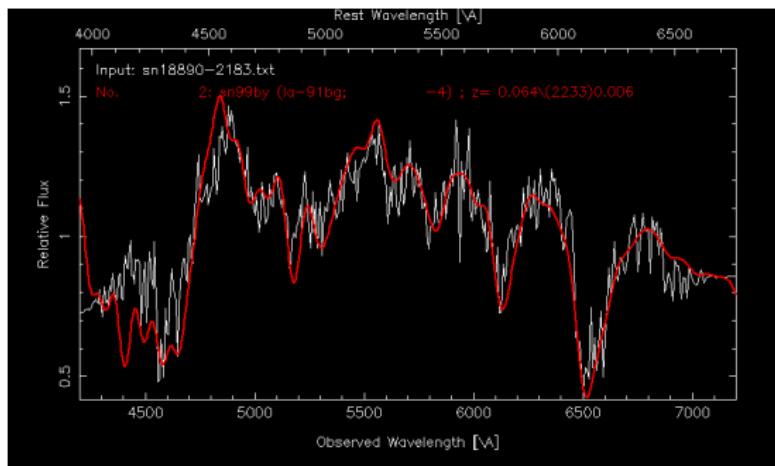
SN17886 - 1991bg type

- $\Delta m_{15} = 1.77$
- $M_g = 17.75$
- absorption features typical of 91-bg type



SN18890 - 1991bg type?

- $\Delta m_{15} = 1.91$
- $M_g = 17.65$
- Only one good SDSS spectrum (rfep -7)



Implications for i agreement

Important! No 12898, 18890, or 17886 included here.

Update: comparing i results for mlcs fit, interpolation

i version	Δm		$\frac{\Delta m}{d\Delta m}$			N	$adj.\delta m$
	mean	rms	μ	rms			
original	-0.005 ± 0.009	0.078	-0.20	1.40	42	0.012	
alt. interp	0.015 ± 0.004	0.065	-0.30	3.479	42	-	
alt. nn	0.004 ± 0.003	0.060	-0.72	3.16	42	-	

- Lack of agreement between the original analysis and alt. interp is puzzling.
- Errors for alt. interpolation need to be checked - underestimating?
- Omitting the probable 91-bg objects does not change u , g , or r agreement.

Conclusions and Future Work

- agreement between CSP, SDSS photometry is
 - ▶ to 2 % in flux in u
 - ▶ consistent at 1σ level in r and i
 - ▶ consistent at 2σ level in g
- results are consistent with error floors for photometry
 - ▶ slightly larger i error reflects difficulties of modeling i
- To do list
 - ▶ tidying alternative analyses
 - ▶ including SNe 4524 and 8151 via observed spectra
 - ▶ perhaps including SNe 18890 and 17886 via 91bg template
 - ▶ finish draft, publish...