

Calán-Tololo, CSPI and CSPII optical spectra of Type Ia supernovae

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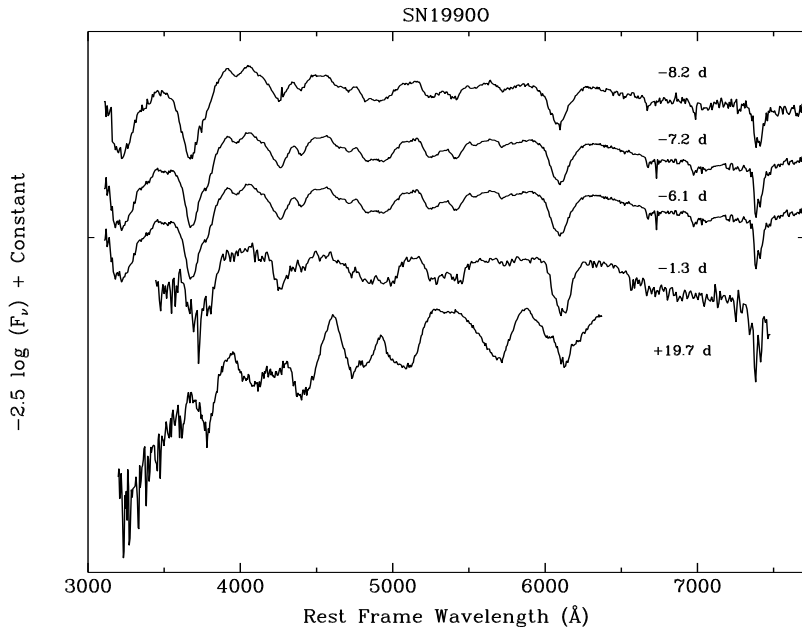
CSP Team Meeting

Pasadena, August 1st, 2015

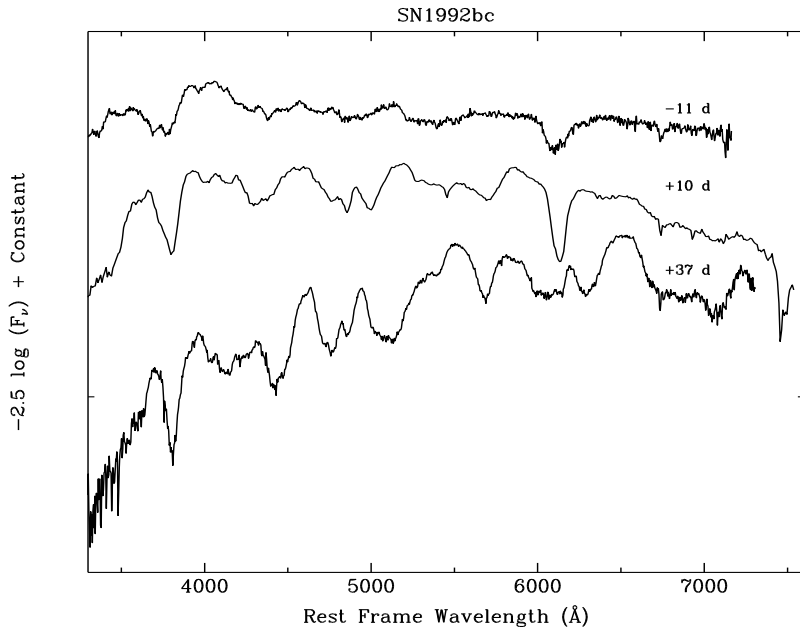
The Calán-Tololo Survey

- ▶ Hamuy et al. 1996, AJ, 112, 240
- ▶ BVRI light curves for 29 type Ia supernovae.
- ▶ From the 29 supernovae in Hamuy et al. 1996, 21 have been observed spectroscopically at or near maximum (± 7 days) by the Calán-Tololo team.
- ▶ There are 52 unpublished spectra from the Calán-Tololo sample.
- ▶ We have measured expansion velocities and equivalent widths for some of the features in the near maximum available optical spectra.

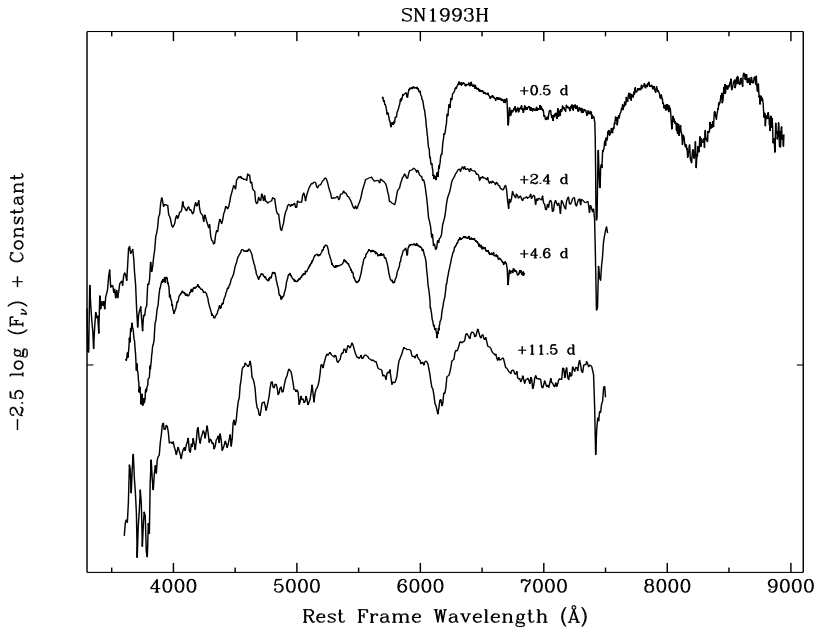
Calán-Tololo examples: SN1990



Calán-Tololo examples: SN1992bc



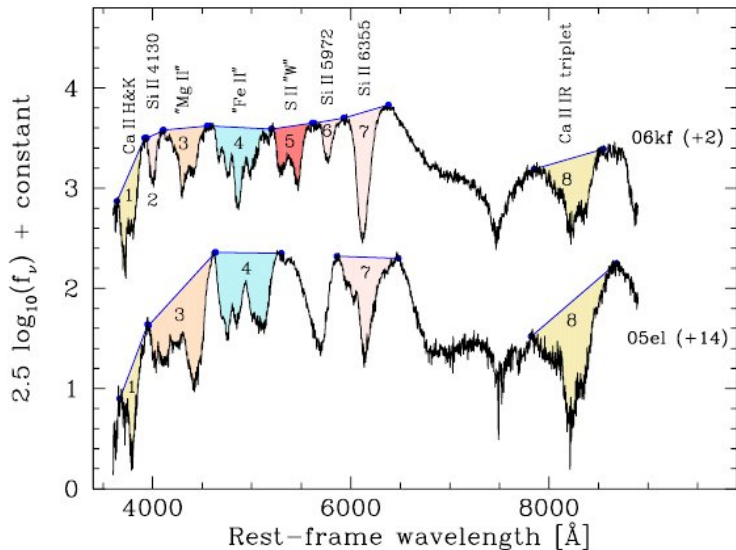
Calán-Tololo examples: SN1993H



CSP Type Ia optical spectroscopy

- ▶ First release: Folatelli et al. 2013, ApJ, 773, 53
- ▶ 604 previously unpublished spectra of 93 type Ia supernovae.
- ▶ Phases from -12 to +150 days from B-band maximum light.
- ▶ Expansion velocities from absorption minima.
- ▶ Pseudo-equivalent widths as in Garavini et al. 2007, A&A, 470, 411
- ▶ All the SNe considered have definitive photometry allowing comparison of photometric and spectroscopic properties.

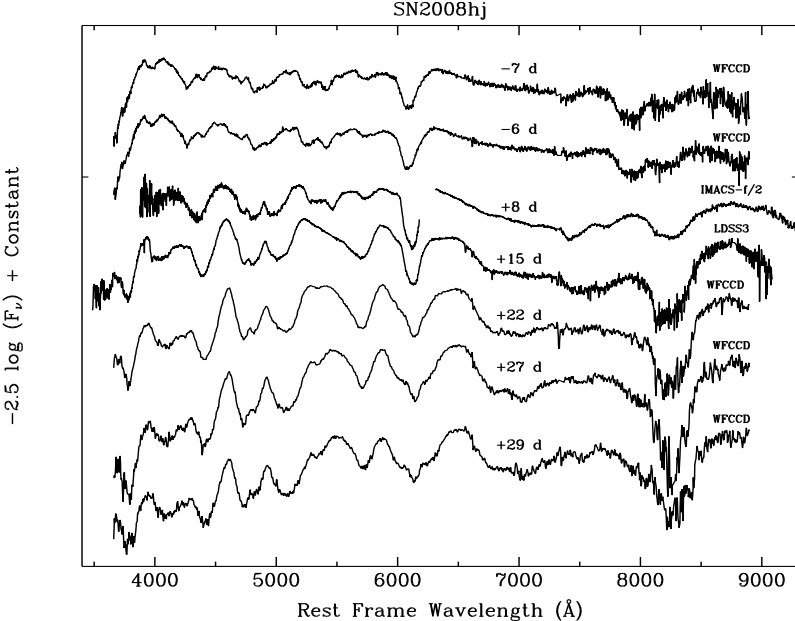
Pseudo-equivalent widths prescription



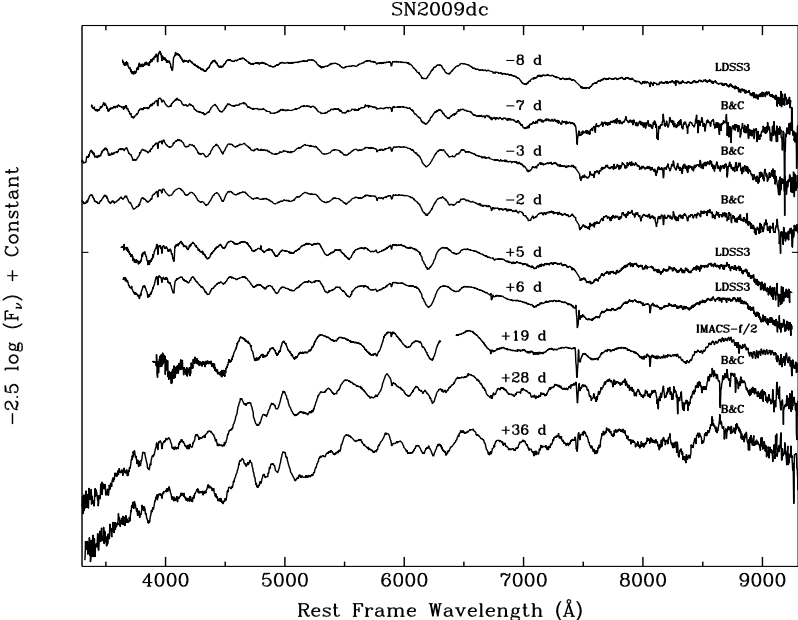
CSPI unpublished Type Ia spectra

- ▶ There is now final photometry for 26 SNe Ia not included in Folatelli et al. 2013
- ▶ For 18 among those SNe we have CSP spectra obtained at or near maximum.
- ▶ The total number of CSPI unpublished type Ia spectra is 108.

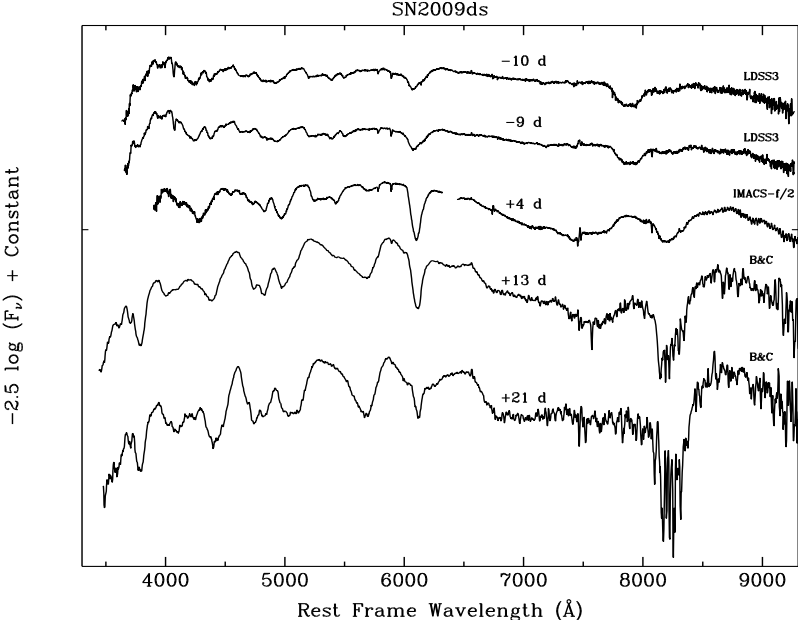
CSPI: SN2008hj



CSPI: SN2009dc



CSPI: SN2009ds



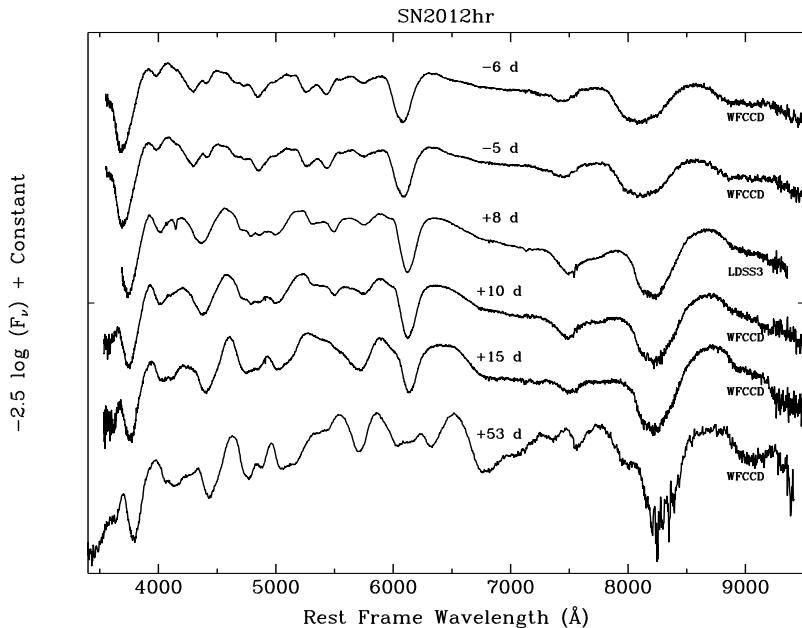
CSP II optical spectroscopy of Type Ia SNe

- ▶ Optical spectroscopy was not our priority.
- ▶ Nevertheless we've gathered some NOT, du Pont, and Magellan optical spectra, produced a number of spectral classifications, etc.
- ▶ First campaign: 34 SNe Ia, 18 with spectra at or near maximum; 90 sp. in total (71 from CSP); 11 SNe without spectra.
- ▶ Second campaign: 60 SNe Ia, 32 with spectra at or near maximum; 112 sp. (94 from CSP); 21 SNe without spectra.
- ▶ Third campaign: 72 SNe, 50 with spectra at/near max.; 80 sp. (42 from CSP); 19 SNe without spectra.
- ▶ Fourth campaign: 72 SNe, 58 with spectra at/near max; 154 sp. (129 from CSP); 4 SNe without spectra.

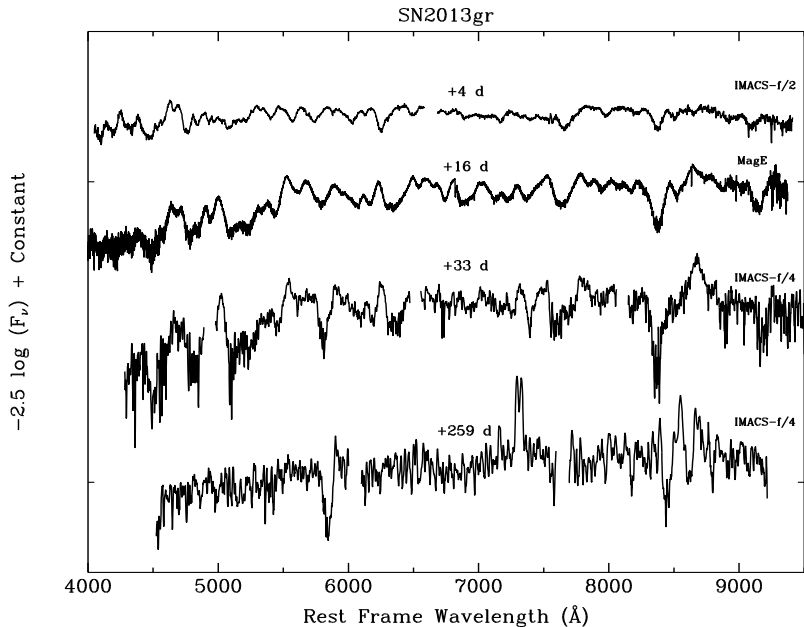
CSP II Type Ia optical spectroscopy summary

- ▶ 183 SNe Ia observed spectroscopically
- ▶ 158 with spectra near maximum light
- ▶ 436 spectra in total (336 from CSP)
- ▶ Phases run from -12 days (LSQ15alq, NOT) to +500 days (SN2012fr, IMACS) related to B-band maximum light.
- ▶ Number of spectra per object goes from 1 (103 objects) to 27 (1 object).
- ▶ Resources:
 - LCO: du Pont (WFCCD, B&C, echelle), Baade (IMACS), Clay (LDSS3, MagE, MIKE)
 - NOT-ALFOSC
 - ESO-NTT via PESSTO (EFOSC)
 - Also: HET, SALT, Yunnan, Lick, Faulkes, APO, WHT, P200, HCT, Keck

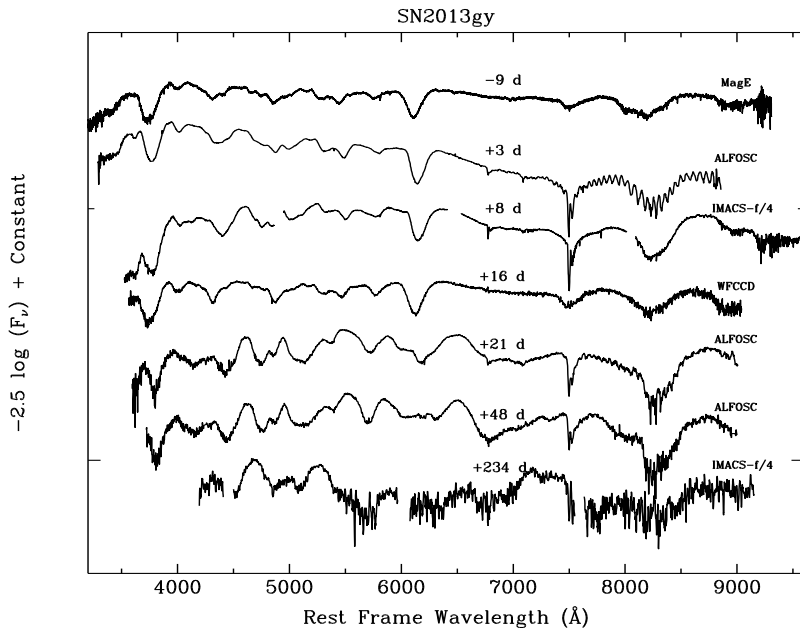
CSP II examples: SN2012hr



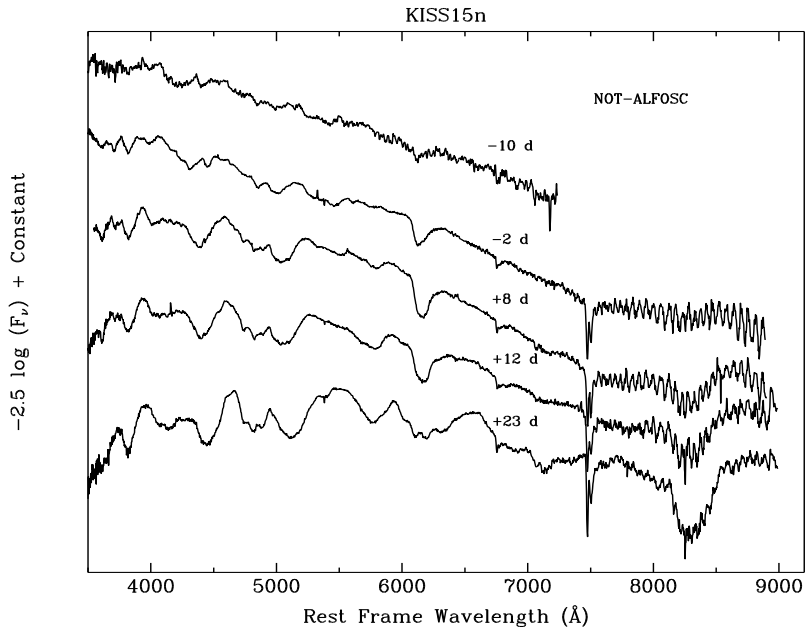
CSP II examples: SN2013gr



CSP II examples: SN2013gy



CSP11 examples: KISS15n



Plan for this work

Calan-Tololo, CSPI (unpublished), CSPII:
496 new spectra of 293 SNe Ia.

We are measuring expansion velocities and pseudo equivalent widths in order to reproduce with these data the analysis in Folatelli et al. 2013.

Then we will prepare a paper and make the spectra public.
Let's hope an update by the next CSP team meeting.