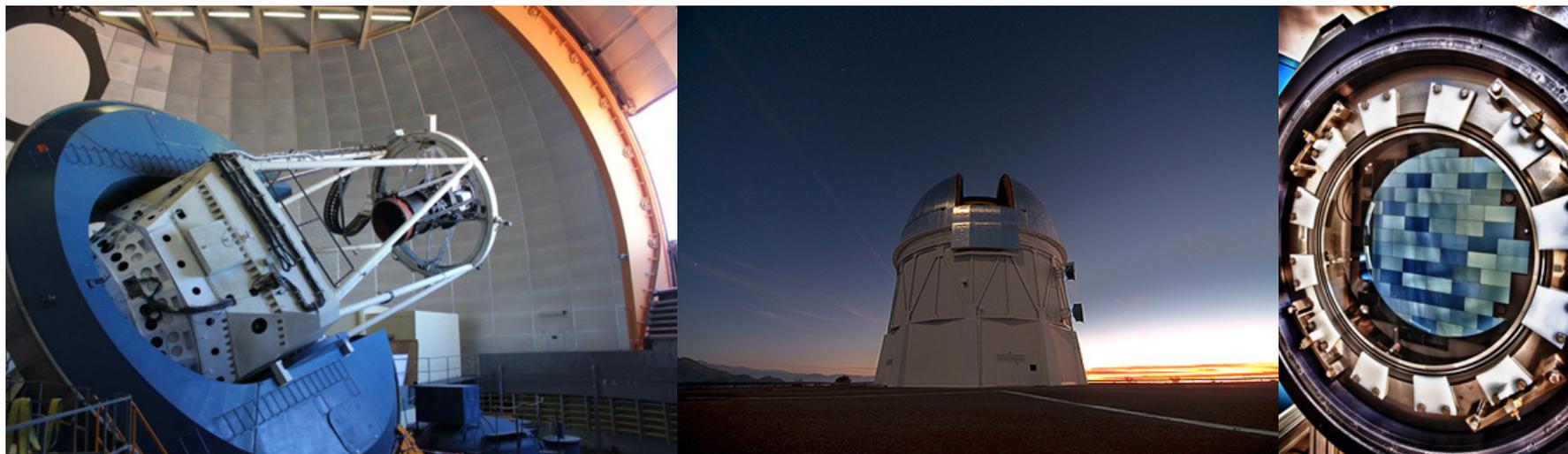# SALT & DES
(The Dark Energy Survey)
First Year Update

SALT Science Day: 11/11

The Dark Energy Survey

- Situated on the 4m Blanco telescope at CTIO, DES is a 5 year survey with DECAM
  - It aims to constrain the evolution of the Universe using 4 probes
    - Main Survey (Large Scale Structure, Weak Lensing, Galaxy Clusters)
      - Covering 5000 square degrees, to 24th magnitude in grizY
    - A search for type Ia supernova – THAT'S US!
- DECAM is a 570Mpx camera, with a 3 square-degree FOV and red sensitive CCDs
- It has been scheduled 525 nights starting in September 2013
- The season runs September – February

The DES Supernova Survey

- Comprised of 10 fields: 2 deep (i=25.1) & 8 shallow (i=23.9)

- Chosen to overlap with other complementary surveys (VIDEO, HERSCHEL, GALEX, ...)

- Anticipated to produce excellent light-curves for over 4000 SNe Ia to z<1.2
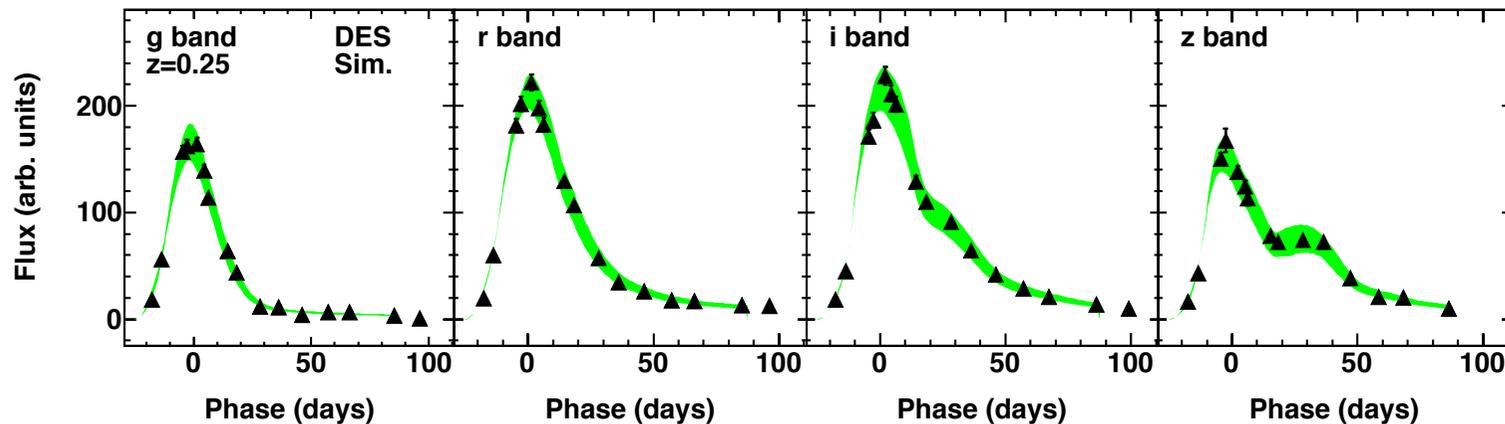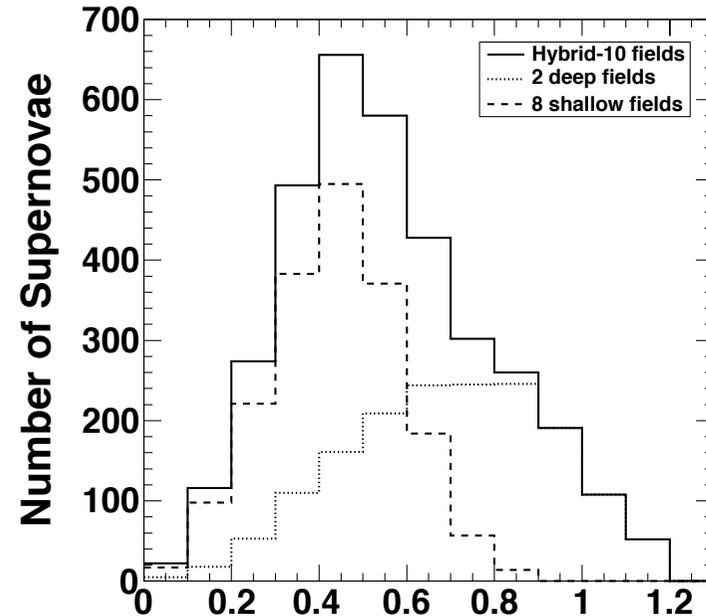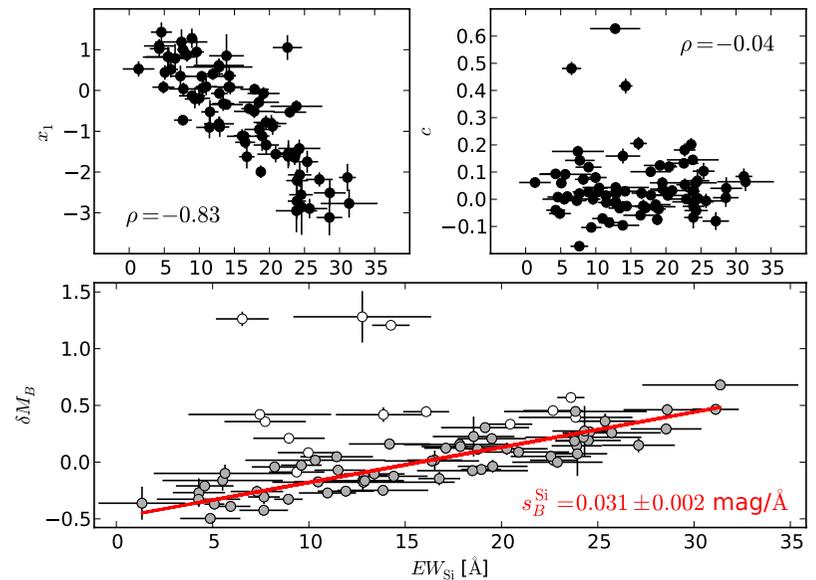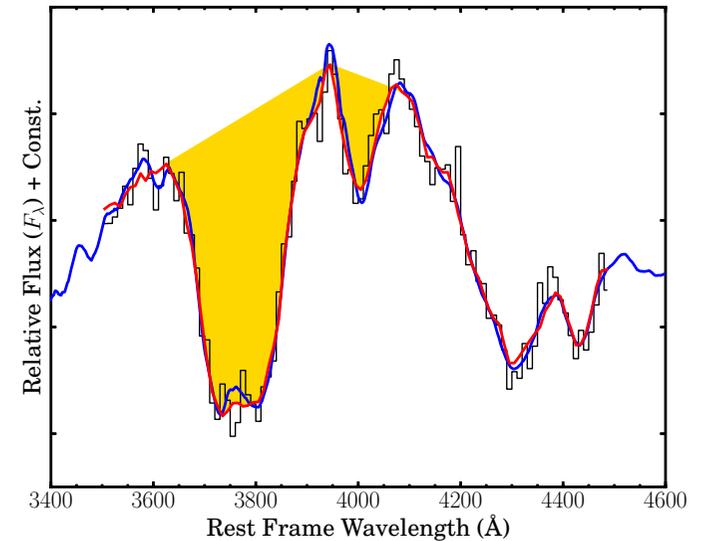
Spectroscopic Follow-up

- With 4000 SNe Ia candidates, it is impossible to spectroscopically observe and type each one
- Therefore there are two distinct goals for the spectroscopic sample:
  - Obtain host galaxy spectroscopic redshifts for each of the candidate supernova (OzDES: a major survey on the AAT)
  - Obtain high S/N spectra for a subset of objects to test for biases in the photometric sample, and to produce independent cosmological constraints, by looking at spectral properties – This is SALT!
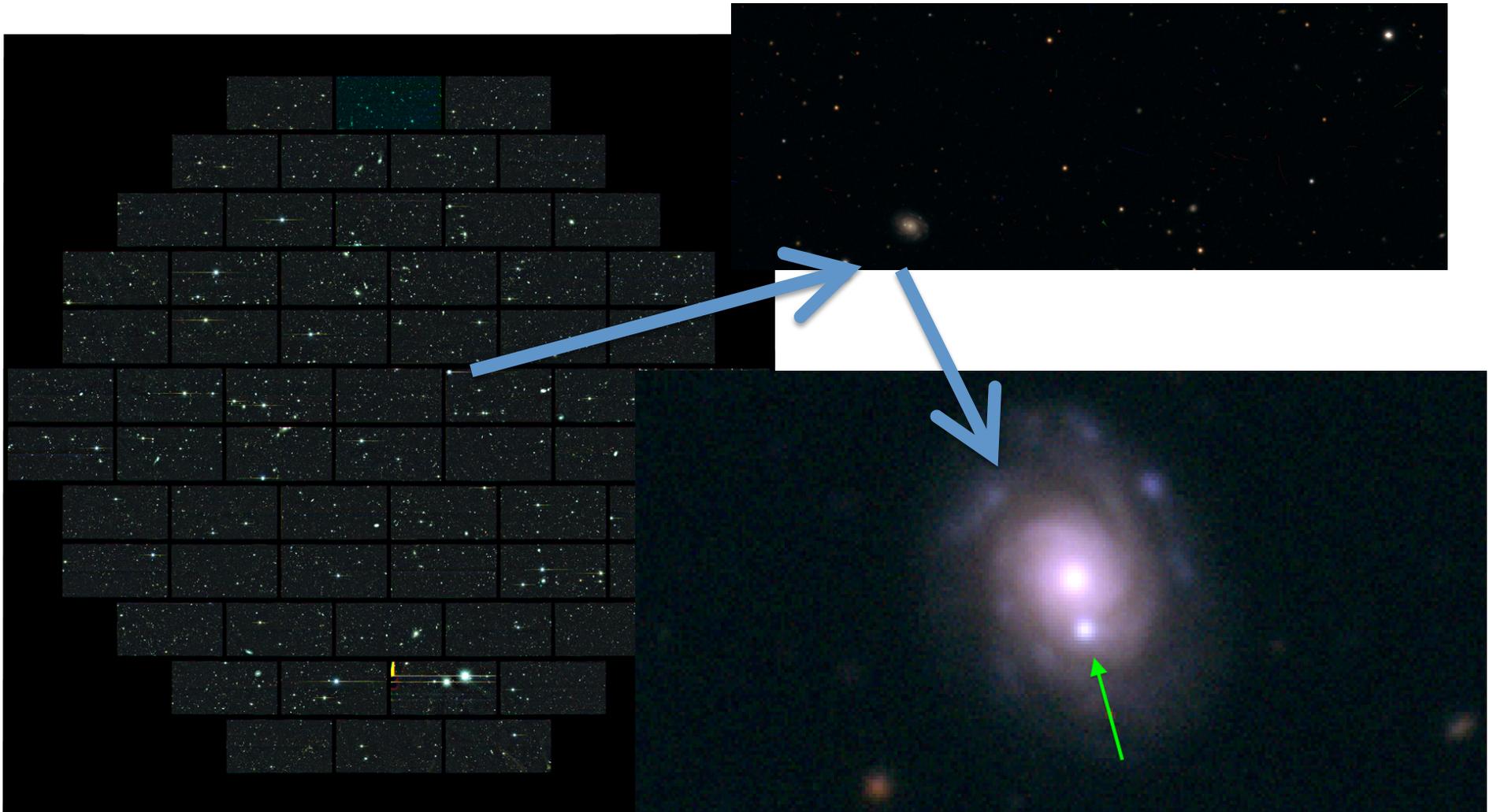
Us

- In the 2013 seasons, we have been allocated 22.5 hours of ToO time on SALT to follow-up DES candidates
  - The plan is to obtain high S/N spectra for ~15 candidate SNe, for immediate typing and later for spectroscopic line width analyses
  - We aim to observe targets with r<21.2 to obtain S/N~12.
  - We use the PG300 grating, with a 3850 order-blocking filter, and a 1.5" slit.
  - Our median exposure times are 3600s
  - We anticipate that this project will be carried over in to the 2014+ seasons to augment our sample
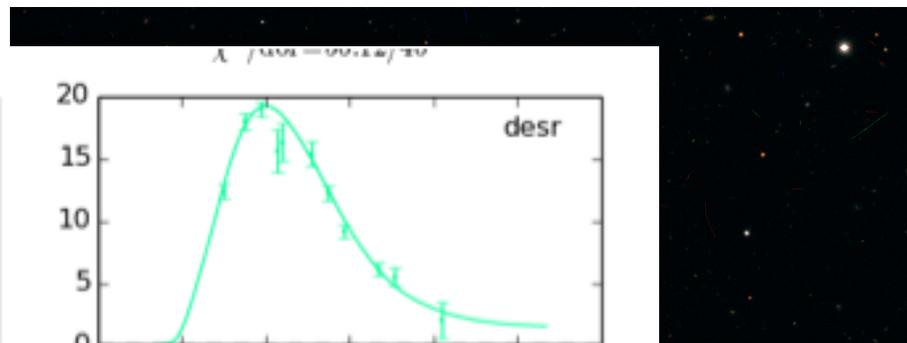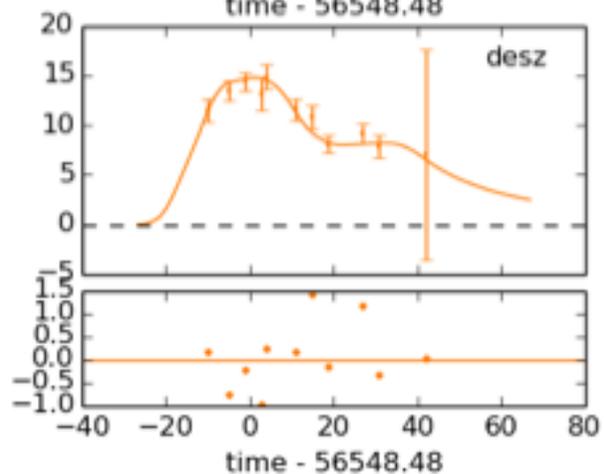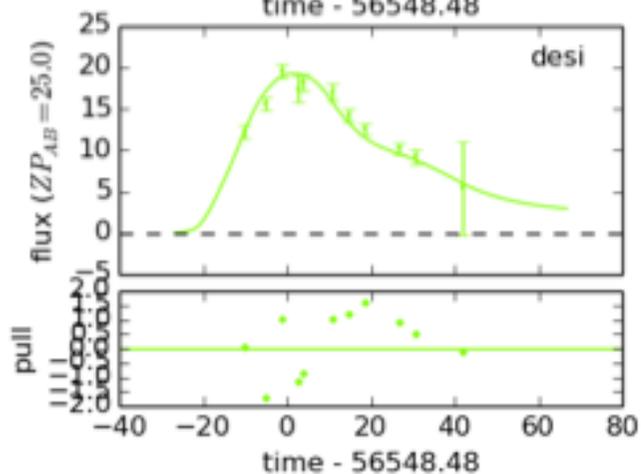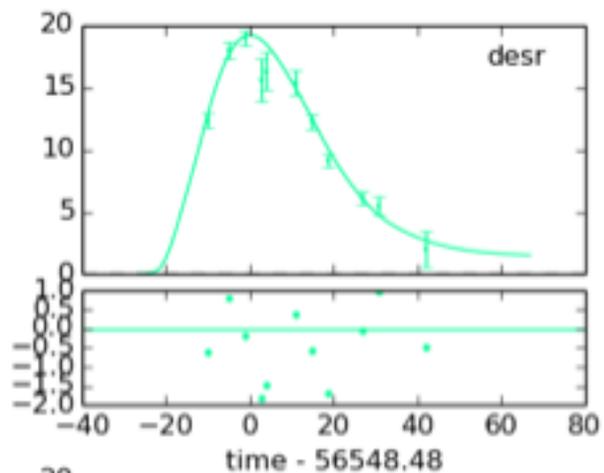
How's DES doing?

- DES began full science operations on the 1st September 2013.
- To date over 500 viable SNe Ia candidates have been found.
- However, in the early part of the season, indentifying potential targets for spectroscopic follow-up was slow
  - the data needs to be fully processed, run through a machine learning algorithms, scanned, and typed in 24 hours!
- Only 2 epochs are required to type an SNe Ia, but the cuts required to select a sub-sample needed to be optimised

- THIS IS NOW SOLVED!

How's DES doing?

How's DES doing?

Results from SALT

DES13X1kae
Template: SN1999aa @ z=0.149 +2 days after peak

Observed Wavelength (Å)

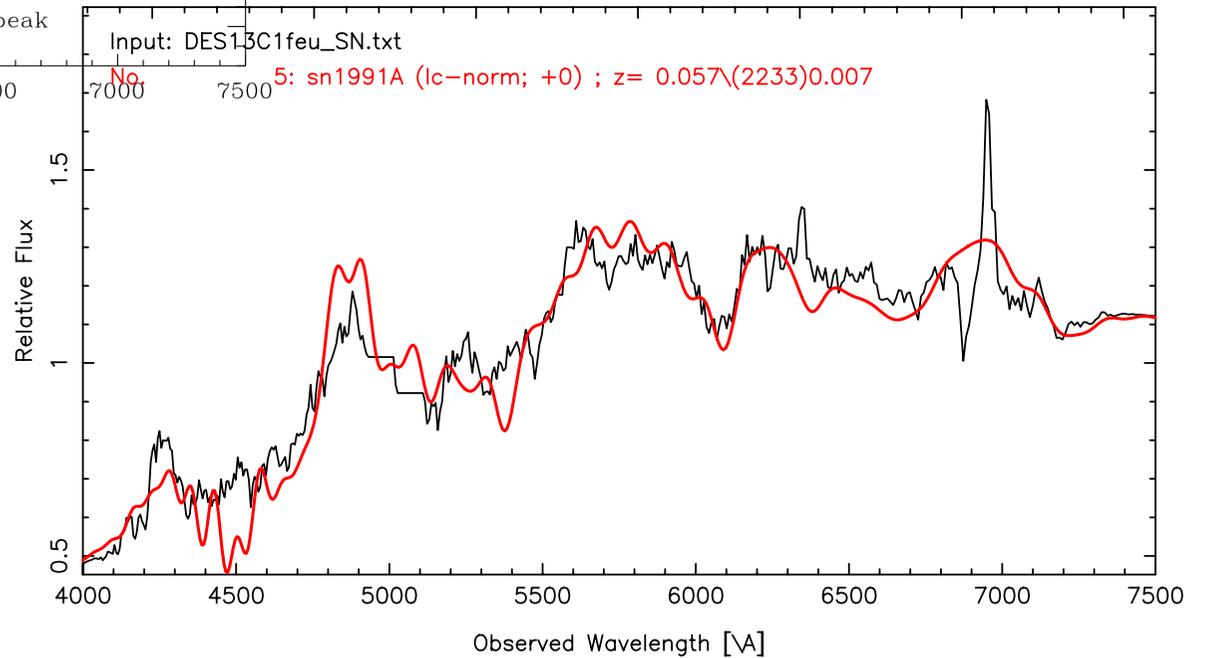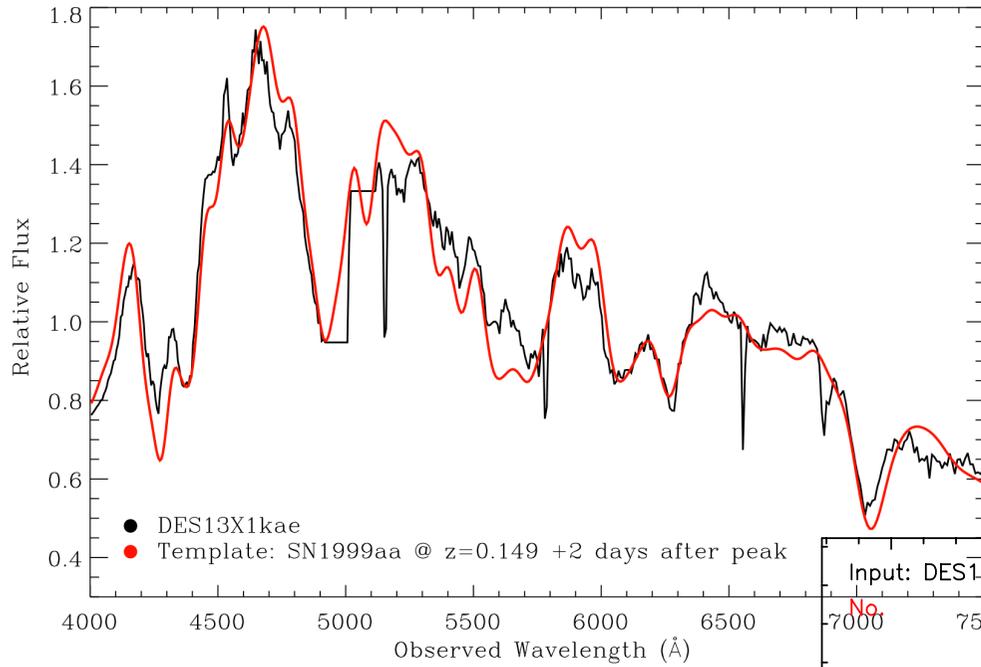Input: DES13C1feu_SN.txt
No.
5: sn1991A (Ic−norm; +0) ; z= 0.057\(2233)0.007

Observed Wavelength [\A]
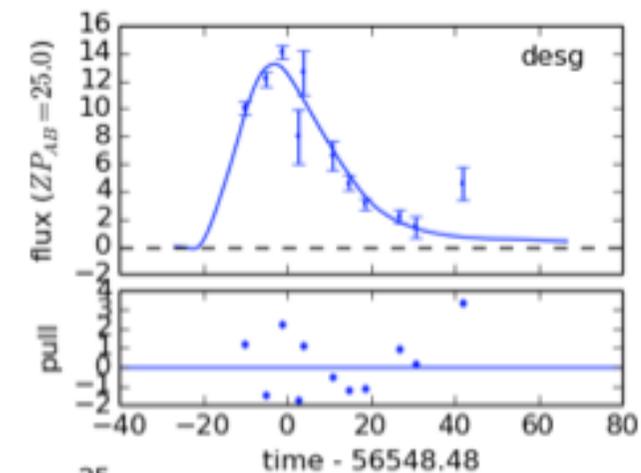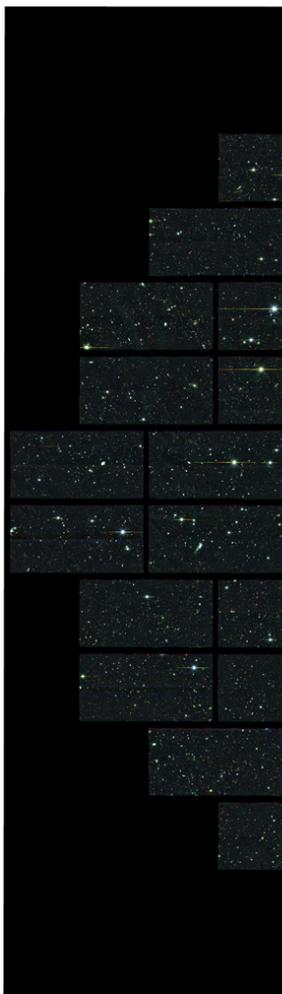
Results from SALT

Spectroscopic Confirmation of DES13X1kae

ATel #5548; *M. Smith (University of the Western Cape), B. Bassett, E. Kasai (University of Cape Town, AIMS, SAAO), S. M. Crawford, P. Vaisanen, D. Buckley (SALT, SAAO), R. Maartens (UWC, University of Portsmouth), R. C. Smith (NOAO/CTIO), R. Kessler (University of Chicago), R. A. Covarrubias (University of Illinois / NCSA), R. Cane, J. A. Fischer, L. Gladney, M. March, M. Sako (University of Pennsylvania), P. J. Brown, K. Krisciunas, N. Suntzeff (Texas A&M University), C. D'Andrea, R. Nichol, A. Papadopoulos (University of Portsmouth), M. Sullivan (University of Southampton), K. Barbary, J. P. Bernstein, R. Biswas, R. Gupta, E. Kovacs, S. Kuhlmann, H. Spinka (Argonne National Laboratory), E. Ahn, D. Finley, J. Frieman, J. Marriner, W. Wester (Fermilab), G. Aldering, J. S. Bloom, D. Goldstein, A. Kim, P. Nugent, S. Perlmutter, R. C. Thomas (Lawrence Berkeley National Laboratory), R. Foley (University of Illinois), S. Desai, K. Paech (Ludwig Maximilians University, Munich)*
on 5 Nov 2013; 15:58 UT
Distributed as an Instant Email Notice Supernovae
Credential Certification: Mathew Smith (matsmith2@gmail.com)

Results from SALT

- From the 2013A season, we have observed 3 SNe Ia candidates from DES
- Of these, 2 are spectroscopically confirmed and have been released to the wider community through ATELs, 1 is still pending
- Weather + DES issues hindered us completing all our time, but that should not be a factor for future seasons.
  - WE CAN DO IT!

Feedback

- We've found the SALT system / PIPT to be excellent for arranging targets for our program
  - Annoyingly, it is currently impossible to remove objects from the queue; they need to be put on hold and removed by a SALT astronomer
  - The fast data product is not immediately useful for classifying our objects. We still need to run a pySALT reduction to identify the correct sources
  - So far, using a reference star, and aligning based on that has been successful, but we have not yet tested it at r=21+