HU Berlin + See Change

SNIa / Europe 2016, J. Nordin

Activities @HU

See Change HST cluster search

Nearby SNe Ia / SNfactory
- SCALA - Physical calibration
- Local progenitor environment
- U-band & SN spec. variation

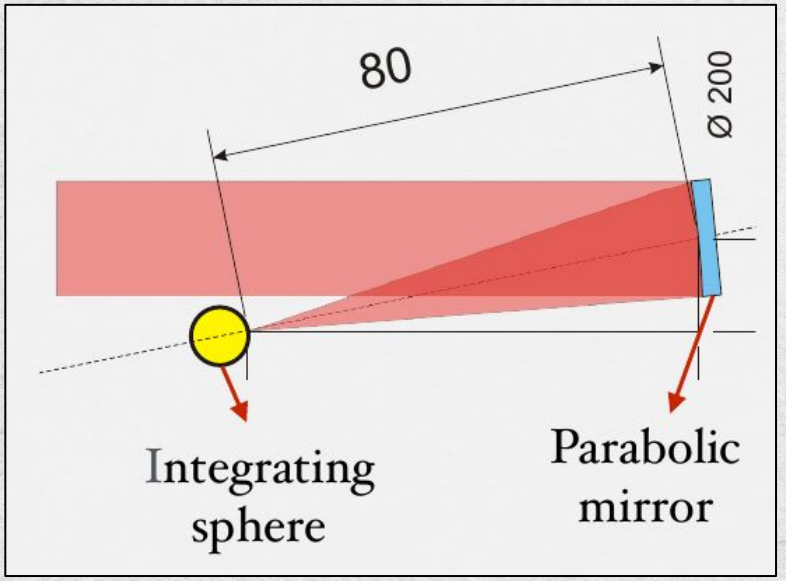
[IceCube, astrophysical neutrinos]

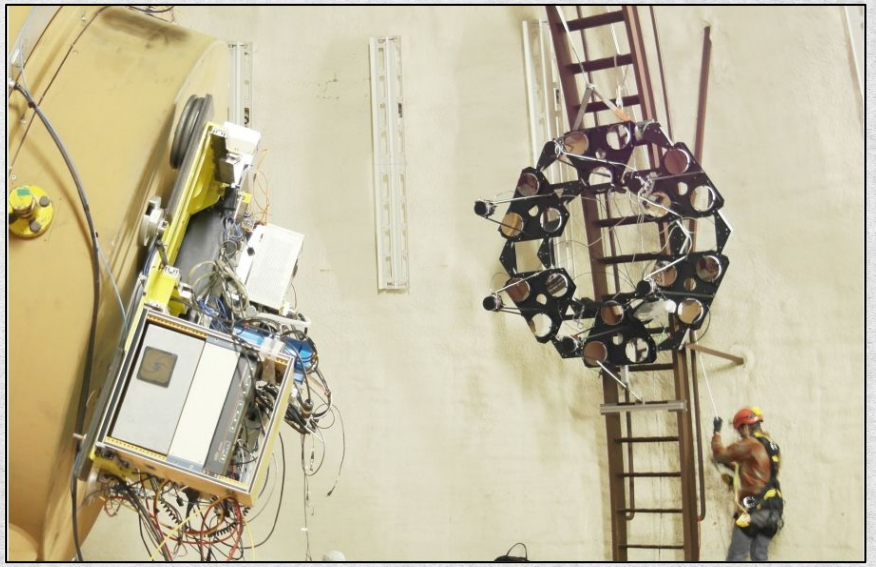
} ZTF

Who? M. Kowalski, JN, M. Rigault, S. Lombardo, D. Kusters, V. Brinnel, C. Cavatoni (+ DESY-ZTF)

SCALA

Physical calibration of the SNIFS IFU, goal of ~1% color calibration
Concept for a portable version exists





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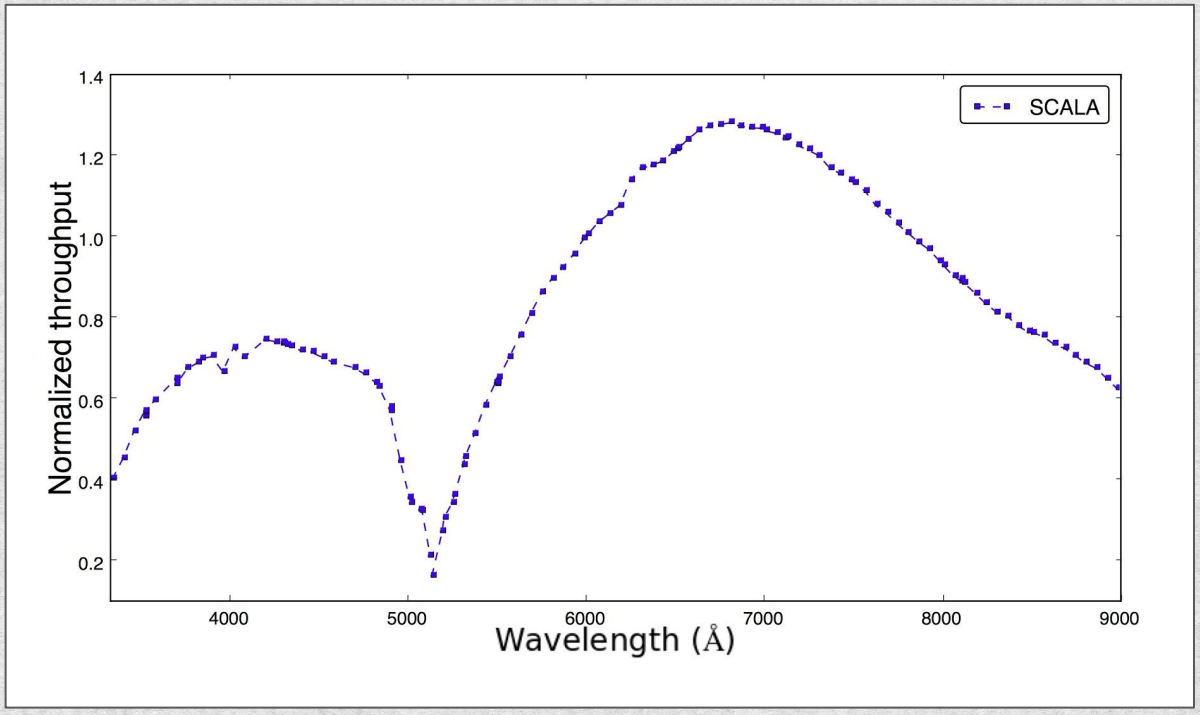
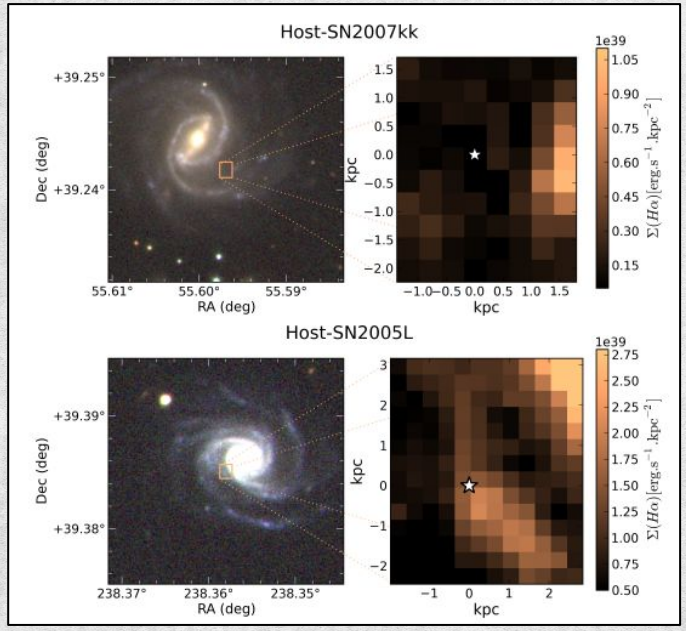
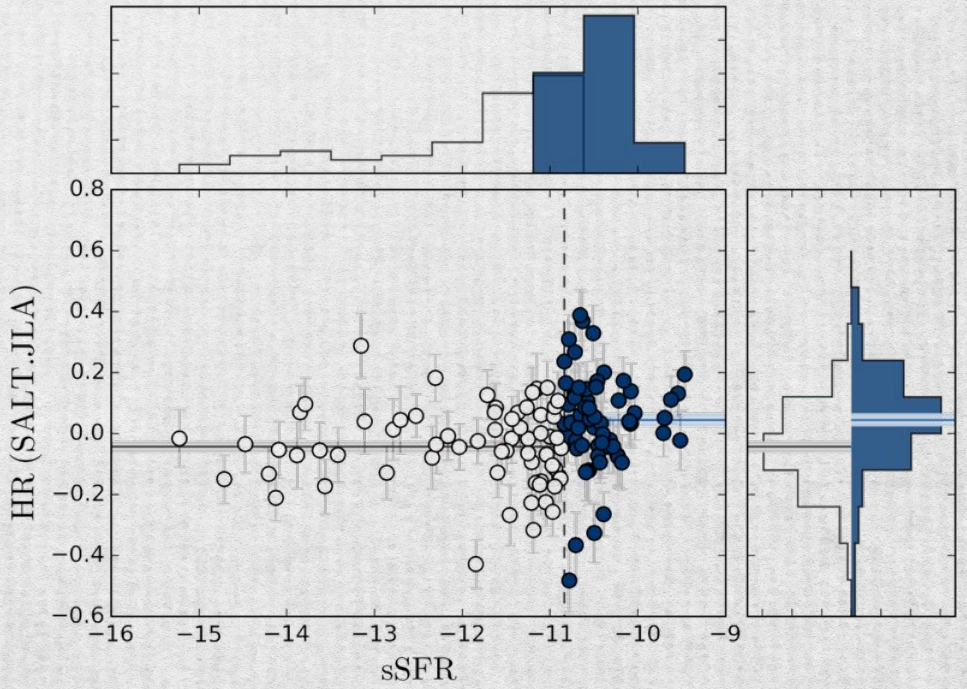


Local environment

- SN brightness (after standardization) vary with local star formation.
- Implications for H0 and evolution with z (intrinsic dispersion).





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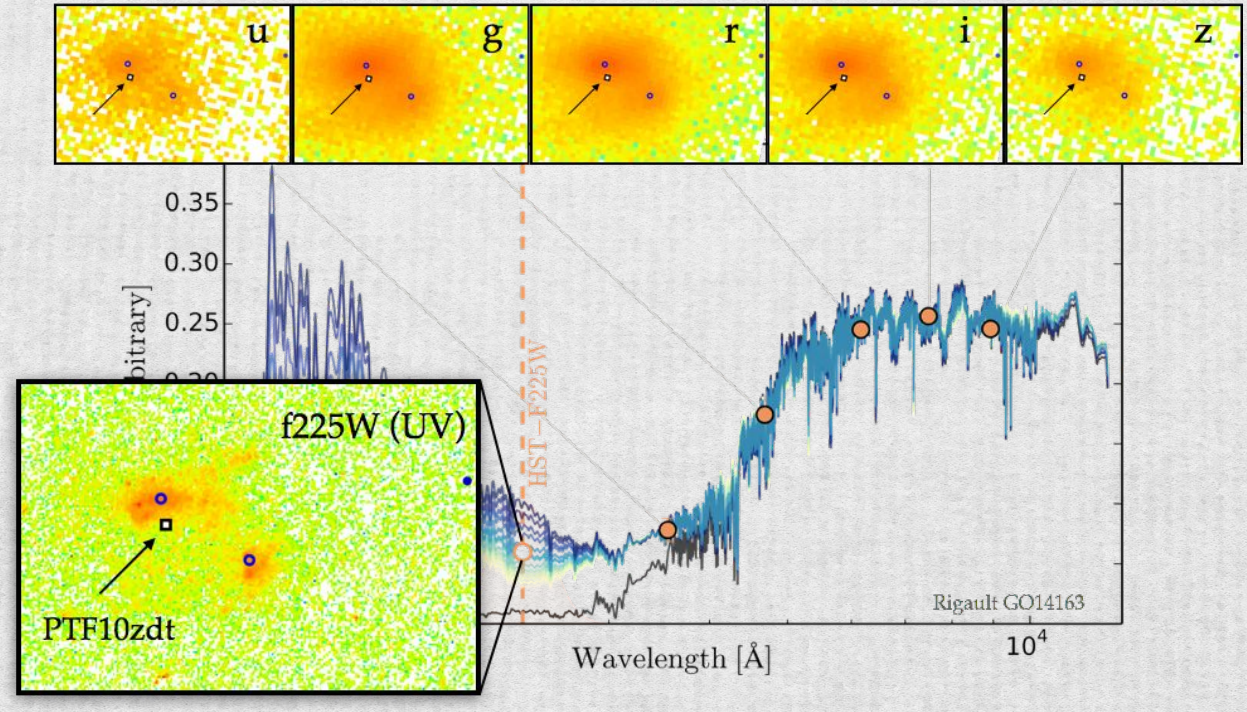
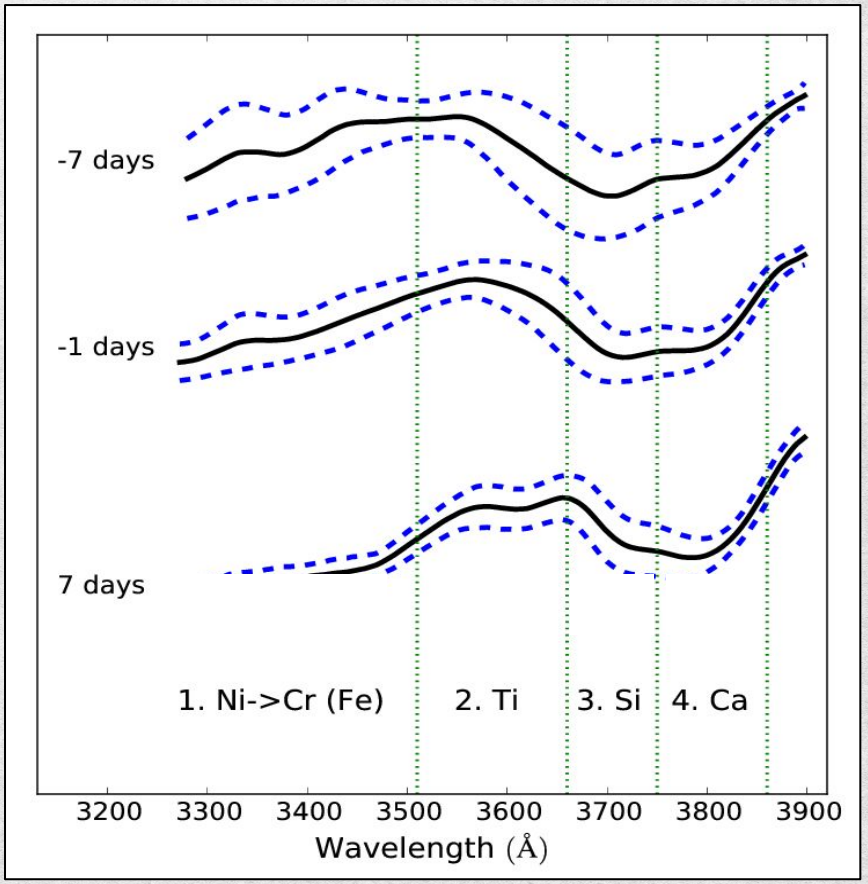


U-band & SN physics

The U-band contains a wealth of information regarding the SN ejecta energy and distribution.

Regions vary independently creating what looks like a large dispersion.

Implications for SN models, reddening and cosmology.



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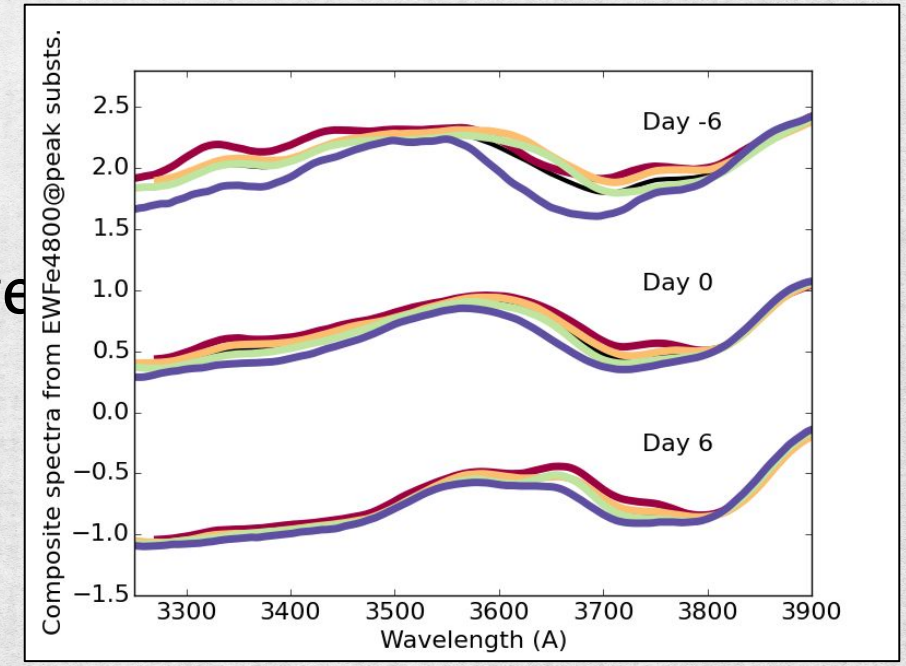
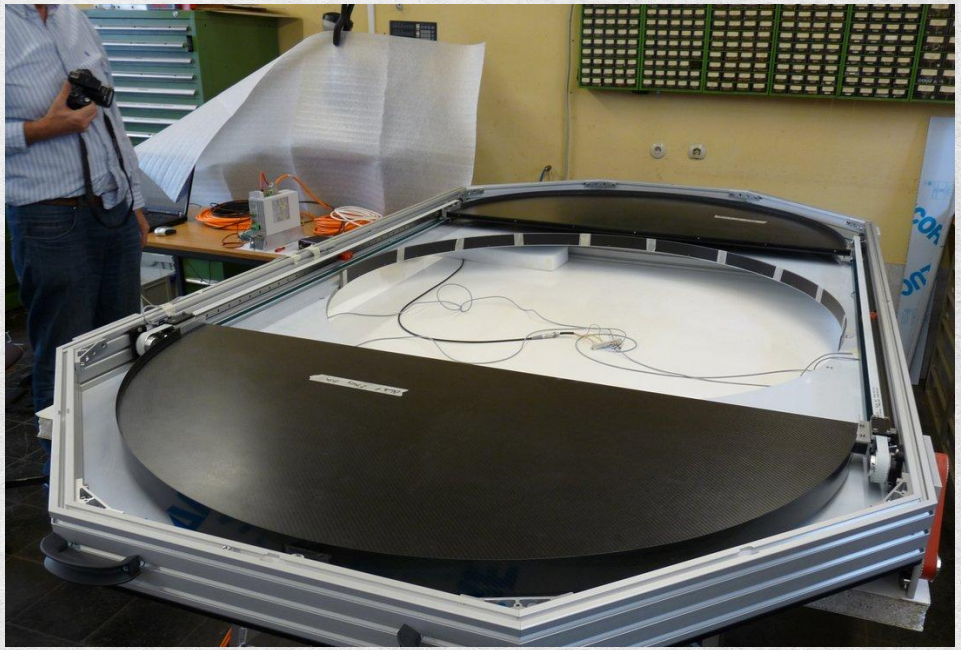


ZTF preparation

HU ZTF activities

- Photometric pipeline verification
- atmosphere study, zeropoint
- SEDmachine
- Follow-up
- *SNIa target selection*



Shutter construction!

DESY

See Change

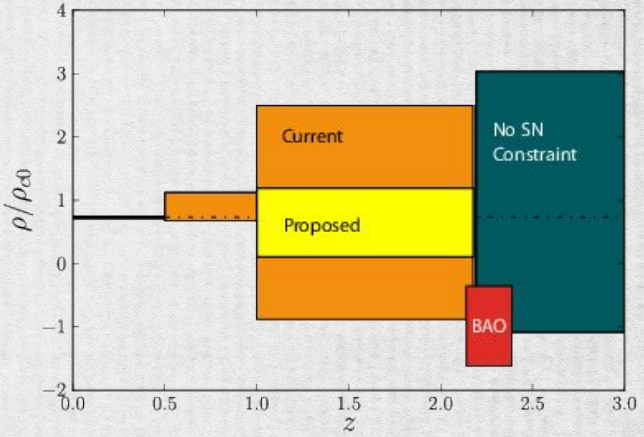
See Change motivation

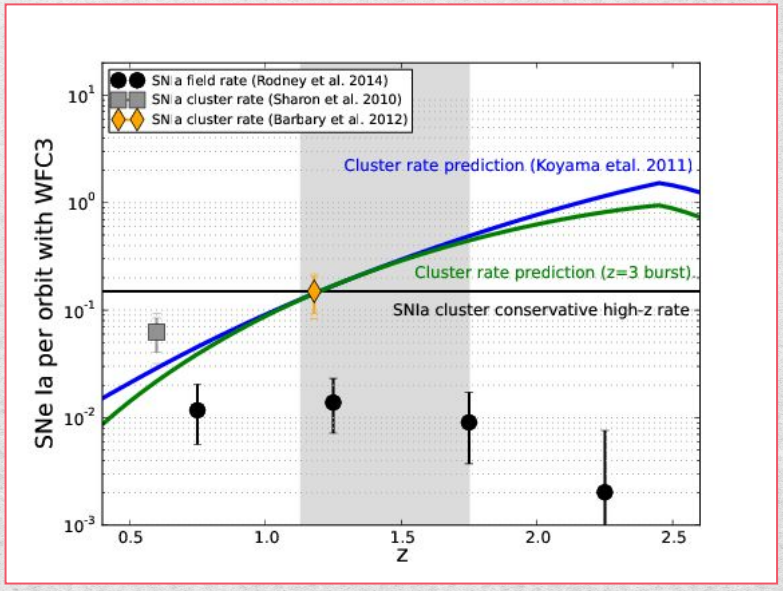
DE density at z>1 poorly constrained

Search for SNe Ia in high-z clusters (same idea as C14).

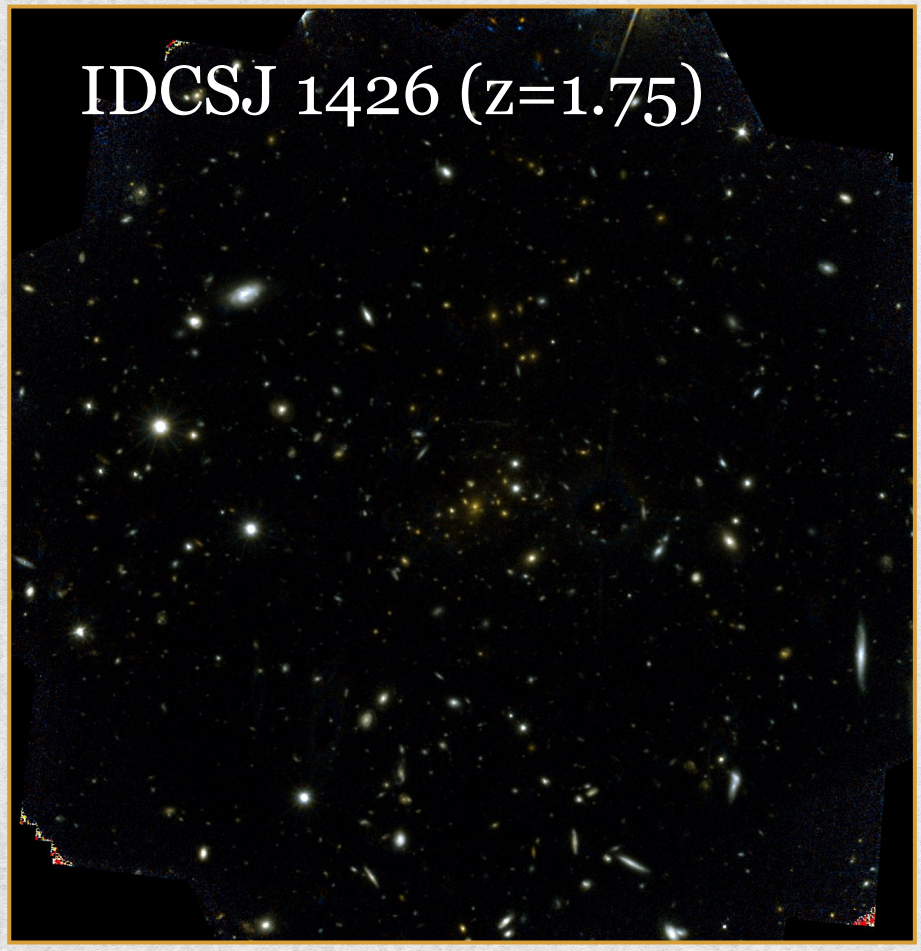
Much higher efficiency due to new cluster detections and HST-WFC.

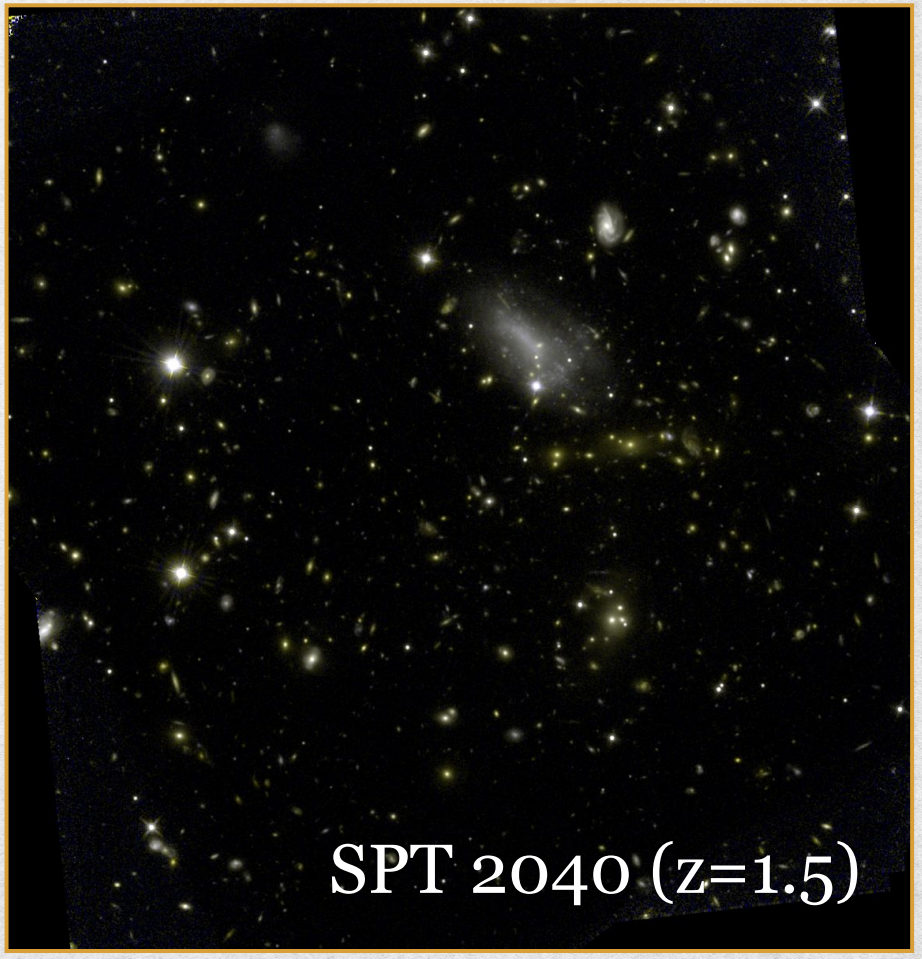
Projected ~20 to ~40 z>1.1 SNe Ia.





New massive z>1.3 clusters





Entering the era of star formation in clusters?

See Change basic structure

Visits to 11 z>1.1 clusters w. ~5 week cadence (814/105/125) + ToO to get second color (160)

- Pre-peak first detection in time to trigger follow-up with HST (to get two WFC colors)
- Short 814 to reject foreground objects
- Monitor full cluster visibility (efficiency)

Two cycle 174 orbit program approved for C22+23

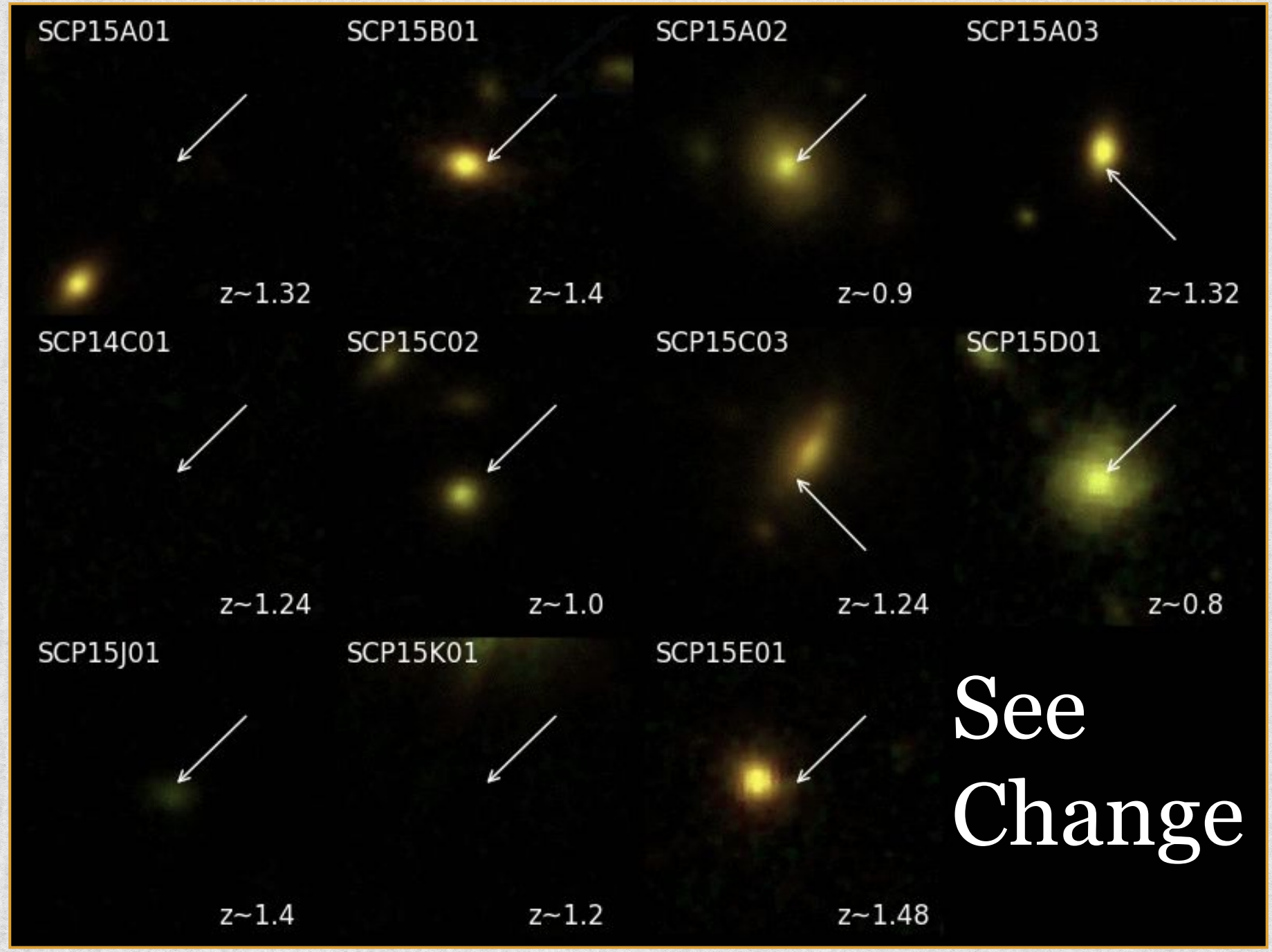
Designed in cooperation with cluster groups:

- Probing structure formation
- Calibrating weak lensing-mass relation at high-z

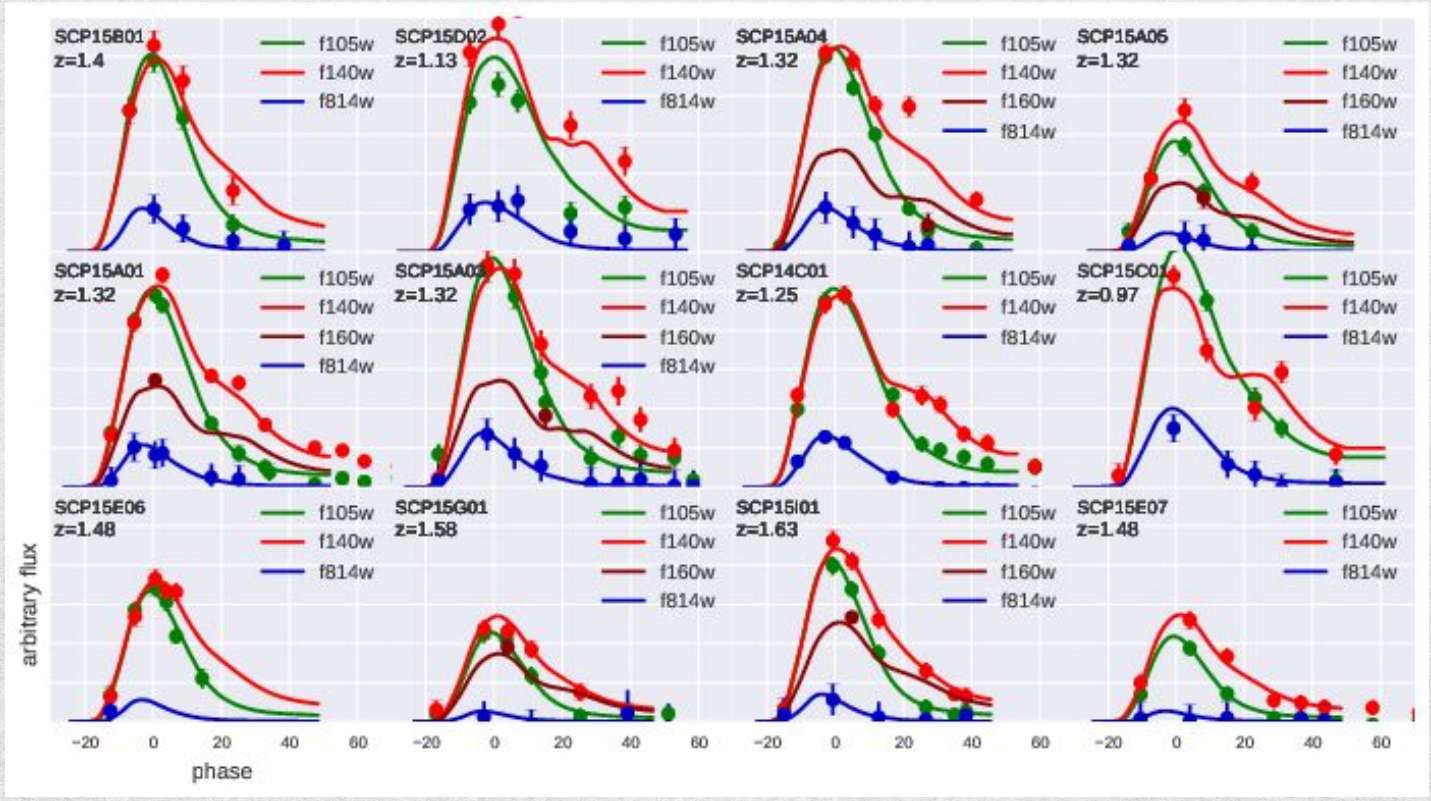
See Change operations

Search and HST coordination run out of LBL (B. Hayden, K. Boone, C. Saunders, C. Sofiatti, X. Huang, G. Aldering ...) + D. Rubin

Also a ground based spectroscopy component: J. Nordin, I. Hook, C. Lidman, P. Ruiz-Lapuente+ S. Williams

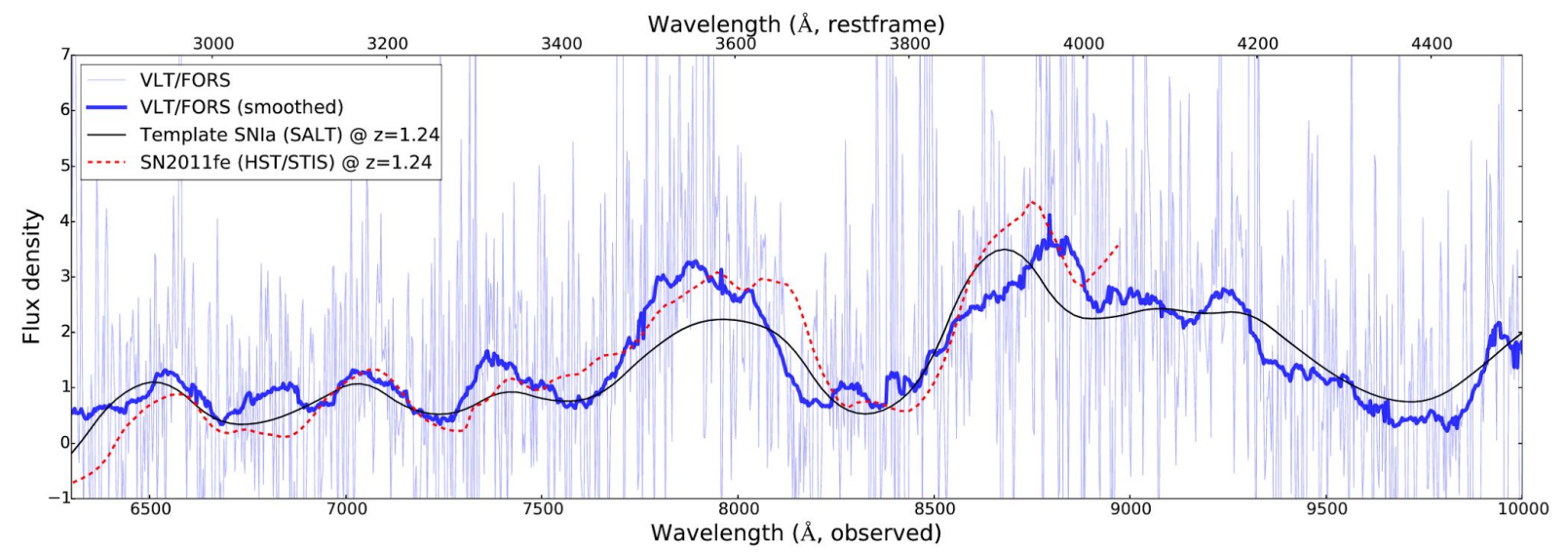

SCP15A01
z~1.32
SCP15B01
z~1.4
SCP15A02
z~0.9
SCP15A03
z~1.32
SCP14C01
z~1.24
SCP15C02
z~1.0
SCP15C03
z~1.24
SCP15D01
z~0.8
SCP15J01
z~1.4
SCP15K01
z~1.2
SCP15E01
z~1.48
See
Change

Its working! - now 80% done



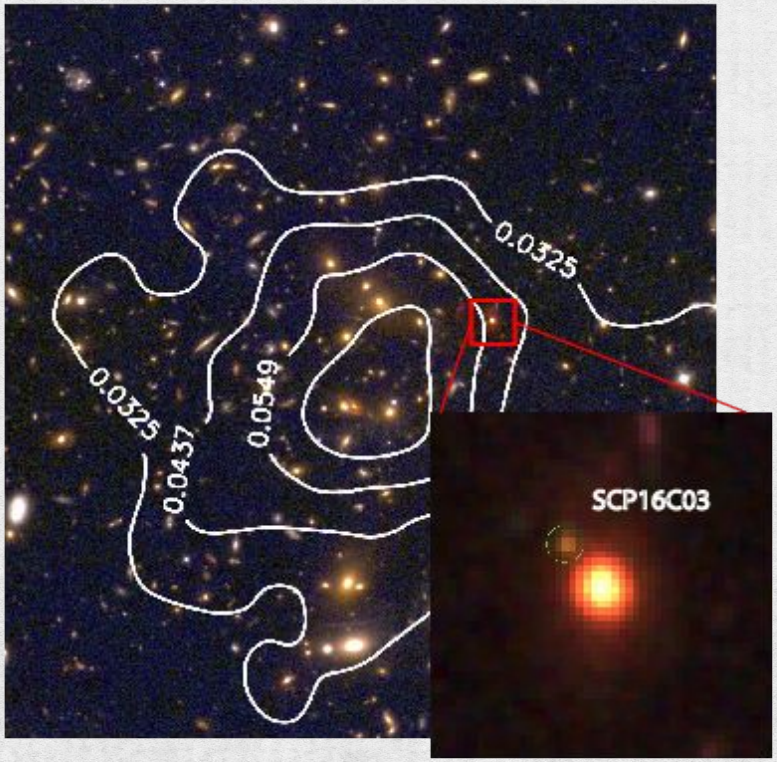
Current count:
- 44 transients
- 24 +/- 2 cosmology SNe I

Surprise I - hostless SNe



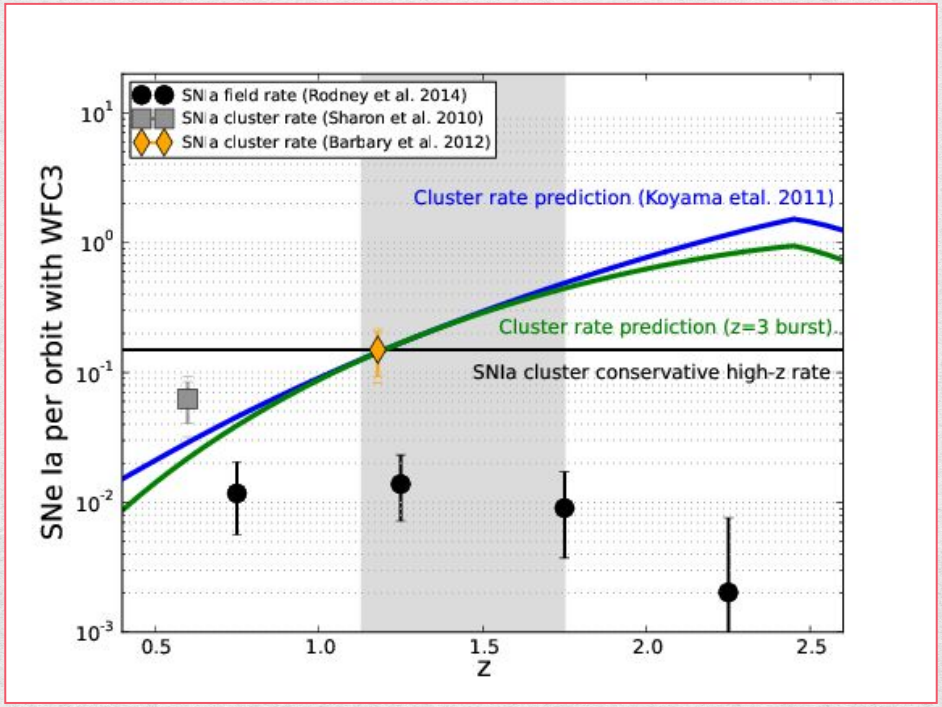
Three likely hostless SNe (at least 2 SN Ia) ~ 10% of sample

Surprise II - lensed SNe



Two gravitationally magnified background SNe Ia, one likely at z~2.2

Surprise III - varying rates



Uneven candidate distributions - some clusters vigorous SN producers. Statistic study needed, possibly sign of ongoing star formation.

What worked well:

Very efficient search pipeline, including forward modeling of all high quality candidates.

Initial photometric typing

Intense work by Brian + Kyle!

Lessons learned:

Need a well staffed spectroscopic program:

- Initial plan included (1+1) full time to provide SN features / host data rapidly after candidate detection.
- Did not match this initially - rather ~10% JN, ~10% Hook (+ 10% Saunders).
- Succeeded in getting time and trigger observations, but slow data turnaround

Need active group working with spectroscopy, allowing rapid interaction with telescope schedulers and pushing information to HST ToO decisions.

Summary:

The SN group at HU Berlin is

- Pursuing a range of studies within SNfactory (calibration, SNIa environment and variability)
- Preparing for ZTF

See Change:

- Works! - many z>1.1 SNe detected and lightcurves look good.
- Need active spectroscopic analyzers