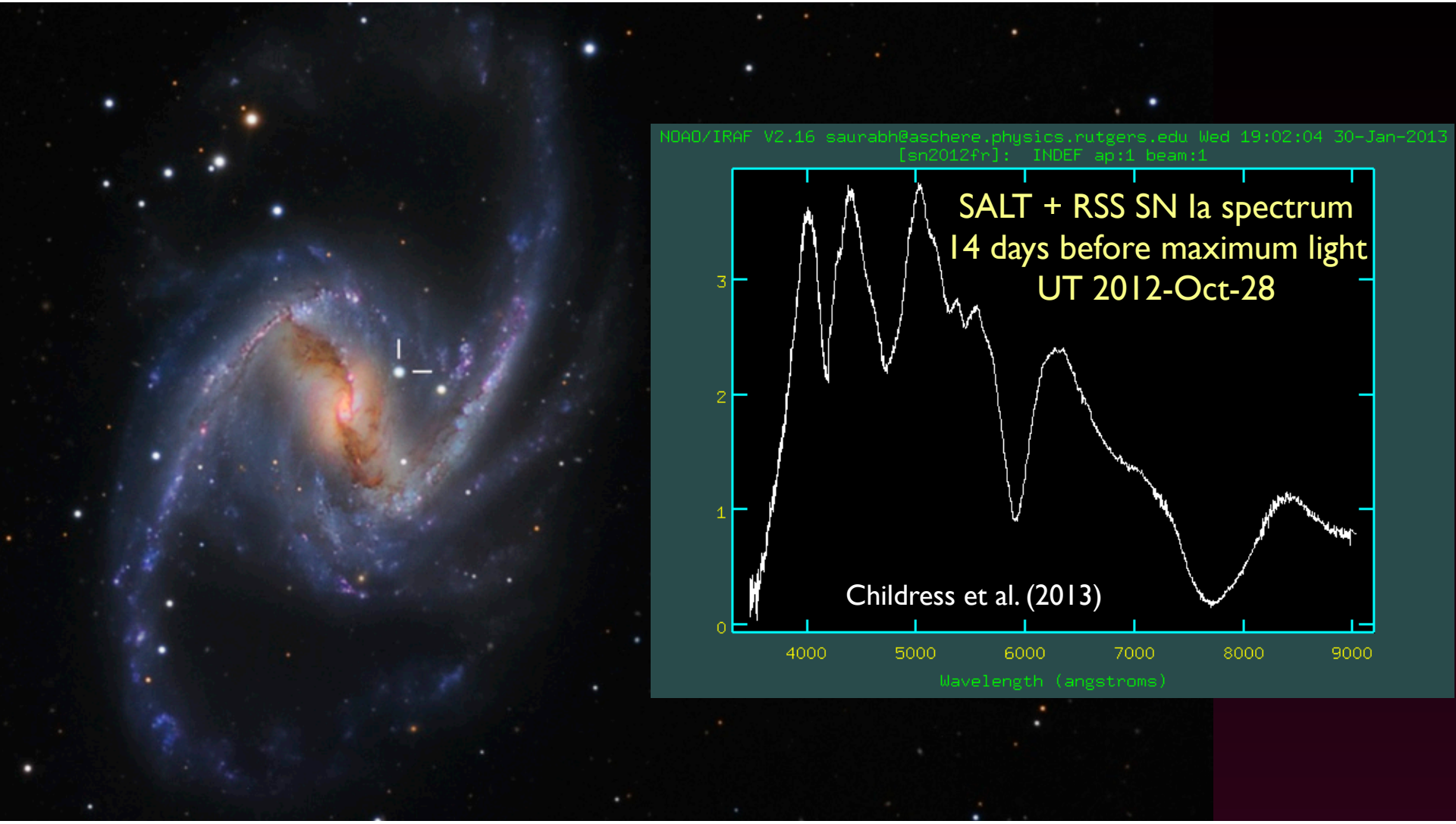
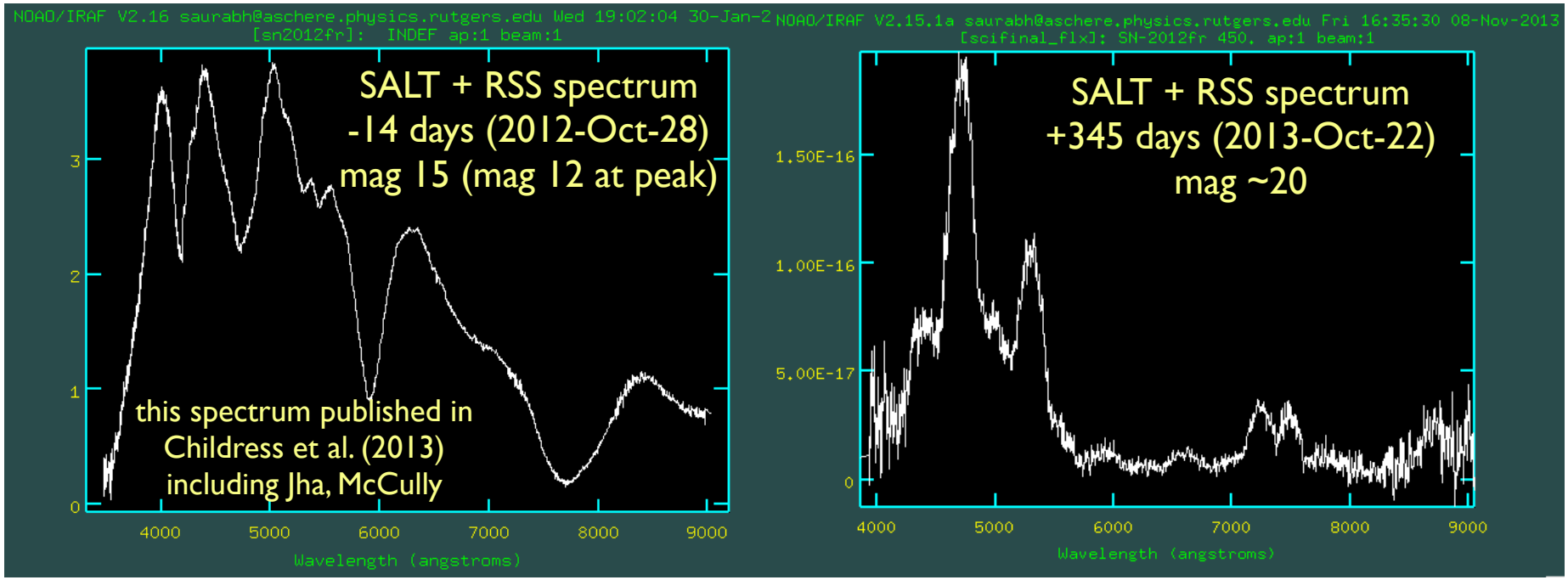
Current SALT Programs at Rutgers

- Thermonuclear Supernovae: SNIa
- Supernova Remnants some with Buckley (RSA)
- Galaxy Dynamics with Williams (RSA)
- High redshift (z=2) star-forming galaxies with Gronwall (HET)
- ACT clusters, mm-band sources with Hilton & Moodley (RSA)
- Herschel/ATLAS lenses with Leeuw (RSA)
- RESOLVE with Kannappan (UNC)


NOAO/IRAF V2.16 saurabh@aschere.physics.rutgers.edu Wed 19:02:04 30-Jan-2013
[sn2012fr]: INDEF ap:1 beam:1
SALT + RSS SN Ia spectrum
14 days before maximum light
UT 2012-Oct-28
Childress et al. (2013)
0
1
2
3
4000
5000
6000
7000
8000
9000
Wavelength (angstroms)

test SN Ia explosion models with early-time + late-time spectroscopy of the same object (e.g., SN 2012fr)



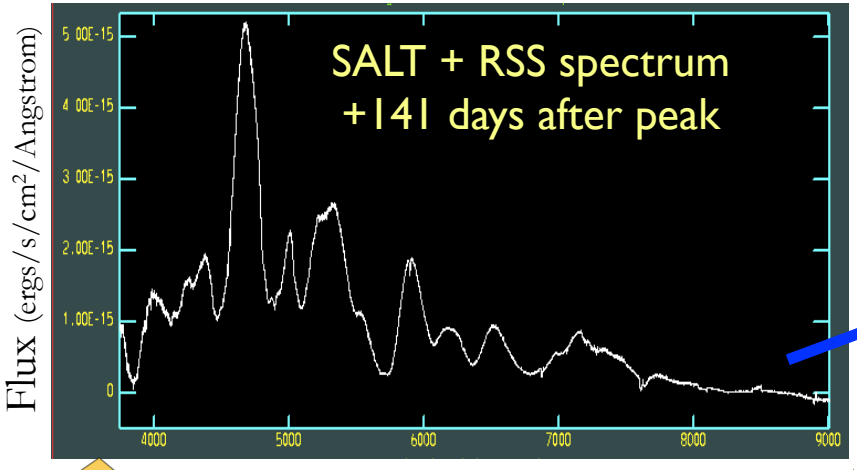
Viraj Pandya (Rutgers undergrad) RSS-longslit homegrown pipeline reductions

looking at connection between early time line velocities and late-time nebular line velocities

we also did this for SN 2013aa, with REU student Yssavo Camacho (Lehigh)

data match Maeda et al. (2010) trends from asymmetric explosion model

Calibrated Spectrum (SN 2013aa)



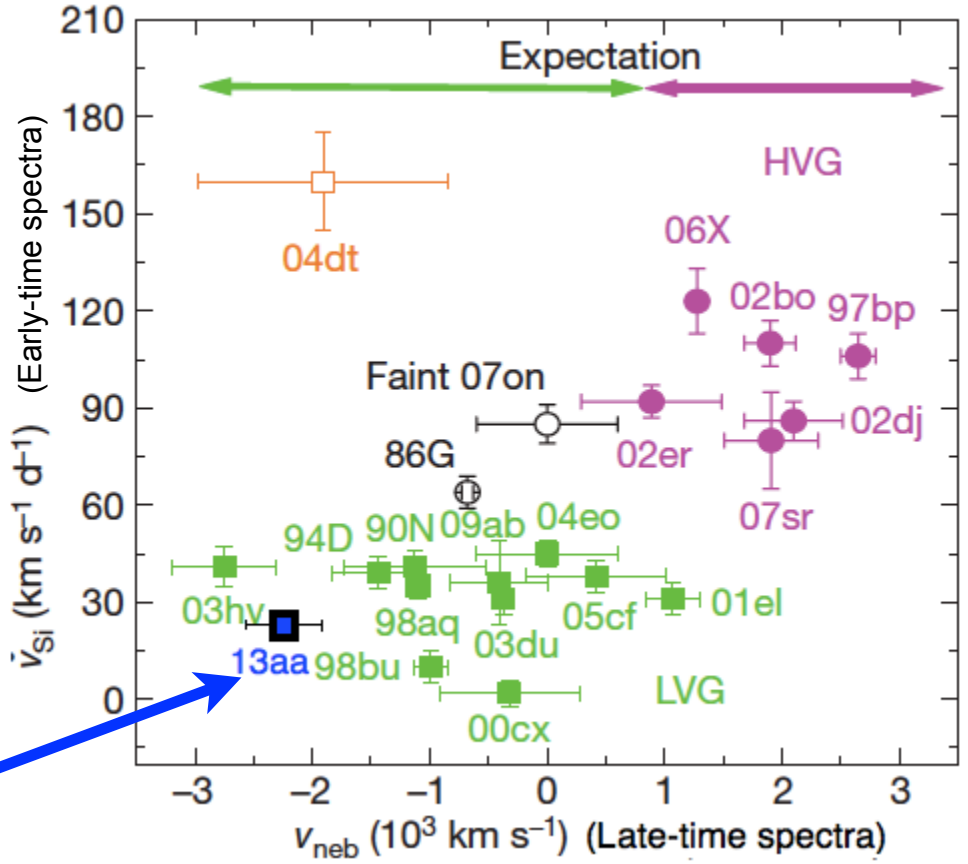
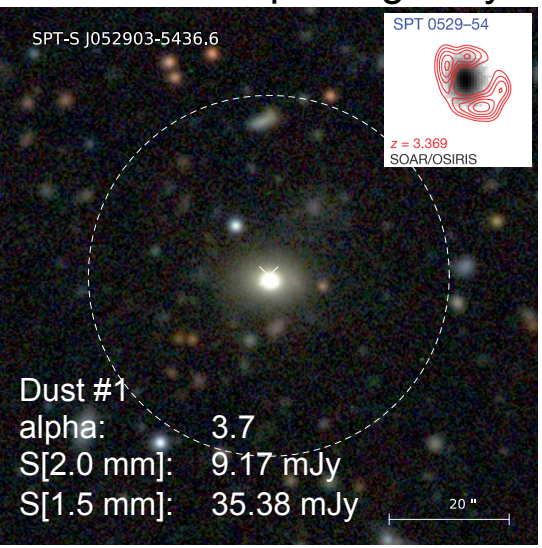


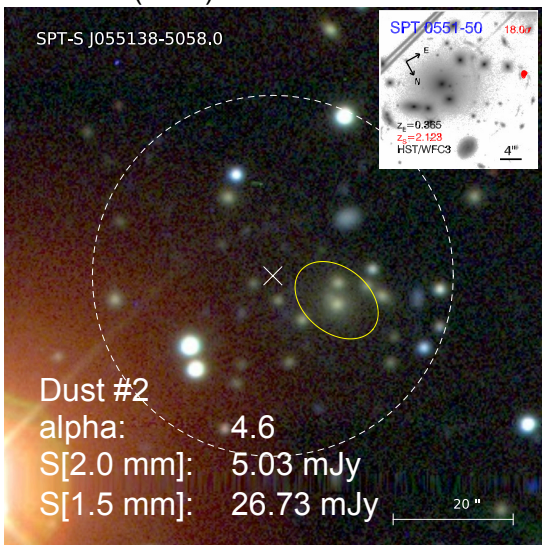
Figure adapted from Maeda et al. (2010, Nature, 466, 82)

Redshifts of SPT Dusty Source Lenses

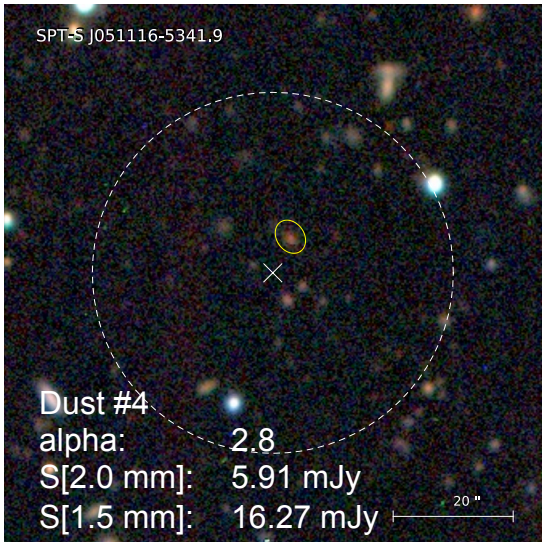
Isolated elliptical galaxy



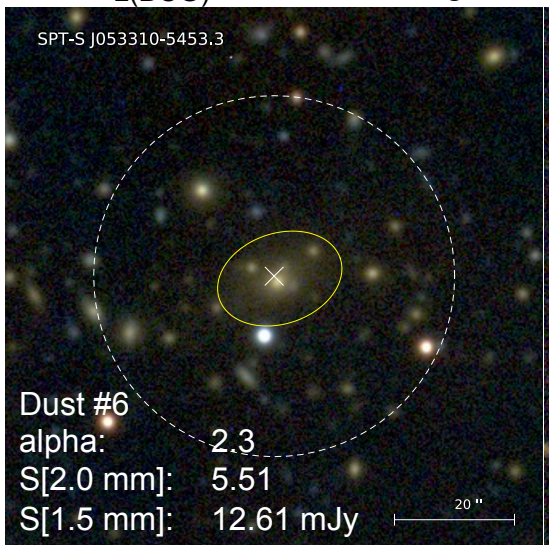
$M_{L(BCG)}$~3.8x10^{13} $M_\odot$



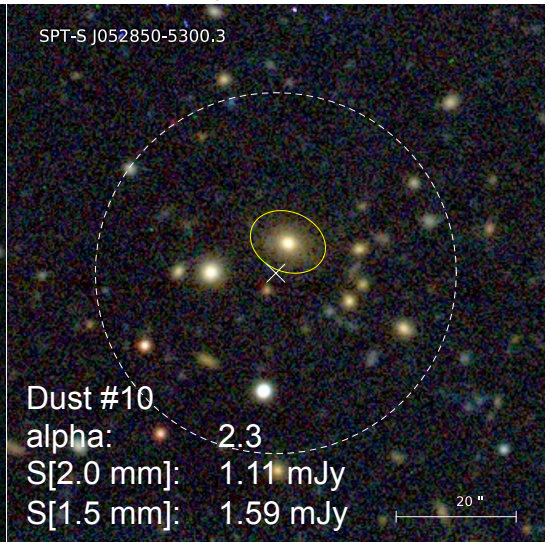
$M_{L(BCG)}$~2.6x10^{13} $M_\odot$



$M_{L(BCG)}$~1.2x10^{14} $M_\odot$



$M_{L(BCG)}$~3.2x10^{13} $M_\odot$
$M_{L(X\text{-}ray)}$<3x10^{13} $M_\odot$



2011-3-RU-015 & 2012-2-RU-005

Jack Hughes
Felipe Menanteau
Ryan Blackman
Amruta Deshpande

Plausible lensing candidates were identified for 1/3 out of 23 SPT distant dusty sources from ~50 deg^2. All sources $S_{1.5mm}$ > 10 mJy show lensing candidates. Measure lens redshifts with RSS.

Redshifts of SPT Dusty Source Lenses

Isolated elliptical galaxy

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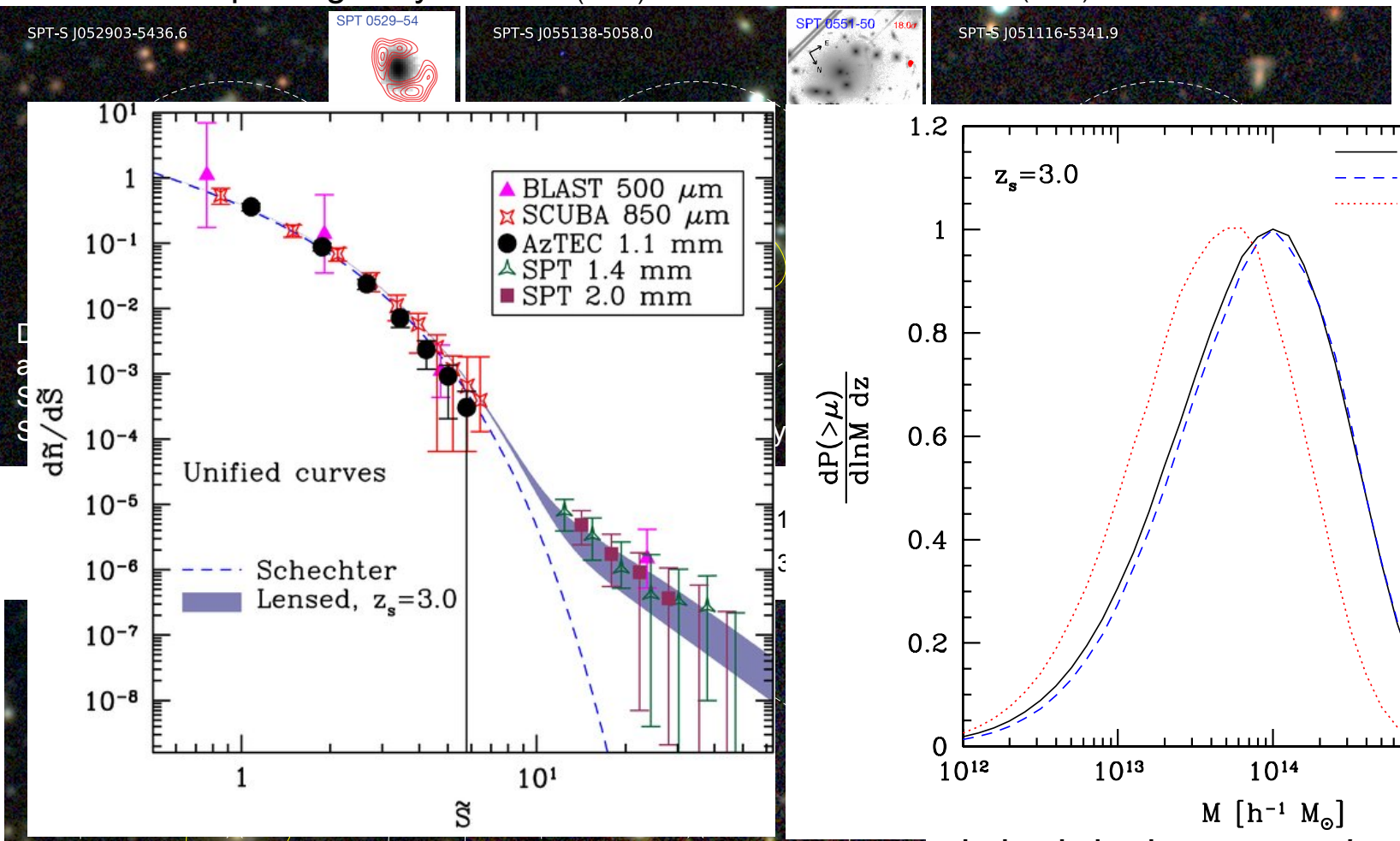
$M_{L(BCG)}$~2.6x10^{13} $M_\odot$



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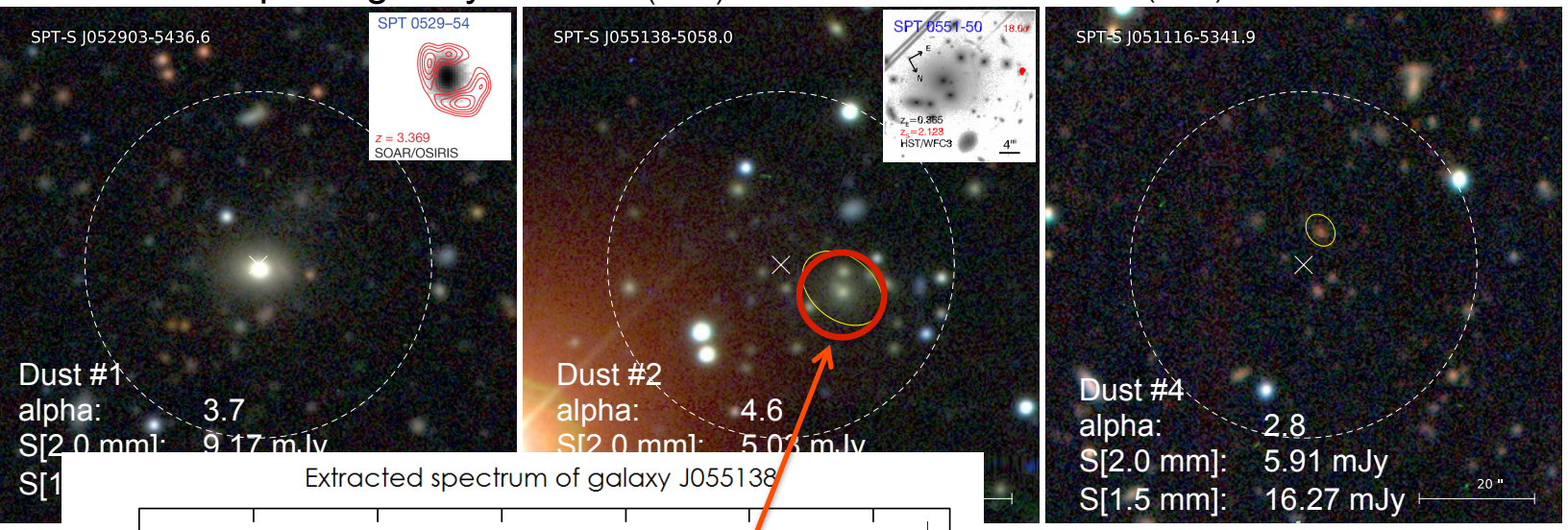

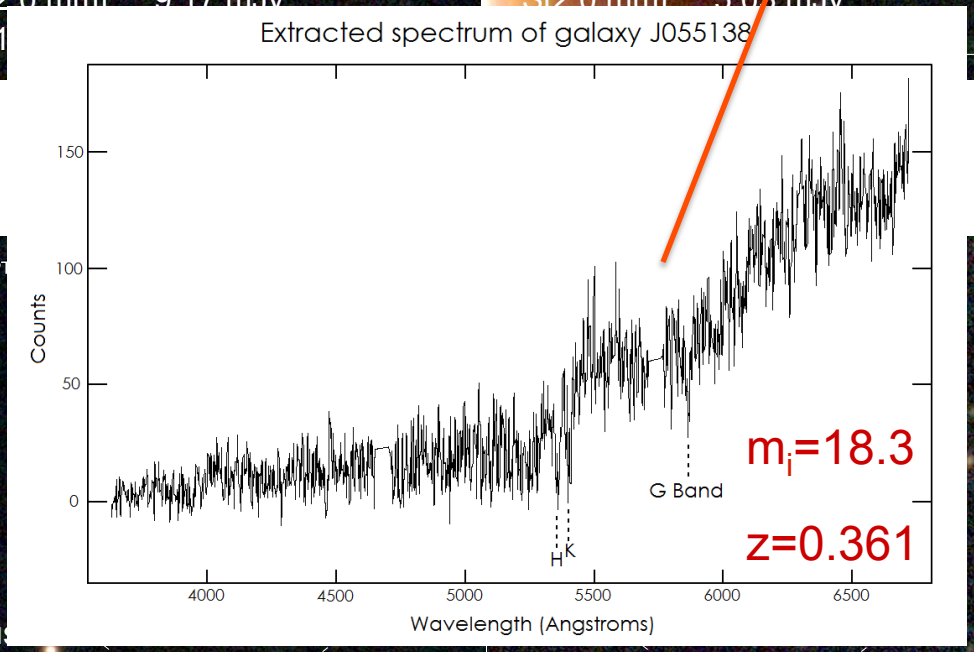

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Redshifts of SPT Dusty Source Lenses

Ephemeris of SALT Spectroscopic Observations

Target Name	RSS Obs Mode[1]	Obs Date	UTC start	Exp time (s)
SPT-S J052903−5436.6	LS-PG900-2″ slit	2012-02-13	21:30:24	652
SPT-S J055138−5058.0	MOS-PG900-1″ slitlet	2013-02-04	22:13:28	840
...	...	2013-02-12	21:48:53	1047
SPT-S J051116−5341.9	LS-PG900-2″ slit	2011-12-06	01:08:50	2390
SPT-S J052850−5300.3	MOS-PG900-1″ slitlet	2013-03-04	20:08:32	2080
SPT-S J053310−5453.3	MOS-PG900-1″ slitlet	2013-03-13	19:48:18	2080

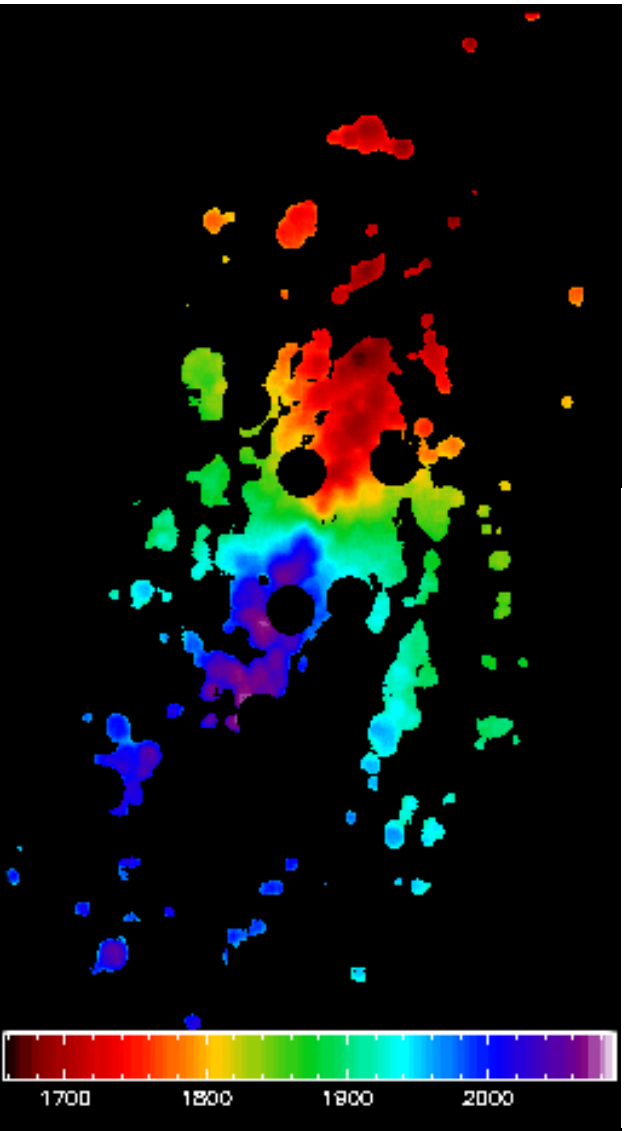
[1] Long slit (LS) observations were obtained under program 2011-3-RU-015 (PI: Amruta Deshpande); multi-object spectra (MOS) were from program 2012-2-RU-005 (PI: John P. Hughes).

SALT Spectroscopic Results

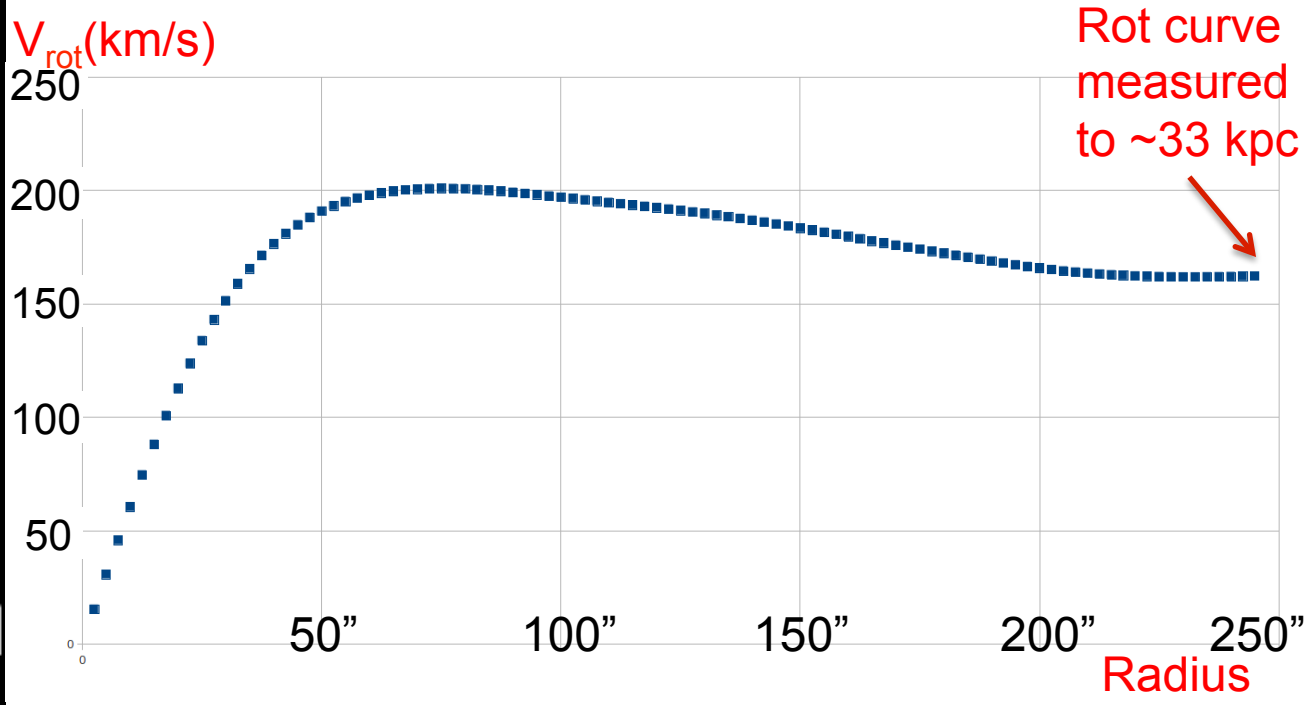
Target Name	Galaxy Id	m_i	redshift	R	sp. type
SPT-S J052903−5436.6	SCS J052903−543639	17.1	0.1401 ± 0.0002	15.7	abs
SPT-S J055138−5058.0	SCS J055137−505808	18.3	0.3614 ± 0.0002	8.2	abs
...	SCS J055137−505805	19.4	0.3625 ± 0.0005	4.3	abs
SPT-S J0521116−5341.9	SCS J051116−534204	22.3	0.8045 ± 0.0002	6.7	em
...	SCS J051116−534154	21.9	0.5912 ± 0.0002	8.8	em
SPT-S J052850−5300.3	SCS J052850−530016	18.9	0.4856 ± 0.0002	8.8	em+abs
SPT-S J053310−5453.3	SCS J053310−545320	17.9	0.4350 ± 0.0002	8.0	abs
...	SCS J053311−545305	19.1	0.4349 ± 0.0003	5.3	abs
...	SCS J053317−545334	18.3	0.4379 ± 0.0006	4.1	abs

RINGS

RSS Imaging and Spectroscopy Nearby Galaxy Survey

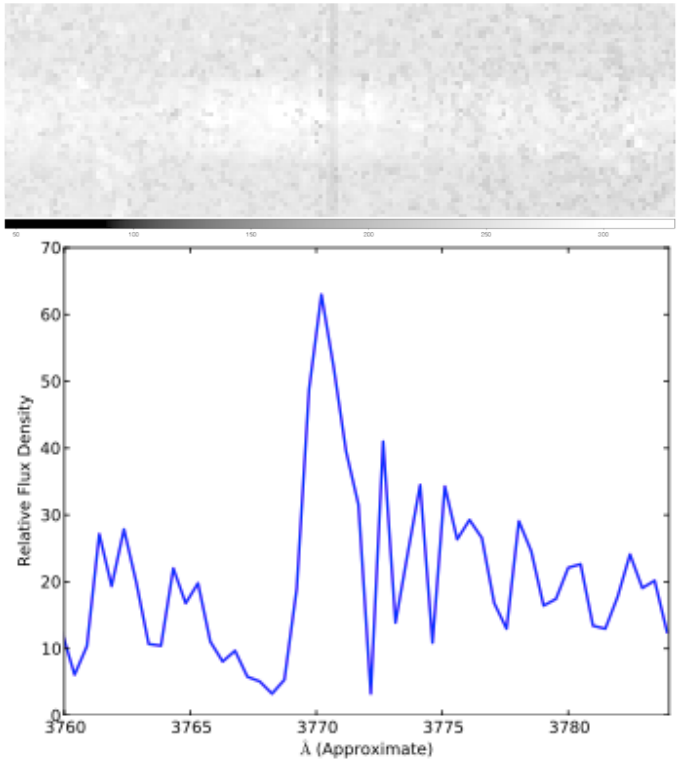


- Left: Velocity map of NGC 2280 produced from SALT RSS Fabry-Pérot imaging. 8' field-of-view.
- Bottom: Model rotation curve fit for NGC 2280.
- Measured systemic velocity: 1861.6 km/s (heliocentric)
- Scale: 1” ~ 136 pc at distance of 28 Mpc.



RSS Multi-Object UV Spectroscopy of z=2 Star-Forming Galaxies

Caryl Gronwall (PSU/HET), Eric Gawiser (Rutgers), Alex Hagen (PSU Ph.D. student), et al.



Spectrum of galaxy at z = 2.101 (in EHDF-S) obtained in four hours (stack of six 40 minute observing blocks).

Top panel shows observed 2-d spectrum.
Bottom panel shows extracted 1-d spectrum.
Lyα emission line detected and resolved with $\Delta v \sim 150$ km s^{-1}.

Demonstrates:
-feasibility of studying emission lines in high-z galaxies
-ability to stack multiple MOS exposures to increase S/N

Stacking exposures with simple integer shifts, we find S/N $\propto t^{0.25}$ (instead of optimal $t^{0.5}$).
Now also trying to rectify rotations between exposures.

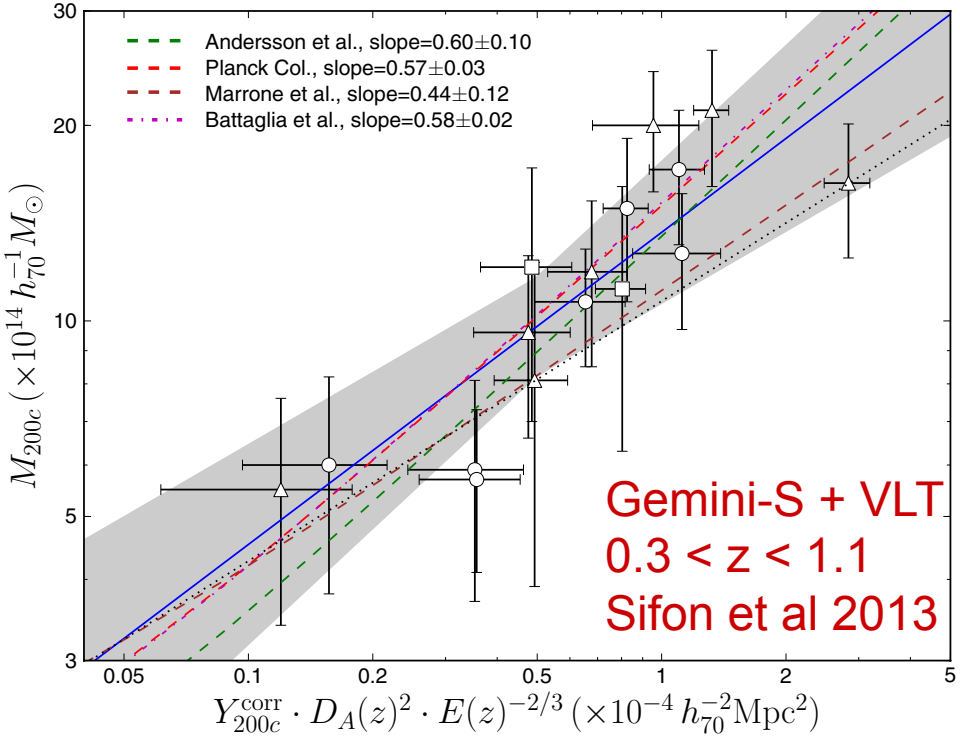
More sophisticated data reduction and additional observing time should improve the quality of the spectra.

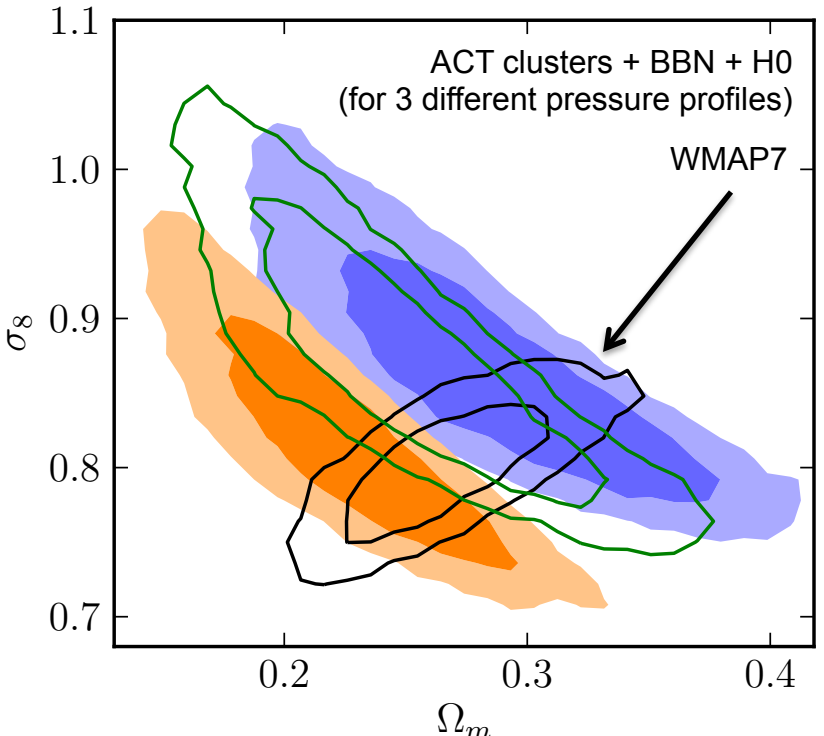
Redshifts of Massive ACT SZE Clusters

Joint RSA+RU program (2013-1-RSA_RU-001, 2013-2-RSA_RU-002)

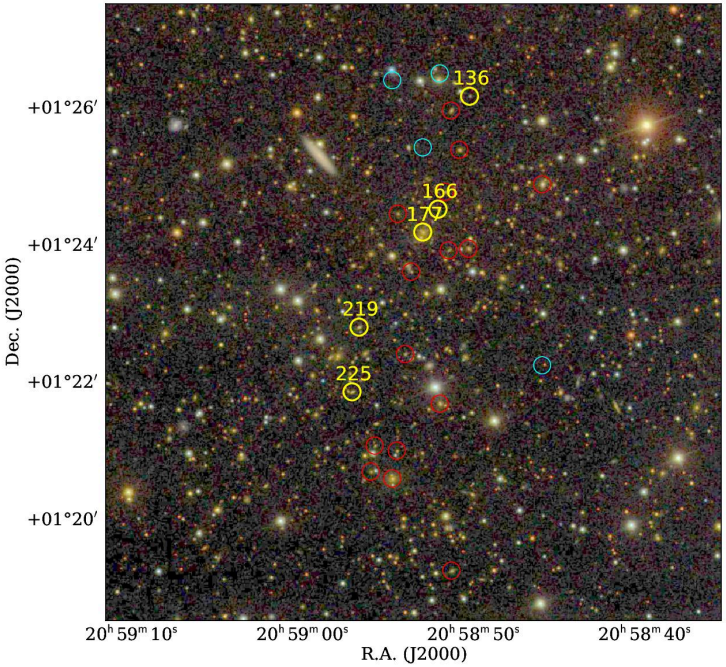
Team: Matt Hilton, Kavi Moodley, Susan Wilson (UKZN), Brian Kirk, Catherine Cress (CHPC), Steve Crawford (SAAO), Jack Hughes (RU), Felipe Menanteau (Illinois)

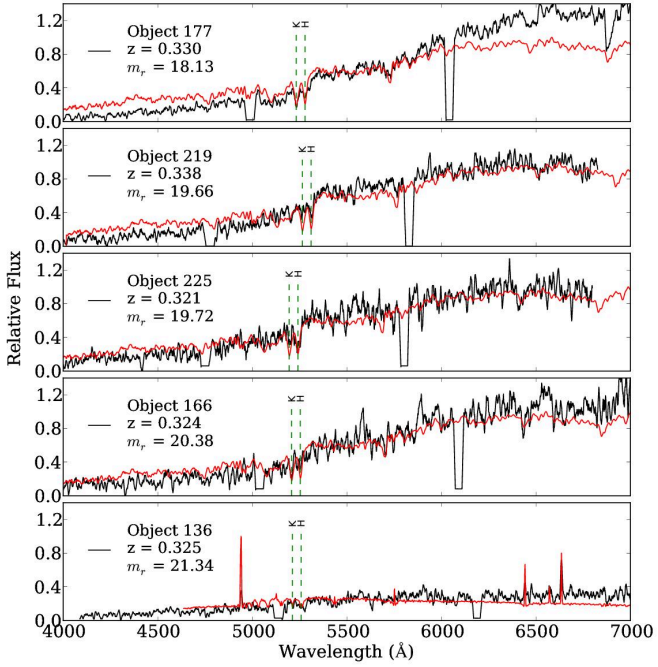
Goal: Measure redshifts of cluster galaxies to estimate dynamical mass from velocity dispersion. Clusters come from the Atacama Cosmology Telescope, selected through the Sunyaev-Zel'dovich Effect. Calibrate the Y_{SZ} vs. M_{dyn} scaling law to use cluster number counts to constrain cosmology.



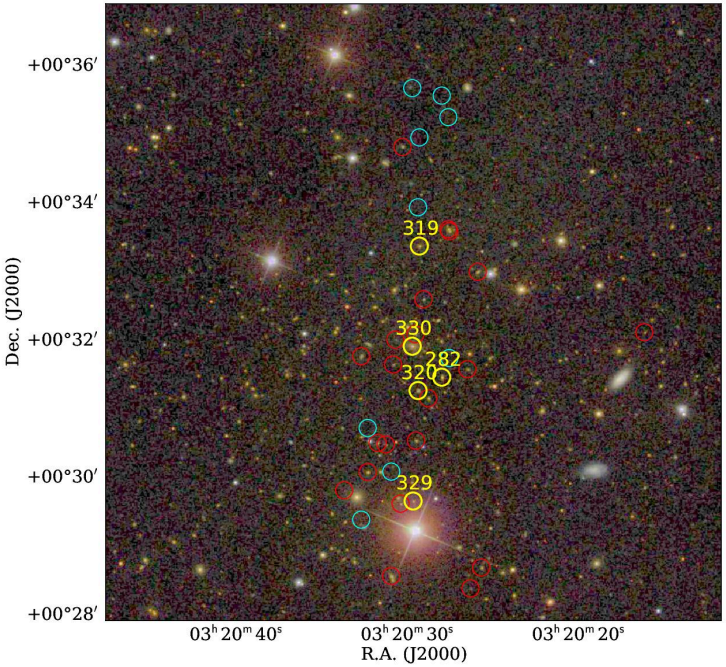


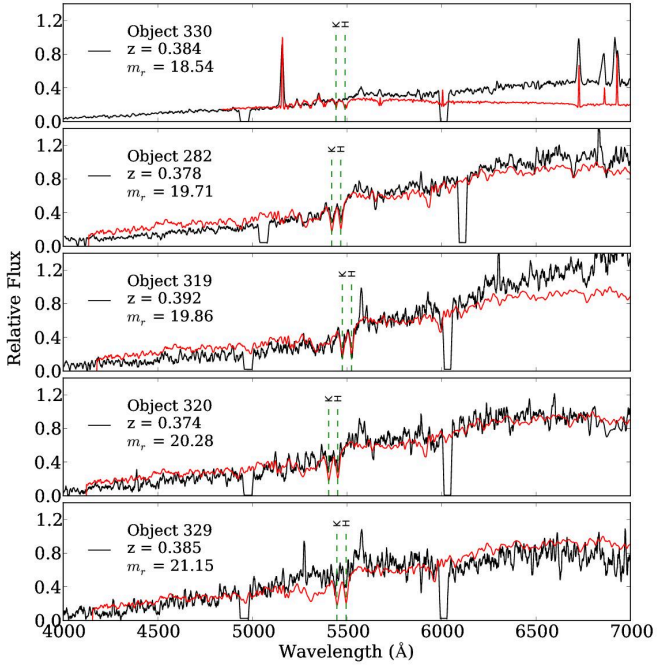
SDSS (Stripe 82) images

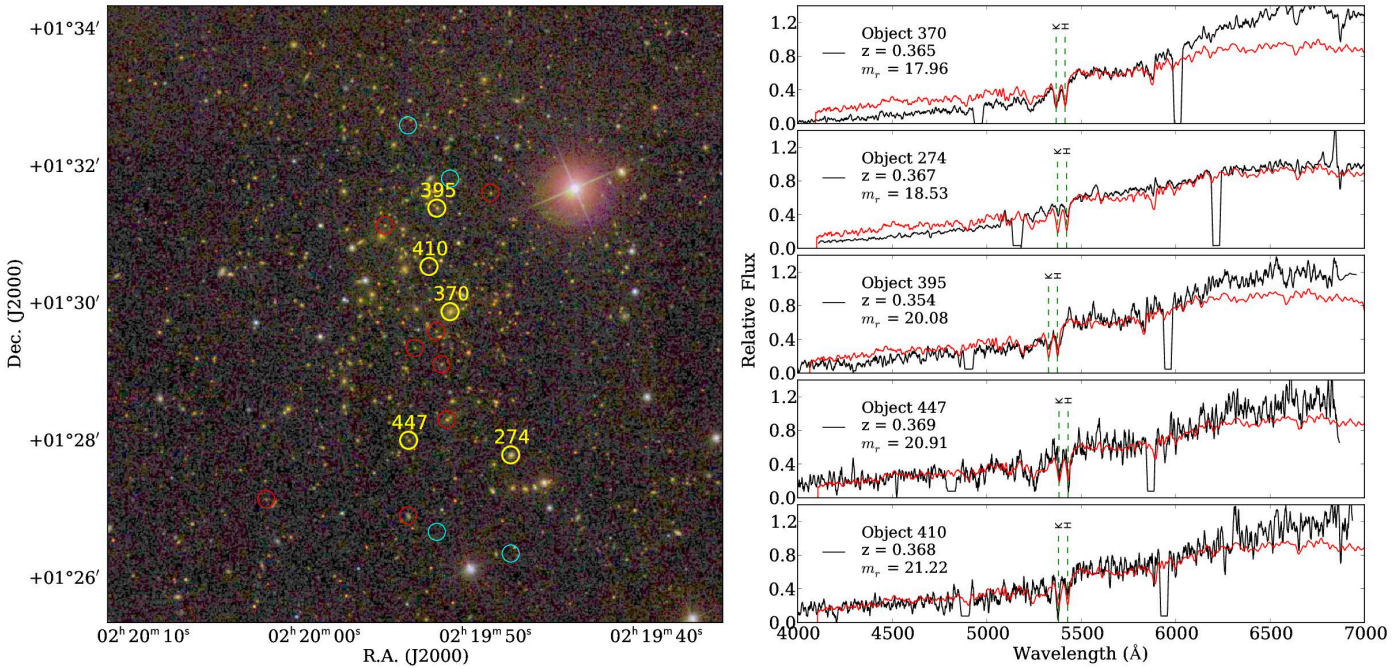




SALT spectra of cluster members






+01°34′
+01°32′
+01°30′
+01°28′
+01°26′
Dec. (J2000)
02h20m10s
02h20m00s
02h19m50s
02h19m40s
R.A. (J2000)
395
410
370
447
274
Relative Flux
Object 370
z = 0.365
m_r = 17.96
Object 274
z = 0.367
m_r = 18.53
Object 395
z = 0.354
m_r = 20.08
Object 447
z = 0.369
m_r = 20.91
Object 410
z = 0.368
m_r = 21.22
K H
0.0
0.4
0.8
1.2
4000
4500
5000
5500
6000
6500
7000
Wavelength (Å)

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