CURRENT CARMA GALAXY CLUSTER RESULTS

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Current CARMA Galaxy Cluster Results

- Interferometric SZ Observations
- CARMA SZ Legacy Sample
- Mass-Observable Calibration
SZ measurements require short u-v spacings

CARMA 3.5m 1cm
CARMA 6.1m 1cm
CARMA 10.1m 1cm
ACA Band 3
ALMA Band 3

CARMA23
MACS 0417
z=0.45
SZ is a nearly redshift independent mass estimator

Highest redshift SZ detection is from CARMA

• $z = 1.75$
• $M_{500c} = 2.4 \times 10^{14} \text{ Msun}$

See Brodwin talk this afternoon

Brodwin+ 2012
CARMA has been observing galaxy clusters since 2005

Now one of the largest SZ catalogs: over 300 clusters with redshifts $z=[0.08,1.75]$
LoCuSS is the first calibration of SZ with weak lensing

- 75 cluster sample between high Lx and low Lx subsamples
- Pilot: 18 clusters, Marrone+ 2012

- Lensing (Subaru, HST)
- X-Ray (Chandra, XMM)
- SZ (CARMA)
LoCuSS: the first calibration of SZ with weak lensing

\[ Y_{\text{sph}} D_A^2 E(z)^{-2/3} (\text{Mpc}^2) \]

Marrone+ 2012

LoCuSS Y–M_{WL} Data
LoCuSS Y–M_{WL} Fit
SPT Y–M_{X-ray}
LoCuSS: does morphology lead to segregation in scaling relations?

Simulated $Y$ During Merger

$Y_{\text{sph}} \frac{D_A^2}{E(z)^{-2/3}} \left( \text{Mpc}^2 \right)$

$M_{\text{WL}} \left( M_\odot \right)$

 Wik et al. 2008

 Wik+ 2008

 Marrone+ 2012

Disturbed

Undisturbed

First Crossing

Final $Y$
maxBCG-SZ: testing richness as a mass proxy for DES

- 28 clusters observed with CARMA
- Richness (SDSS)
- SZ (CARMA)

Abell 1703

$L_X (10^{42} h^{-2} 70 \text{ ergs/s})$

$\lambda$

Greer+ in prep
maxBCG-SZ: DES estimator $>2x$ improvement over past methods

$Y_{sz} \Delta D^2 E(z)^{-2/3} \text{ [Mpc}^2\text{]}$

Greer+ in prep
Conclusions

- LoCuSS: first calibration of SZ with WL.
- LoCuSS: calibration agrees with X-ray, but hints of morphological segregation.
- maxBCG: first calibration of DES richness estimator.
- maxBCG: scatter ~30%, >2x improvement over old richness estimators.
- Much more to come!