



eROSITA International Conference  
Garching – 2024



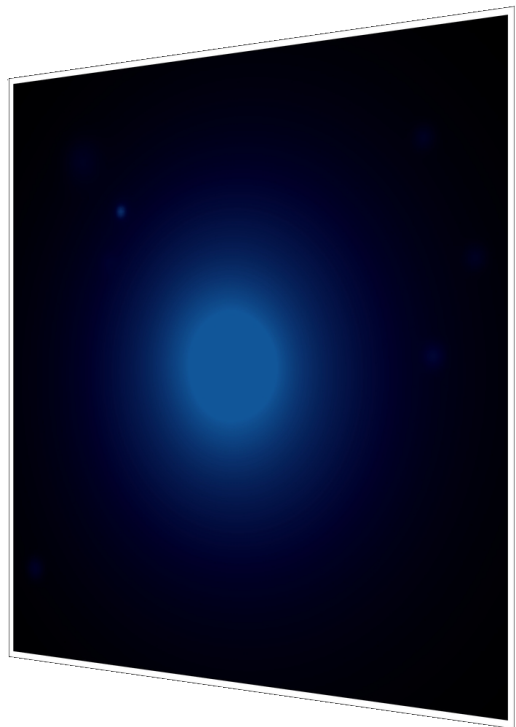
# eRASS1 Catalog of Galaxy Clusters & Groups

eROSITA – Catalog & Cosmology work package

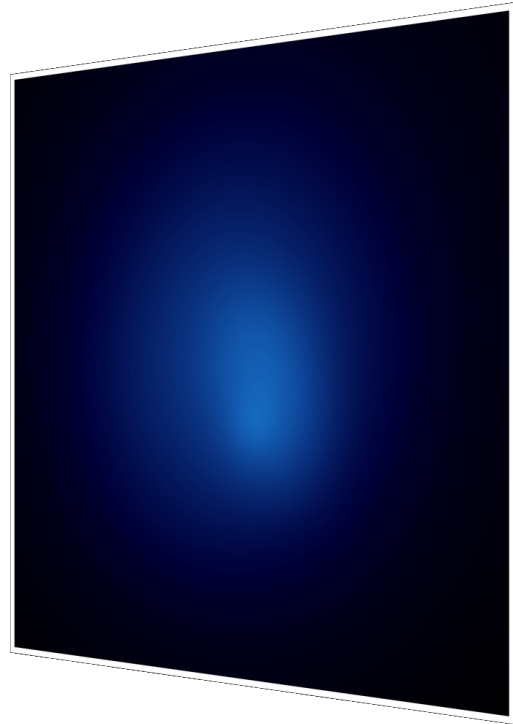
E. Bulbul, M. Kluge, A. Liu, J. Comparat, F. Balzer, J. Ider Chitham, V. Ghirardini, C. Garrel, Y. E. Bahar, E. Artis, R. Bender, K. Böckmann, M. Brüggen, N. Clerc, K. Dennerl, K. Dolag, T. Dwelly, M. H. Fabricius, M. Freyberg, S. Grandis, D. Grün, D. Hernández-Lang, G. J. Hill, J. Joshi, F. Kleinebreil, S. Krippendorf, G. Lamer, A. Merloni, K. Migkas, K. Nandra, F. Pacaud, P. Predehl, M. E. Ramos-Ceja, T. H. Reiprich, M. Salvato, J. S. Sanders, T. Schrabback, A. Veronica, R. Seppi, S. J. Weller, Zelmer, A. Zenteno, X. Zhang

# eROSITA's view

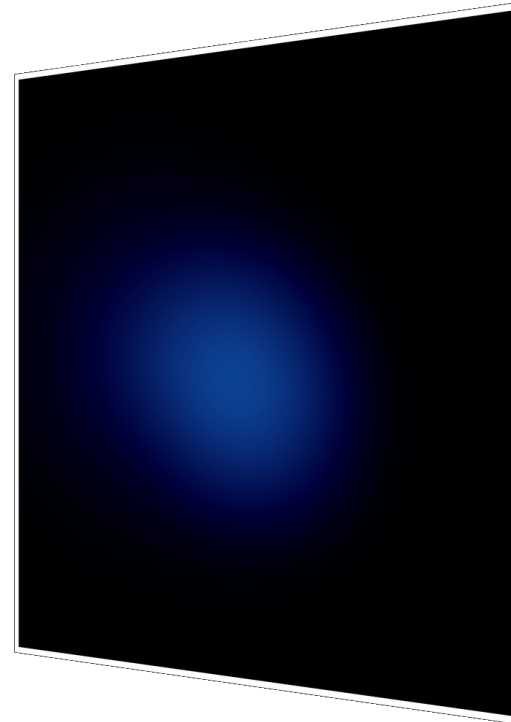
26,000 extended eRASS1 sources



$z = 0.1$



$z = 0.4$



$z = 0.9$



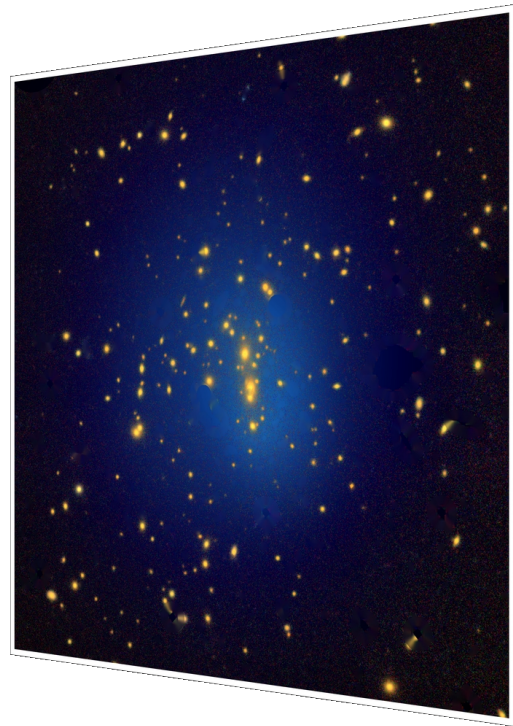
$z = 1.3$

# eROSITA + Optical

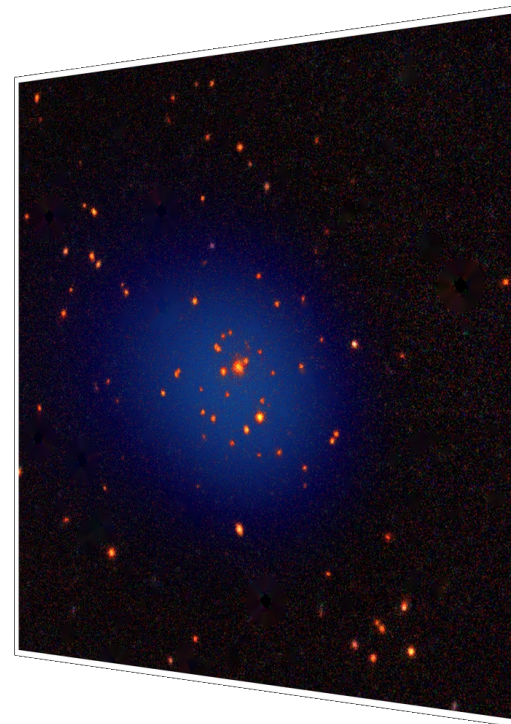
26,000 extended eRASS1 sources  
12,000 identified clusters & groups



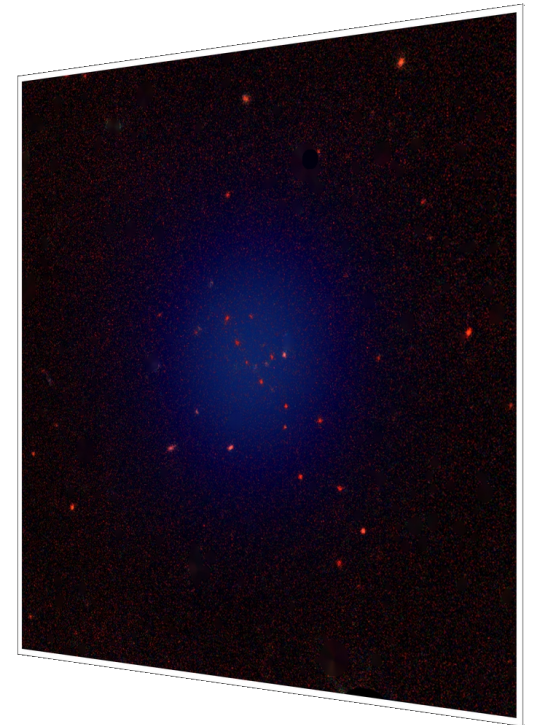
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$z = 0.4$

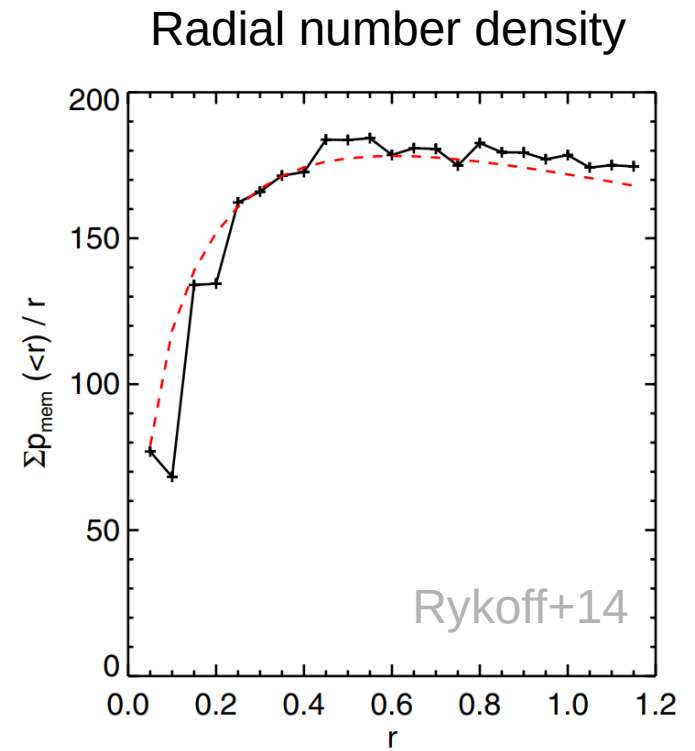
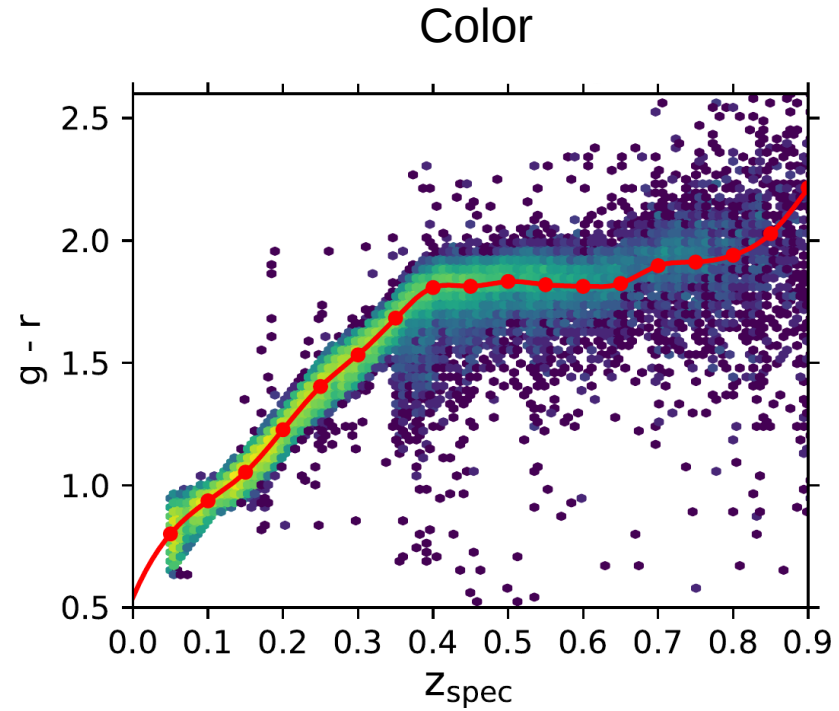
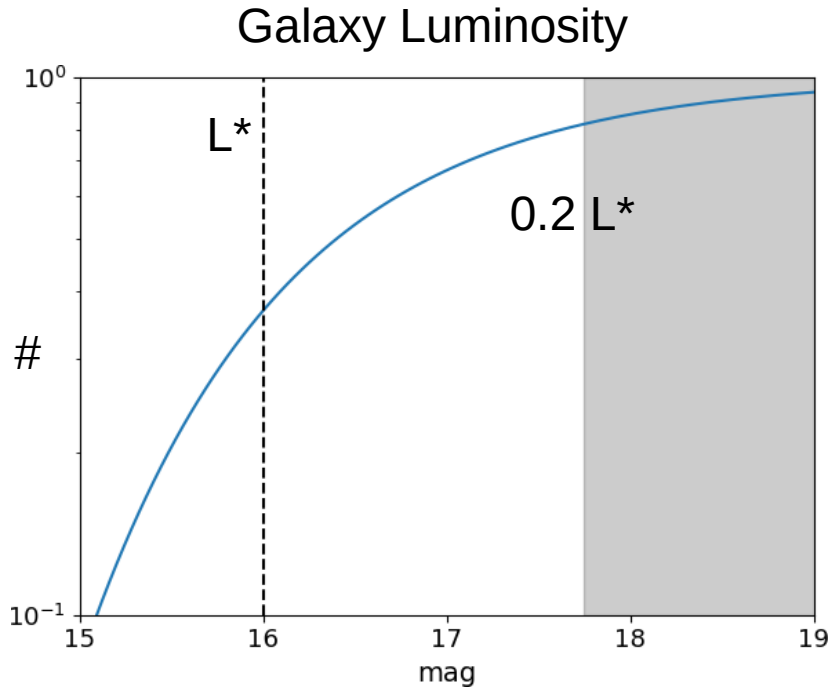


$z = 0.9$



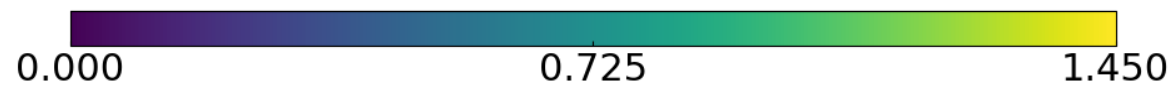
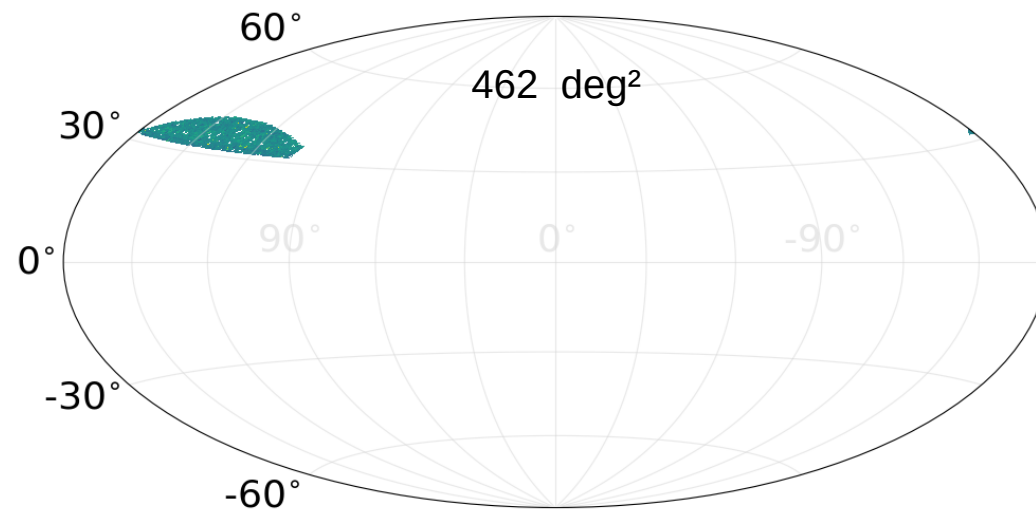
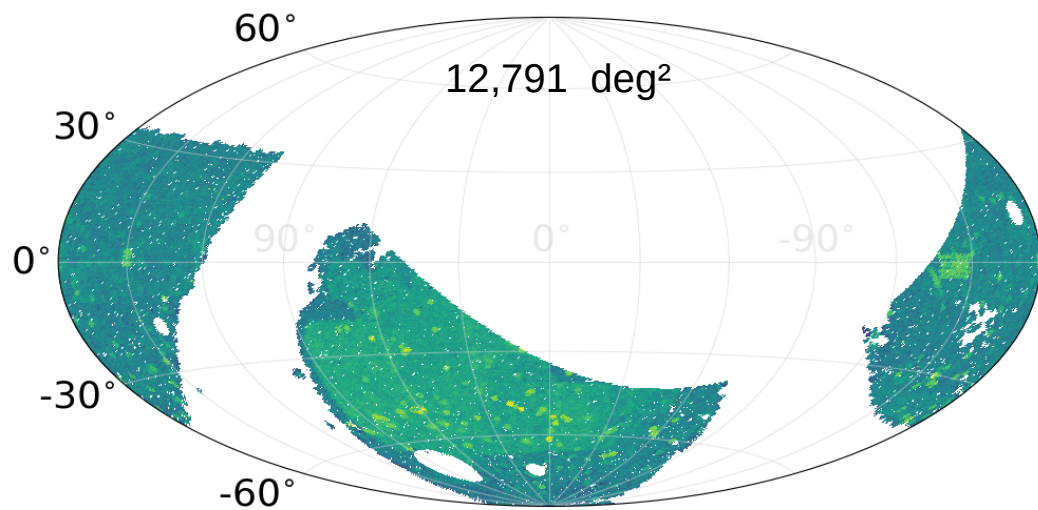
$z = 1.3$

# redMaPPer Filters



# Optical & NIR imaging data:

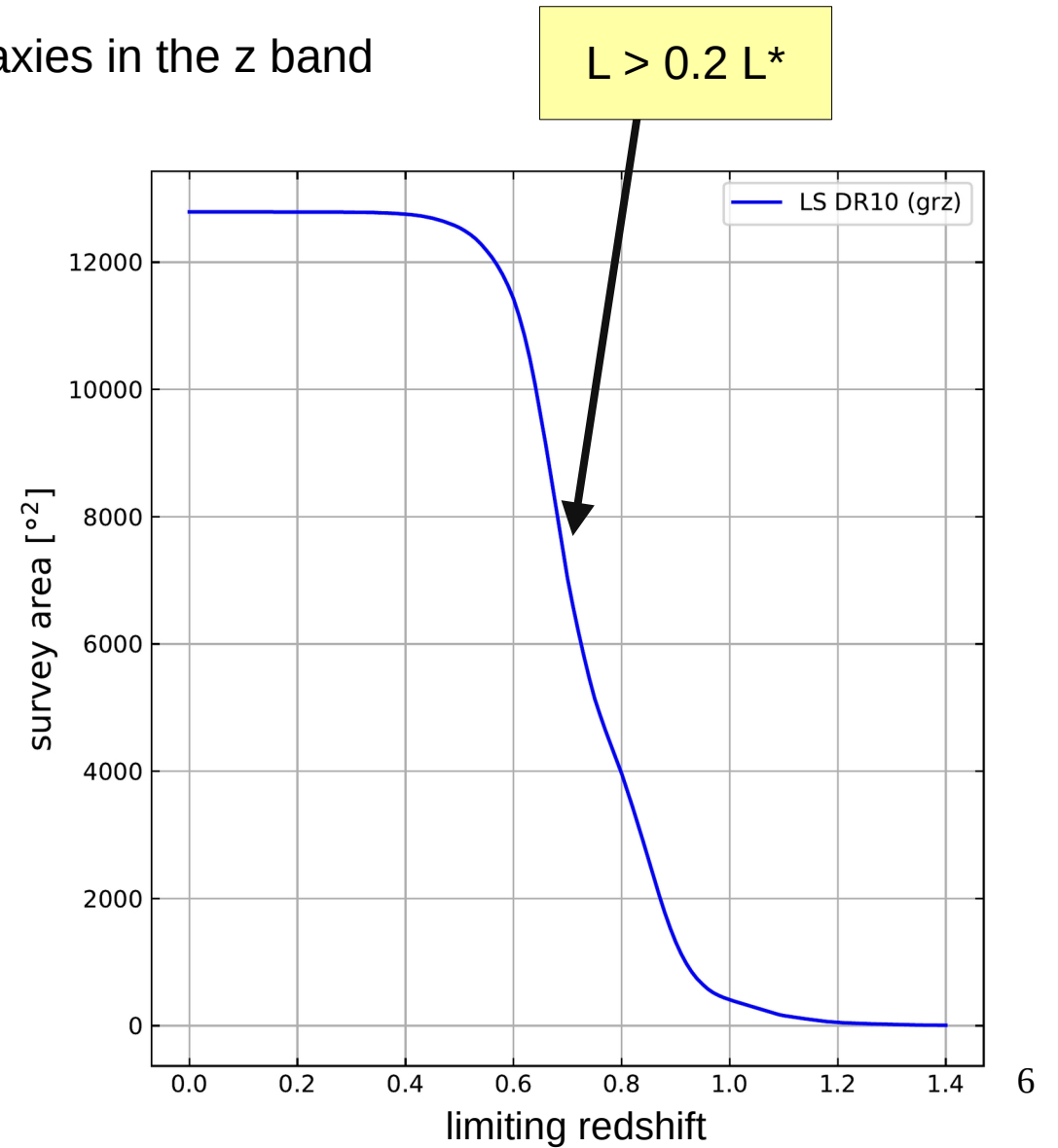
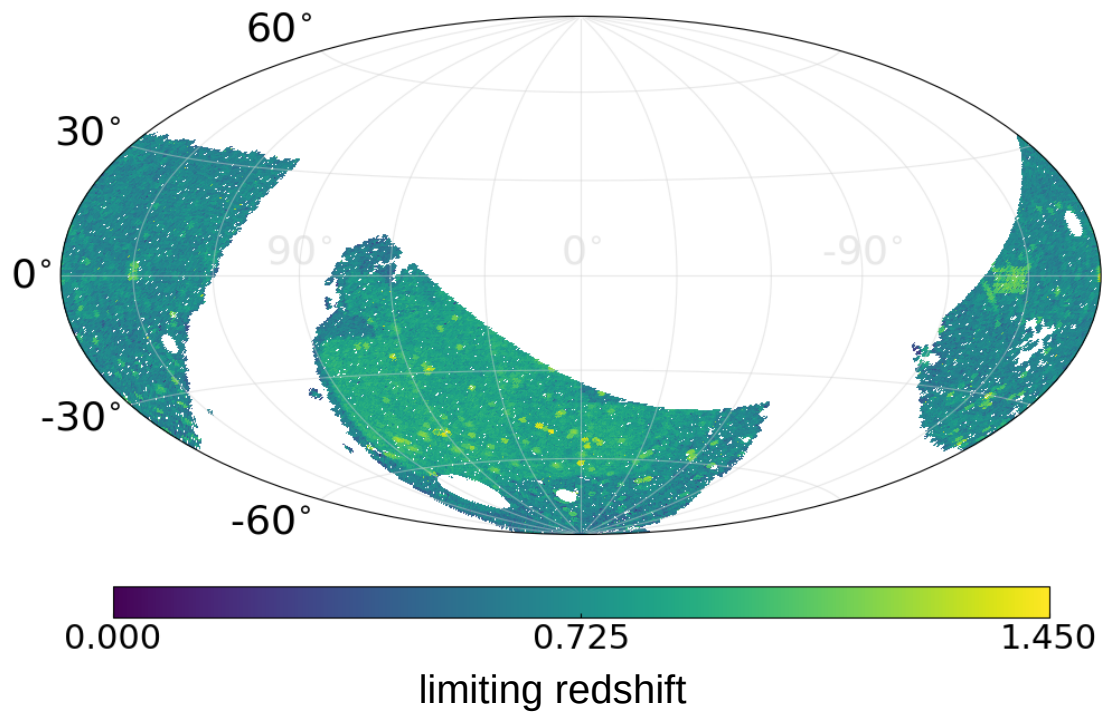
DESI Legacy Imaging Surveys DR10



limiting redshift

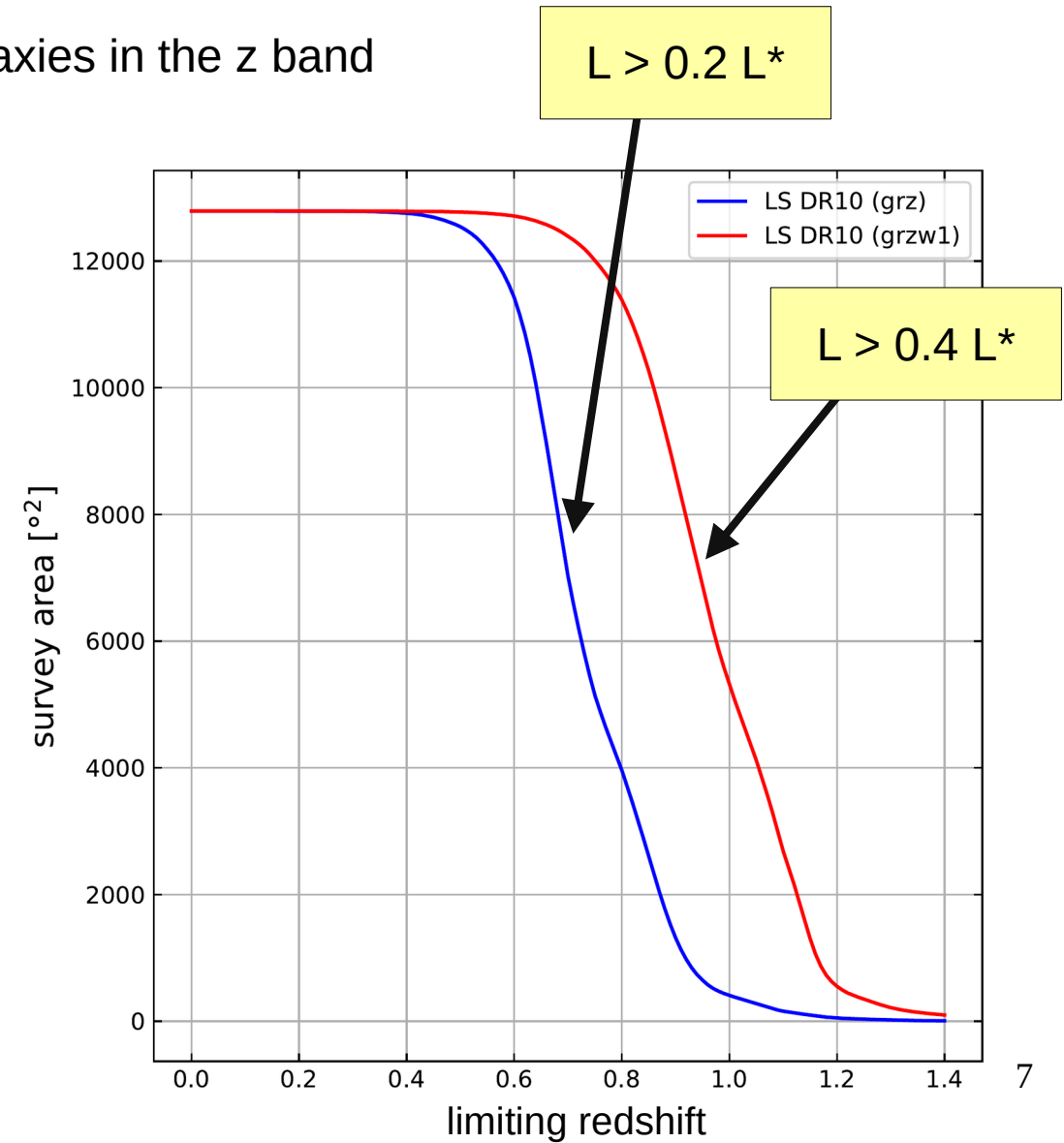
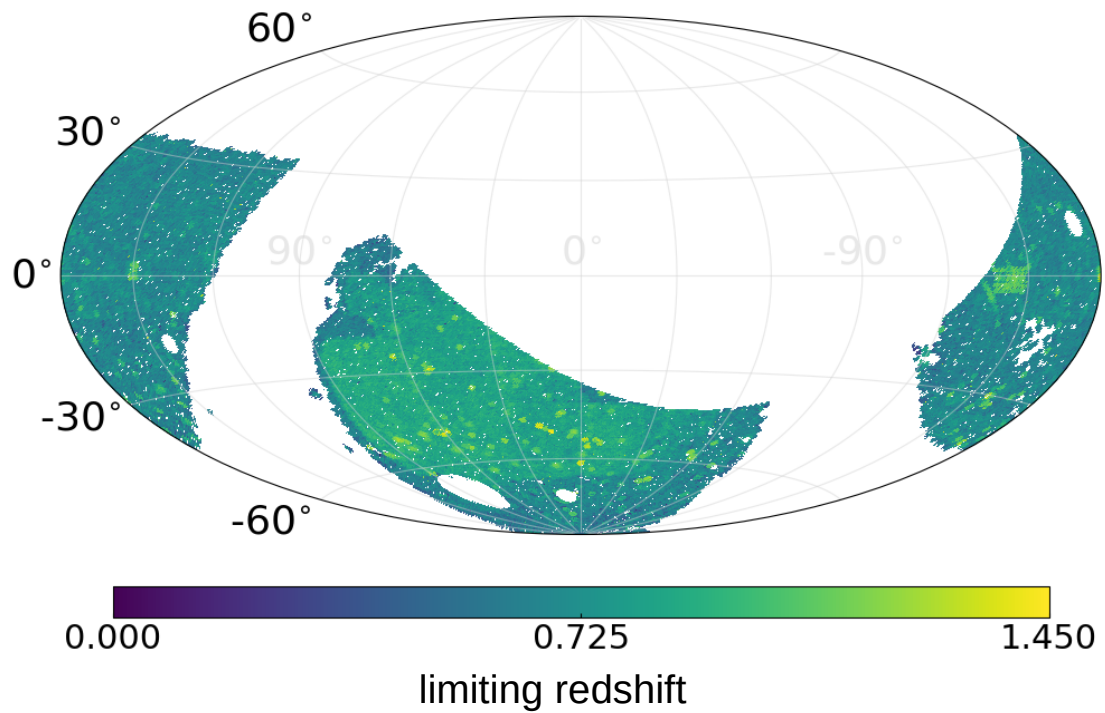
# Limiting Redshift

10  $\sigma$  detection of 0.2  $L^*$  galaxies in the z band



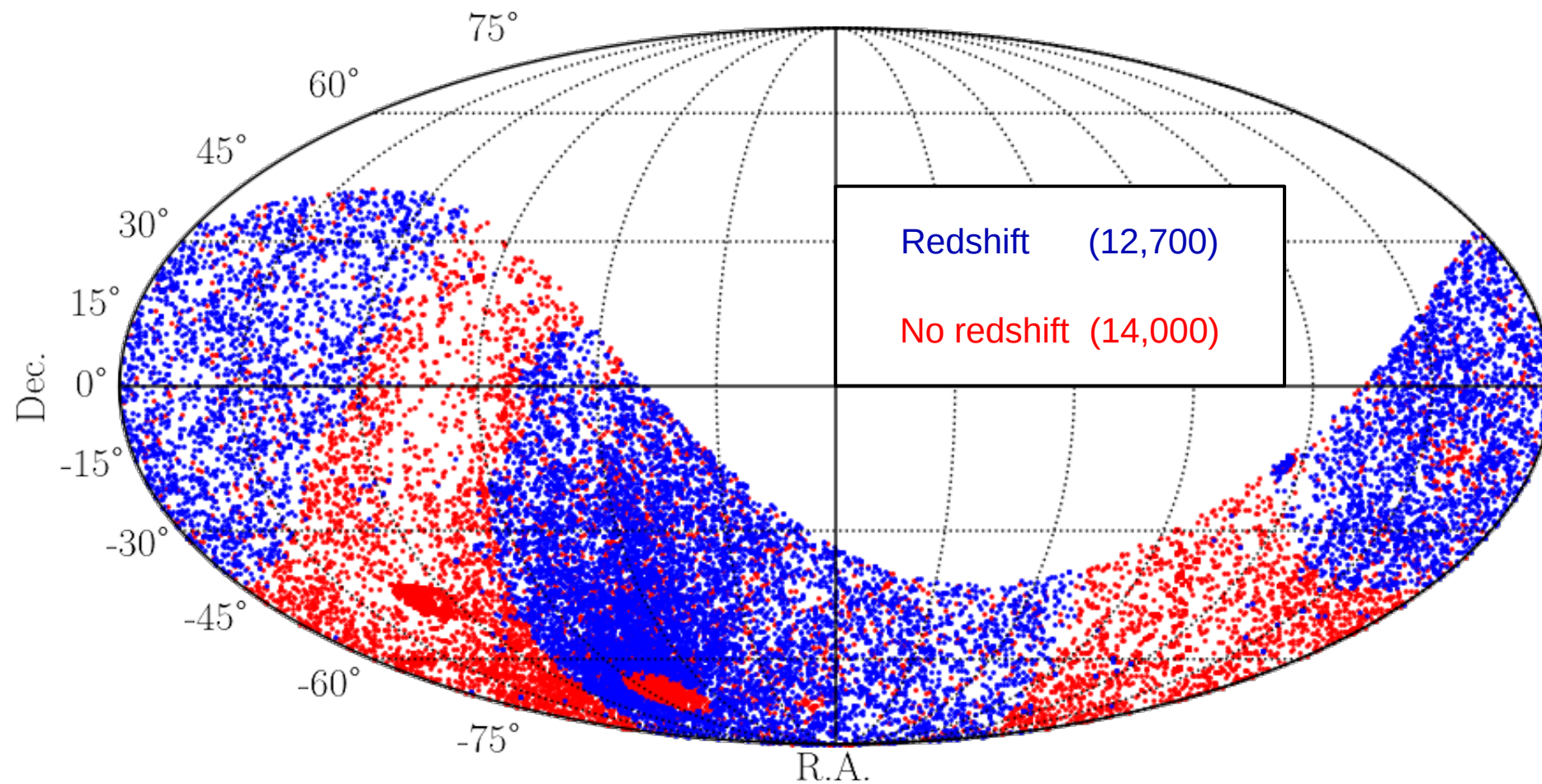
# Limiting Redshift

10  $\sigma$  detection of 0.2  $L^*$  galaxies in the z band



# eRASS1 Cluster Catalog

EXT\_LIKE > 3





# Redshifts

# spec-z & velocity dispersions

available for 26% (12%) of eRASS1 clusters

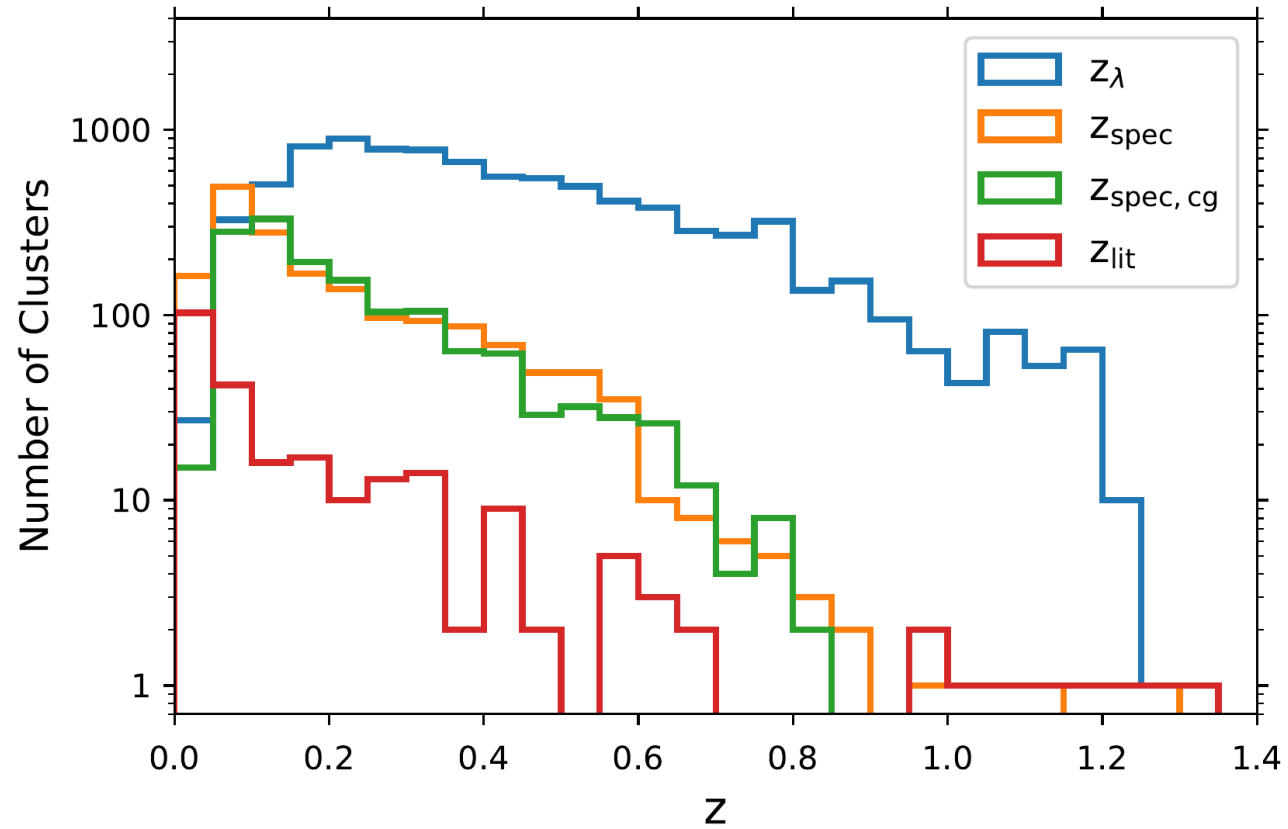
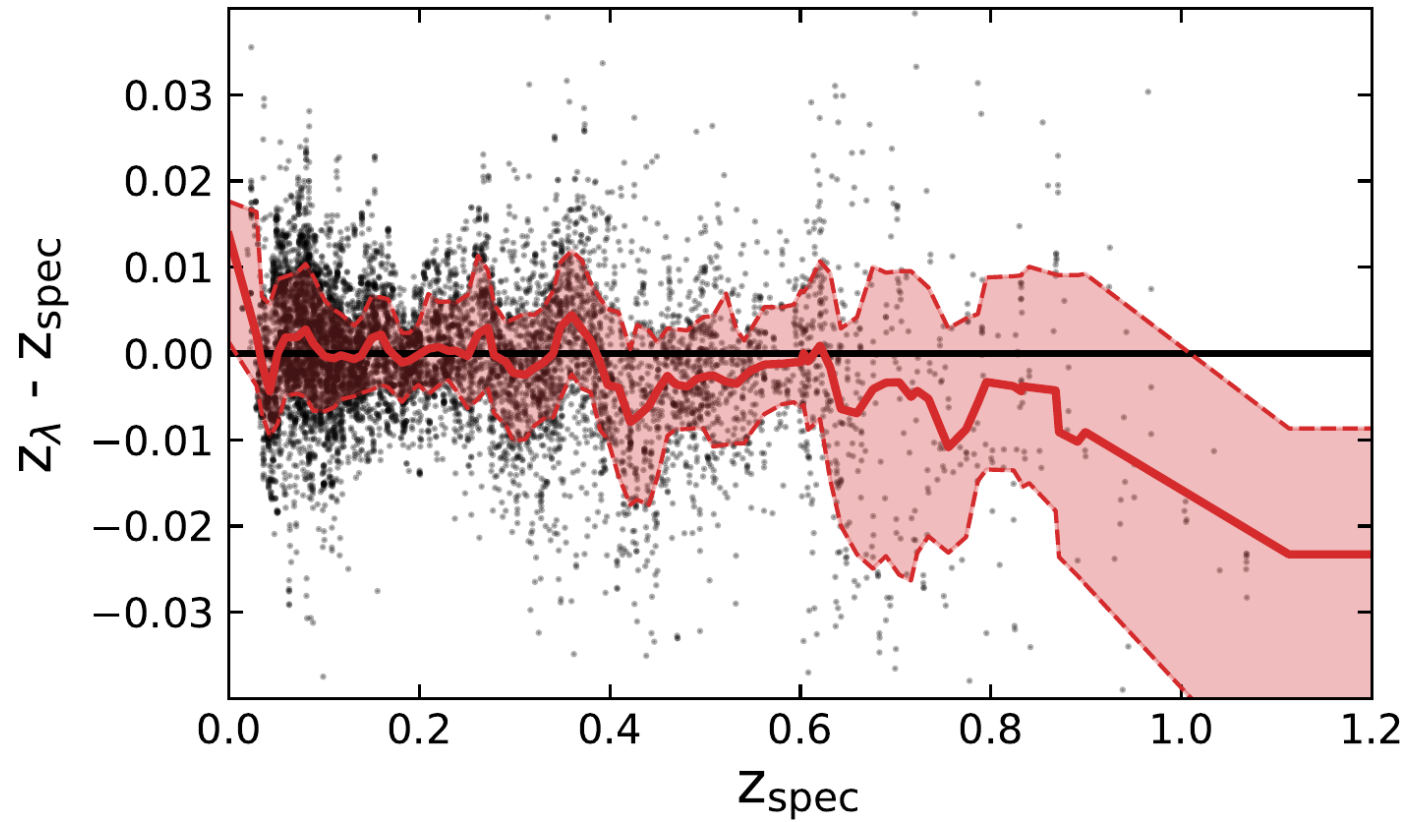
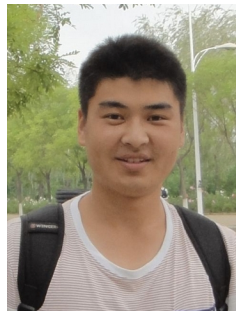
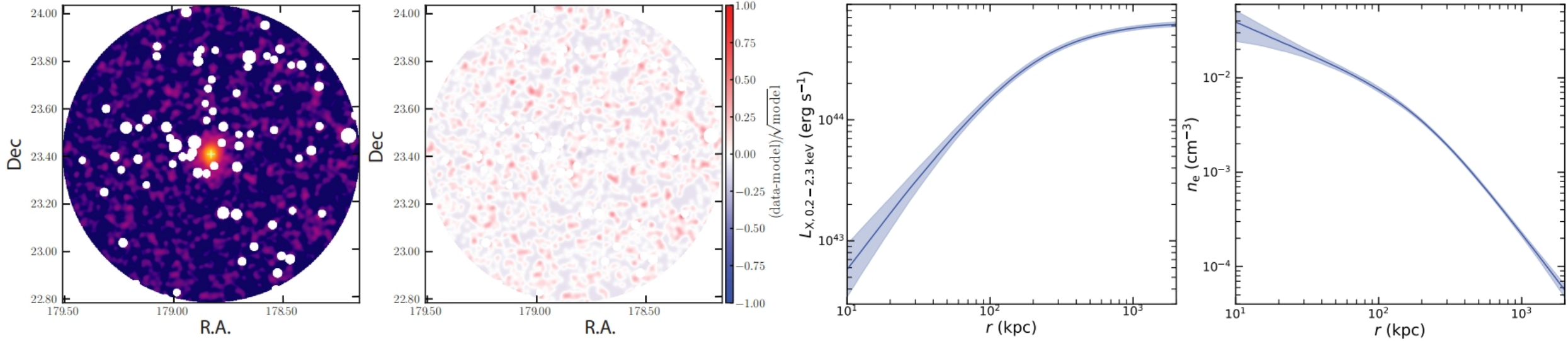


Photo-z uncertainty  $\frac{\delta z}{1+z} = 0.005$



# X-ray Processing



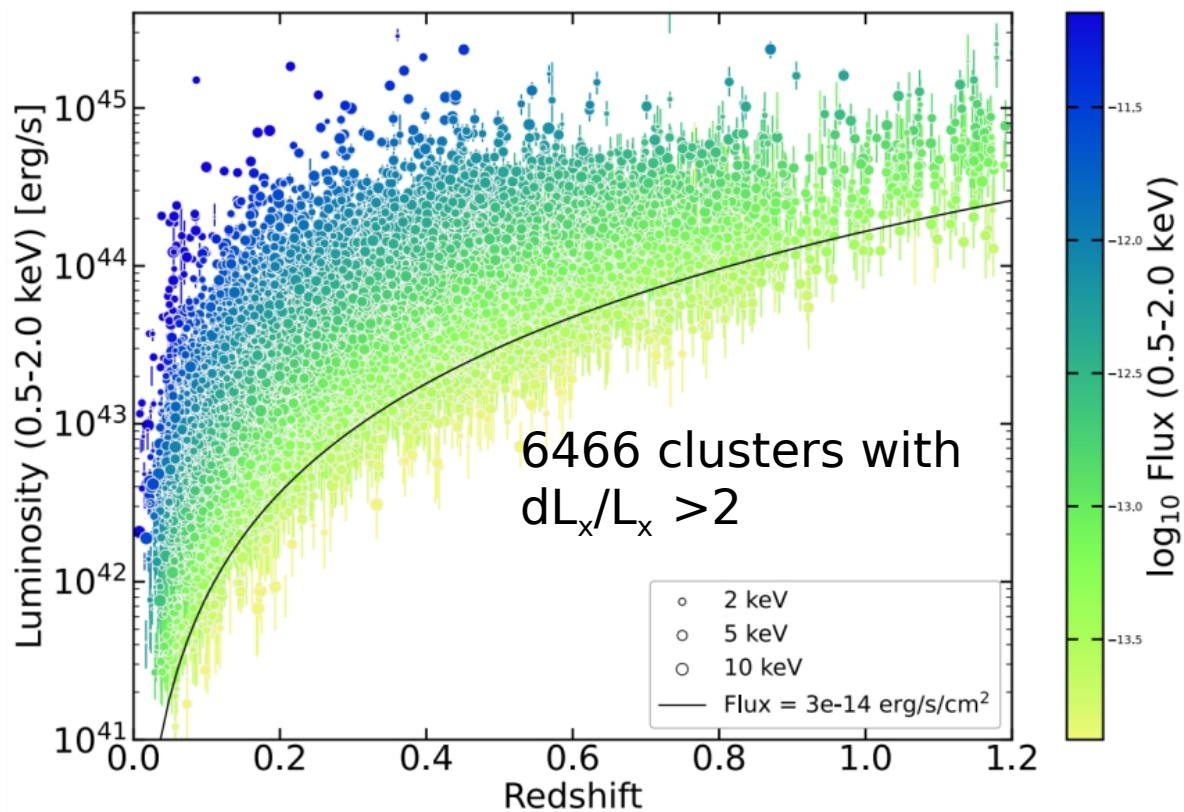
Ang Liu



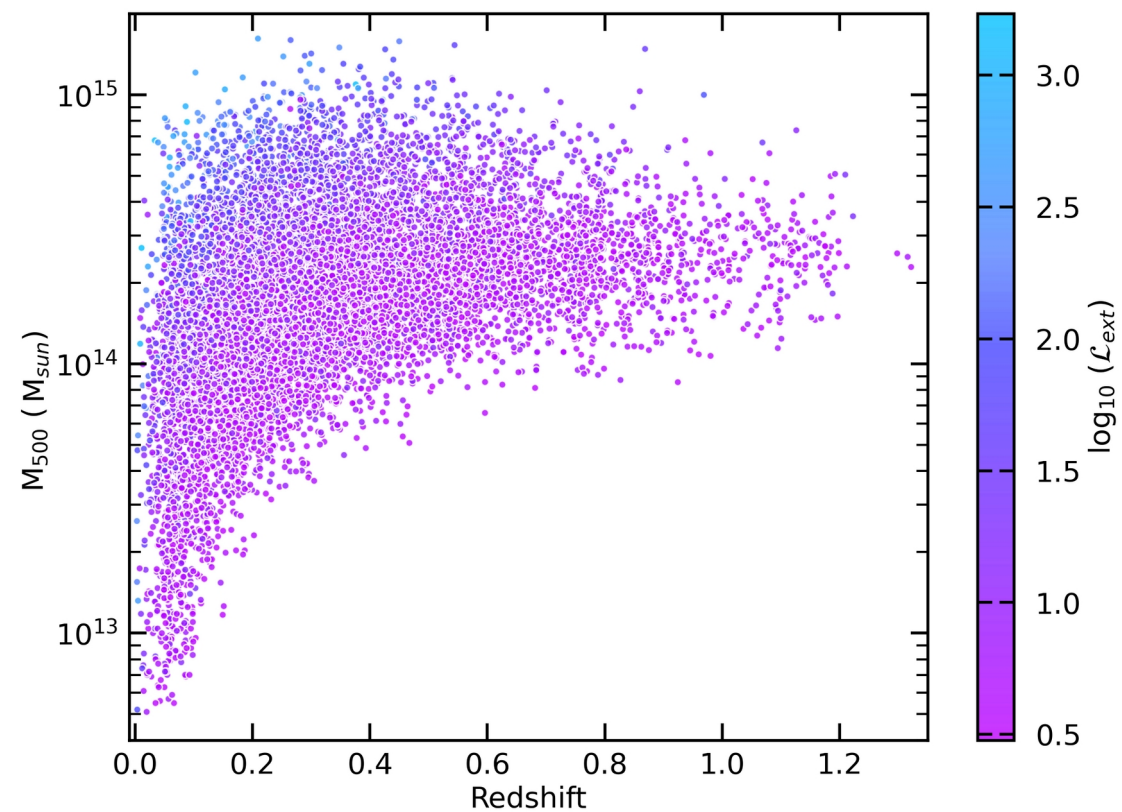
Jeremy Sanders

# Mass

# X-ray Luminosity → Weak-Lensing Mass

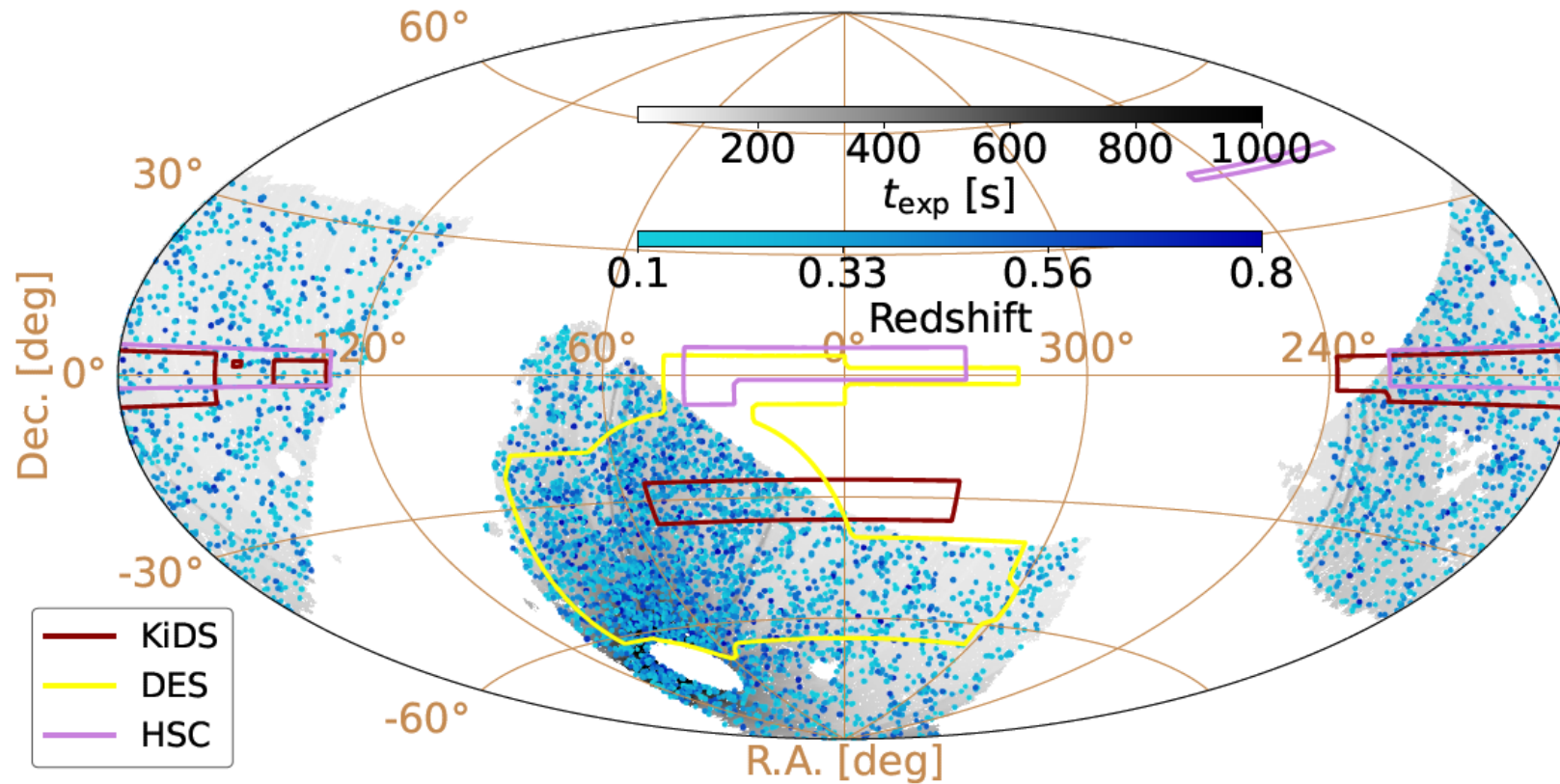


Bulbul+(2024)



Grandis+(2024)

# Weak Lensing Mass Calibration



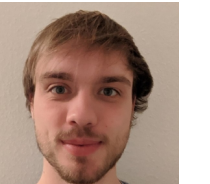
Sebastian Grandis



Tim Schrabback



Inon Chiu



Florian Kleinebreil

Grandis+2024  
Kleinebreil+2024

# Weak Lensing Mass Calibration



Sebastian Grandis



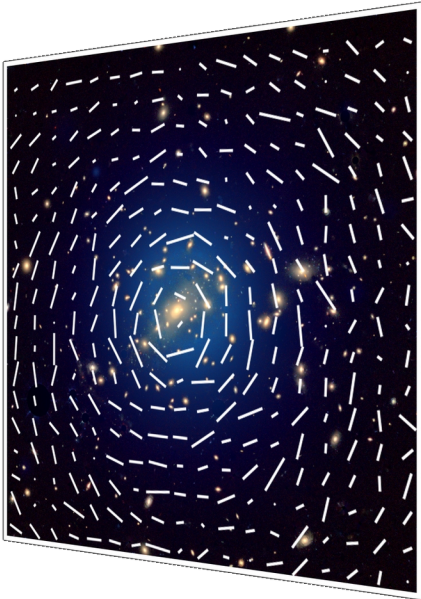
Tim Schrabback



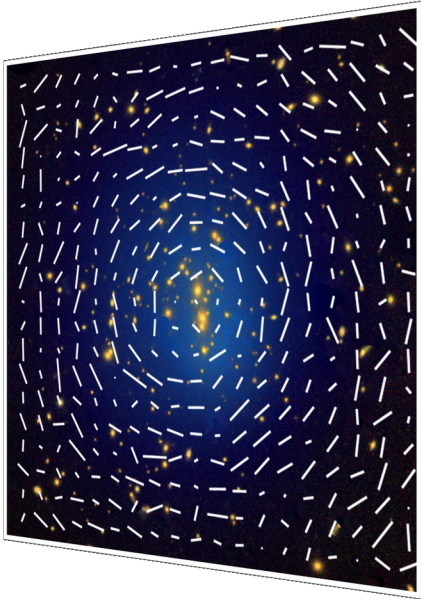
Inon Chiu



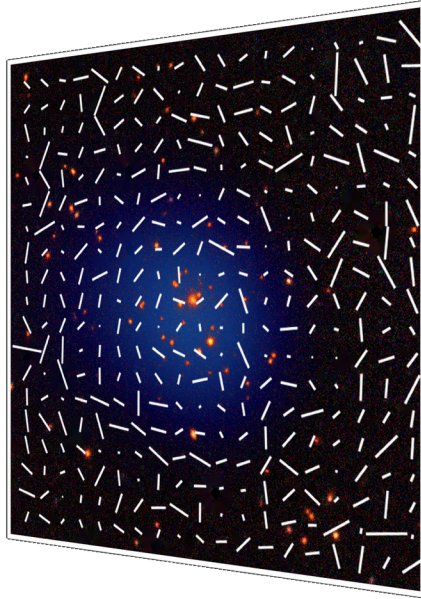
Florian Kleinebreil



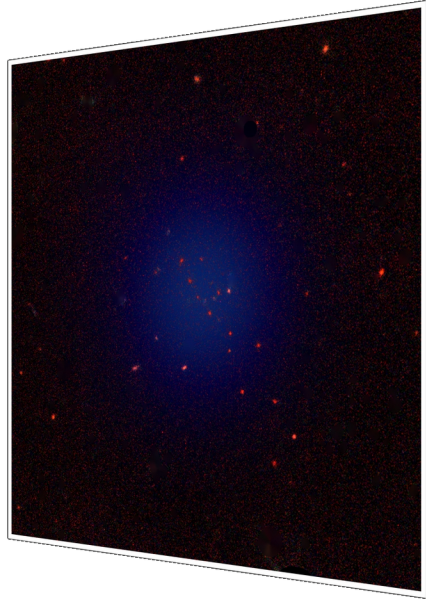
$z = 0.1$



$z = 0.4$



$z = 0.9$

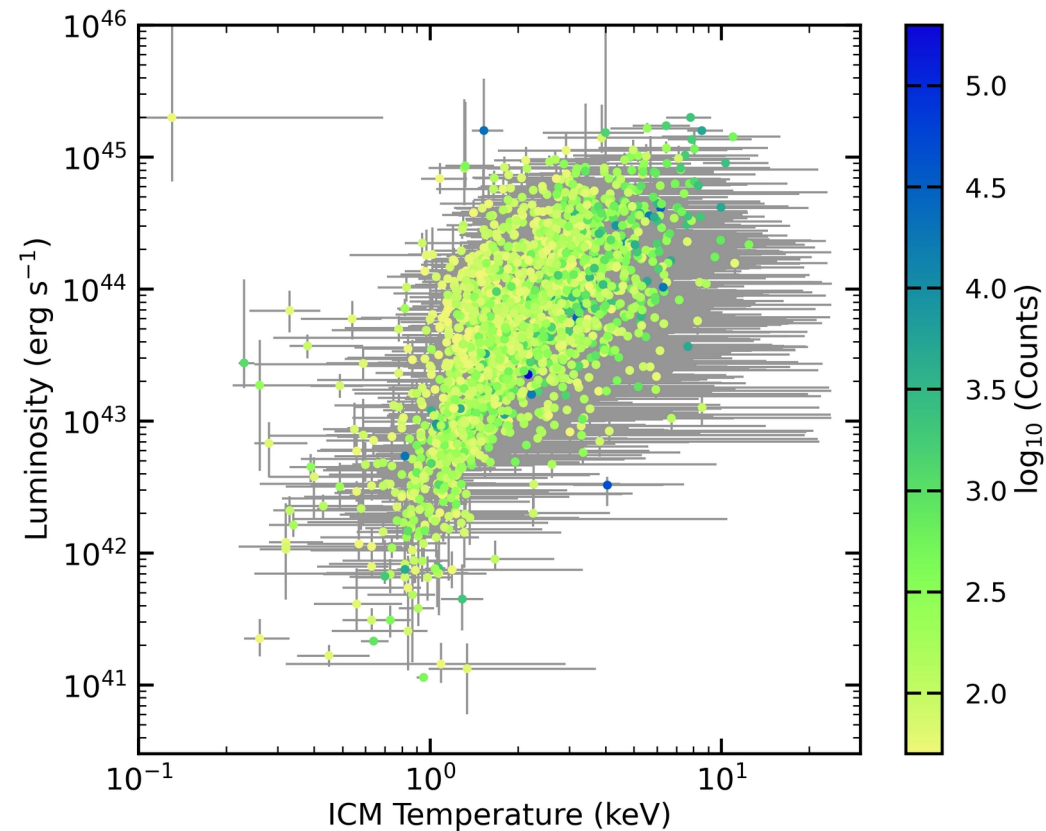


$z = 1.3$



# ICM Temperatures

3506 ICM kT measurements, 5% have  $dT/T < 20\%$



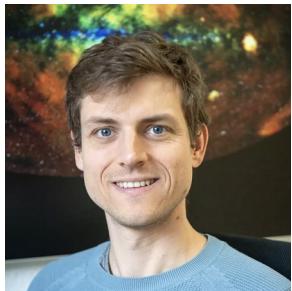
Bulbul+2024a  
Migkas+2024



Johan Comparat

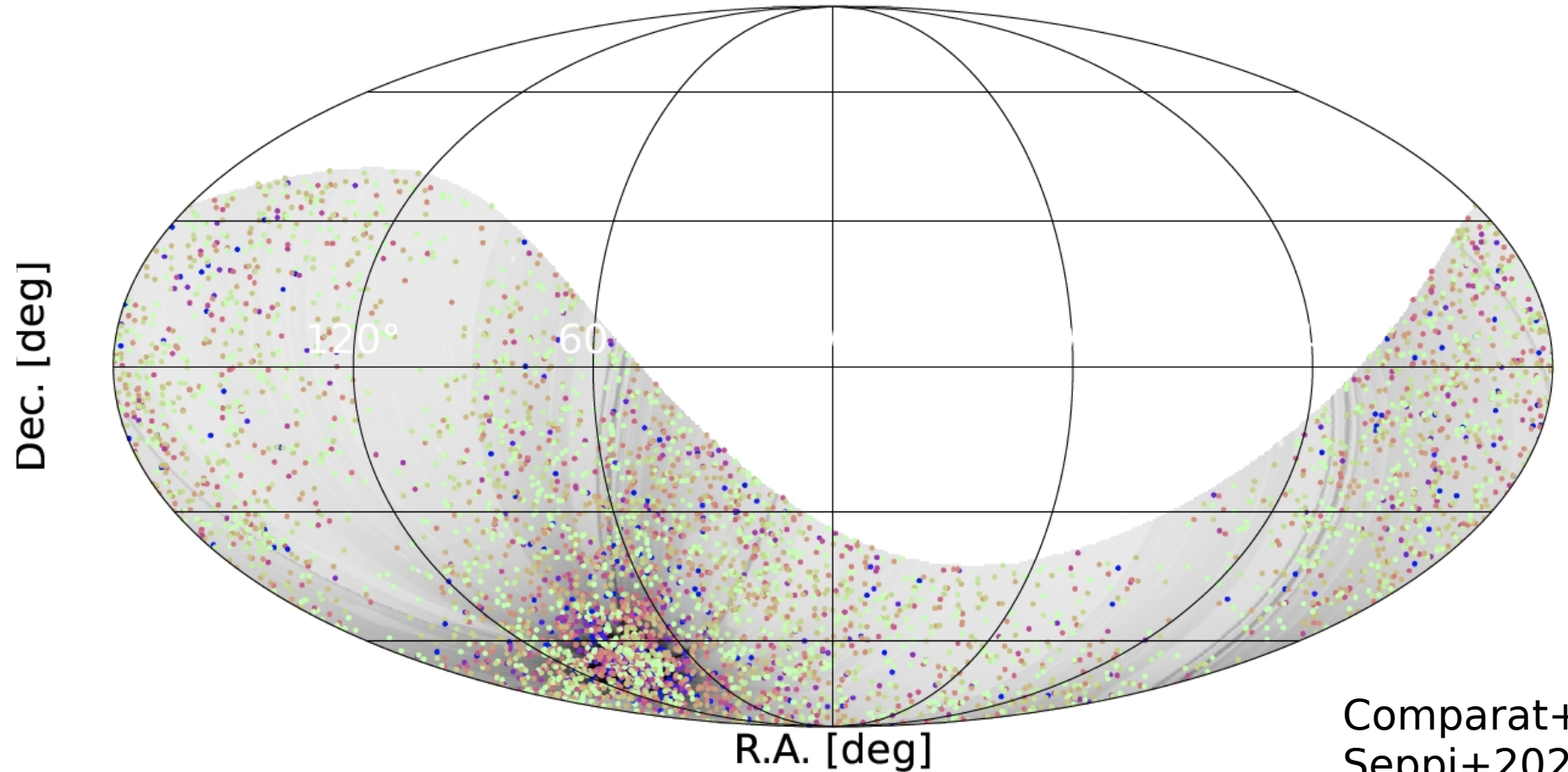


Riccardo Seppi



Nicolas Clerc

# Selection Function



Comparat+2020  
Seppi+2022  
Clerc+2024

# Catalogs

## Primary Sample ( $L_{\text{ext}} > 3$ ):

Total Effective Area: 13.1k deg<sup>2</sup>  
12,247 clusters with redshift measurements  
86% purity

High Completeness

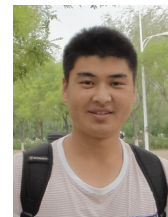
## Cosmology Sample ( $L_{\text{ext}} > 6$ ):

5259 clusters  
Total Effective Area: 12,791 deg<sup>2</sup>  
95% purity

High Purity

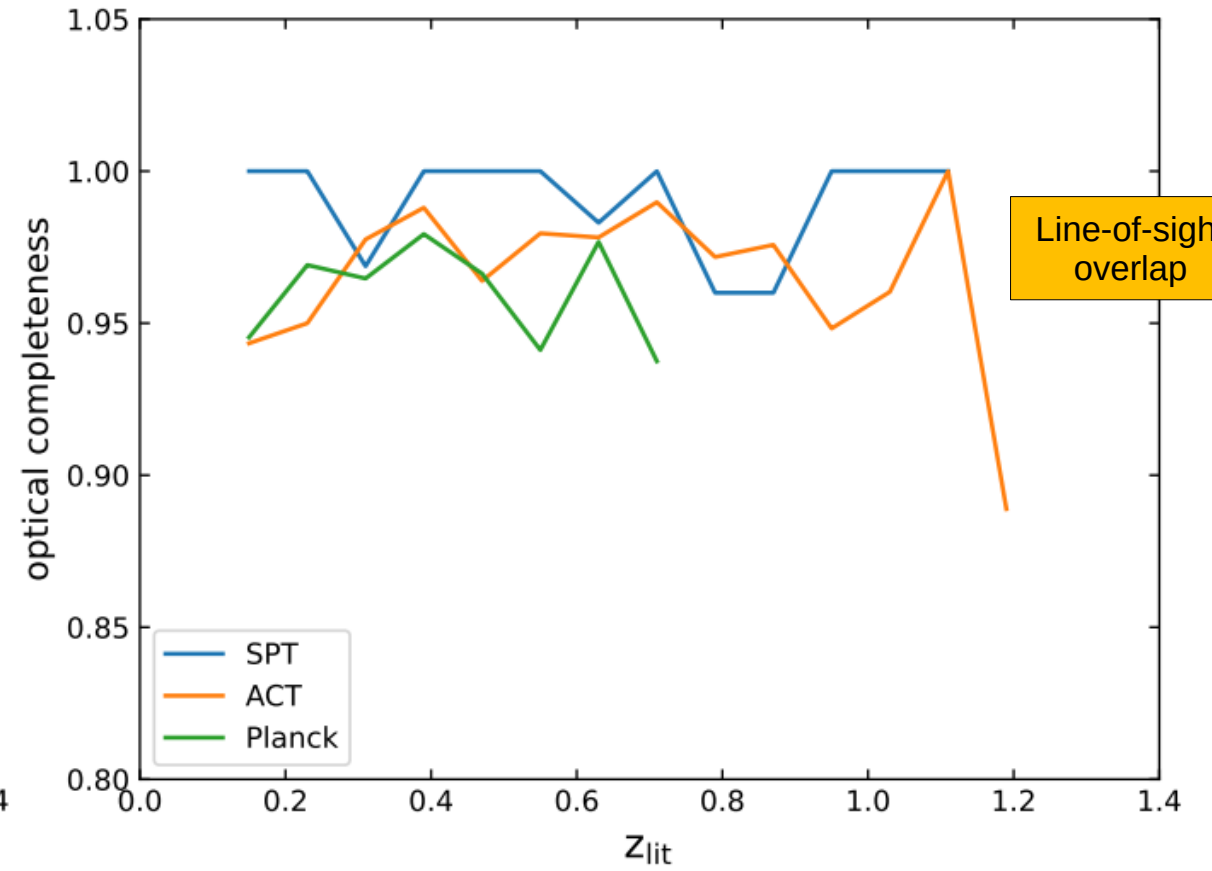
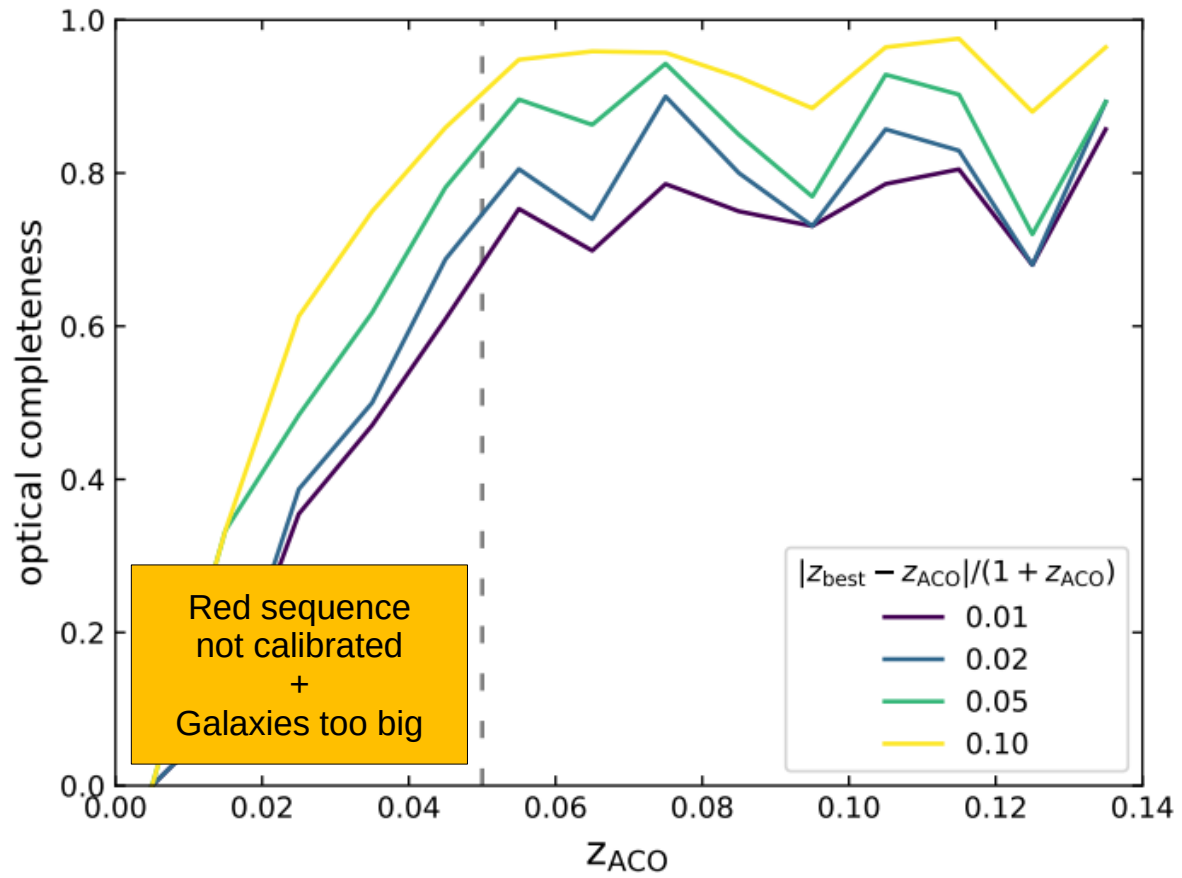
## Supercluster Sample

520 rich superclusters with  $\geq 3$  members  
818 cluster pairs

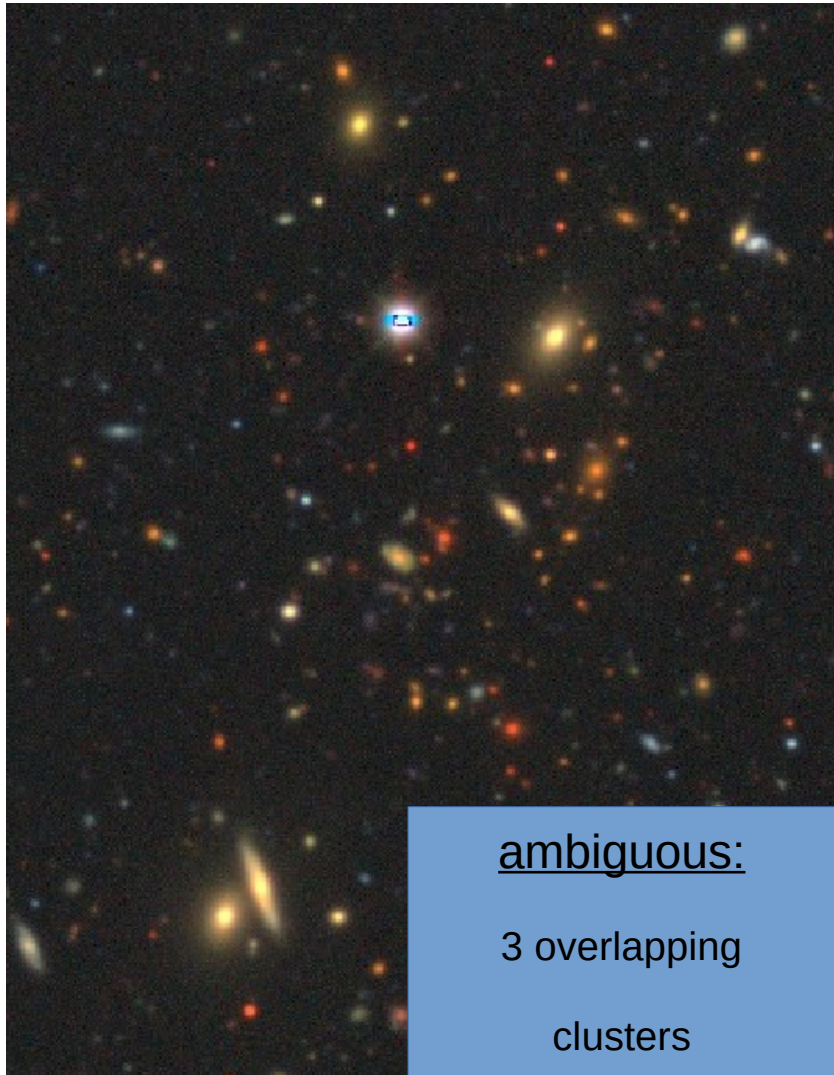


Ang Liu

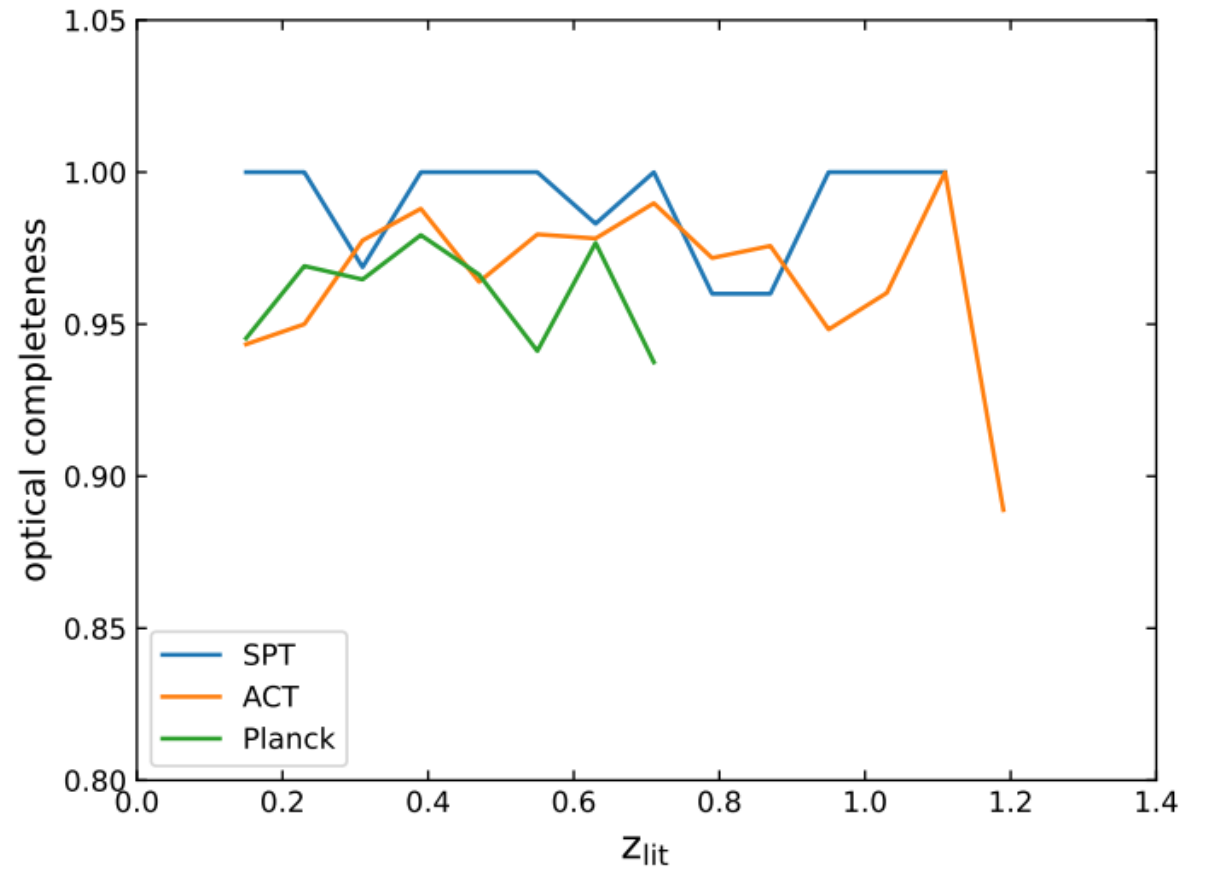
# Optical Completeness



# Optical Completeness



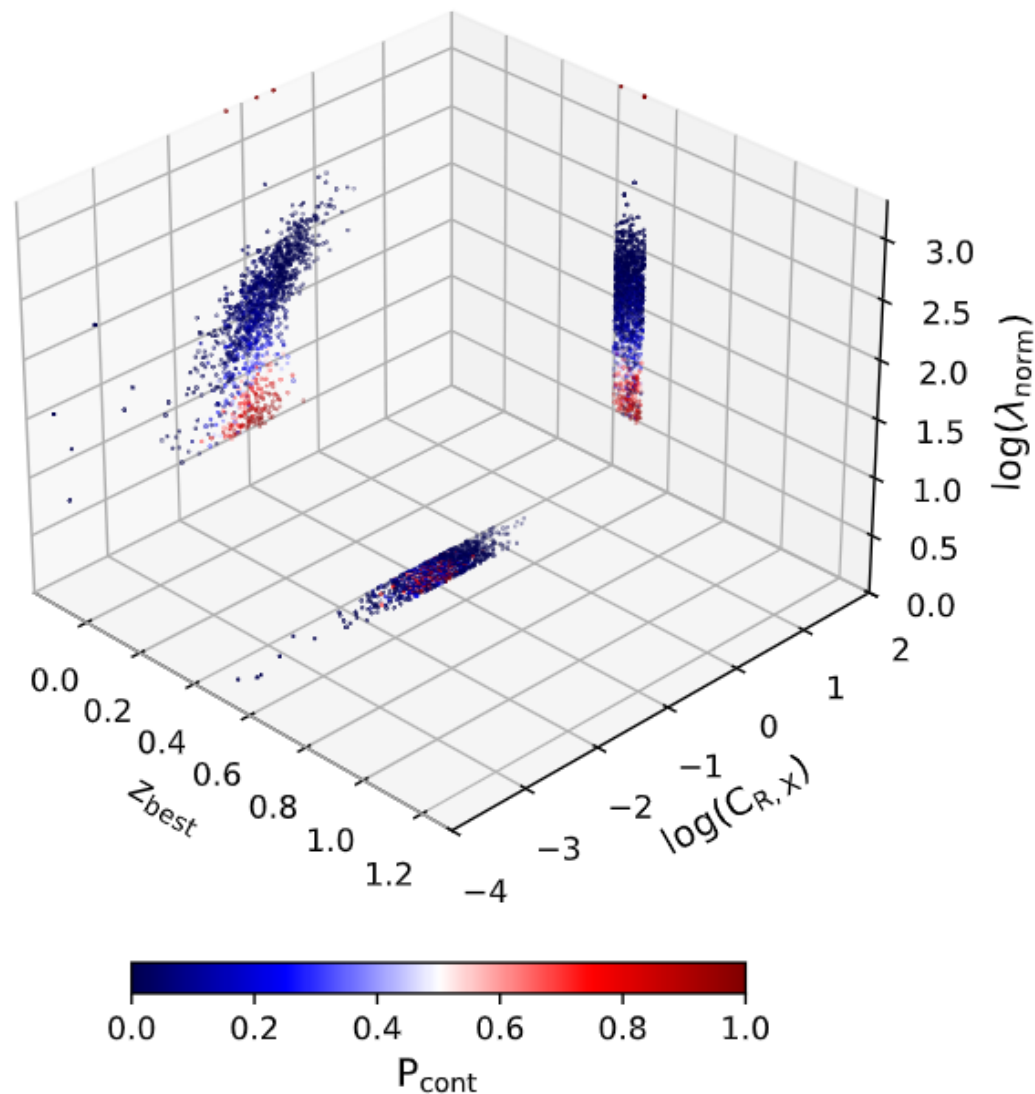
J042609.7-573054



# Contamination

$$\langle P_{cont} \rangle = 14\%$$

- For a given redshift:
  - X-ray count rate
  - optical richnesscorrelate for clusters



SIMBAD name:

Catalog name:

R.A.:

Dec.:

max. distance:  arcmin

< BEST\_Z <

< LAMBDA\_NORM <

≤ MASKFRAC ≤

≤ PCONT ≤

IN\_ZVLIM  IN\_FOOTPRINT  IN\_XGOOD

not IN\_ZVLIM  not IN\_FOOTPRINT  SPLIT\_CLEANED

VISUAL\_CONT.

X-ray selected

- eRASS1 (extended sources)
- eFEDS
- MCXC
- NORAS
- XCLASS
- XXL
- CODEX (published)
- CODEX (all candidates)

SZ selected

- ACT
- SPT
- PLANCK

optically selected

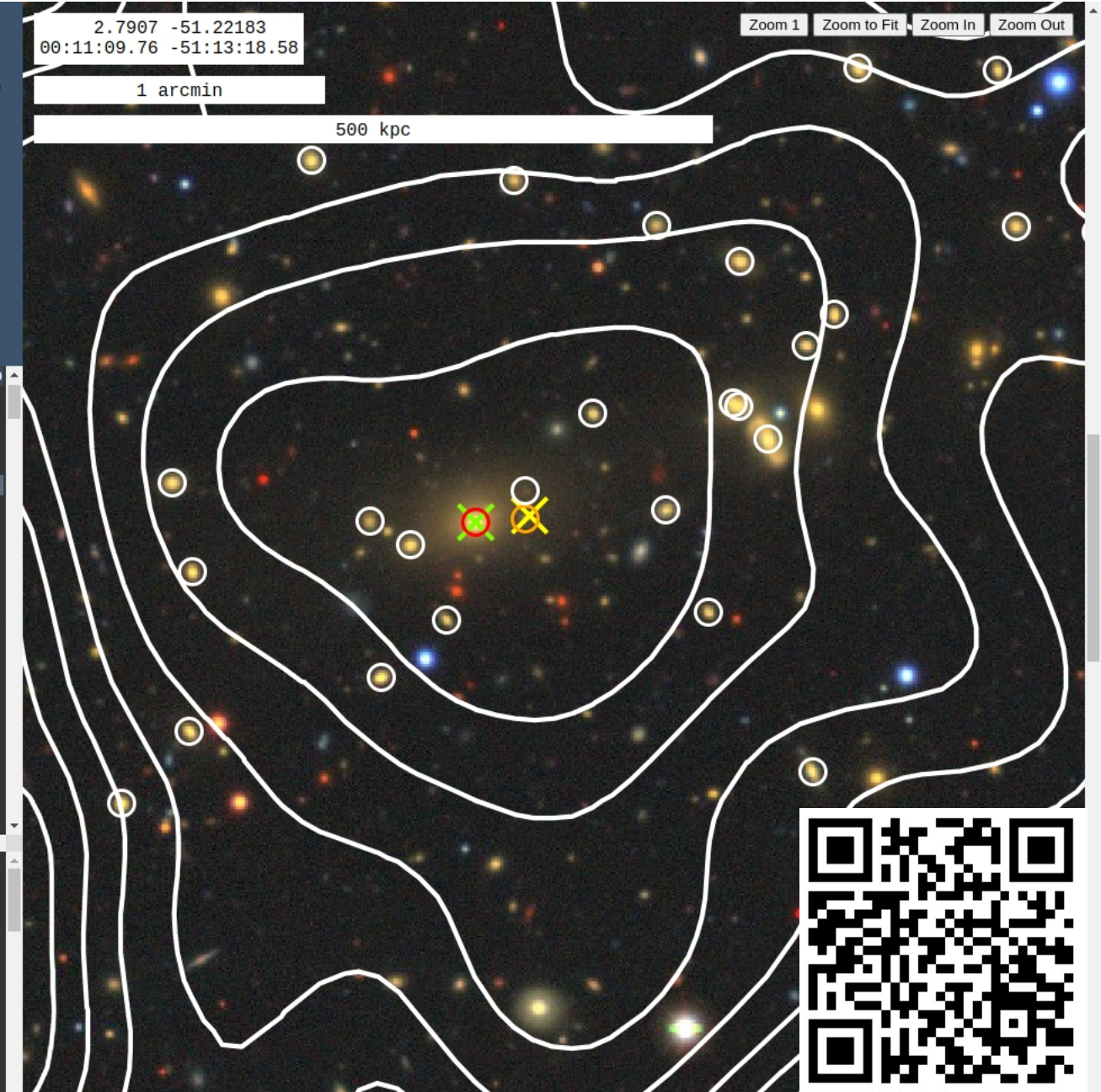
- LS DR9 north (grz)
- LS DR10 south (grz)
- ACO
- DESY1
- Kluge+20

?

E	RA	DEC	LIT_Z	BEST_Z	Z_LAMBDA	Z_LAMBDA_2	LAMBDA_NORM	MASKFRAC	VDISP	VDISP_ERR	LMAX	PCONT	L500	M500	R500
9.4-592854	2.4562	-59.48178	--	0.26001	0.26001	--	19.5	0.01	--	--	41.9	0.04	43.51	14.09	692
6.9-353948	2.4873	-35.66355	0.12008	0.12140	0.12398	--	47.2	0.03	536	175	95.4	0.00	43.69	14.37	901
8.1-642738	2.4922	-64.46074	--	0.11979	0.11979	--	30.6	0.04	--	--	46.8	0.00	43.47	14.23	807
3.4-341319	2.7228	-34.22221	--	0.09859	0.10464	--	13.7	0.05	790	602	24.6	0.02	43.25	14.07	722
8.6-511214	2.7443	-51.20416	0.17000	0.21233	0.21233	--	52.2	0.02	--	--	101.1	0.00	44.08	14.60	1041
0.2-832019	2.7511	-83.33883	--	0.45559	0.45559	--	32.3	0.03	--	--	31.8	0.14	43.94	14.38	803
3.4-493406	2.7642	-49.56847	--	0.75917	0.75917	--	21.9	0.00	--	--	14.7	0.03	44.34	14.34	690
7.9-662748	2.9081	-66.46347	--	0.18676	0.18676	--	47.5	0.03	--	--	69.0	0.00	43.52	14.21	777
8.3-421552	2.9515	-42.26458	--	0.08522	0.09627	--	27.4	0.25	--	--	34.9	0.00	43.26	14.09	738
3.0-810910	2.9709	-81.15289	--	0.12326	0.12326	--	39.6	0.04	--	--	60.6	0.00	43.56	14.31	863
9.6-353723	3.0401	-35.62322	0.69000	0.68911	0.68911	--	49.6	0.02	--	--	41.3	0.01	44.87	14.79	1001
4.0-535140	3.0587	-53.86133	0.34554	0.33680	0.33680	--	47.1	0.02	--	--	75.8	0.00	44.05	14.44	884
1.6-334703	3.0903	-33.78443	0.68000	0.66024	0.66024	--	73.4	0.01	--	--	54.7	0.01	44.44	14.49	804
5.0-781037	3.1458	-78.17705	--	0.21009	0.21009	--	3.1	0.02	--	--	2.4	0.86	43.39	14.03	672
7.6-634441	3.1570	-63.74485	--	0.51027	0.51027	0.36922	16.9	0.01	--	--	18.4	0.21	44.01	14.31	744
7.9-672909	3.1582	-67.48604	--	0.35667	0.35667	--	6.6	0.00	--	--	8.4	0.44	43.85	14.30	783
8.3-501730	3.1597	-50.29184	--	0.14419	0.14419	--	52.0	0.01	--	--	87.5	0.00	43.35	14.10	727
0.4-691851	3.2101	-69.31424	--	0.24444	0.24444	--	27.6	0.04	--	--	62.3	0.01	43.50	14.14	724
1.2-664600	3.2137	-66.76678	--	0.34967	0.34967	--	5.1	0.01	--	--	5.9	0.00	--	--	--
3.0-374420	3.2210	-37.73899	0.36864	0.36909	0.36909	--	44.1	0.03	--	--	87.7	0.03	43.94	14.29	775

### 72 MEMBERS in CLUSTER 1eRASS J001058.6-511214

RA	DEC	PMEM	REFMAG	ZSPEC	ZSPEC_REF
2.7492	-51.20458	0.98	15.79	--	--
2.7225	-51.19982	0.98	15.84	--	--
2.6009	-51.17316	0.61	17.07	--	--
2.8863	-51.22893	0.75	17.14	--	--
2.6880	-51.19776	0.99	17.23	--	--
2.8498	-51.22097	0.96	17.25	--	--
2.7116	-51.24970	0.84	17.42	--	--
2.8844	-51.22830	0.03	17.75	--	--
2.6772	-51.17898	0.96	17.78	--	--
2.8821	-51.24752	0.06	17.84	--	--



<https://erass-cluster-inspector.com>