The 2XMMi/SDSS Galaxy Cluster Survey

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The 2XMMi/SDSS Galaxy Cluster Survey

Aims:

- Identifying new X-ray galaxy clusters
- Investigating the X-ray scaling relations
- Correlating X-ray and optical properties

I - The X-ray cluster candidates

2XMMi-DR3 : XMM-Newton Serendipitous Source Catalogue (Watson et al. 2009)

Number of extended detections : 30470

Selecting:

1- extended

2- | bII| > 20 deg
3- real detection
4- in the footprint of the SDSS-DR7
--------- 1887 detections

Excluding:
I – targets of ObsIds
II – in a field with large extended targets
III – repeating detections
IV – spurious detections
V – low-redshift galaxies
--------- 1180 cluster candidates

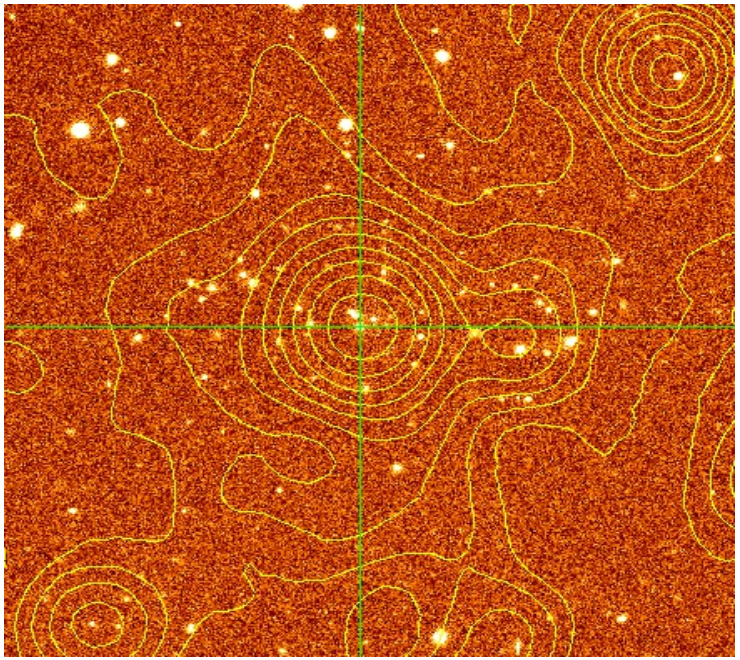
II- Galaxy Cluster redshifts

1- Redshifts from the literature

(Takey et al. 2011, 2011A&A...534A.120T)

2XMM J104421.8+213029

Photo_z : 0.498 (Szabo et al. 2011)



Optically selected cluster catalogs

CLG catalogue	Nr. CLG	Redshift range	SDSS	X-ray CLG (1′)	Nr.CLG sample
GMBCG	55 000	0.1–0.55	DR7	136	123
WHL	39 688	0.05–0.6	DR6	150	72
MaxBCG	13 823	0.1–0.3	DR5	54	20
AMF	69 173	0.045–0.78	DR6	127	60
Total					275

275 optically confirmed clusters with photo_z (< SDSS-DR7)

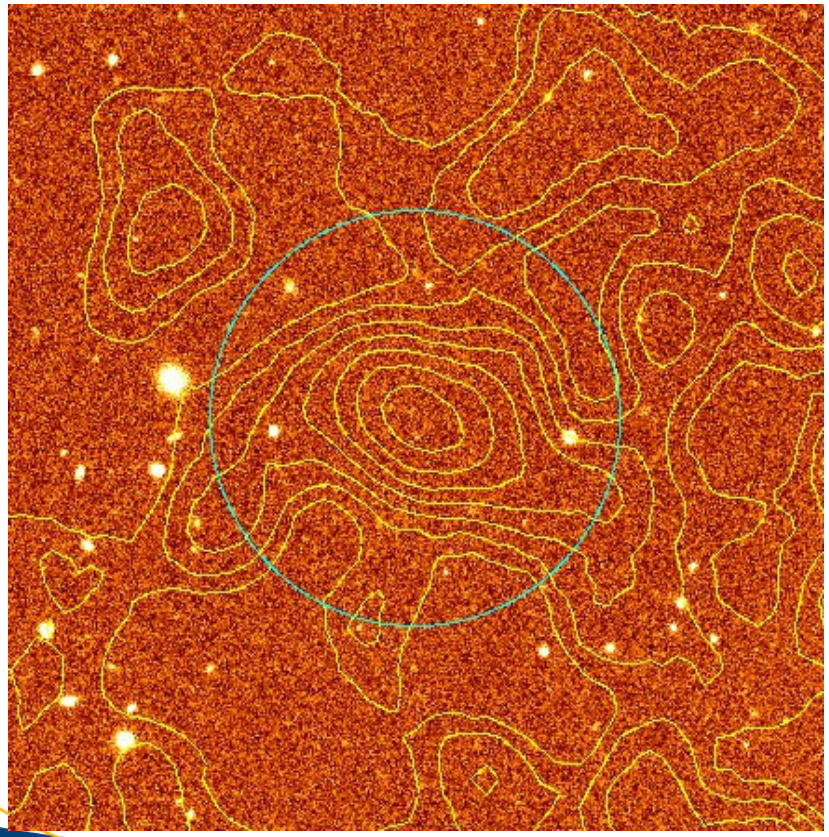
182/275 with spec_z (SDSS-DR8)

175/275 first cluster sample with their X-ray parameters (L-T relation)

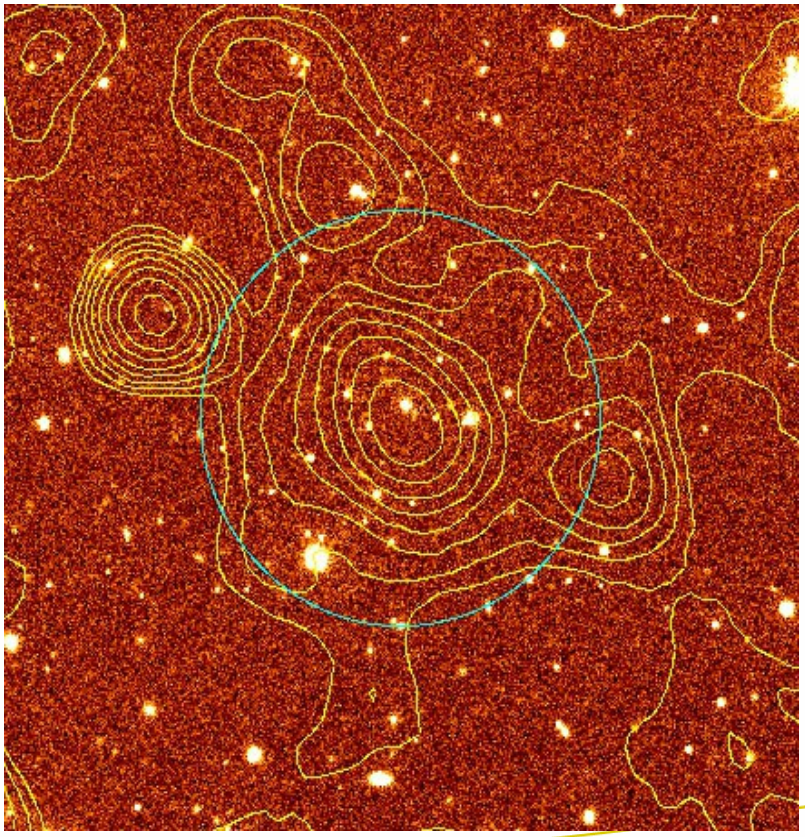
II- Galaxy Cluster redshifts

2- Estimation of the optical redshifts
3- Follow-up imaging and spectroscopy

cluster candidates at z > 0.6 (Opt/NIR)
cluster at z > 1



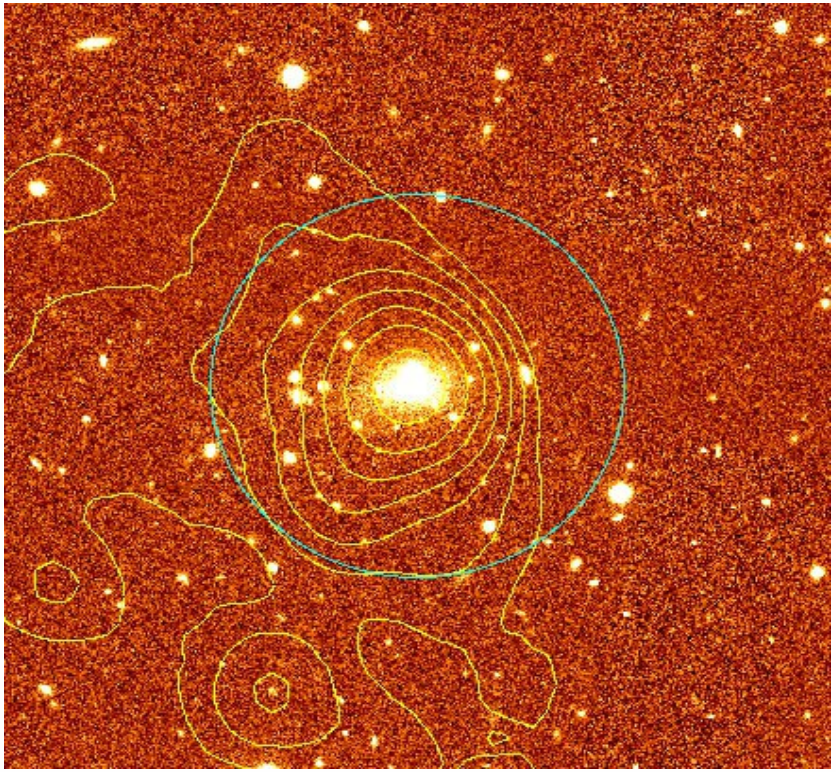
cluster candidates at z <= 0.6 (SDSS)
cluster at z = 0.48

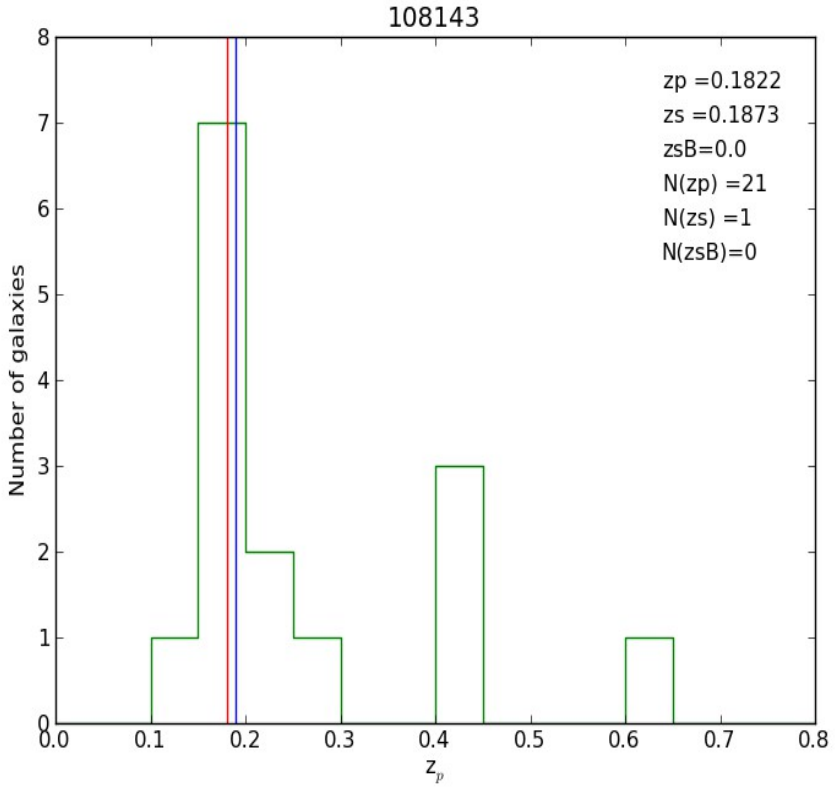


The detection algorithm of CLGs in optical band

I- Identify the BCG (<1 arcmin)

2XMM J102133.2+213752 at z = 0.1873





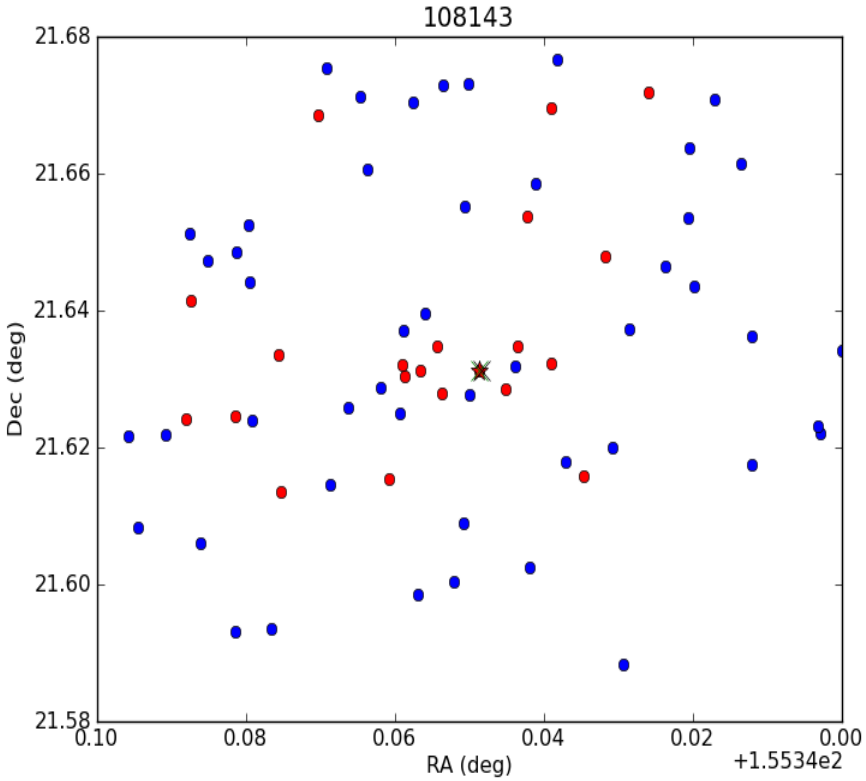
The detection algorithm of CLGs in optical band

II- N_{memb} ($<R_{500}$) $[z_{p,\,BCG} \pm 0.04(1+ z_{p,\,BCG})]$

III- A cluster is detected if : 1- $N_{memb}(<R_{500}) >= 8$

2- confirmed through the visual inspection

- cluster z_p and z_s as average of N_{memb} ($<R_{500}$)



The optically confirmed cluster sample

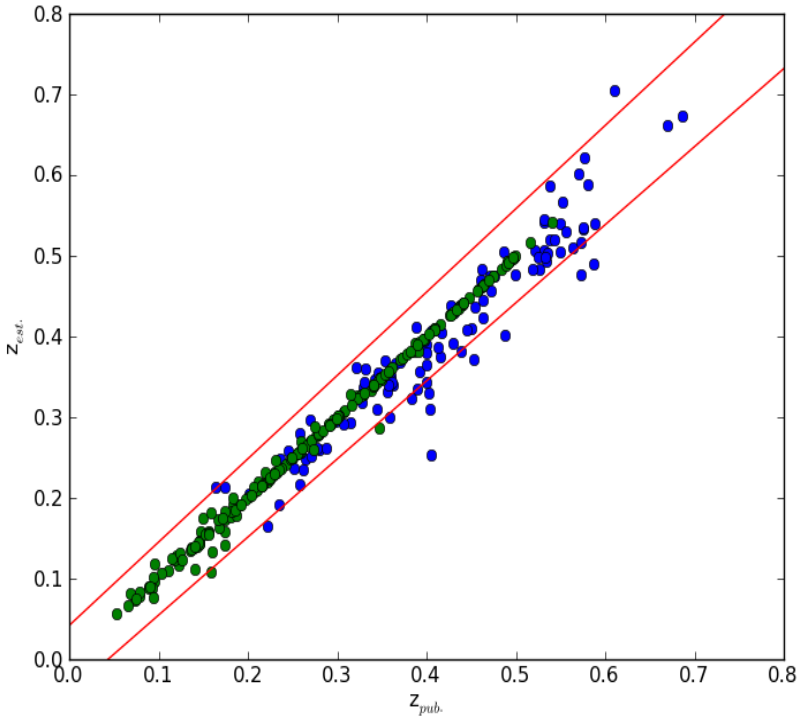
530/1180 clusters

75% are new X-ray galaxy clusters.

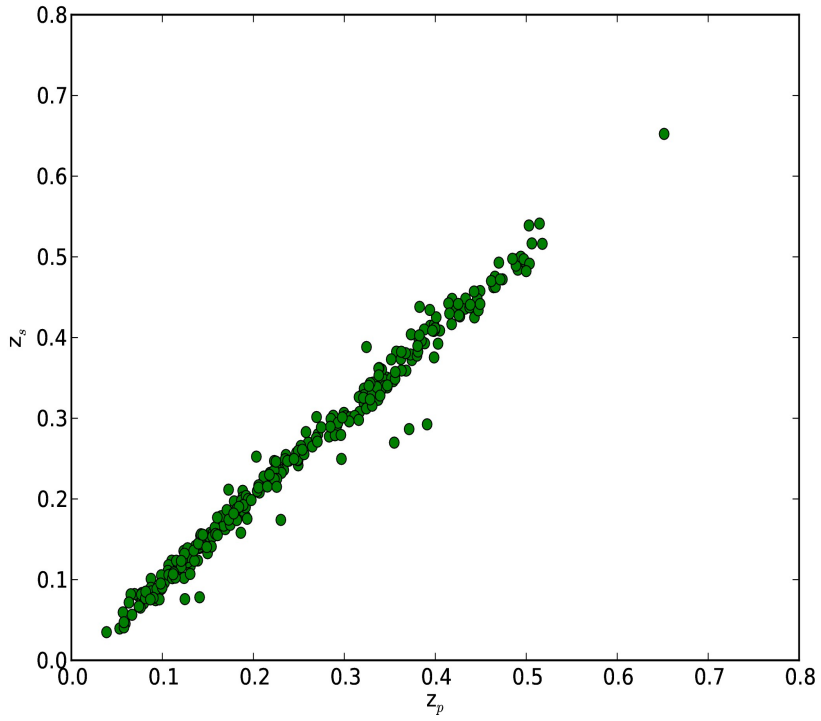
301/530 objects are known as optically selected clusters

310/530 with spectroscopic redshifts

$z_{est} - z_{pub}$

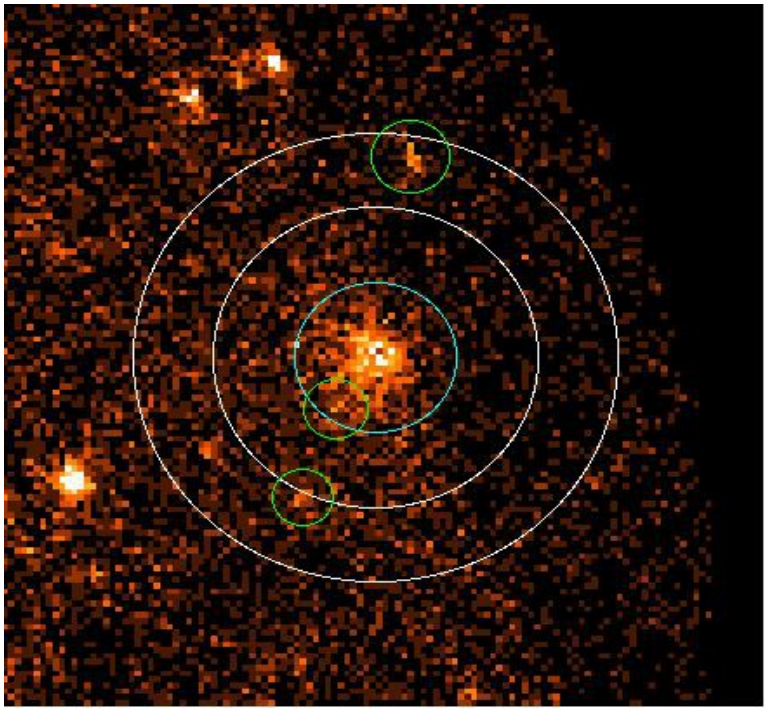


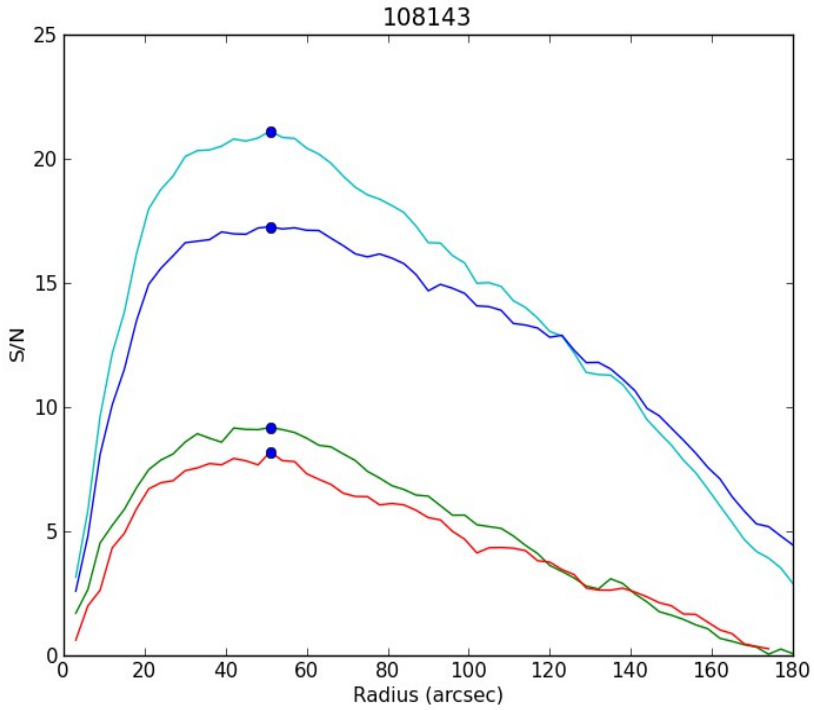
$z_s - z_p$



III- X-ray data reduction and analysis

2XMM J102133.2+213752 at z = 0.1873





Spectral Fitting:

(Tx, Fx, Lx (0.5-2keV, Bol.), errors)

($\Delta T/T < 0.5$, $\Delta L/L < 0.5$, acceptable fits)

Extrapolation:

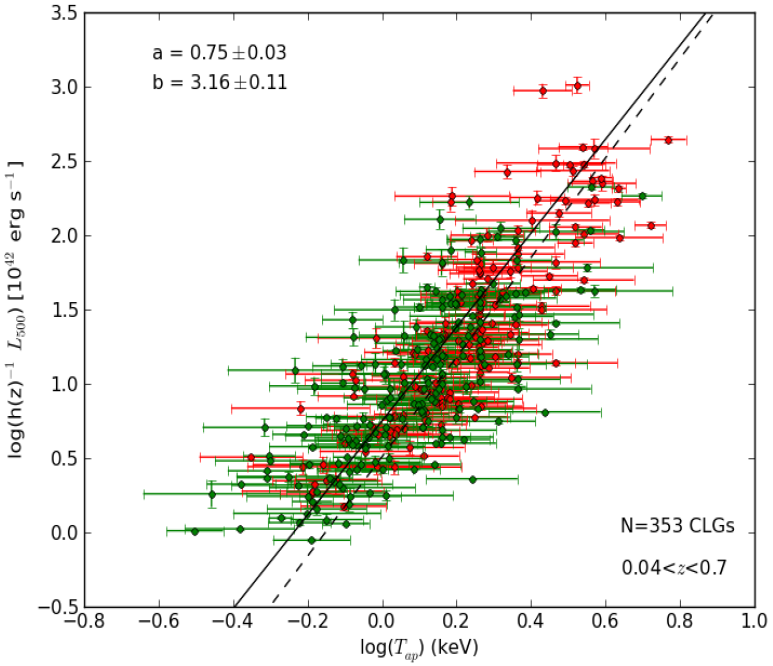
L_{500} , M_{500} , R_{500}

353 clusters with X-ray spectroscopic parameters

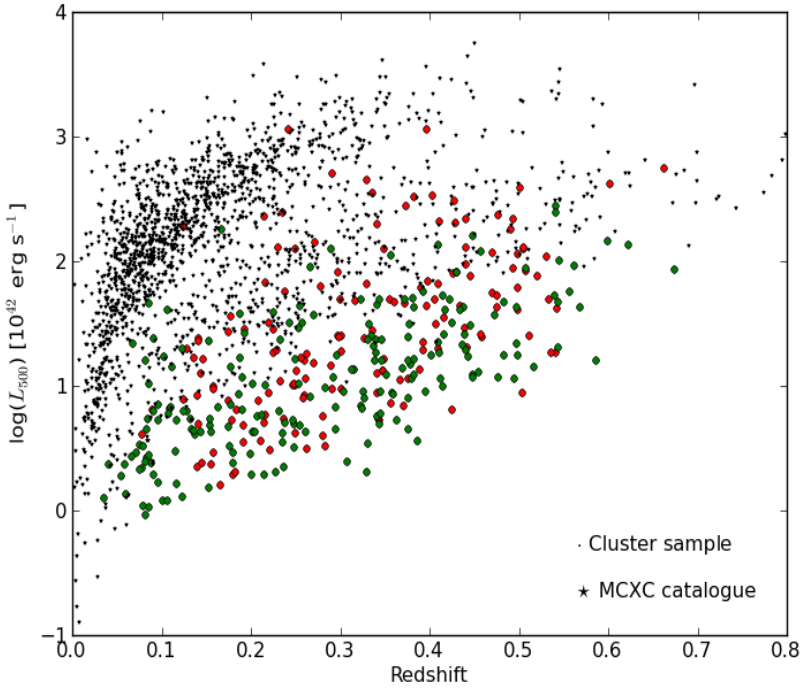
L_{500}-T_{ap} relation (Takey et al. in preparation)

slope : 3.16±0.11 (present work, solid line)
slope : 3.35±0.32 (Pratt et al. 2009, dashed line)
slope : 2.94±0.16 (Mittal et al. 2011)

L_{500} – T_{ap} relation



L_{500} – z distribution

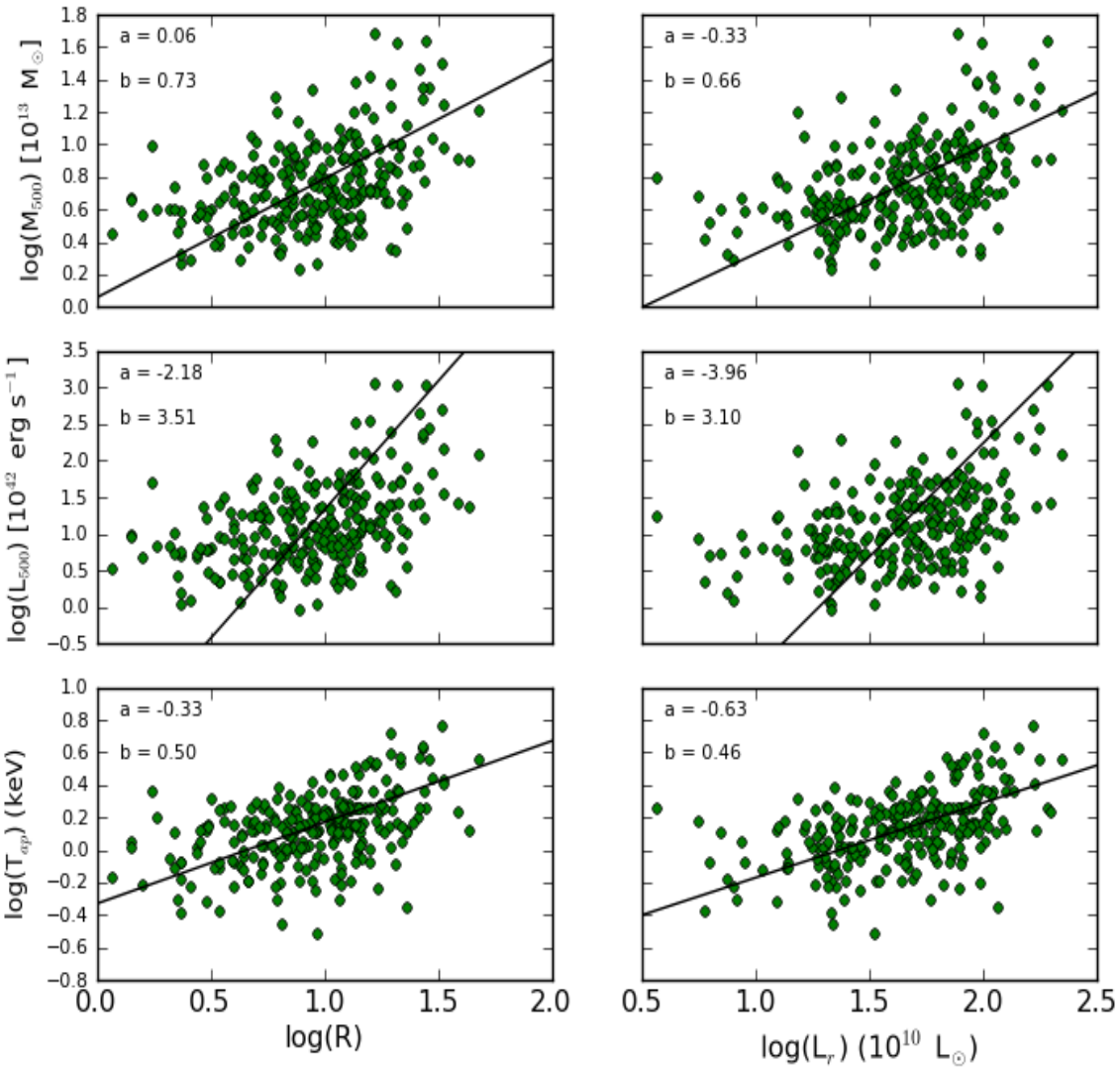


Correlating X-ray and optical properties (250 clusters at z<0.42)

Cluster Mass

X-ray Luminosity

X-ray Temperature



Optical Richness, R

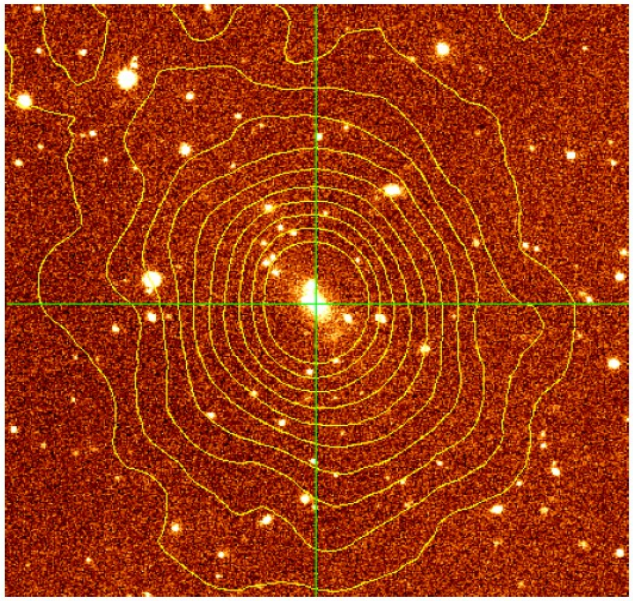
Optical Luminosity, L_r

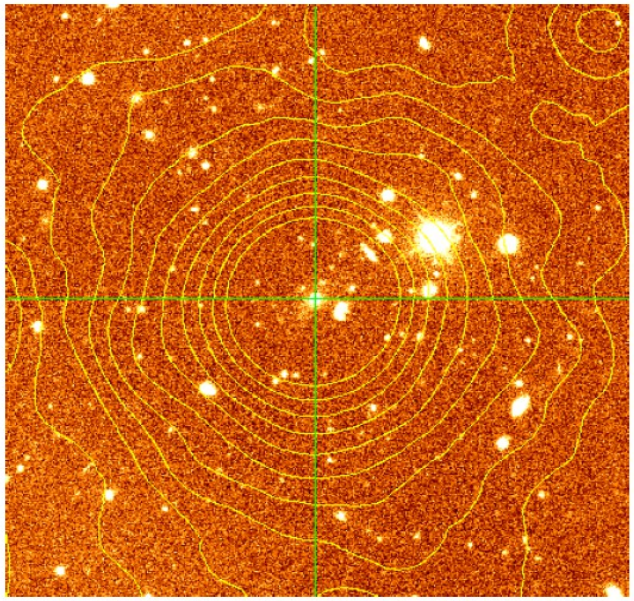
Summary

- The survey comprises 530 optically confirmed clusters with redshift estimations (0.04 – 0.7), of these 310 with spectroscopic redshifts.
- 353 clusters with temperature measurements (0.3 - 6 keV) and mass estimations (2 - 50 x 10^{13} M_{sun}).
- The slope of the derived L-T relation from the current sample is consistent with the published ones for clusters with high luminosities.
- We investigated the correlations between the optical and X-ray properties of a sub-sample.

Gallery

http://ooo.aip.de/groups/xray/XMM_SDSS_CLUSTERS.html





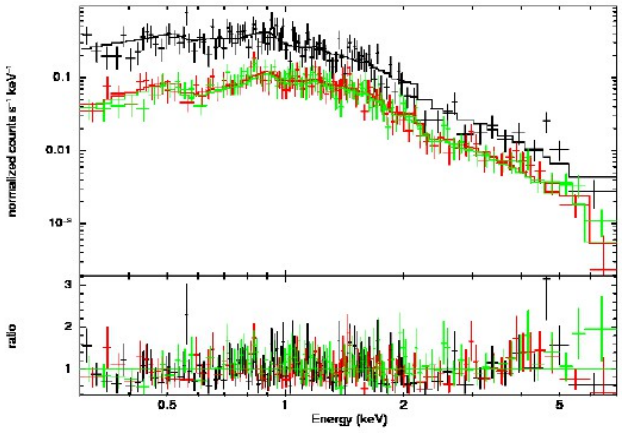


Fig. A.2. detid = 090256: 2XMM J083454.8+553422 at $z_s = 0.2421$ (F_{ap} [0.5 – 2] $keV = 165.21 \times 10^{-14}$ erg cm^{-2} s^{-1}).

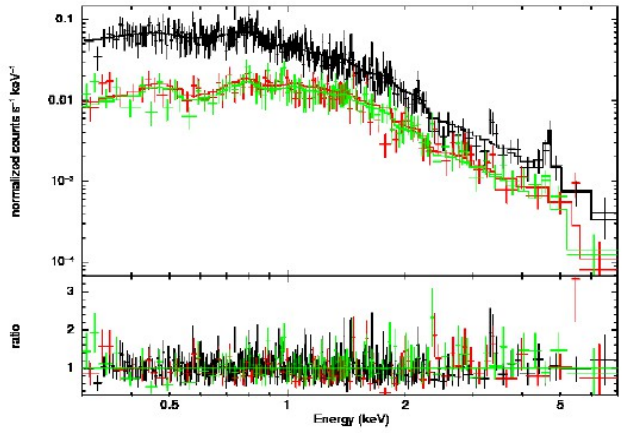


Fig. A.3. detid = 312615: 2XMM J091935.0+303157 at $z_s = 0.4273$ (F_{ap} [0.5 – 2] $keV = 16.03 \times 10^{-14}$ erg cm^{-2} s^{-1}).