Paolo Tozzi – INAF OATs

INAF ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS

Search and characterization of high-z, massive Clusters of Galaxies

Chandra photo gallery







Growing-up at high redshift: from proto-clusters to galaxy clusters – ESAC Villanueva de la Cañada, Madrid, Spain

Constraints on the power spectrum and density of matter

Vikhlinin et al. (2009); 400sd Cluster Surveys



Constraints on Dark Energy parameters

Vikhlinin et al. (2009); 400sd Cluster Surveys



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X-ray cluster surveys in the Chandra/XMM-Newton era

Name	Flux limit cgs (0.5–2 keV)	Solid angle deg ²	Number of sources	Reference	
SEXCLAS	0.6×10^{-14} (min)	2.1	19	Kolokotronis et al. (2006)	
DCS	0.6×10^{-14} (min)	5.55	36	Boschin (2002)	
ChaMP	1.0×10^{-14} (min)	13.0	49	Barkhause et al. (2006)	
SXCS	$1.0 imes 10^{-14} \ (min)$	40.0	72	This work	
XDCP	1.0×10^{-14} (average)	76.0	22 (z > 0.9)	Fassbender et al. (2011)	
XCLASS	2×10^{-14} (min)	90.0	347	Clerc et al. (2012)	
Peterson09	$\sim 0.3 \times 10^{-14} \text{ (min)}$	163.4	462	Peterson et al. (2009)	
XCS	>300 net cts	410.0	993	Lloyd-Davies et al. (2011)	
SXDF	0.2×10^{-14} (min)	1.3	57	Finoguenov et al. (2010)	
COSMOS	0.2×10^{-14} (min)	2.1	72	Finoguenov et al. (2007)	
XMM-BCS	0.6×10^{-14} (min)	6.0	46	Suhada et al. (2012)	
XMM-LSS	$\sim 10^{-14}$ (min)	11.0	66	Adami et al. (2011)	

Tundo et al. 2012







Tundo et al. 2012



SWJ124812+170451 SWJ093749+153540 SWJ092719+301342 SWJ090946+415713 SWJ082113+320004 SWJ035259-004842 SWJ 164956+313021 SWJ 148646+275157 SWJ140639+273546 SWJ133055+420017 SWJ131300+080259





http://adlibitum.oats.inaf.it/sxcs/



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News and Updates



The Swift X-ray Cluster Survey (SXCS) is an ongoing project aimed at finding serendipitously galaxy clusters in the Swift X-ray Telescope (XRT) archive.

The Swift mission, launched in 2004, is dedicated to the study of Gamma-ray bursts (GRBs), which are detected and localized by the Burst Alert Telescope (BAT) and then followed-up by the XBT. The arebive of GRB follow up images obtained in this way constitutes a random survey of

Aug-01-2012: Catalog I released	
X-ray Cluster Surveys	
ROSAT 400d	
ROSAT MACS	
ROSAT WARPS	
ROSAT REFLEX	
Chandra ChaMP	
XMM XCS	
XMM LSS	
XMM XDCP	
XMM X-CLASS	

Papers

Useful Links

SWIFT-XRT

WFXT

Clusters of galaxies @ z>1



Clusters of galaxies @ z>1



Jee et al. (2011)



Deep near-infrared image of RXJ1252 with ISAAC and optical with FORS at the VLT with overlaid Chandra emission



Rosati et al. 2004

Color image of XMM2235 from the combination of *i*, *z* (HST/ACS) and *K*s (VLT/ISAAC) filters. Overlaid X-ray contours from *Chandra* (196 ks)





Rosati et al. 2009



C





CXO1415, z_x ~ 1.5 Tozzi et al. (2012)



CXO1415 mass measurements

Tozzi et al. 2012



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CL 1415 HST/ACS i775-z850

CL1415 @ z=1, a CC in the distant Universe

Chandra ACIS-I 90 ks (archival) + ACIS -S 280 ks (PI Joana Santos)

CL1415 @ z=1, a CC in the distant Universe

Angular resolution ~ 25 kpc in the inner regions About 7000 net photons with Chandra



Santos et al. (2012)



AGN radio feedback in action at z = 1



WFXT in few words

The WFXT mission: one high resolution (~5"), high collecting area and wide FOV X-ray telescope with low background, to image the 0.5-7 keV X-ray sky down to very low fluxes and characterize the spectra of millions of X-ray sources.

The scientific outcome will be a coverage of at least half of the 0.5-7 keV X-ray sky with a quality and a depth at the level of future wide area surveys, a product which is not delivered by any other existing or planned mission.



XMM COSMOS survey (2 deg²) (Cappelluti et al. 2009)



Chandra COSMOS survey (1 deg²) (Elvis et al. 2009)



WFXT simulation (one tile from the medium survey)





Source statistics and Spectral characterization

See The Wide Field X-ray Telescope – MemSAIt Murray et al. 2011 Rosati et al. 2011 Tozzi et al. 2011 Borgani et al. 2011



WFXT Cluster sample

N_{det}(z>0.5) N_{det}(z>1) N_T(z>0.5) N_{T-prof}(z>0.5) Log (Number of Clusters) 0 10 10^{2} 10^{3} 10^{4} 10⁵ 106 5.3 WFXT 4.9 3.9 eROSITA 45 0.3 3.5 ROSAT 0.6

<u>Detection</u>: 50-100 counts <u>T measurements</u>: 1500 counts <u>T profiles</u>: 15.000 counts

> Temperatures critical to cluster cosmology

Profiles, cluster physics

Large samples allow study of systematics

WFXT can reach into early groups

CONCLUSIONS

X-ray observations of distant clusters still the best way to measure total mass, constrain the cosmological model and investigate astrophysical processes.

Chandra and XMM surveys are increasing the number of high-z clusters candidates (but time expensive to characterize them) down to $\sim 10^{-14}$ cgs on $\sim 100-200$ deg².

A small telescope like Swift/XRT is competitive thanks to low background, constant psf and a ~flat spectral response.

Deep X-ray observation of distant clusters give accurate mass measurements and ICM properties.

Angular resolution is crucial for distant clusters, the astrophysics of the ICM is important both in itself and for accurate mass measurements

Major breakthrough only with wide angle, deep, high angular resolution X-ray surveys or with wide and deep SZ surveys. SZ selection and mass measurements will take over in the next few years (but calibration still relies on X-ray data).



Building on this tradition, along with the organization of conferences which typically take place once every 3-5 years, in 2008 we have set up the Sexten Centre for Astrophysics (SCfA).

venues where to meet colleagues and shape new scientific collaborations.

The main aim of SCfA is organising and hosting every year small and medium-size workshops and schools, in order to offer to scientists, working in the fields of Astrophysics, Cosmology and Physics, the opportunity to meet in an informal environment and to carry out collaborative work, surrounded by the spectacular view of the Dolomites.



http://www.sexten-cfa.eu/

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Where:	Haus Sexten - Via Dolomiti 45, 39030, Sexten	
Category:	Conferences 2013	

Description