Clustering Dependence of *XMM-COSMOS* AGN on Host Galaxy Properties
arXiv:1906.07911

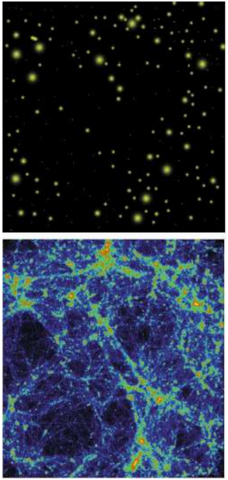
Akke Viitanen
akke.viitanen@helsinki.fi
V. Allevato, A. Finoguenov,
A. Bongiorno, N. Cappelluti, R. Gilli, T. Miyaji, M. Salvato

Supermassive Black Holes: Environment and Evolution
Corfu, June 19-22 2019

HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI
Faculty of Science

WHY CLUSTERING?

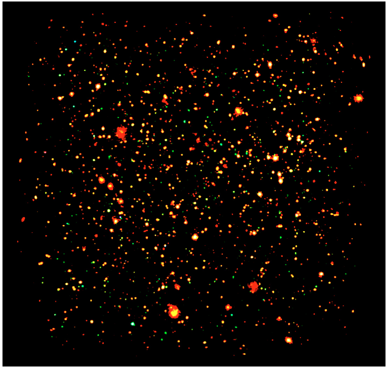
- See talks by V. Allevato, M. Powell, G. Mountrichas
- Connect AGN population (top) with DM halo population (bottom) and put constraints on e.g. AGN triggering mechanisms
- AGNs are biased tracers; Large-scale bias may be measured with the two-point correlation function, and related to the typical DM halo mass
- Different AGN selections (radio, IR, optical, X-ray) likely sample different host galaxies – host galaxy properties (M_*, L_X/M_*, SFR) are important in understanding AGN clustering



Cooray & Sheth 2003

XMM-COSMOS AGN SAMPLE

- $2\,\text{deg}^2$ area, soft band flux limit $1.7 \times 10^{-15}\,\text{erg/s}\,\text{cm}^2$
- 632 X-ray selected AGNs with spectroscopic redshifts (Hasinger+07, Cappelluti+07, 09, Brusa+10, Hasinger+18)
- Redshift $0.1 < z < 2.5$ with mean $z \sim 1.2$
- Host galaxy properties M_*, L_X/M_* from SED fitting (Bongiorno+12)



XMM-COSMOS (Cappelluti+09)

RESULTS

Specz	$N_{\rm AGN}$	$\langle z \rangle$	log M_* M$_\odot$	log L_X/M_* erg s^{-1} / M$_\odot$	bias	log $M_{\rm halo}$ h^{-1}M$_\odot$
All	632	1.19	10.72	33.02	$2.20^{+0.37}_{-0.45}$	$12.79^{+0.26}_{-0.43}$
Low L_X/M_*	309	0.88	10.73	32.53	$2.14^{+0.35}_{-0.41}$	$13.06^{+0.23}_{-0.38}$
High L_X/M_*	309	1.50	10.73	33.49	$2.95^{+0.93}_{-1.42}$	$12.97^{+0.39}_{-1.26}$
Low M_*	309	0.97	10.39	33.03	$2.11^{+0.45}_{-0.58}$	$12.93^{+0.31}_{-0.62}$
High M_*	309	1.41	11.05	33.02	$2.69^{+0.61}_{-0.79}$	$12.90^{+0.30}_{-0.62}$

Specz no groups						
Low M_*	287	0.99	10.37	33.06	$1.69^{+0.49}_{-0.72}$	$12.50^{+0.47}_{-1.67}$
High M_*	292	1.45	11.05	33.05	$2.48^{+0.55}_{-0.71}$	$12.73^{+0.32}_{-0.64}$

Viitanen+, submitted

RESULTS

Specz	N_{AGN}	$\langle z \rangle$	log M_* M$_\odot$	log L_X/M_* erg s^{-1} / M$_\odot$	bias	log M_{halo} h^{-1}M$_\odot$
All	632	1.19	10.72	33.02	$2.20^{+0.37}_{-0.45}$	$12.79^{+0.26}_{-0.43}$
Low L_X/M_*	309	0.88	10.73	32.53	$2.14^{+0.35}_{-0.41}$	$13.06^{+0.23}_{-0.38}$
High L_X/M_*	309	1.50	10.73	33.49	$2.95^{+0.93}_{-1.42}$	$12.97^{+0.39}_{-1.26}$
Low M_*	309	0.97	10.39	33.03	$2.11^{+0.45}_{-0.58}$	$12.93^{+0.31}_{-0.62}$
High M_*	309	1.41	11.05	33.02	$2.69^{+0.61}_{-0.79}$	$12.90^{+0.30}_{-0.62}$

Specz no groups						
Low M_*	287	0.99	10.37	33.06	$1.69^{+0.49}_{-0.72}$	$12.50^{+0.47}_{-1.67}$
High M_*	292	1.45	11.05	33.05	$2.48^{+0.55}_{-0.71}$	$12.73^{+0.32}_{-0.64}$

Viitanen+, submitted

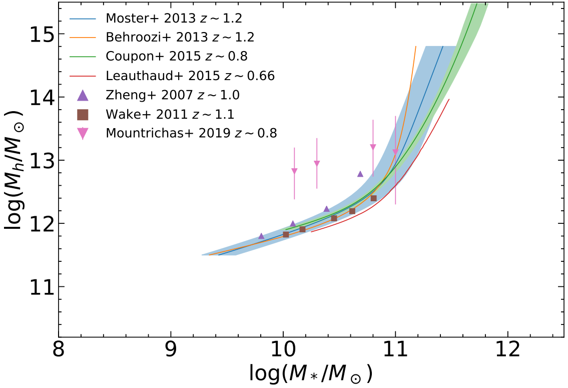
RESULTS

Specz	N_{AGN}	$\langle z \rangle$	log M_* M$_\odot$	log L_X/M_* erg s^{-1} / M$_\odot$	bias	log M_{halo} h^{-1}M$_\odot$
All	632	1.19	10.72	33.02	$2.20^{+0.37}_{-0.45}$	$12.79^{+0.26}_{-0.43}$
Low L_X/M_*	309	0.88	10.73	32.53	$2.14^{+0.35}_{-0.41}$	$13.06^{+0.23}_{-0.38}$
High L_X/M_*	309	1.50	10.73	33.49	$2.95^{+0.93}_{-1.42}$	$12.97^{+0.39}_{-1.26}$
Low M_*	309	0.97	10.39	33.03	$2.11^{+0.45}_{-0.58}$	$12.93^{+0.31}_{-0.62}$
High M_*	309	1.41	11.05	33.02	$2.69^{+0.61}_{-0.79}$	$12.90^{+0.30}_{-0.62}$

Specz no groups						
Low M_*	287	0.99	10.37	33.06	$1.69^{+0.49}_{-0.72}$	$12.50^{+0.47}_{-1.67}$
High M_*	292	1.45	11.05	33.05	$2.48^{+0.55}_{-0.71}$	$12.73^{+0.32}_{-0.64}$

Viitanen+, submitted

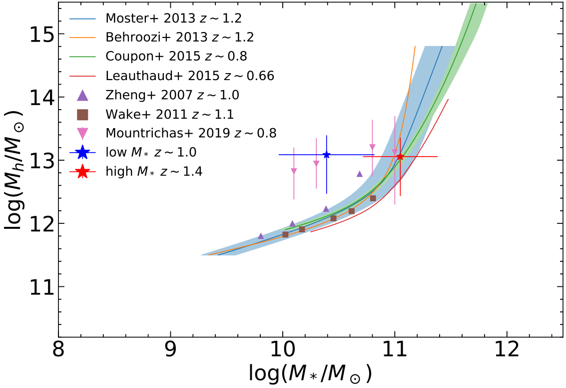
RESULTS



- Compare with $M_* - M_{\text{halo}}$ of non-active galaxies at similar redshifts
- Also, X-ray AGN measurements from *XMM-XXL* (Mountrichas+19)

Viitanen+, submitted

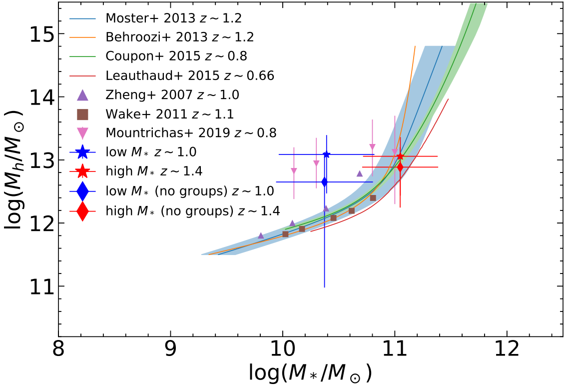
RESULTS



Viitanen+, submitted

- Compare with $M_* - M_{\text{halo}}$ of non-active galaxies at similar redshifts
- Also, X-ray AGN measurements from *XMM-XXL* (Mountrichas+19)

RESULTS



Viitanen+, submitted

- Compare with $M_* - M_{\text{halo}}$ of non-active galaxies at similar redshifts
- Also, X-ray AGN measurements from *XMM-XXL* (Mountrichas+19)
- Excluding galaxy groups suggest that at low M_* AGNs are more preferentially satellites in massive biased systems

Thank you for your attention!

Full paper available: arXiv:1906.07911