
The X-ray Properties of Optically Selected Galaxy Groups

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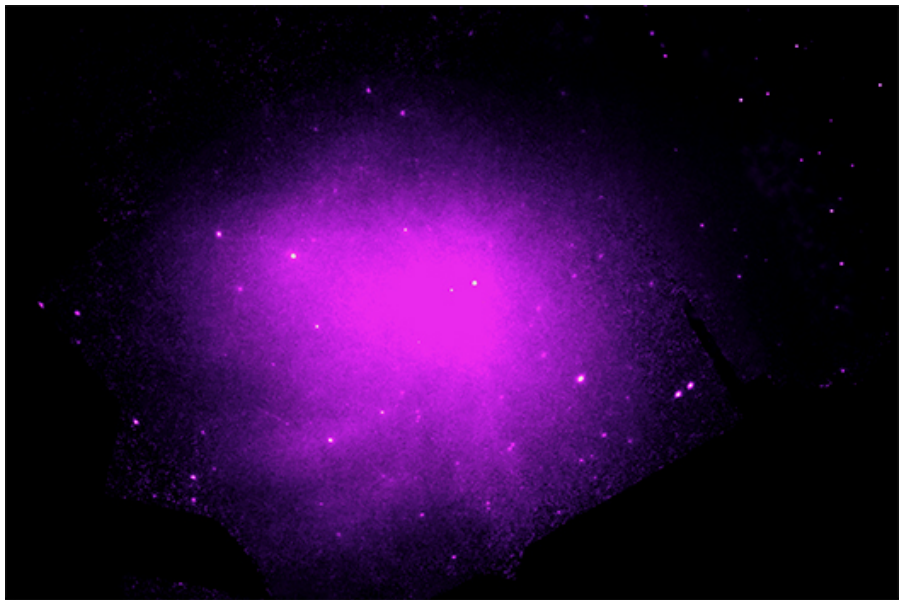
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Introduction

- ✦ What are Galaxy Groups?
- ✦ GAMA & XXL surveys
- ✦ Measure X-ray Luminosity of Optically Selected Galaxy Groups
- ✦ X-Ray Luminosity Function
- ✦ Luminosity - Mass Relation



Credit: SDSS

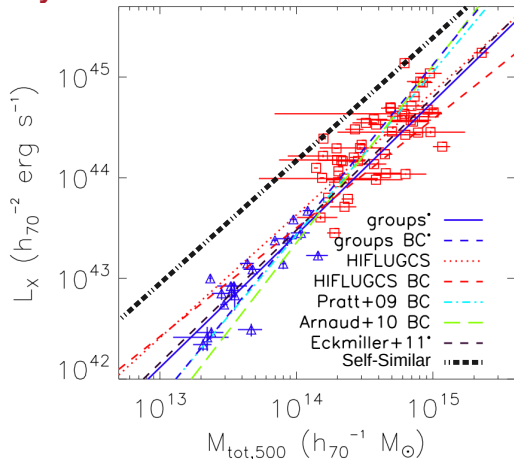


Credit: NASA/CXC/Univ. of Chicago, I. Zhuravleva et al

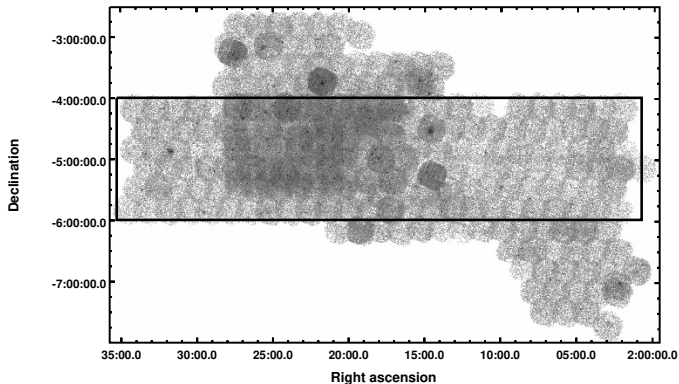


Credit: X-ray: NASA/CXC/Univ. of Chicago, I. Zhuravleva et al, Optical: SDSS

Self-Similarity



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- ✦ XXL X-ray survey
 - ✦ GAMA spectroscopic survey
 - ✦ 235 GAMA groups (with 5+ members) in overlapping region

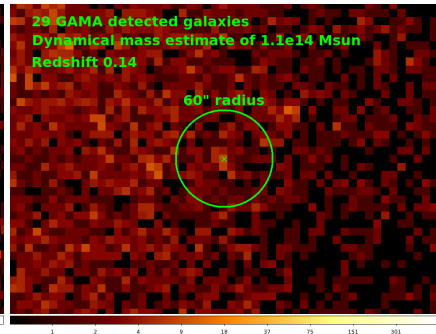
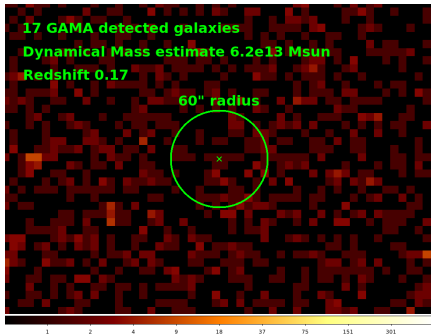


GAMA: Driver et. al (2011), XXL: Pierre et al. (2016)

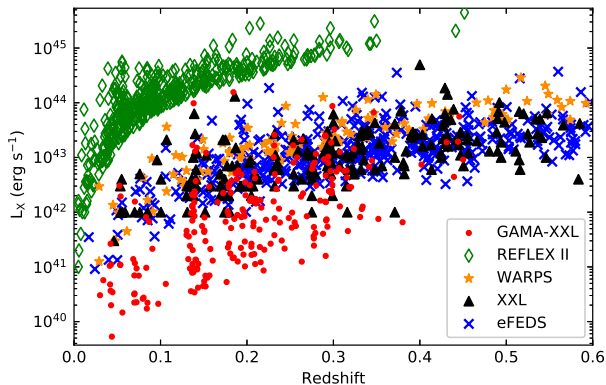
FoF Algorithm: Robotham et al. (2011)

X-ray Undetected Groups

- ✦ 25% of groups are non-detections
- ✦ Use Luminosity posterior

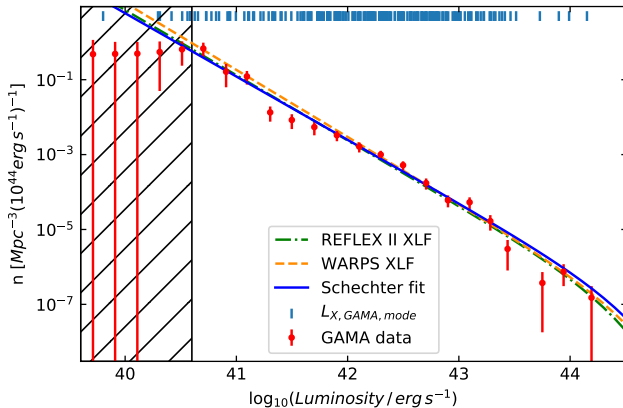


Luminosity - Redshift Space

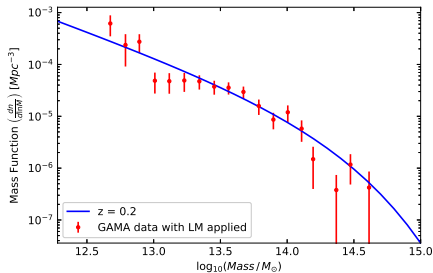
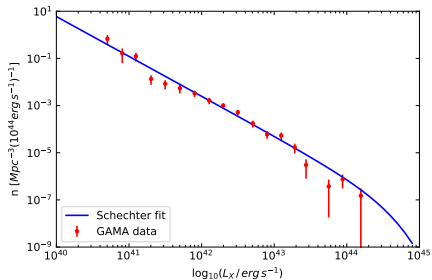


REFLEX II: Böhringer et al. (2014), WARPS: Koens et al. (2013), bristol.ac.uk
XXL: Pacaud et al. (2016), eFEDS: Liu et al. (2021)

X-ray Luminosity Function

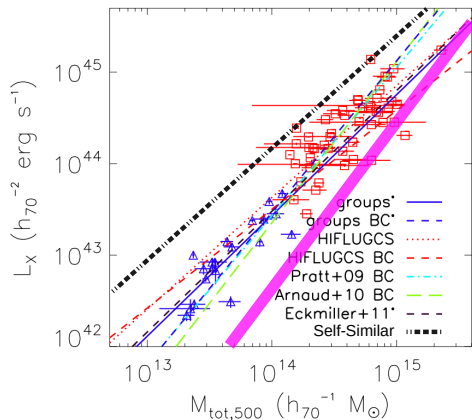
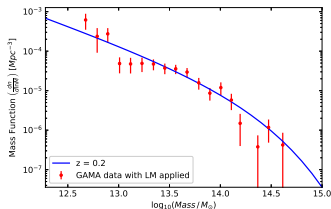
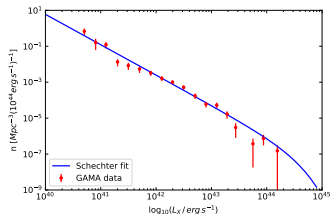


X-ray Luminosity Function \Rightarrow Halo Mass Function



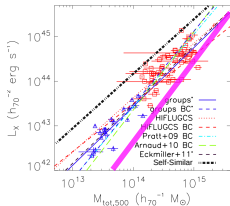
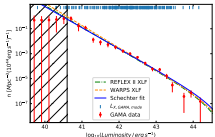
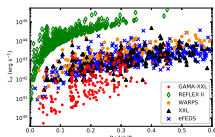
Colossus: Diemer (2018)
Model: Tinker et al. (2008)

Luminosity - Mass Relation



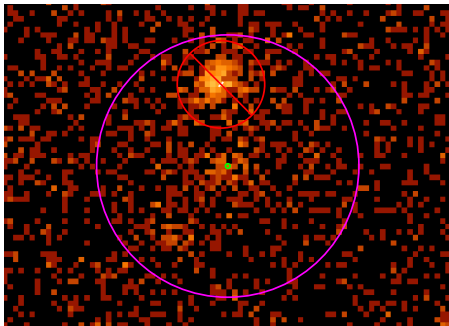
Summary

- Measured X-Ray Luminosities of Optically Selected Galaxy Group Sample
- Compared observed X-Ray Luminosity Function with theoretical Halo Mass Function to infer Luminosity-Mass Relation
- Inclusion of non-detections allowed exploration of Low Luminosity and Low Mass regime
- Results suggest Feedback and X-ray selection bias present



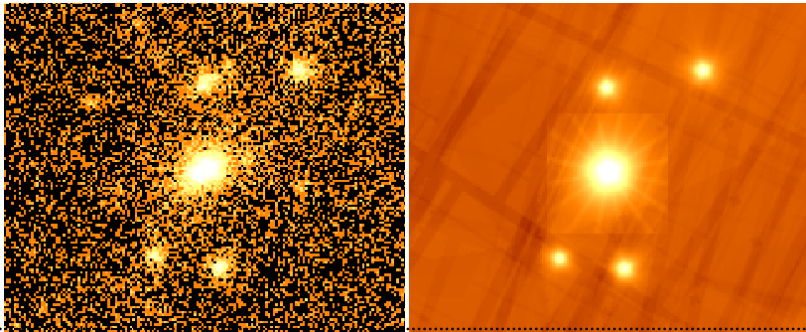
Excluding Non-Central Point Sources

For point sources located between 30" and 110" away from the group location, the point source region was masked and remaining flux in the aperture modelled and subtracted.

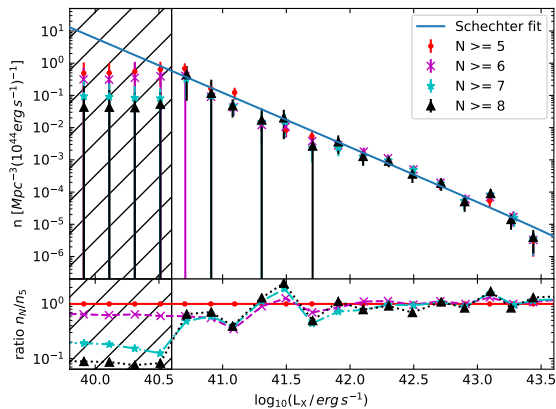


Modelling Central Point Sources

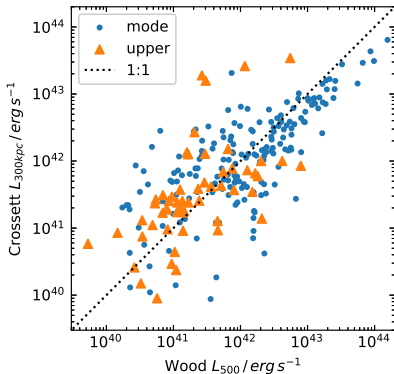
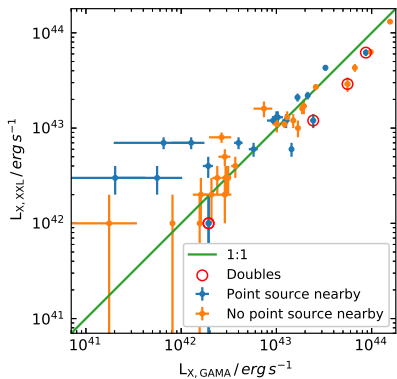
In cases where the point source was closer, the point source and group emission were modelled using the PSF and a beta model, and the proportion of emission expected from the group found.



Testing $N \geq 5$ cut-off



Comparing Luminosities



XXL: Pacaud et al. (2016)

Crossett et al. (2022)

Luminosity - Mass Relation

