

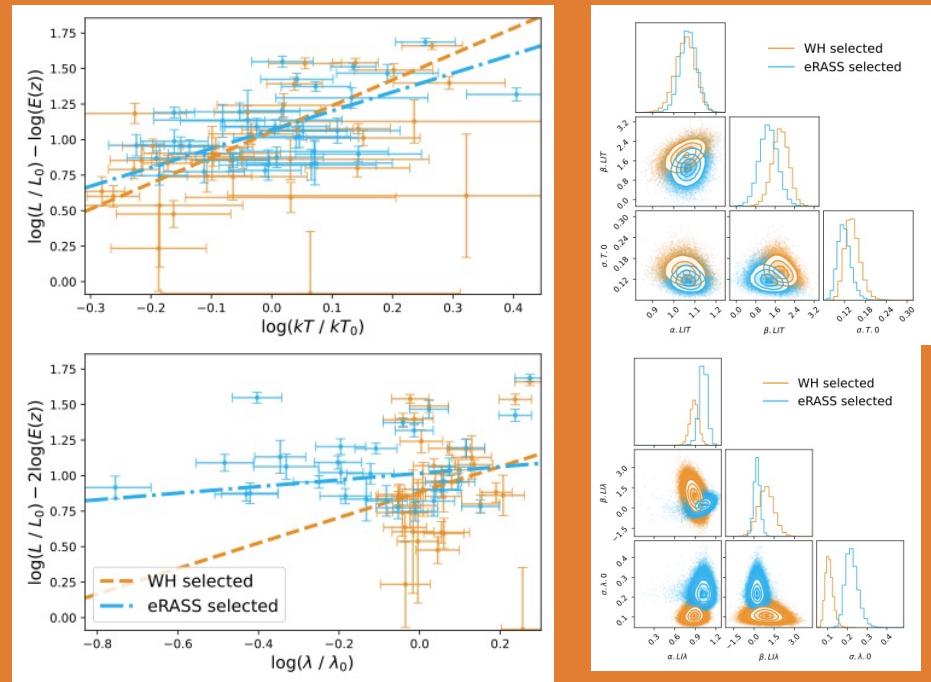
X-ray Properties of Galaxy Clusters with *eROSITA*

Progress Update

Joseph Hall

Astro Lunch Meeting

30 July 2025



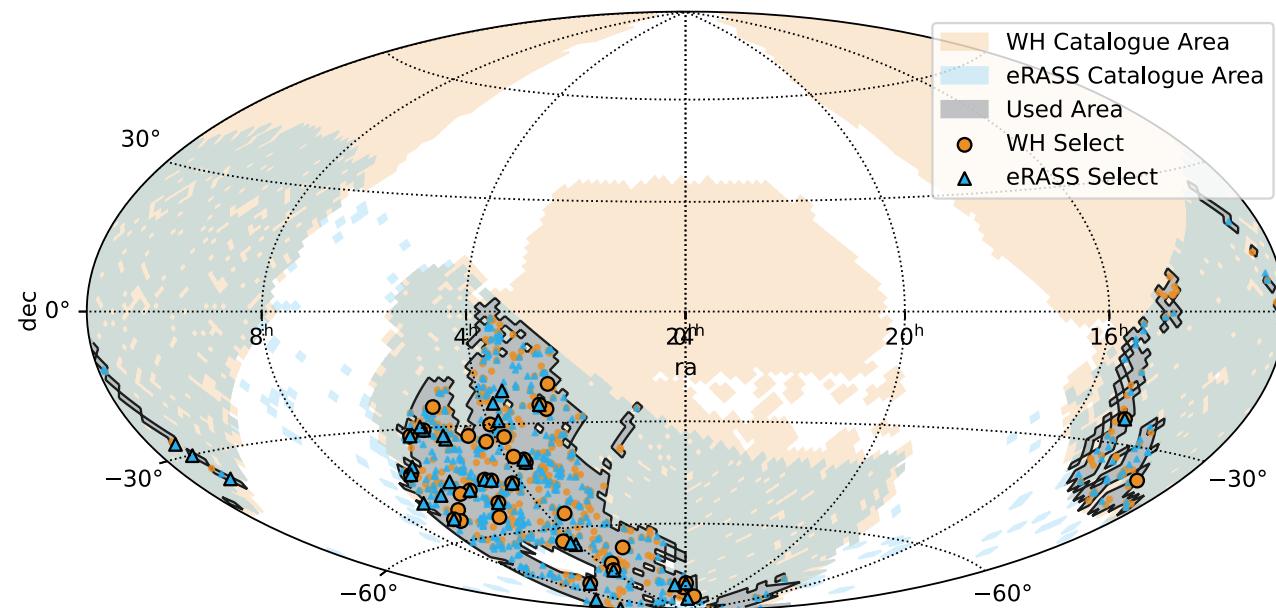
BACKGROUND

A New Era

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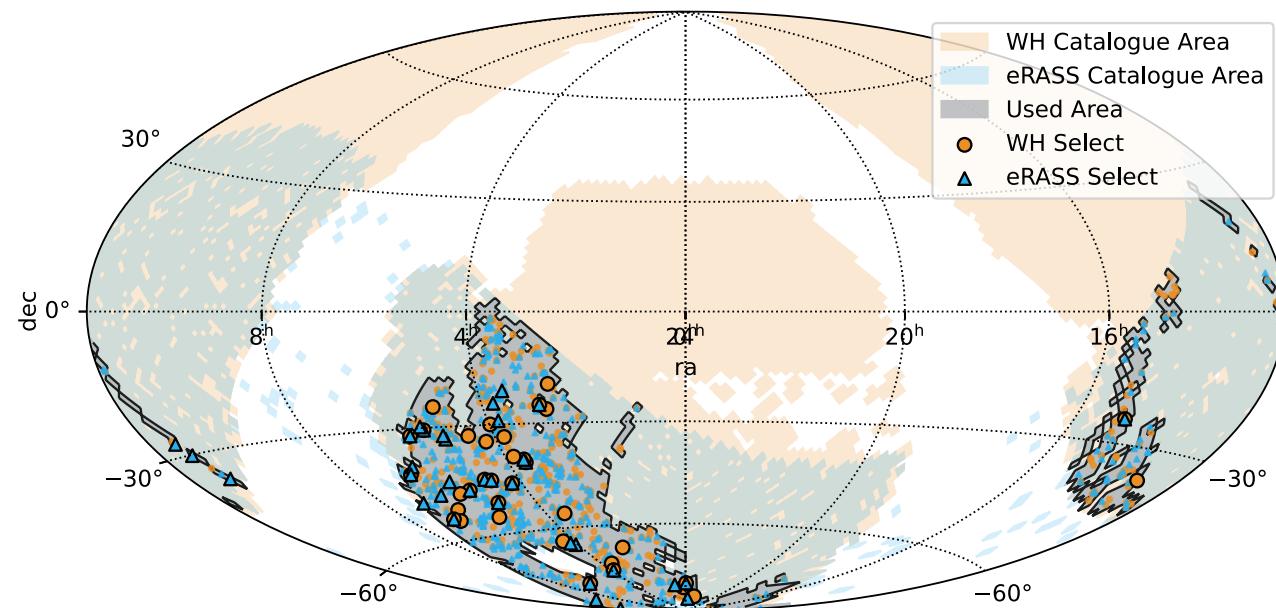


For 2.5 years from 2019 **eROSITA** mapped the X-ray sky, so far providing 2 data releases

(Brunner et al. 2022, Merloni et al. 2024)

A New Era

This is an exciting time for wide field cosmological surveys:



The optical sky has been well-mapped by **DES** and **DESI**, with **Euclid** Q1 data providing a preview of the full data coming next year

(*DES Collaboration 2021, Dey et al. 2022, Euclid Collaboration 2025*)

Galaxy Clusters: They're Like Dragons.

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They're the *largest gravitationally bound objects*, only 20% of their baryons are in stars, the rest is in the X-ray emitting **ICM**.

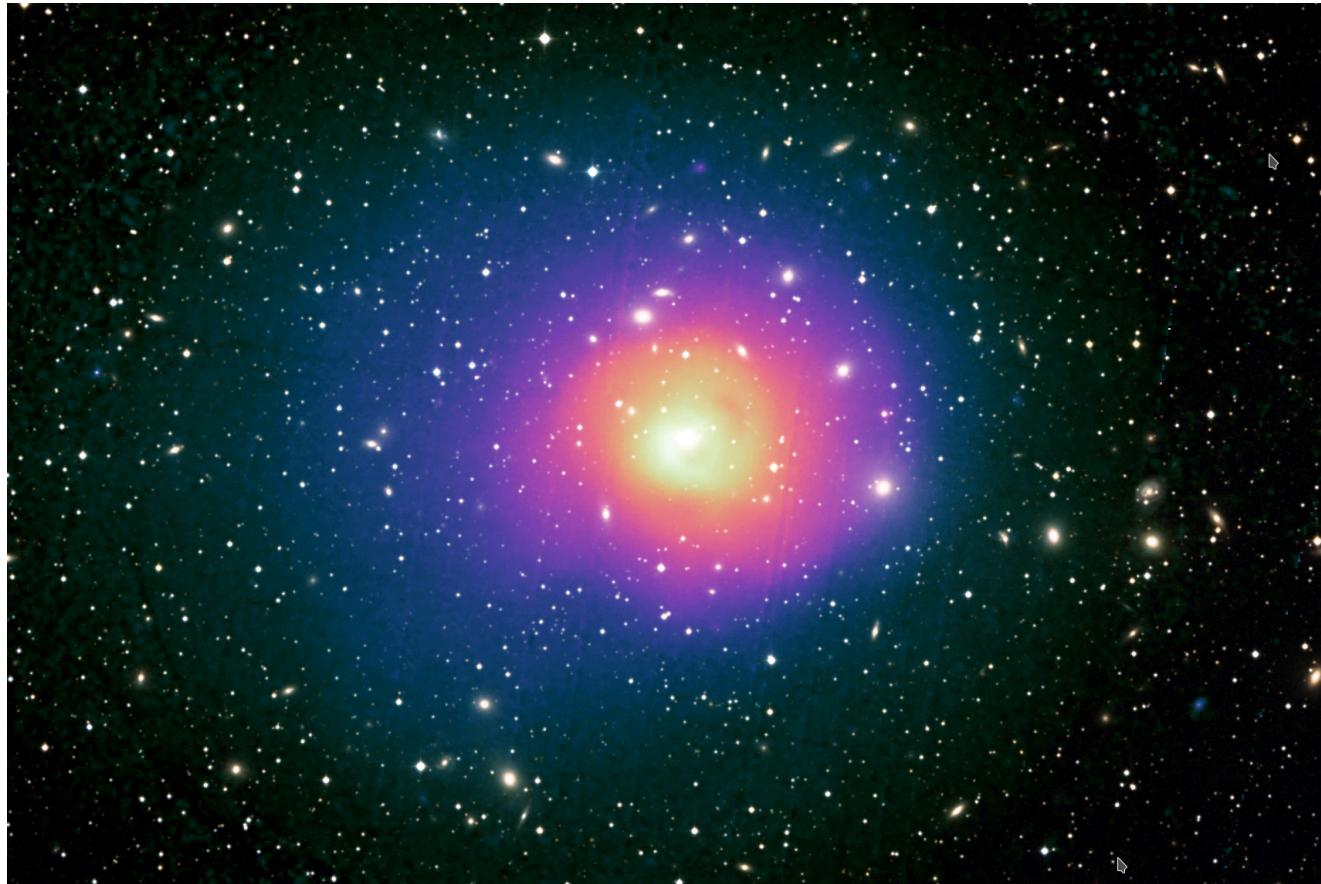


Image Credit: ESA/XMM-Newton/DSS-II/J. Sanders et al. 2019

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Assuming that only gravity dictates these properties, the scaling relations can be fit by the **self-similar model**.

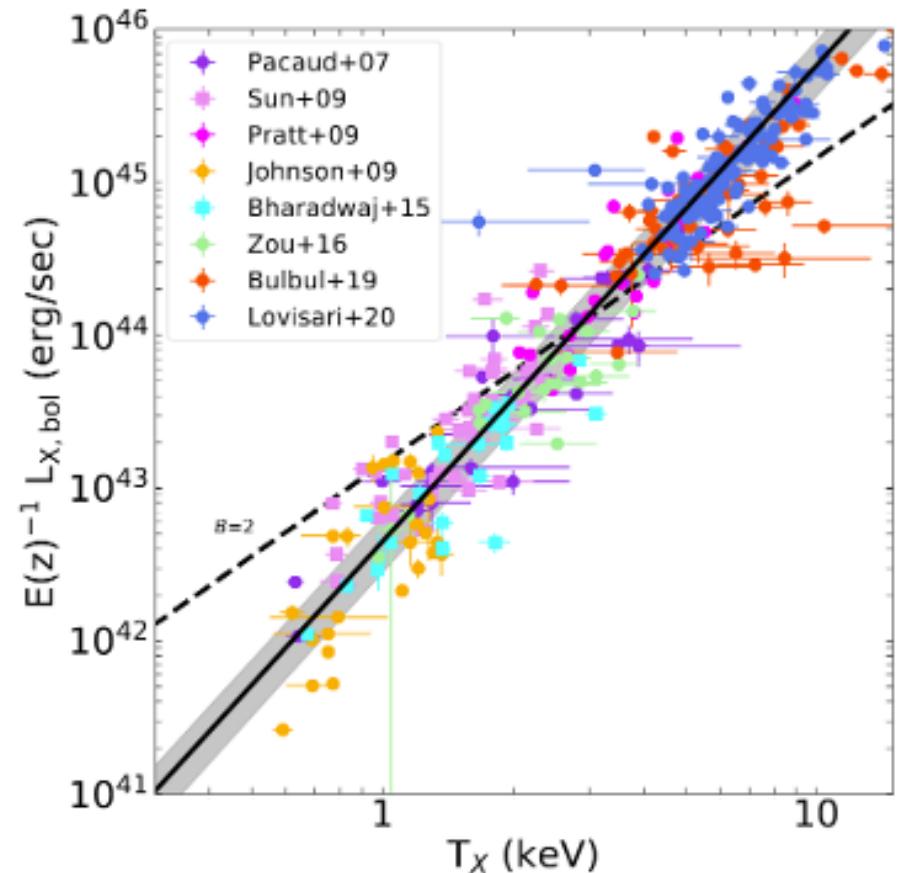


Image Credit: Lovisari & Maughan 2022

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Deviations from the model are the result of extra astrophysics.

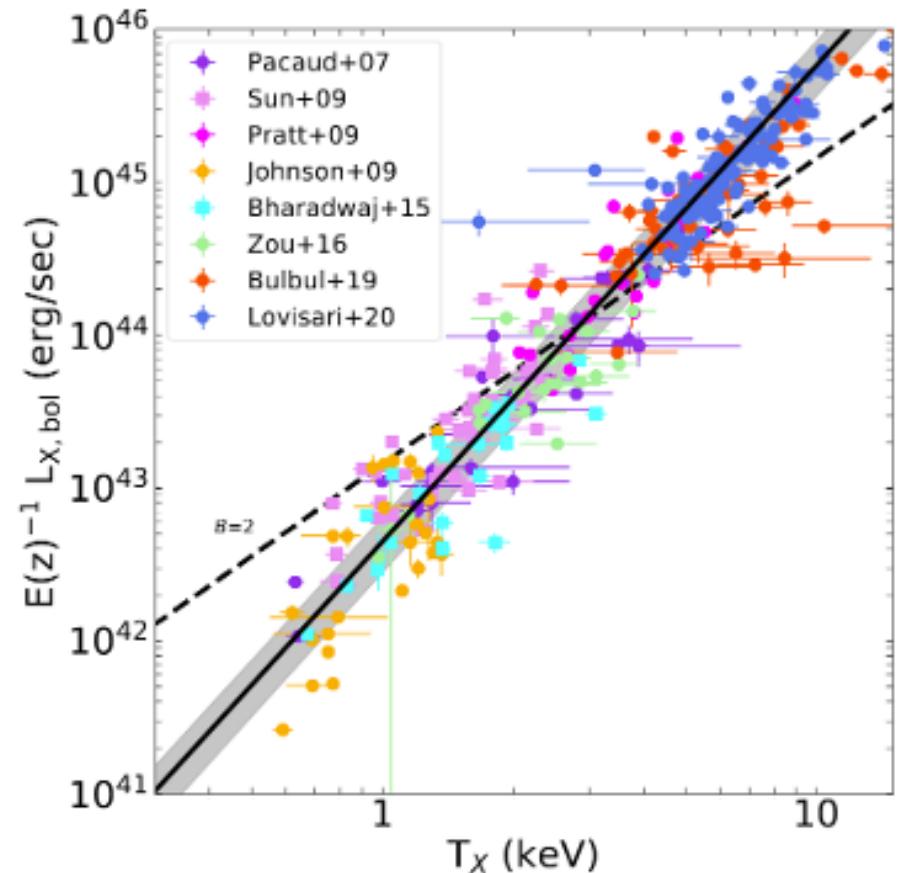


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Cluster Cosmology

Counting the number of clusters in the universe can help to constrain cosmological parameters, particularly σ_8 and Ω_M

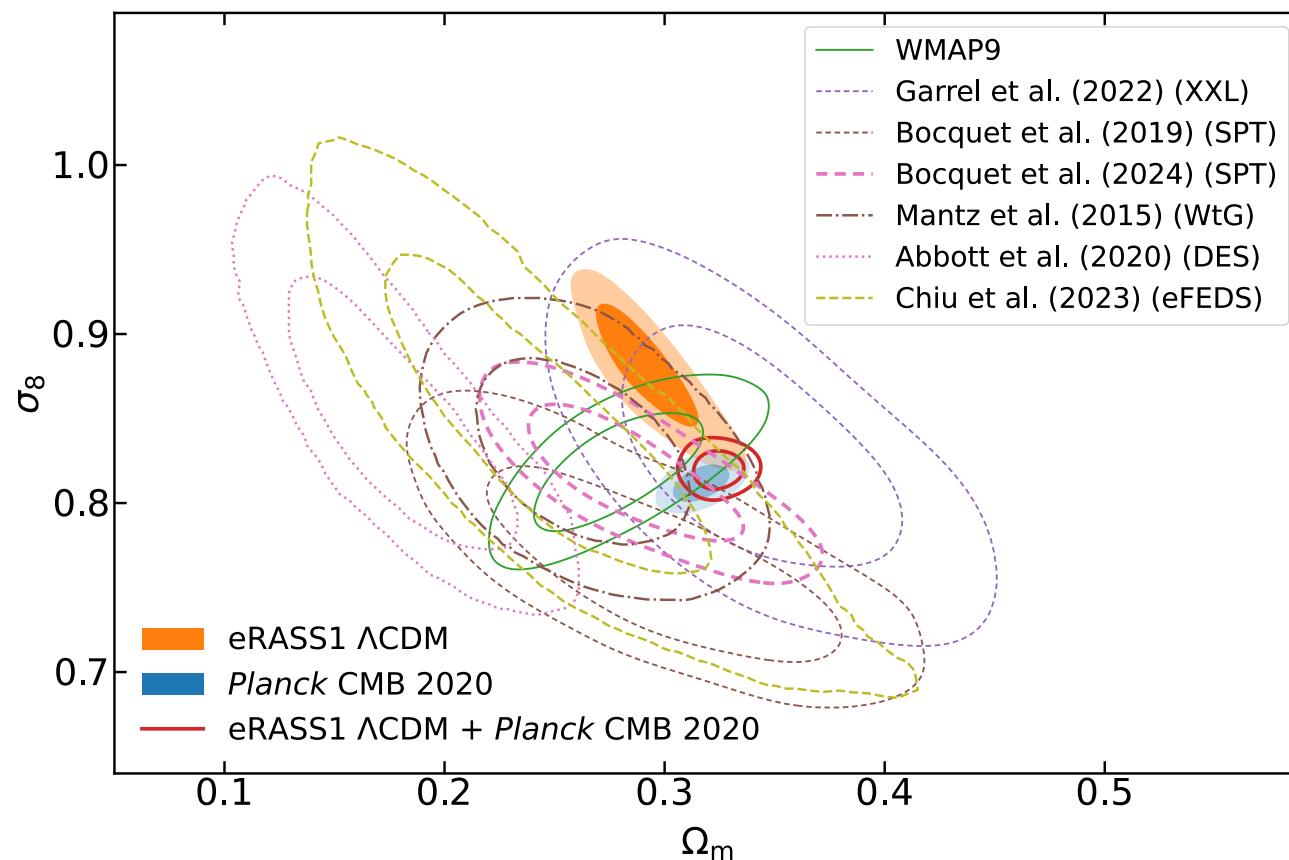


Image Credit: Ghirardini et al. 2024

Cluster Cosmology

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To do this effectively we need accurate **selection functions**

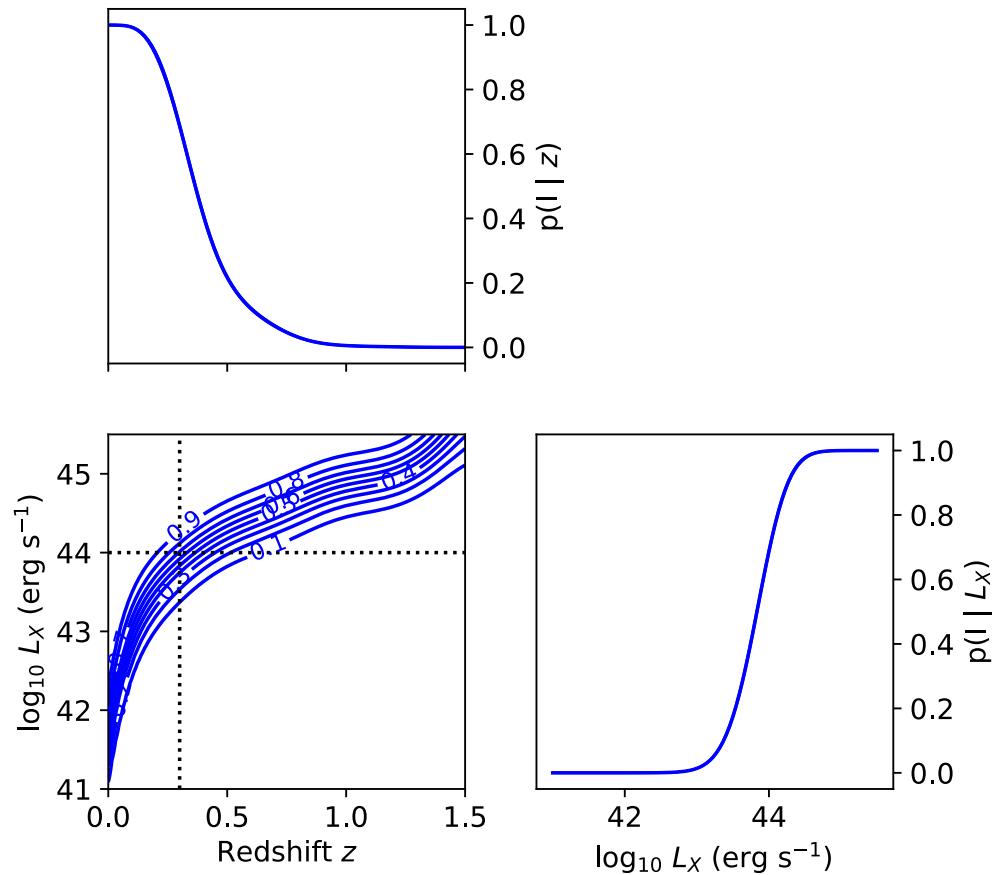


Image Credit: Clerc et al. 2024

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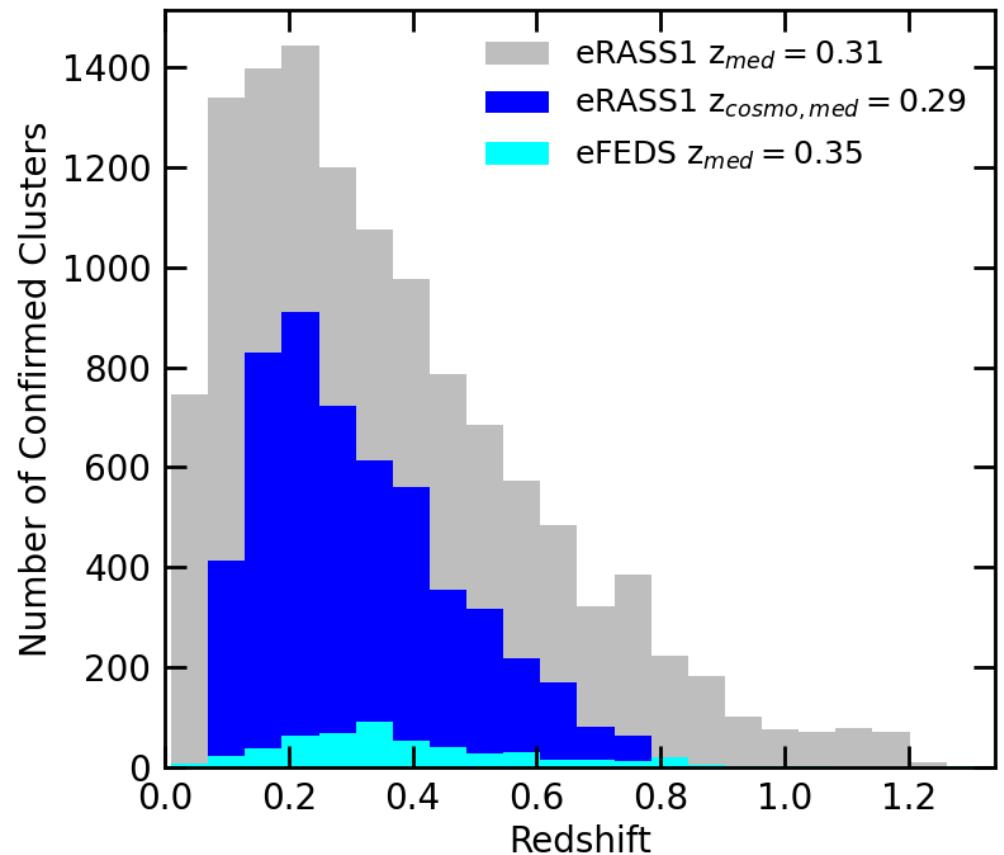


Image Credit: Bulbul et al. 2024

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Andreon et al. (2016) found diff's in scaling rels for **optical and X-ray clusters**

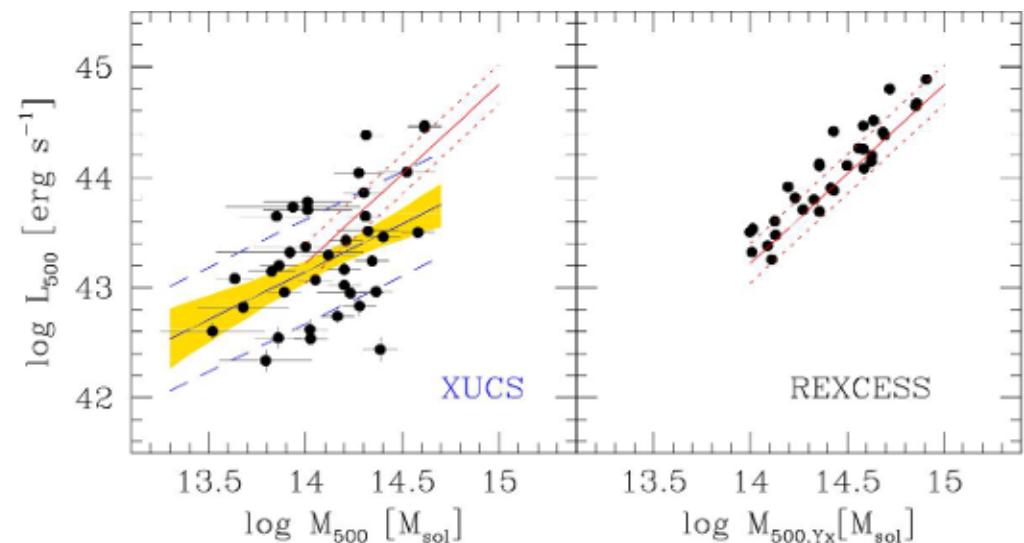
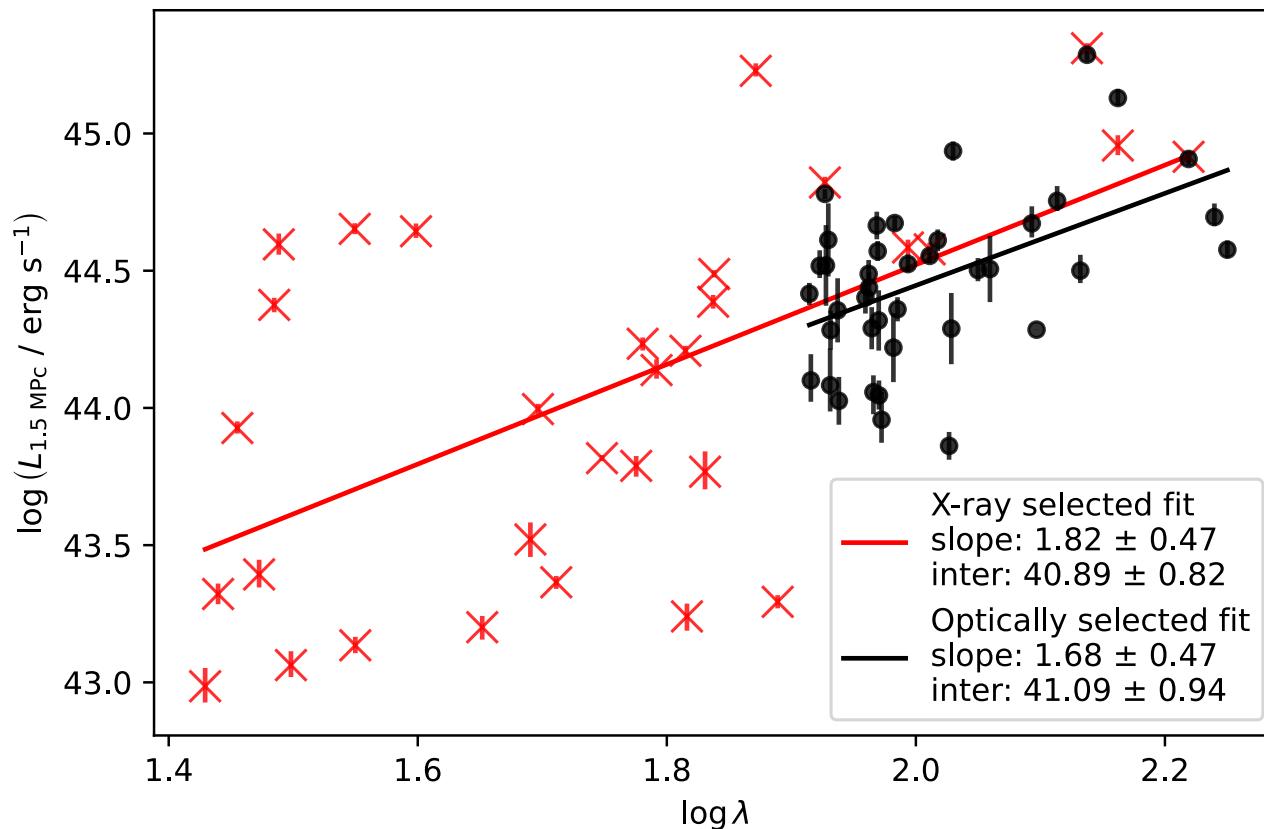


Image Credit: Andreon et al. 2016

**Combining eROSITA data with
clusters found in wide optical
surveys gives the ideal platform to
test these biases**

Last Update

In September, I presented these results from eRASS flux selected clusters and **richness (λ)** selected from the DES science verification catalogue analysed by a pipeline I wrote.

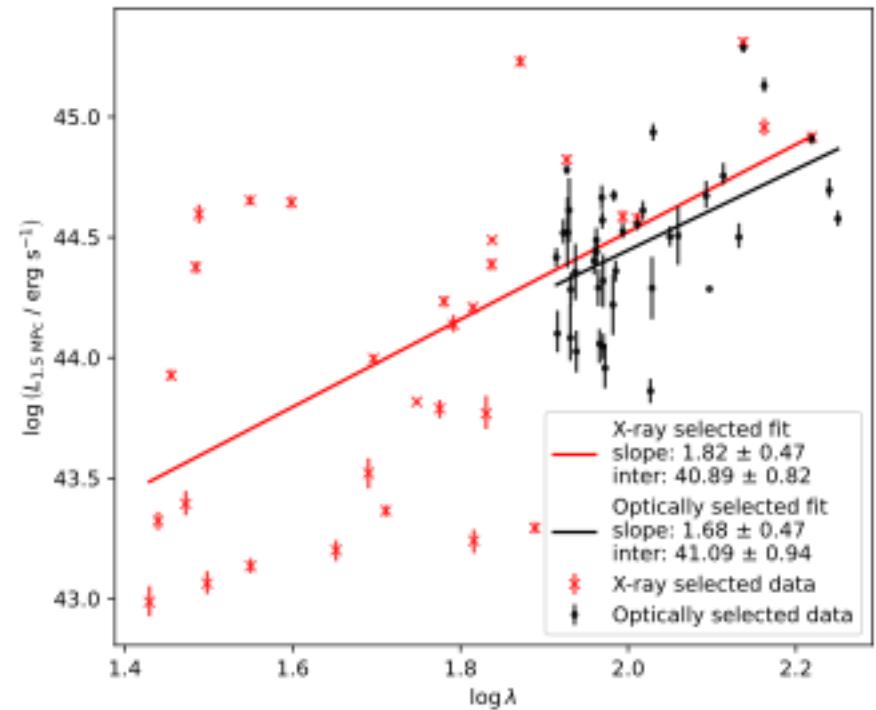


Bulbul et al. 2024, Rykoff et al. 2016

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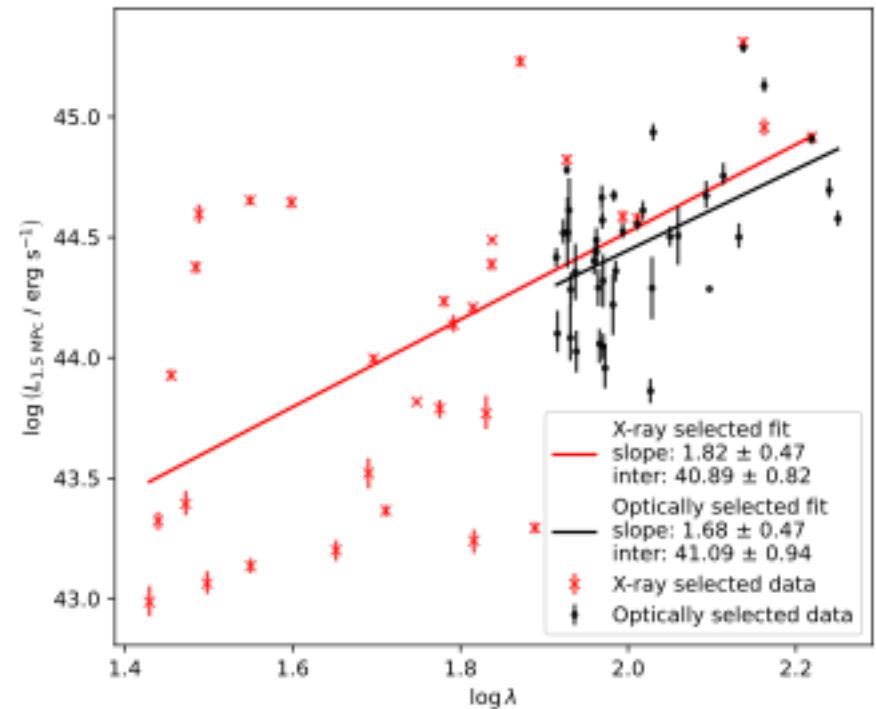
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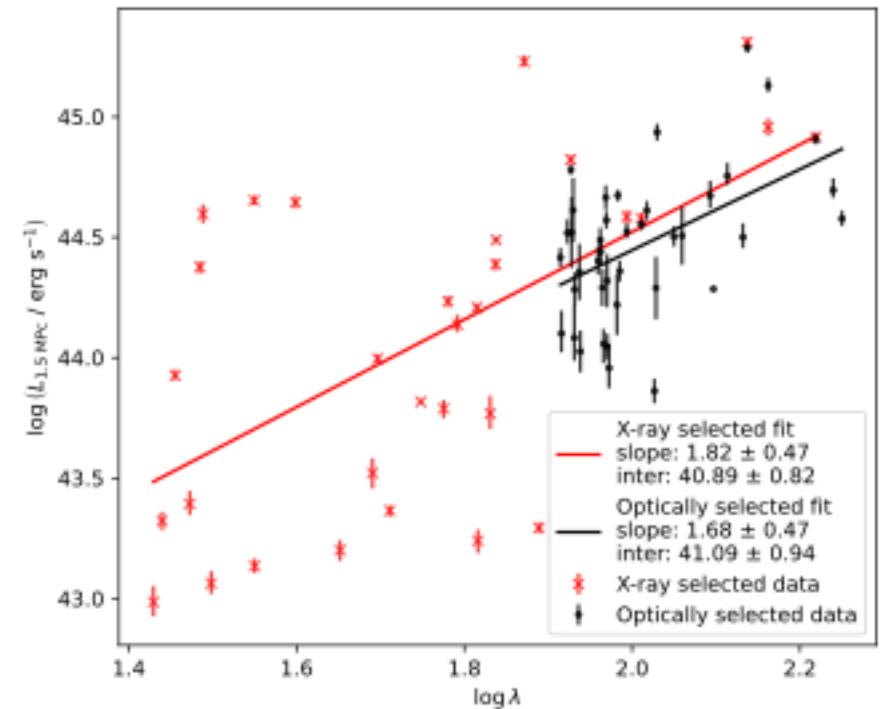
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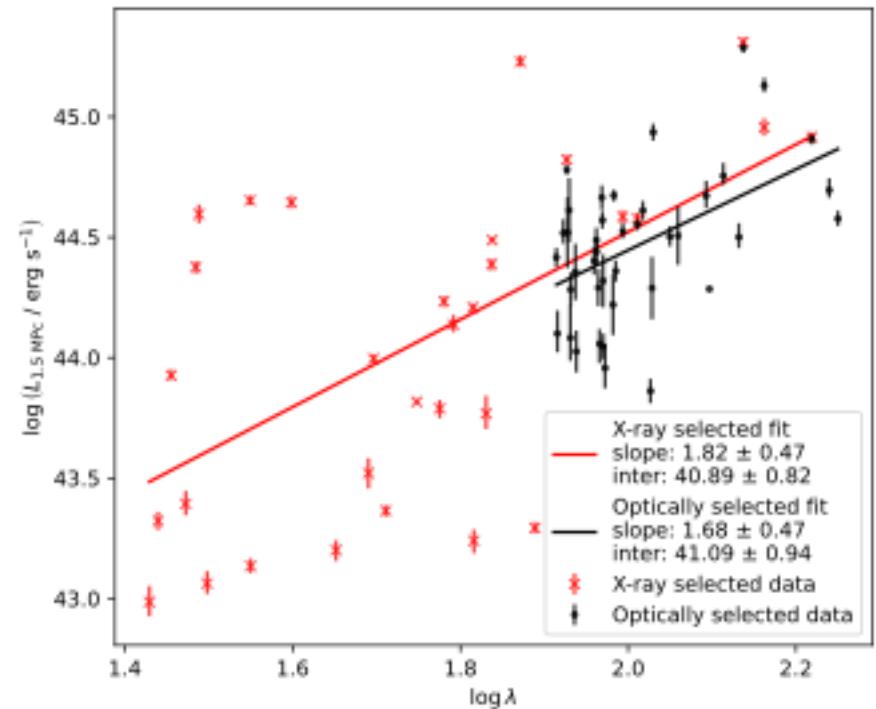
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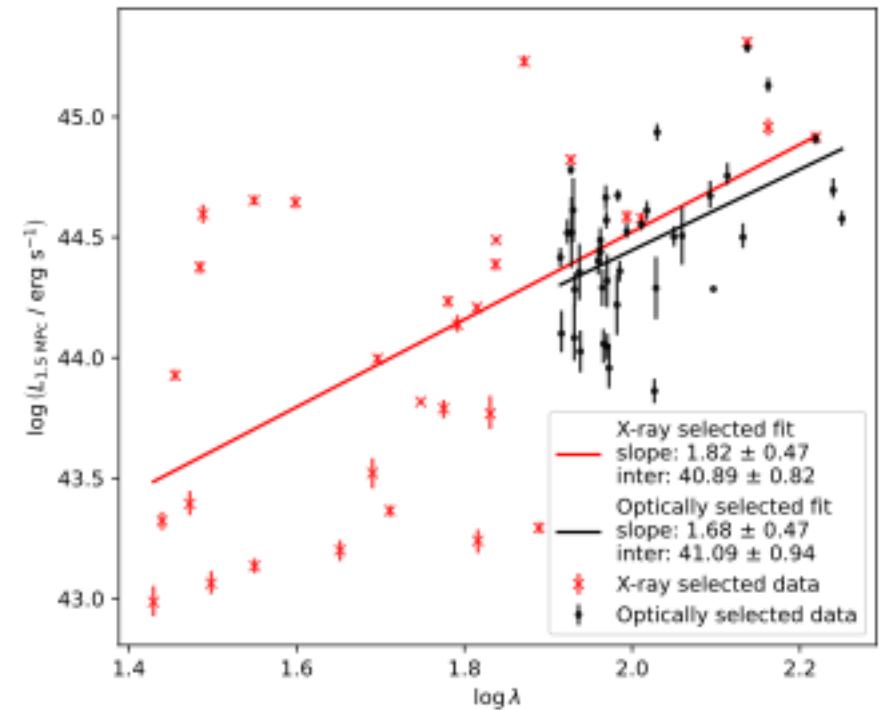
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Over the past year I have been addressing these issues



Bulbul et al. 2024, Rykoff et al. 2016

SAMPLE SELECTION

DATA ANALYSIS

RESULTS