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Semi-empirical models of X-ray AGN in galaxy clusters:

The role of environment on AGN triggering

Final conference Bid4BESt - 06/02/2024

Iván Muñoz Rodríguez
Antonis Georgakakis
Francesco Shankar

AGN

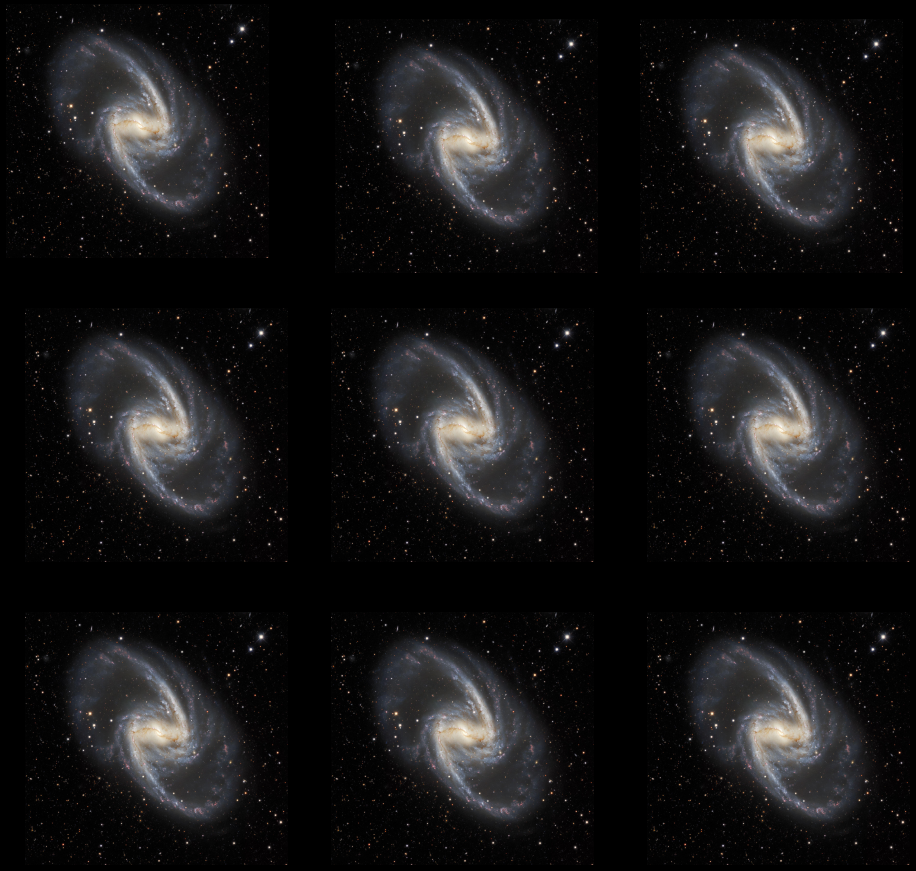
NGC1365

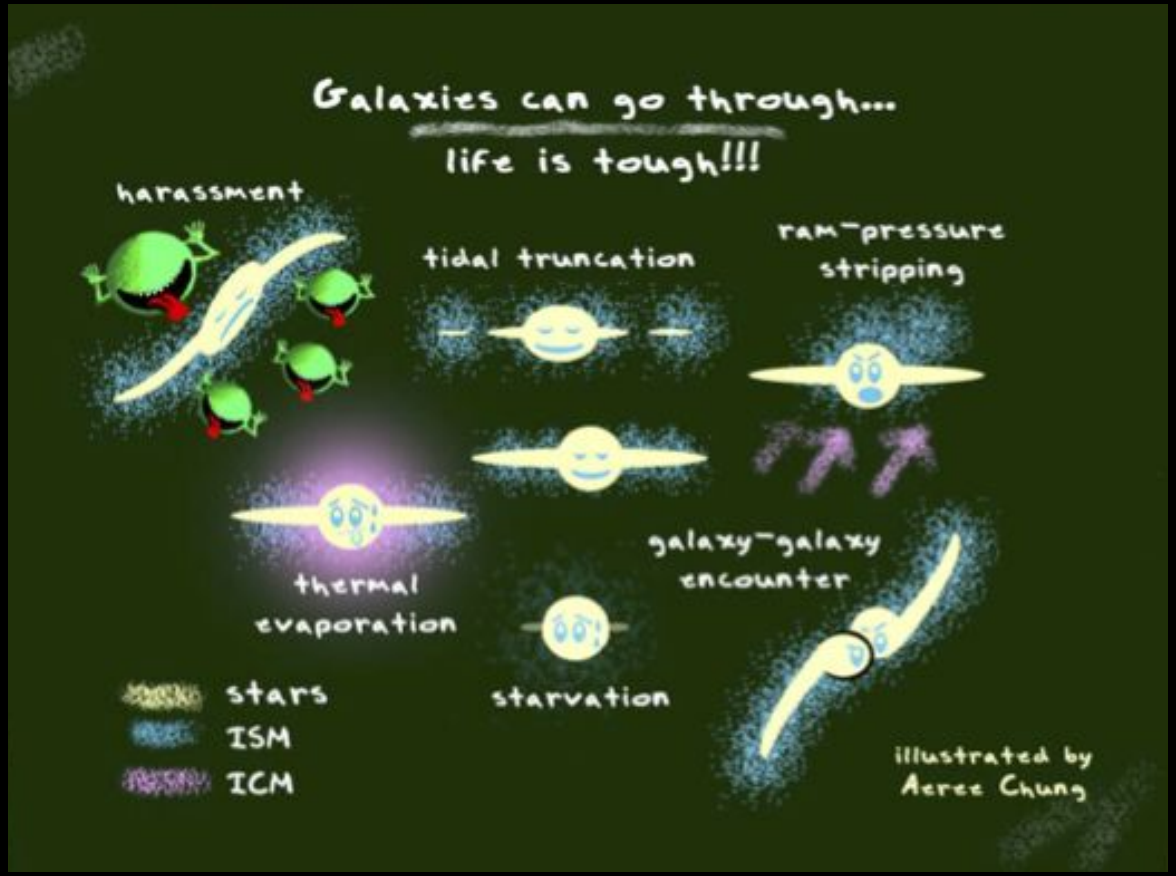
Credits: Dark Energy Survey/DOE/FNAL/DECam/CTIO/NOIRLab/NSF/AURA
Image processing: Travis Rector (University of Alaska Anchorage/NSF's NOIRLab), Jen Miller (Gemini Observatory/NSF's NOIRLab), Mahdi Zamani & Davide de Martin (NSF's NOIRLab)

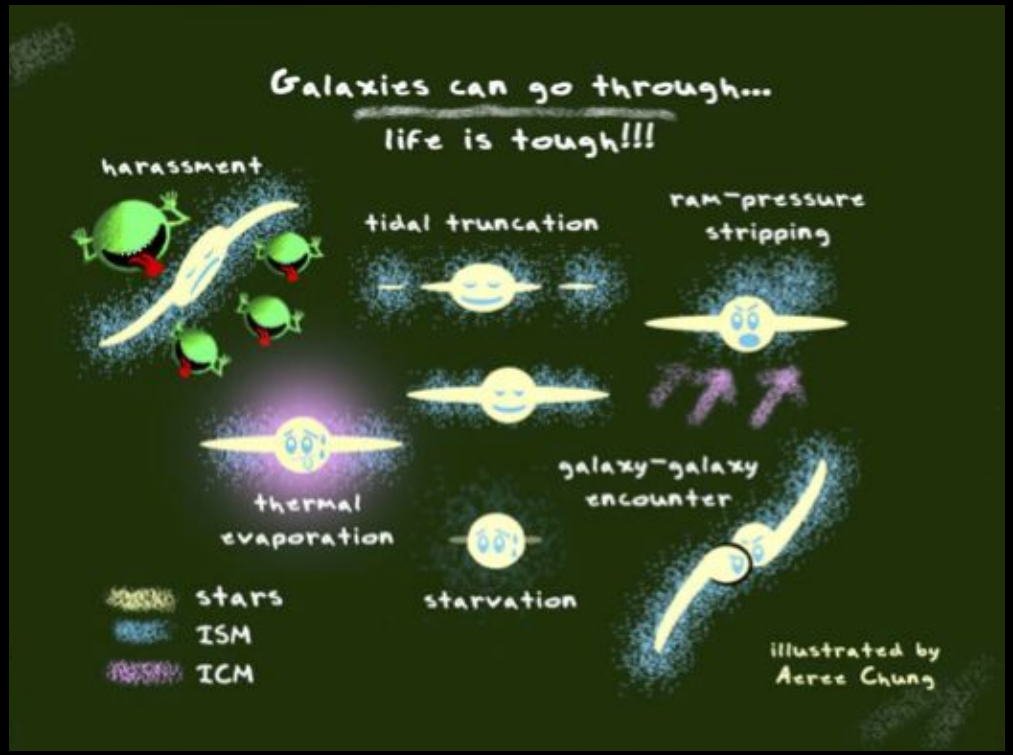
UGC 6093

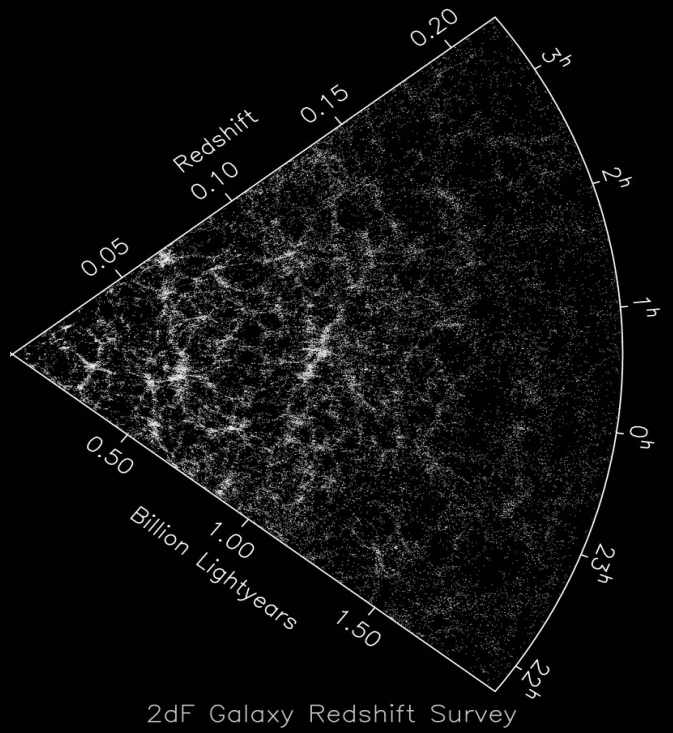
Credits: ESA/Hubble & NASA

Non-AGN more frequent than AGN

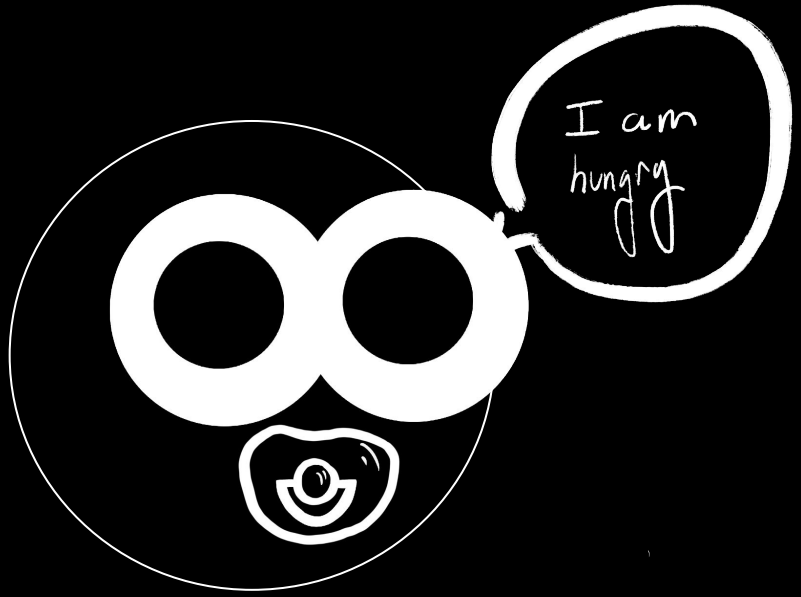



Galaxies can go through...
life is tough!!!
harassment
tidal truncation
ram-pressure stripping
thermal evaporation
galaxy-galaxy encounter
starvation
stars
ISM
ICM
illustrated by Aeree Chung

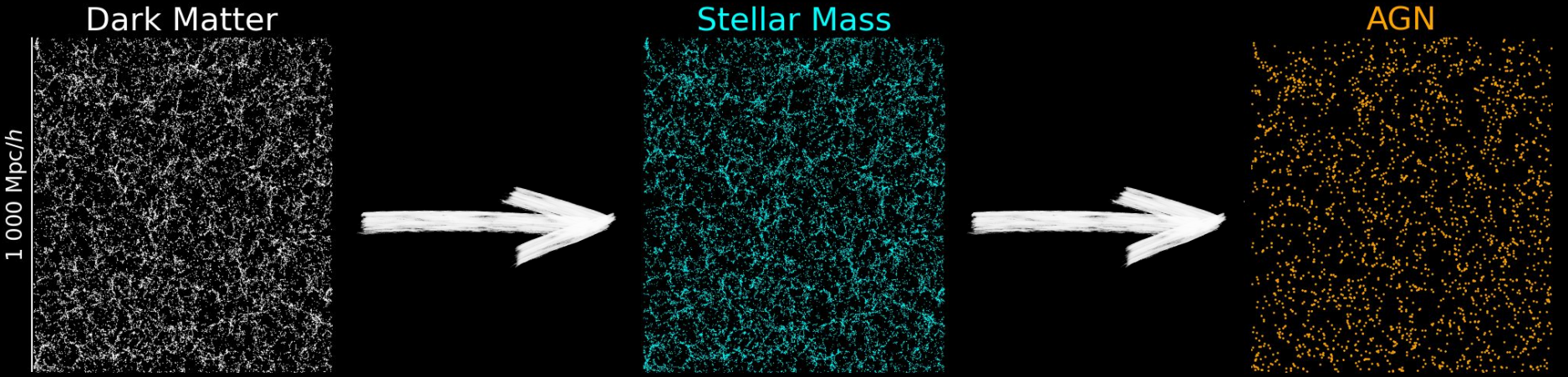




Yes, life it is tough…but it also depends on the neighbourhood!


I am
hungry

Semi-empirical model

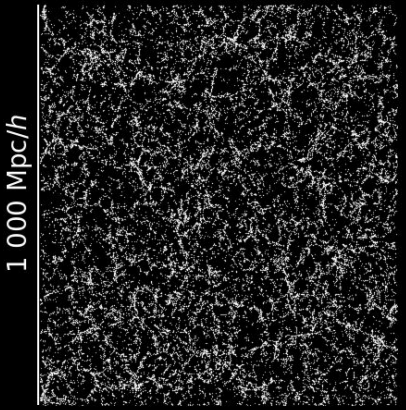


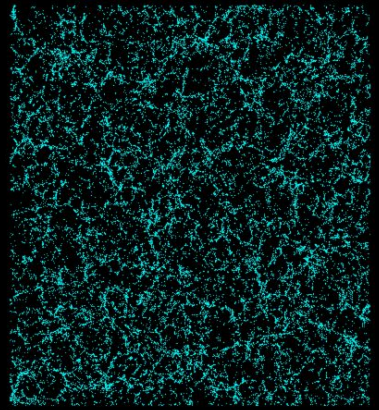
Semi-empirical model

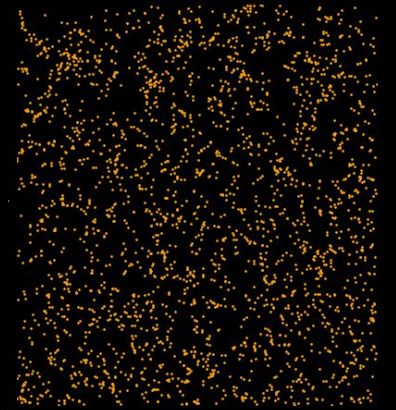
Dark Matter

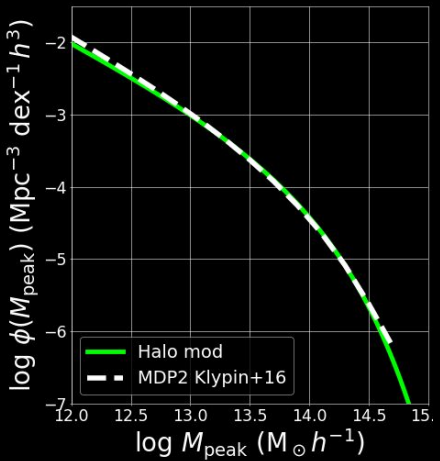
Stellar Mass

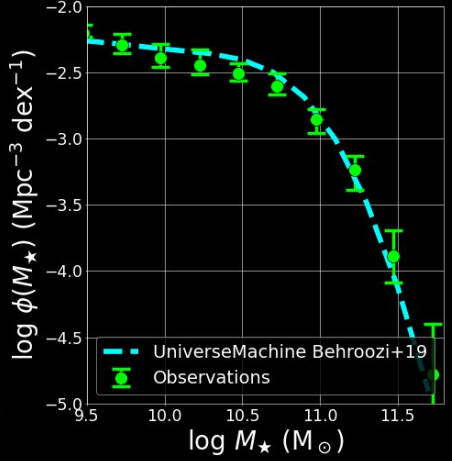
AGN

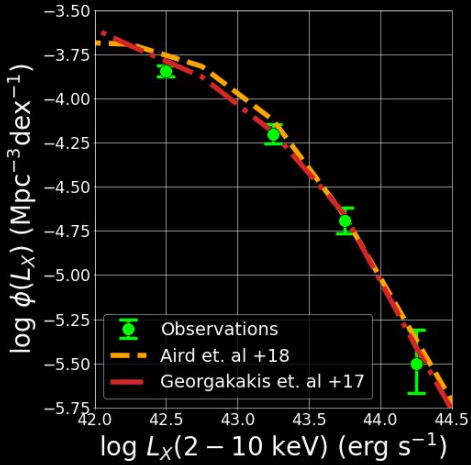












Semi-empirical model

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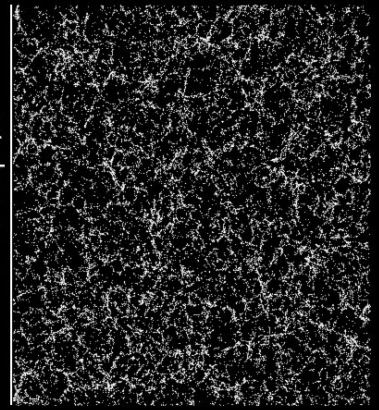
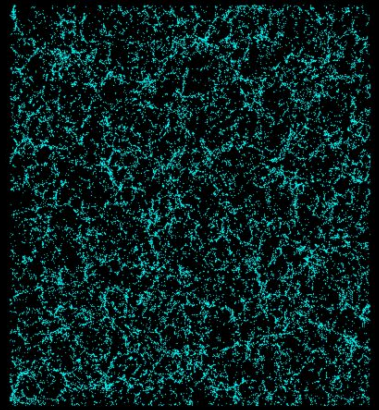
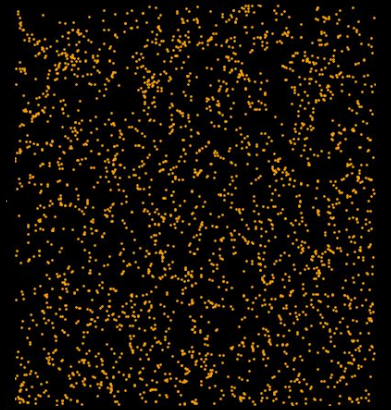
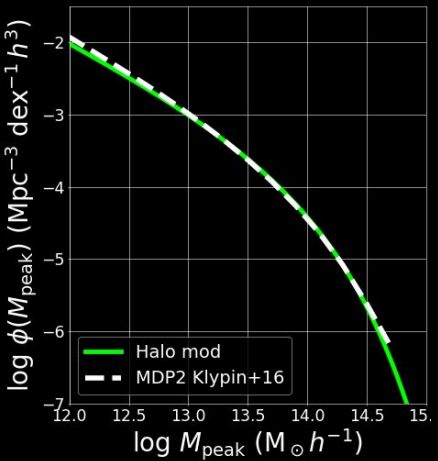
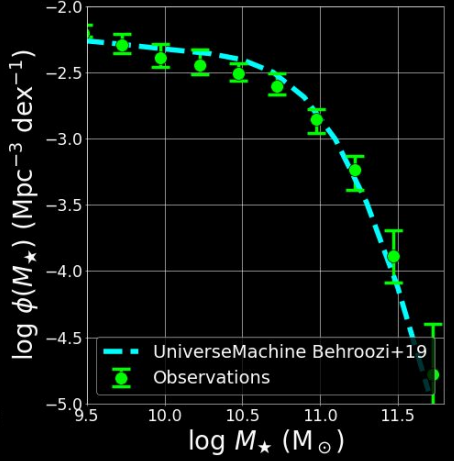
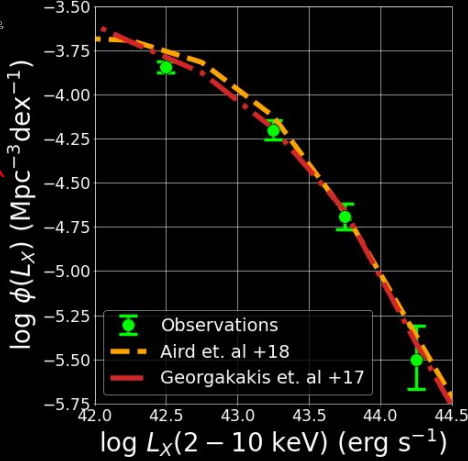




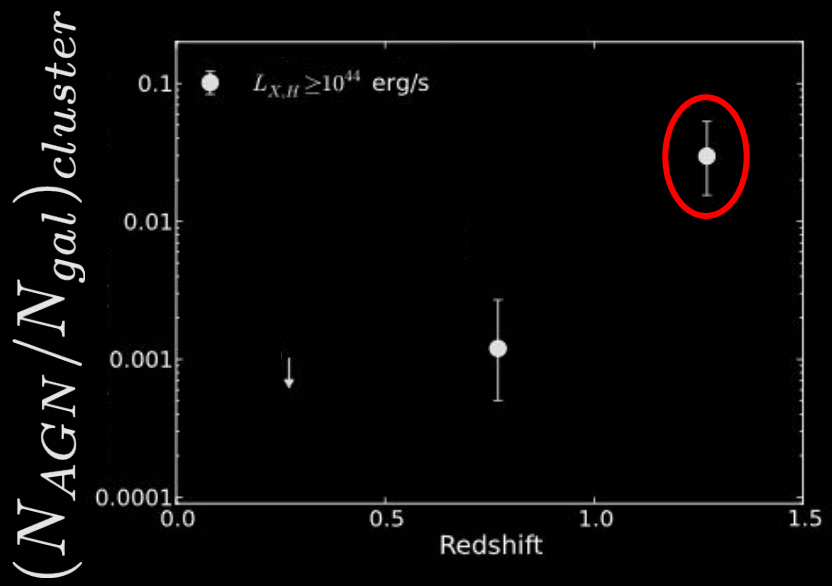


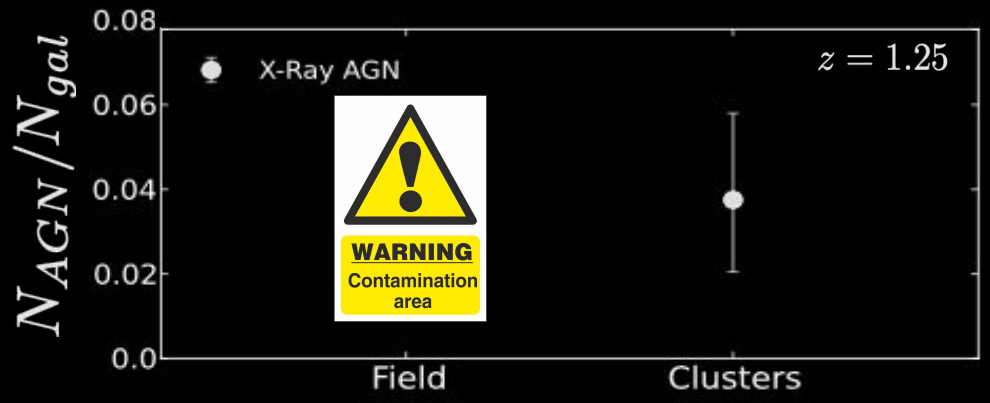




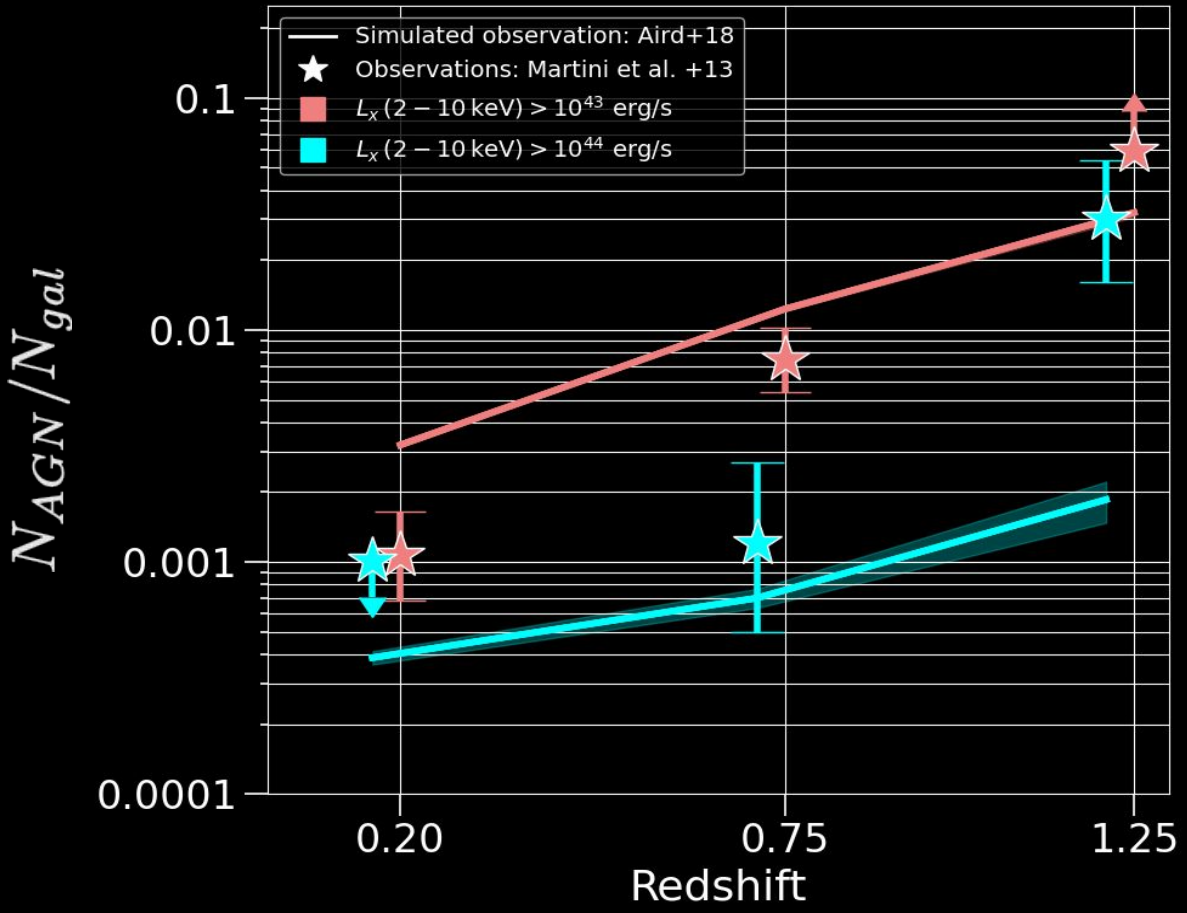


AGN fractions Martini+13

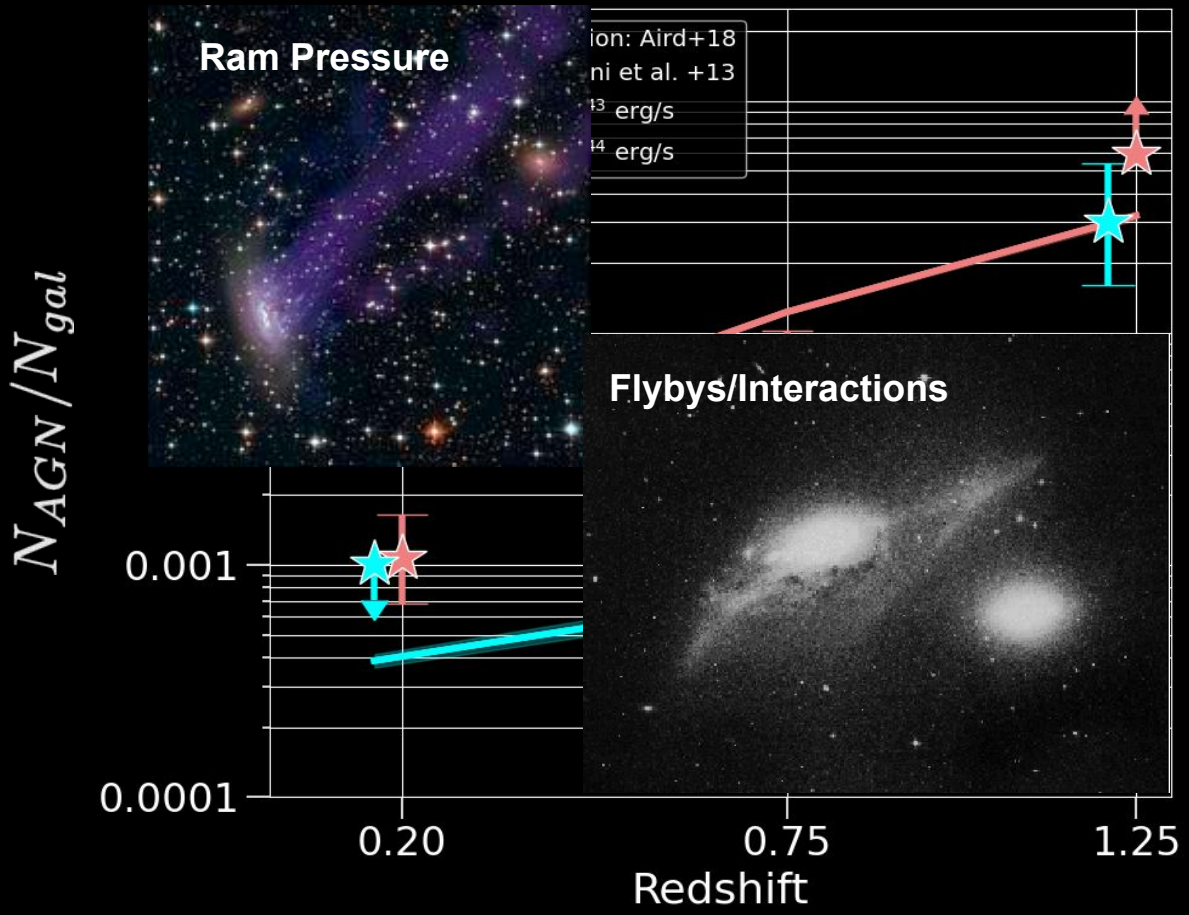




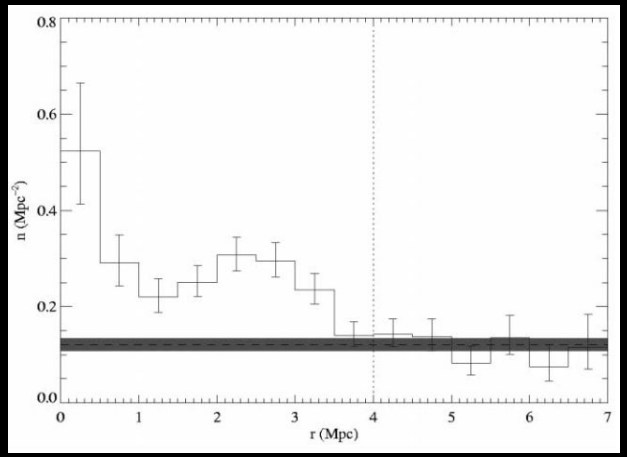
AGN fractions Muñoz Rodríguez+23



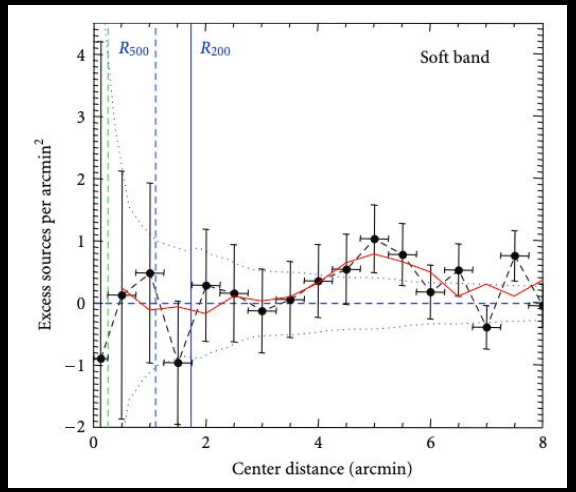
AGN fractions Muñoz Rodríguez+23



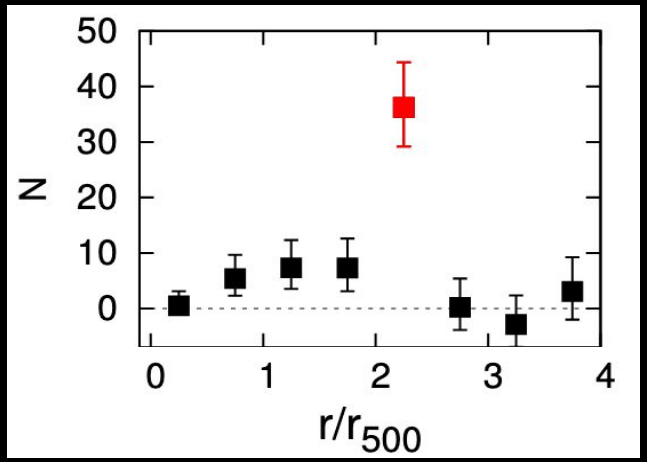
(Projected) Radial distribution of AGN in clusters



Ruderman & Ebeling (2005)



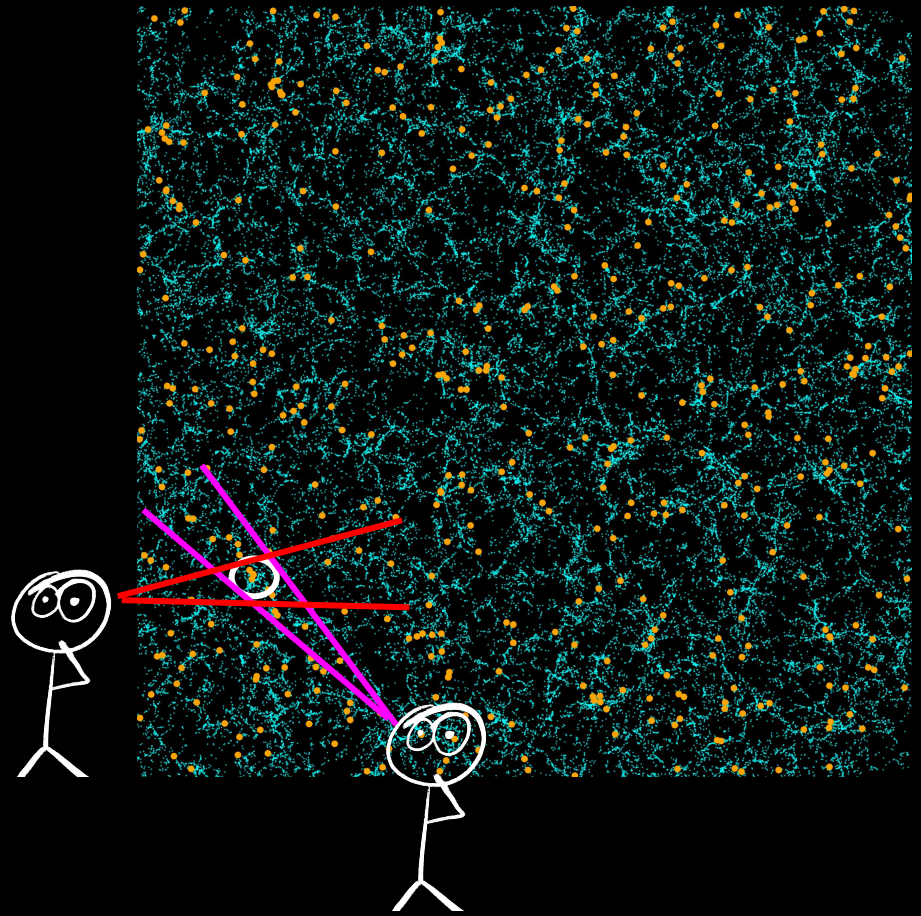
Fassbender, Suhada & A. Nastasi (2012)

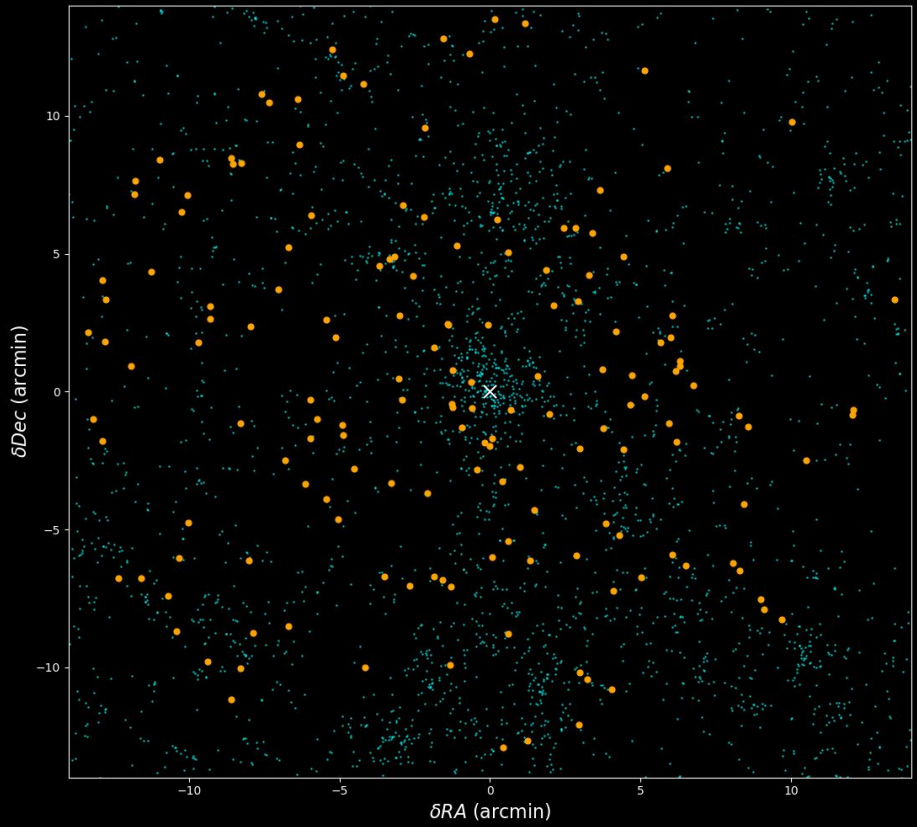


Koulouridis & Bartalucci (2019)

Projection effects?

Galaxies, AGN





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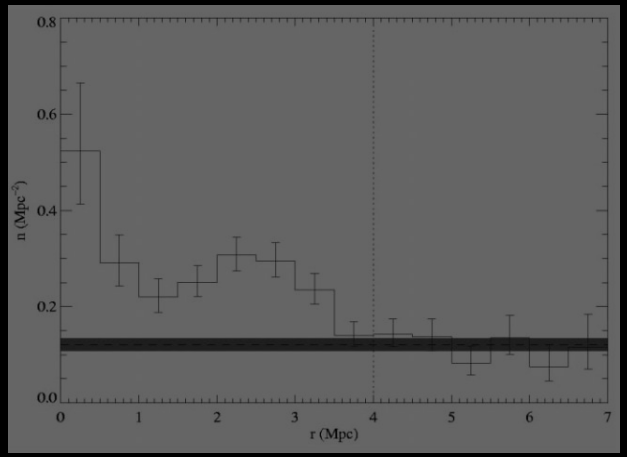
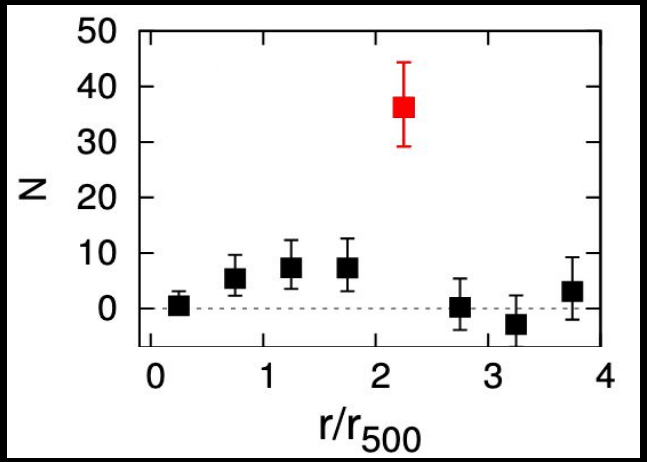
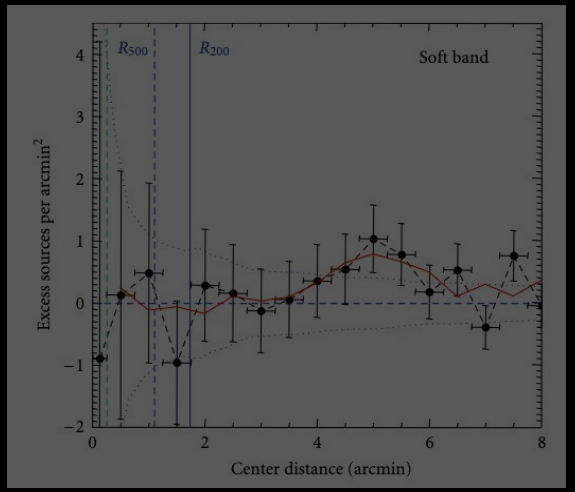


Ruderman & Ebeling (2005)

Mean of 5 clusters



Koulouridis & Bartalucci (2019)



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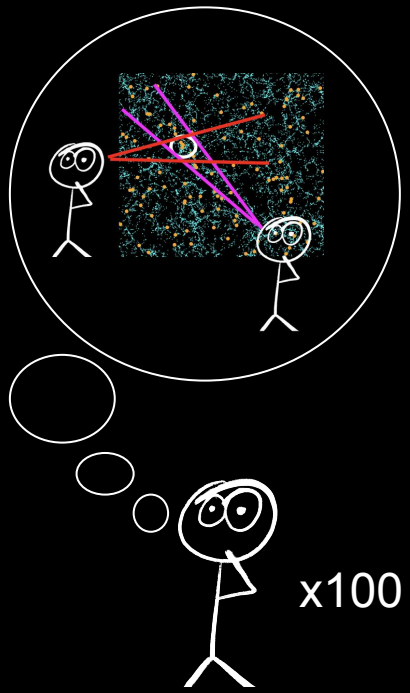
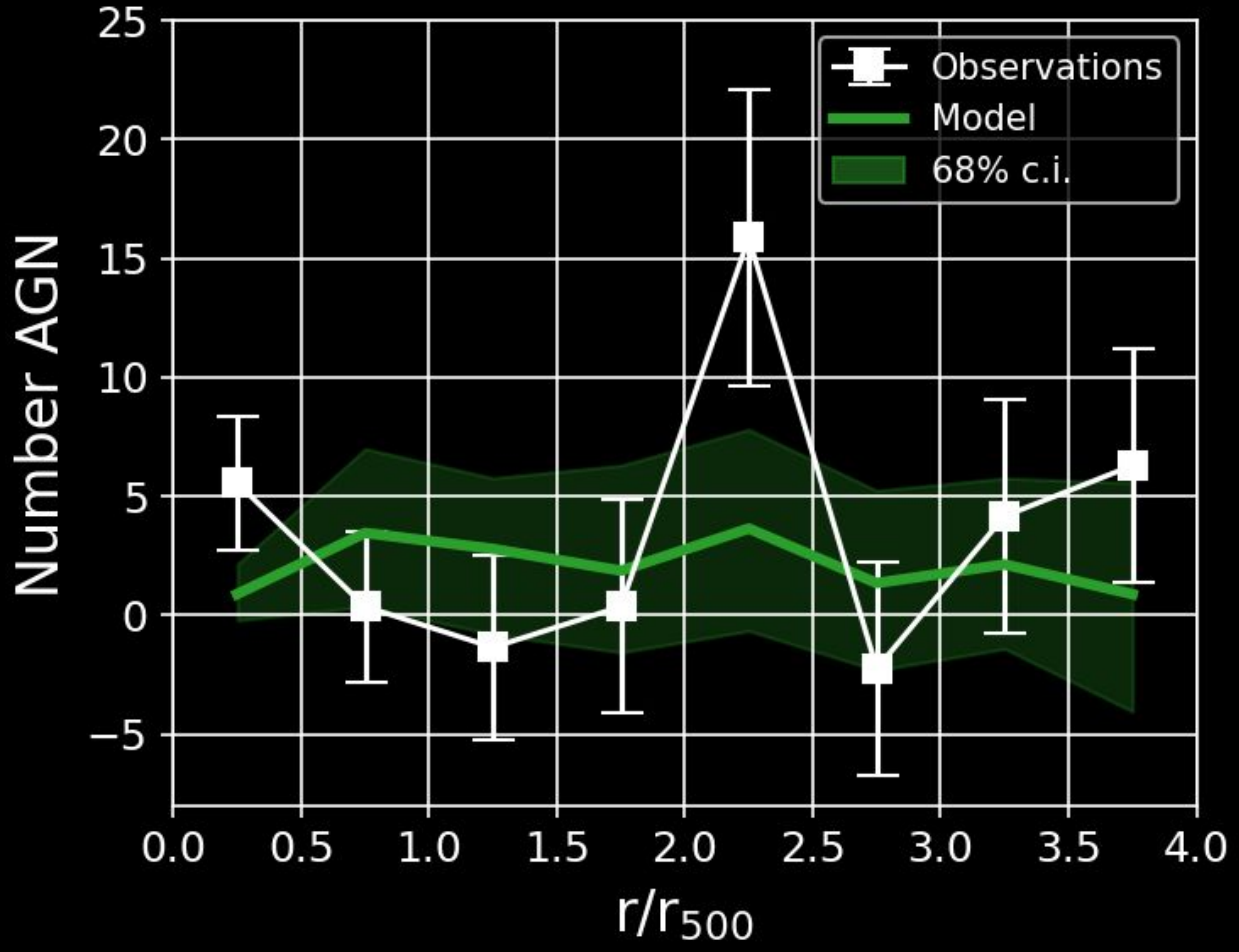
Radial distribution of AGN in clusters



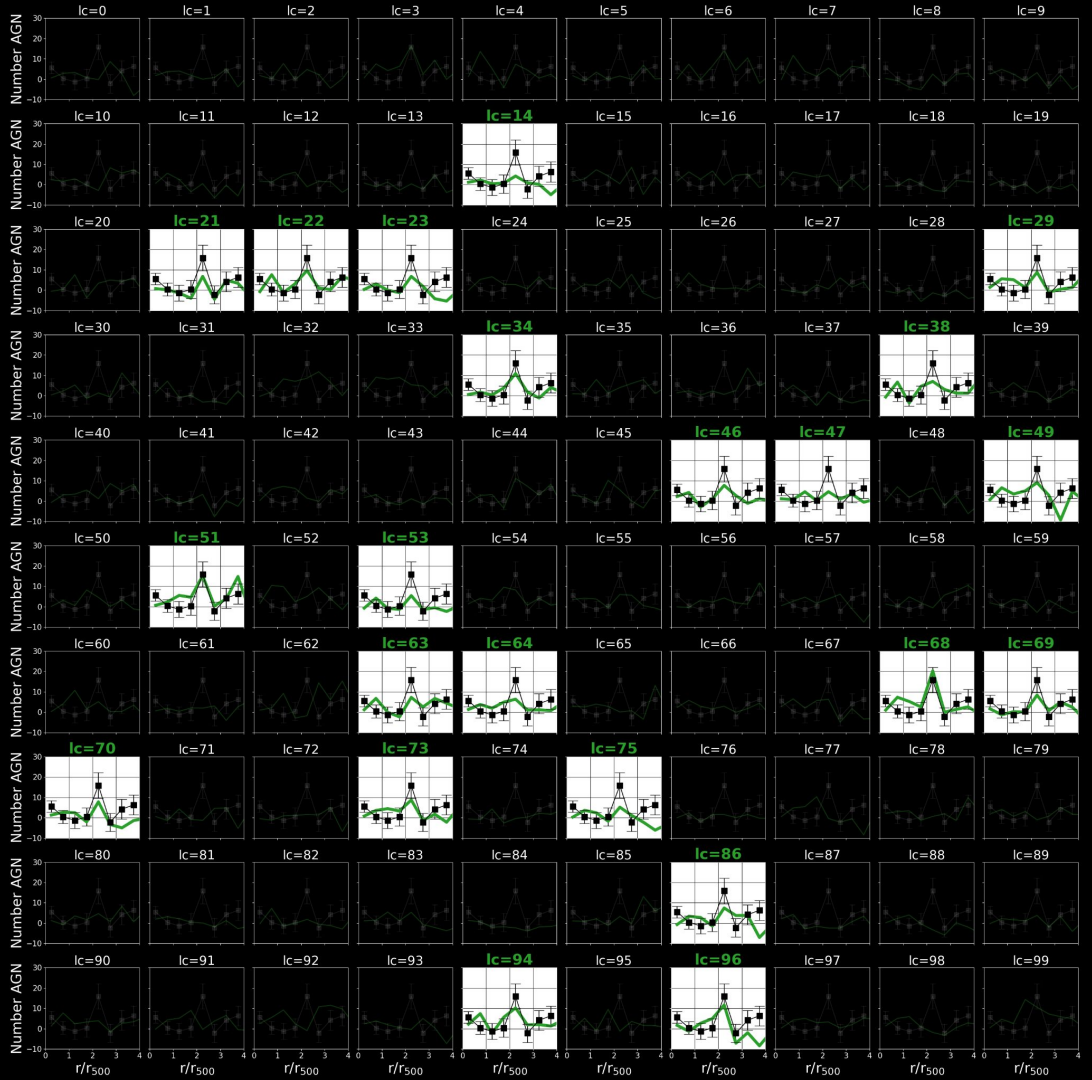
In prep.

Radial distribution of AGN in clusters



In prep.

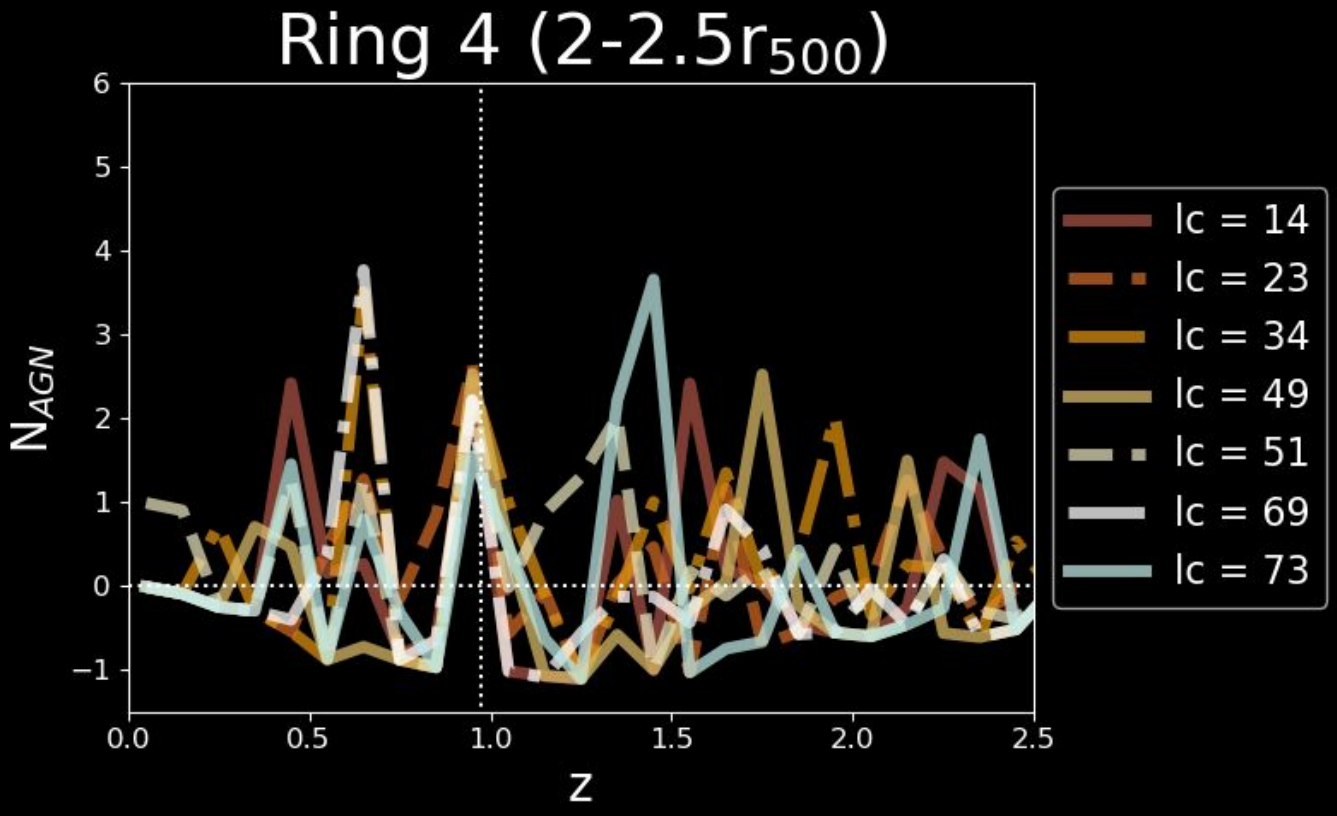
Radial distribution of AGN in clusters



~ 10-20 % of the observers show an overdensity

In prep.

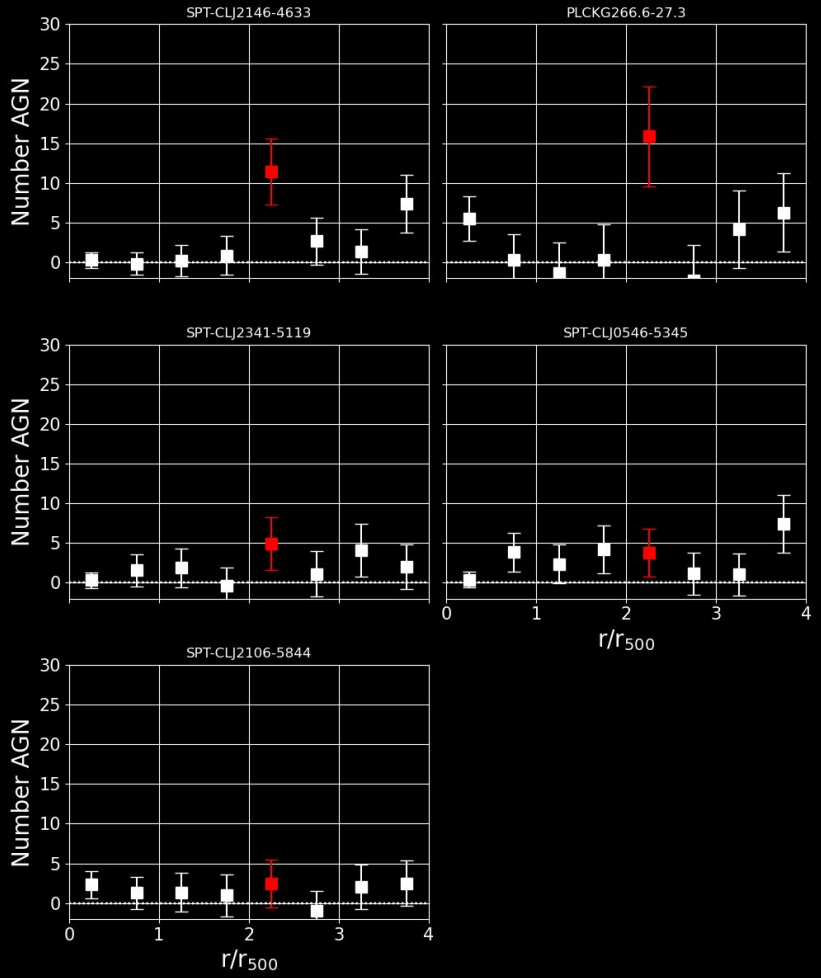
Radial distribution of
AGN in clusters



~ 10-20 % of the observers show an overdensity

In prep.

Radial distribution of AGN in clusters



~ 50±20 % of the clusters observed show a clear overdensity

Koulouridis & Bartalucci (2019)

Future plans

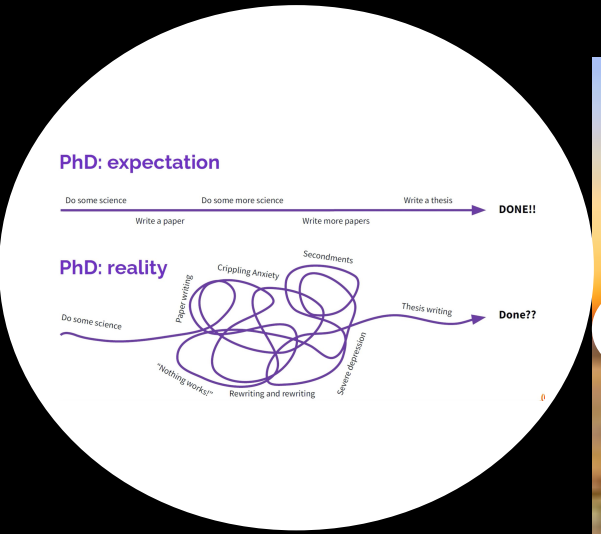
Observations

- Increase sample of cluster and study their radial distributions (on going)
- Optical follow-up (photo. and spect.) of clusters with overdensities (on going)
- Archival data cluster cluster catalogues + spectroscopy (e.g., Abell+SDSS, GOGREEN)
- Explore other environments (e.g., voids)

Modelling

- Explore modifications of the SEM (including some environment dependence e.g., close pairs)
- Compare these results with other approaches (e.g., hydrodynamical simulations, SAMs)

Thank you!



ivan.rodriguez@noa.gr

That's all Folks!