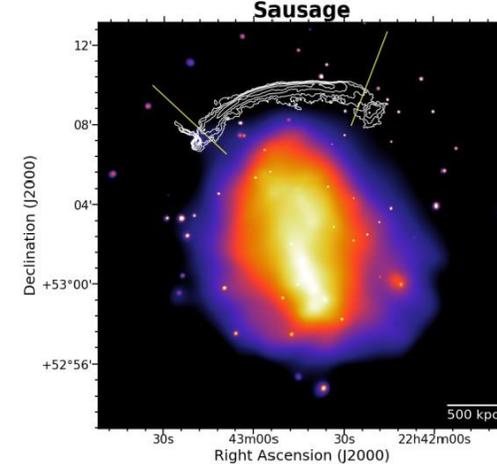
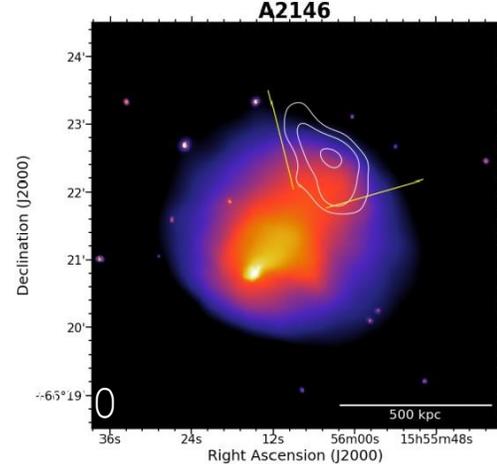
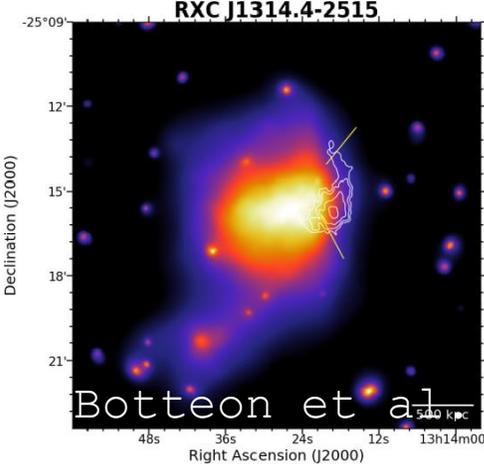
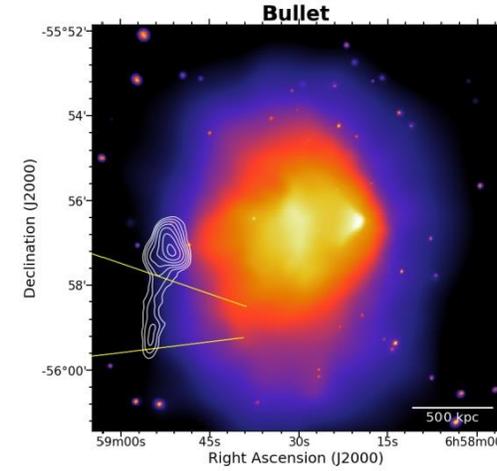
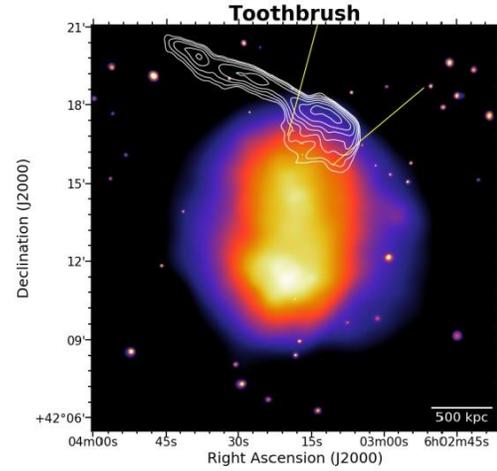
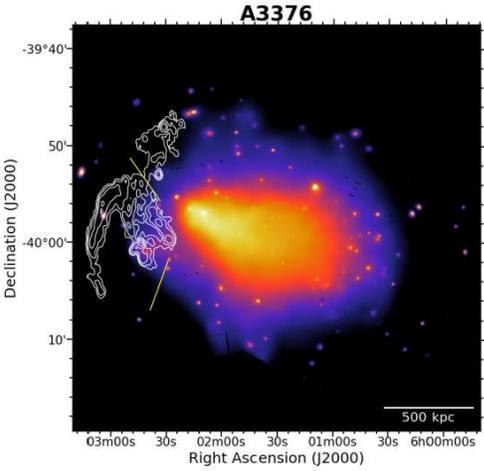
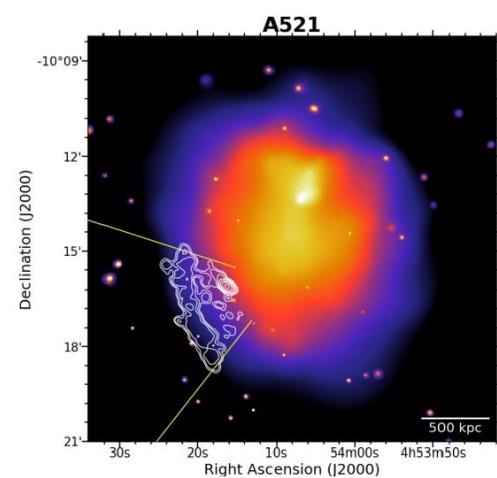
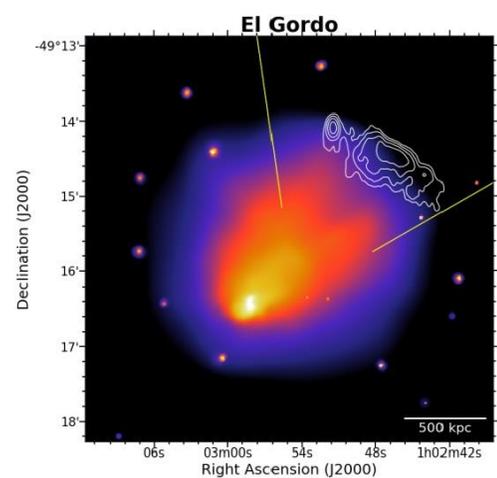
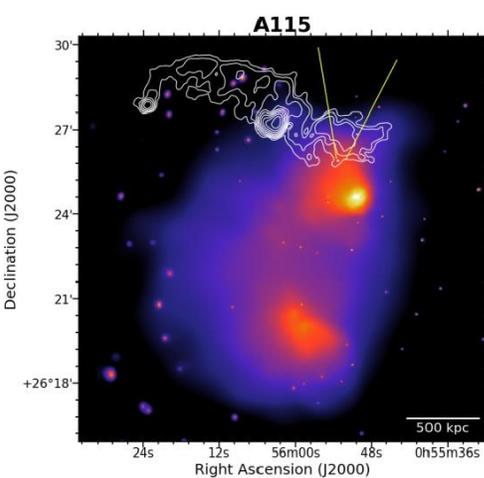


Large Scale Structure, Protoclusters,  
Galaxy Clusters and Groups

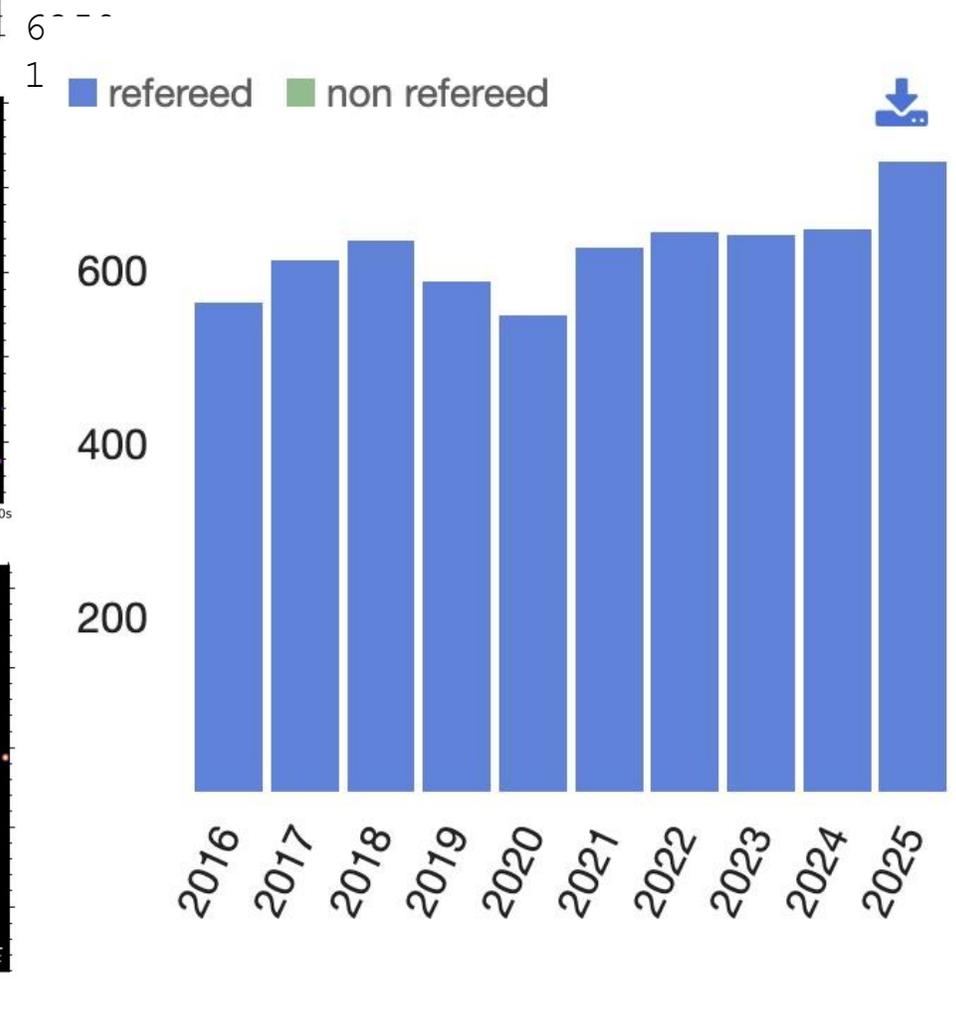
@ INAF

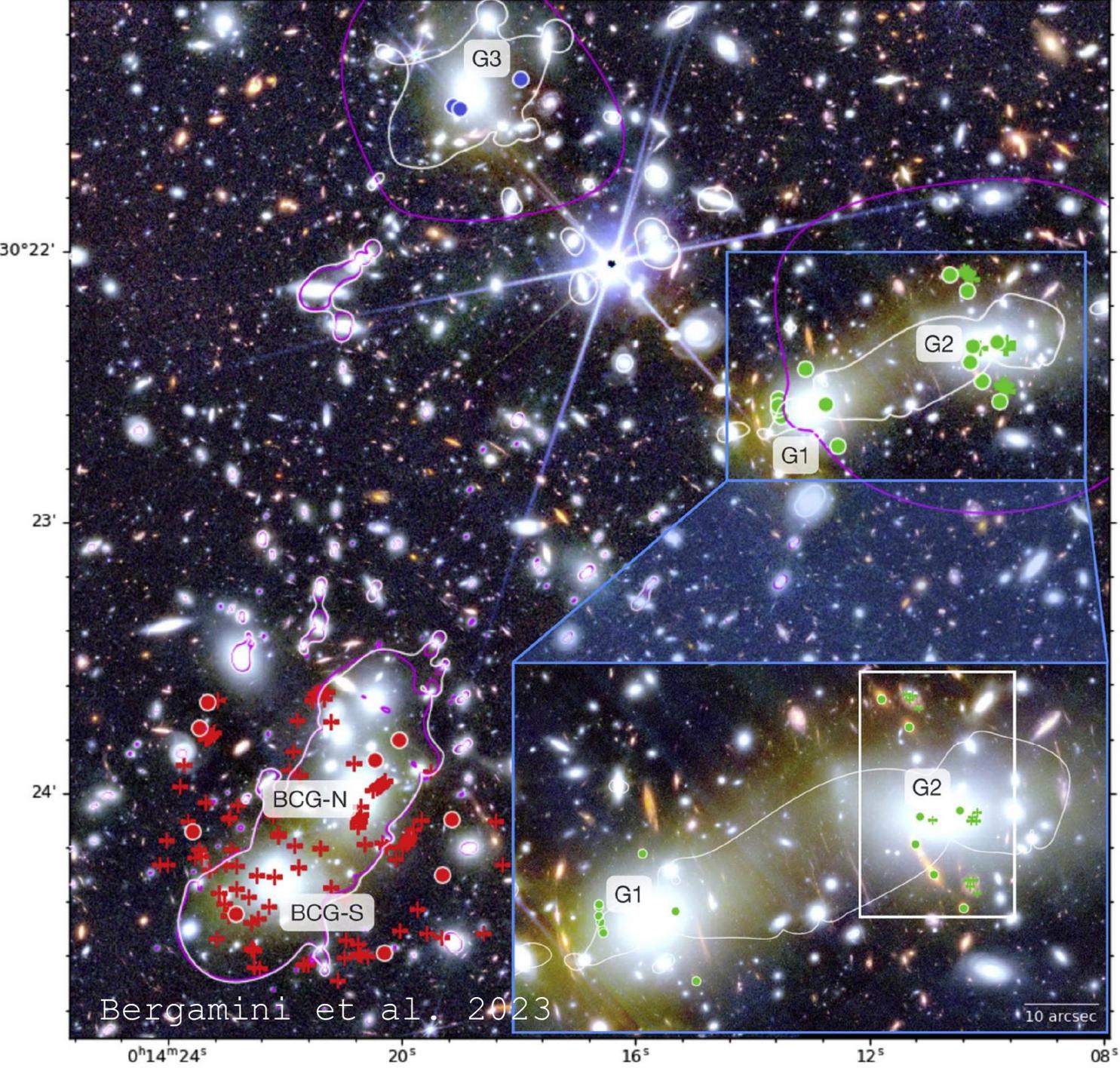


Silvano Molendi – INAF IAPS Milano  
Paolo Tozzi – INAF-Osservatorio Astrofisico  
di Arcetri

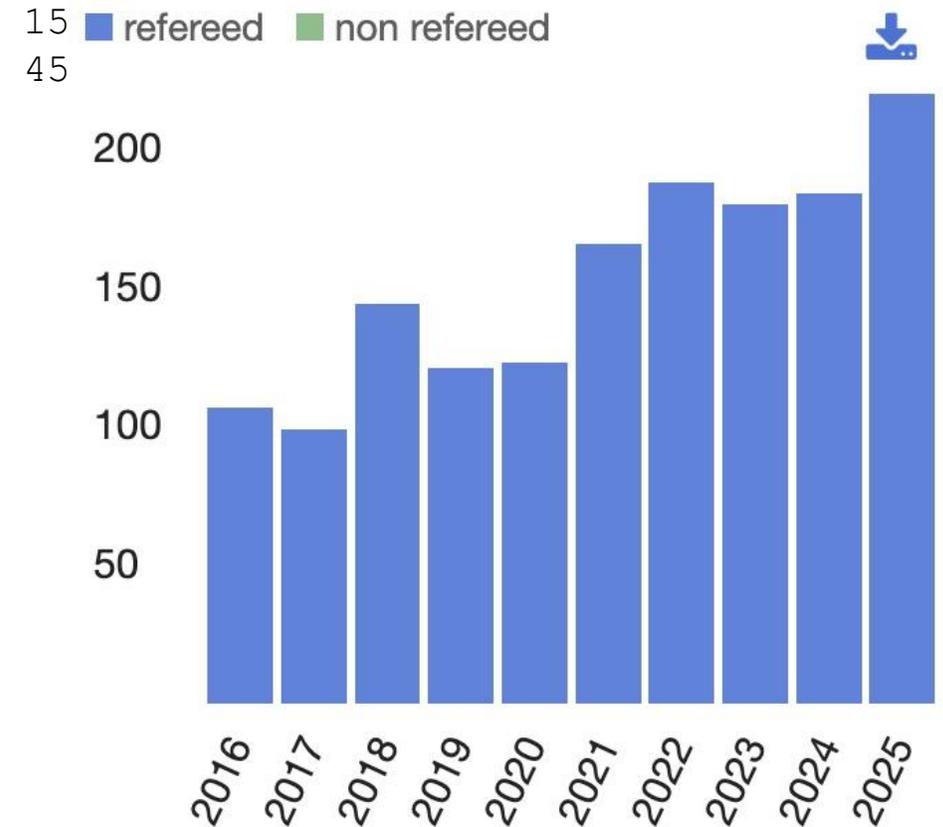


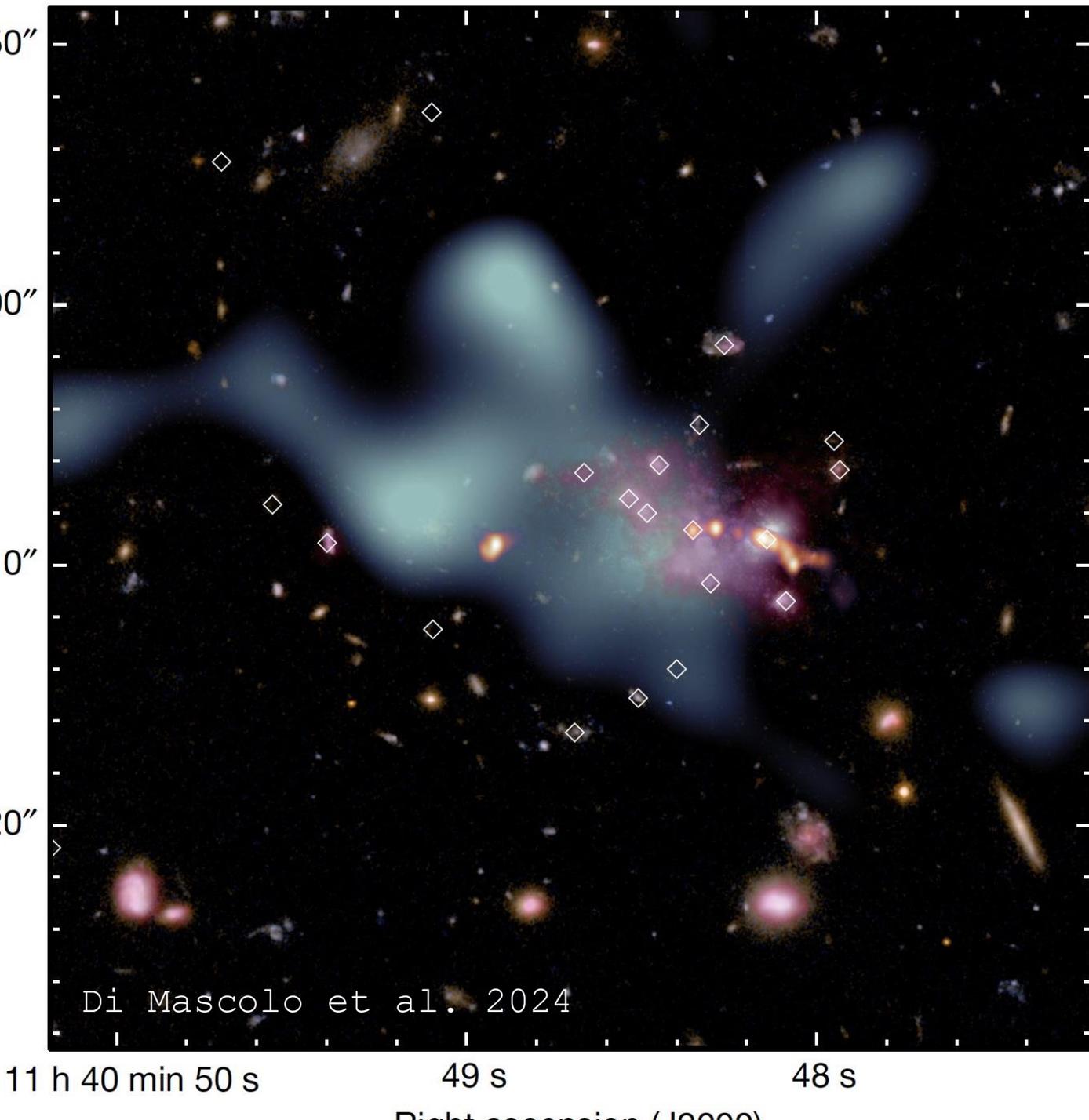
```
keyword: ("galaxy-cluster" OR "galaxy-group" OR "protocluster" OR "cosmic web") NOT (keyword: "solar" OR =keyword: "open cluster" OR =keyword: "star cluster" OR keyword: "globular") -title: "solar" year: 2016-2025 property: refereed
```





```
keyword: ("galaxy-cluster" OR "galaxy-
group" OR "protocluster" OR "cosmic
web") NOT (keyword:"solar" OR
=keyword:"open cluster" OR
=keyword:"star cluster" OR
keyword:"globular" OR
keyword:"Polycyclic") -title:"solar"
year:2016-2025 property:refereed
aff:(INAF OR Osservatorio)
```



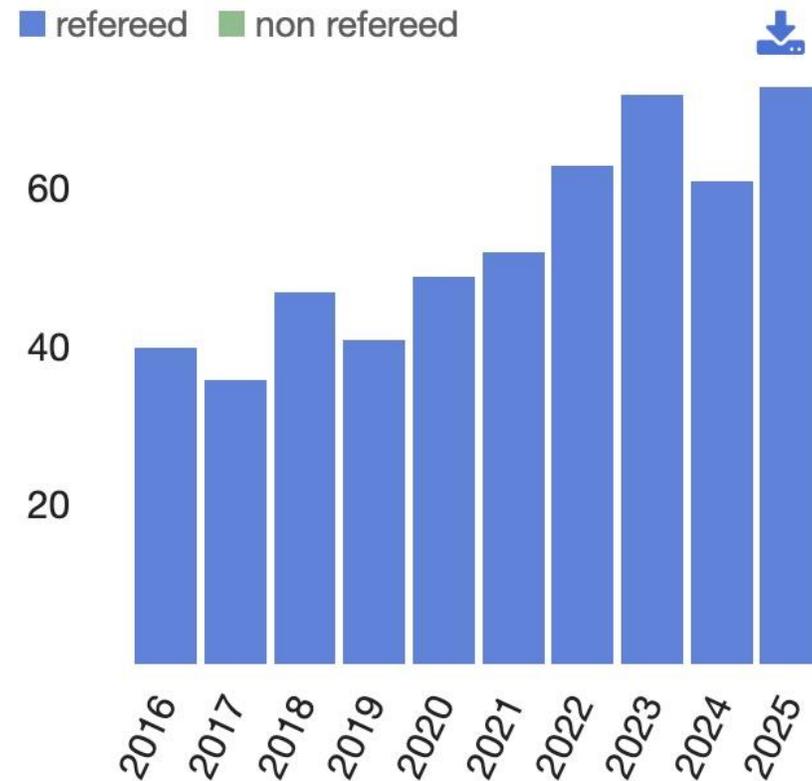


```
keyword: ("galaxy-cluster" OR "galaxy-
group" OR "protocluster" OR "cosmic
web") NOT (keyword:"solar" OR
=keyword:"open cluster" OR
=keyword:"star cluster" OR
keyword:"globular") -title:"solar"
year:2016-2025 property:refereed
pos(aff:(INAF OR Osservatorio), 1)
```

534 papers (8.5%)

15

■ refereed ■ non refereed





### **Non-Thermal Processes (103 papers/316)**

Feedback; Radio halos and relics; Radio galaxies; Magnetic fields: magnetohydrodynamical simulations; cosmic rays (LOFAR, MeerKAT, SKA, Chandra, XMM)

### **Environment (67 papers/316)**

Galaxy population: evolution, jellyfish galaxies, star formation and nuclear activity vs space and cosmic time: inversion of the red sequence, AGN in clusters and protoclusters; Cool cores/cooling flows; Cosmic weather; Massive galaxies: BCG (MUSE@VLT, ALMA, JWST, HST)

### **Cosmology and Early Universe (60 papers/316)**

Topology of the cosmic web; strong lensing: clusters as cosmic telescope; early universe; geometrical (time delay, lensing,  $\sim$ baryon fraction) vs dynamical (mass function, concentration) cosmological tests with clusters ;cluster surveys (Euclid; eROSITA; Planck; SPT, ACT; LSST; numerical simulations)

### **Baryon Distribution (55 papers/316)**

Baryon budget across scale and time: groups vs clusters, and clusters vs protoclusters (stars, dark matter, ICM, warm and cold gas); chemical enrichment & evolution; scaling relations; baryon cycle; large samples/surveys (MUSE@VLT, ALMA, Chandra, XMM; numerical simulations)

### **Dynamics (25 papers/316)**

Hydrostatic equilibrium; velocity dispersion; optical - dynamics at many  $R_{\text{vir}}$ ; ICM bulk motion (XRISM, Athena; VLT, ELT, Subaru, VST, NTT, numerical simulations)

### **Fundamental Physics (6 papers/316)**

Alternative theories of gravity; Dark matter annihilations: gamma; Dark matter substructures (GTA)

## Non thermal processes

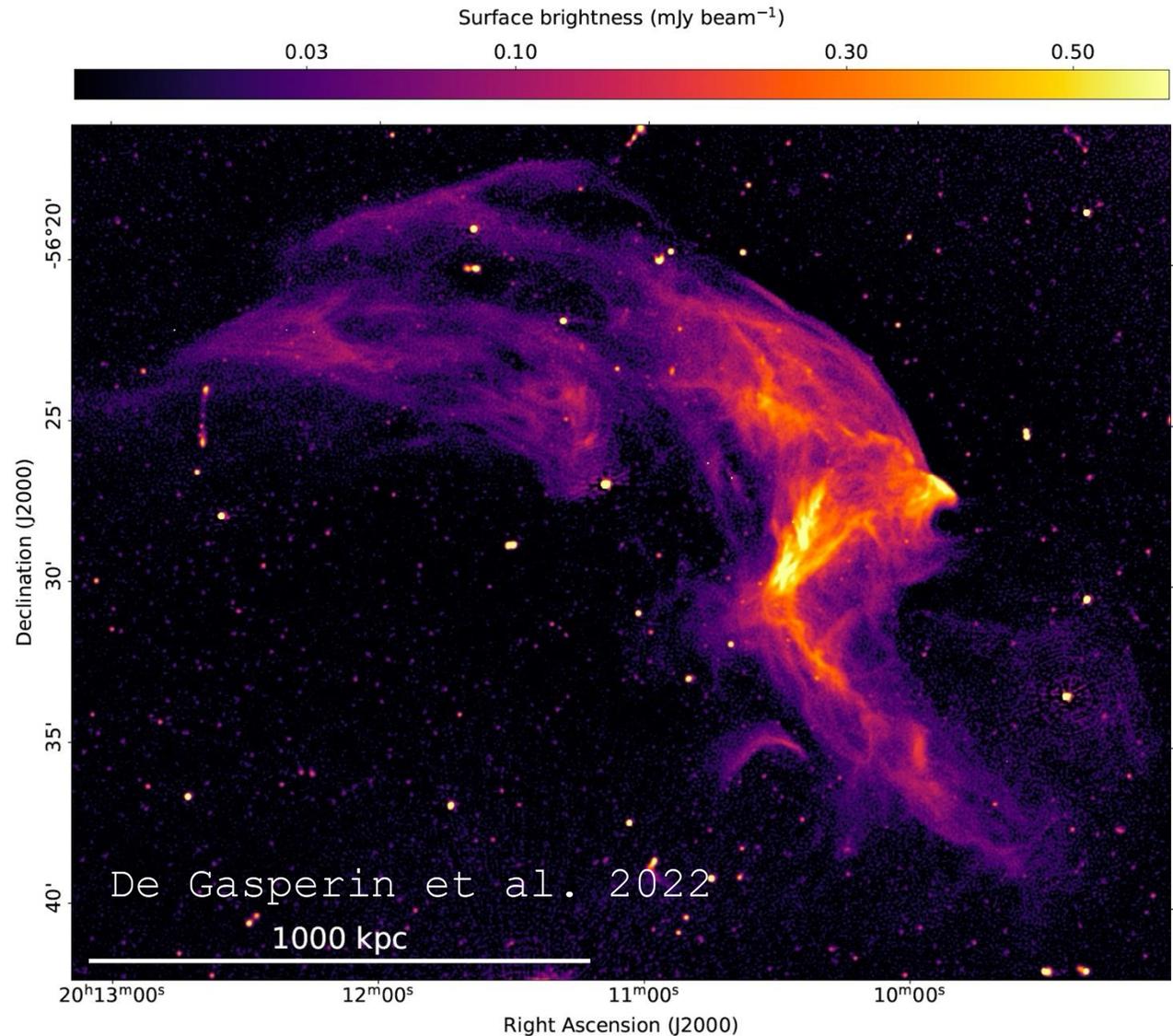


LOFAR observations of the radio halo in Coma:  
a step forward in the understanding of  
particle acceleration in clusters.

# Non thermal processes

LOFAR observations of the radio halo in Coma: a step forward in the understanding of particle acceleration in clusters.

MeerKAT view of A3667 + simulations unveiled the complexity of the interplay between the thermal and non-thermal components in the most active regions of a merging cluster - examples of non-trivial magnetic properties of the ICM.

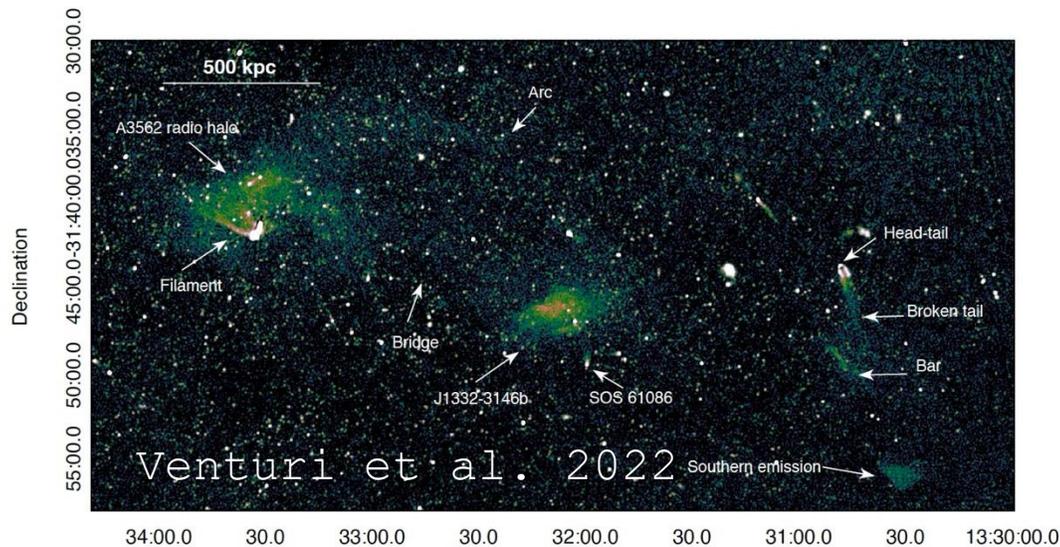
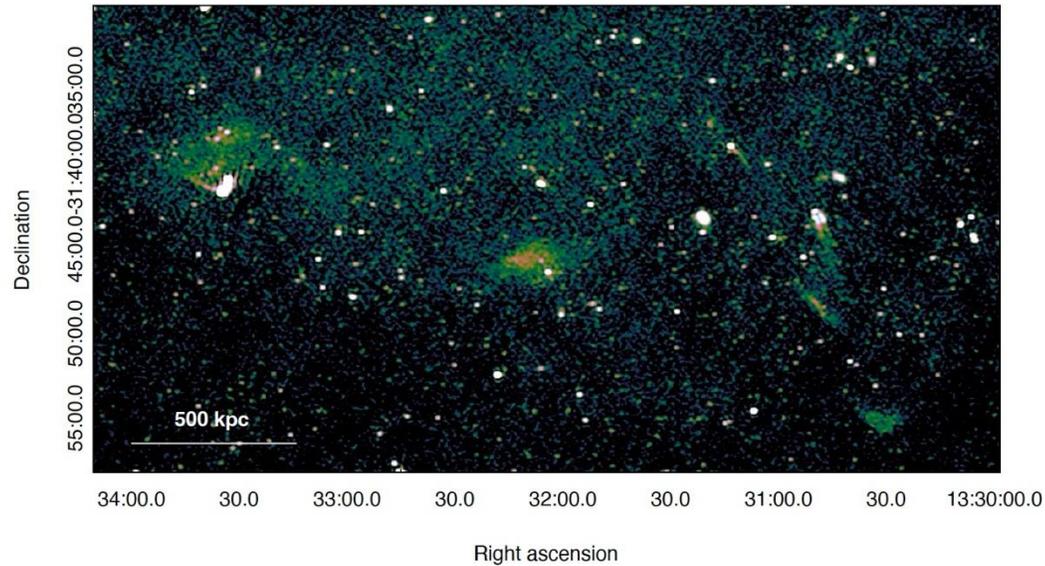


# Non thermal processes

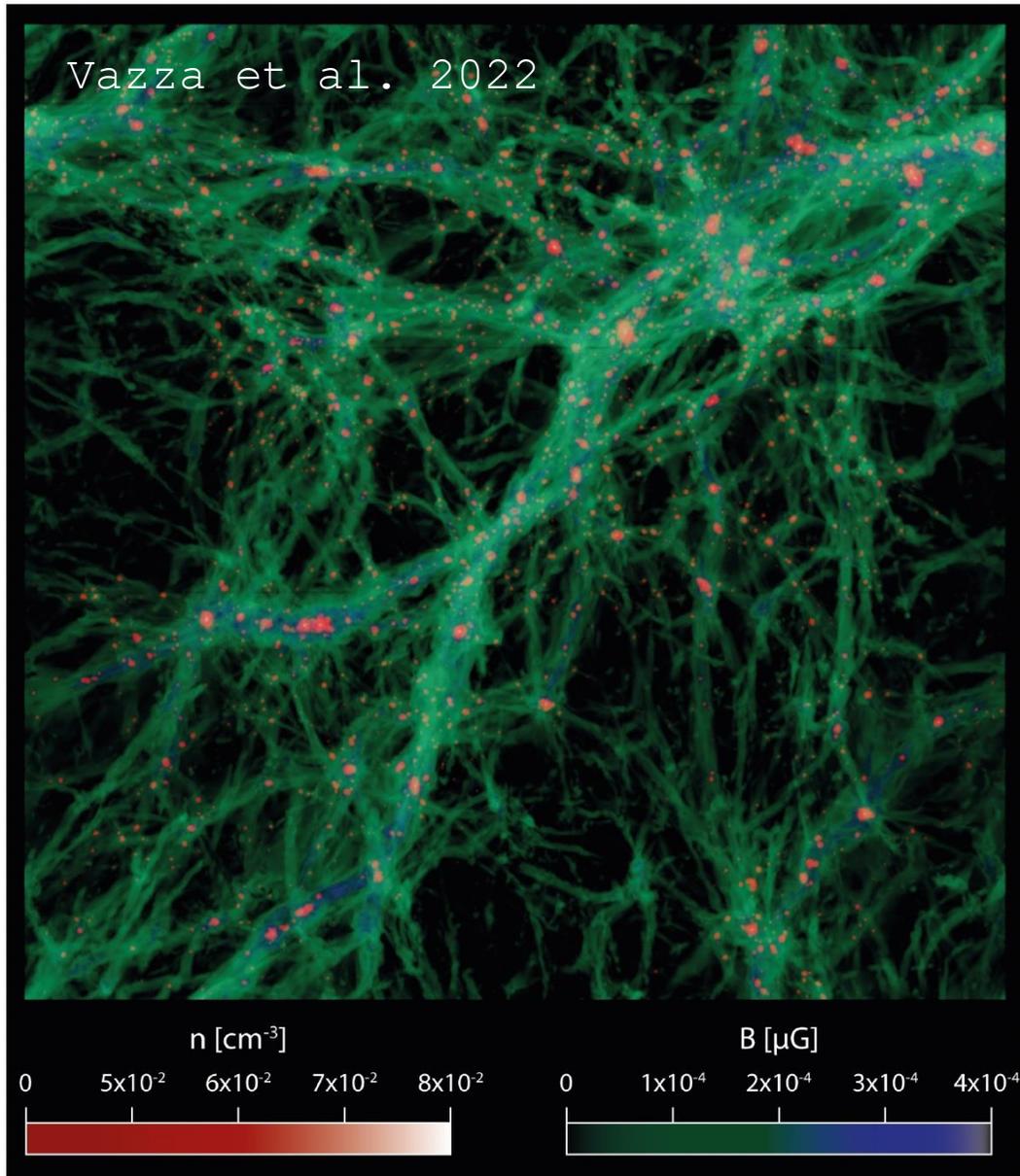
LOFAR observations of the radio halo in Coma: a step forward in the understanding of particle acceleration in clusters.

MeerKAT view of A3667 + simulations unveiled the complexity of the interplay between the thermal and non-thermal components in the most active regions of a merging cluster - examples of non-trivial magnetic properties of the ICM.

ASKAP, MerKAT, GMRT and XMM view of A3562: minor mergers have the potential to generate diffuse radio emission that carries important information on the formation of large-scale structures in the Universe.



## Non thermal processes



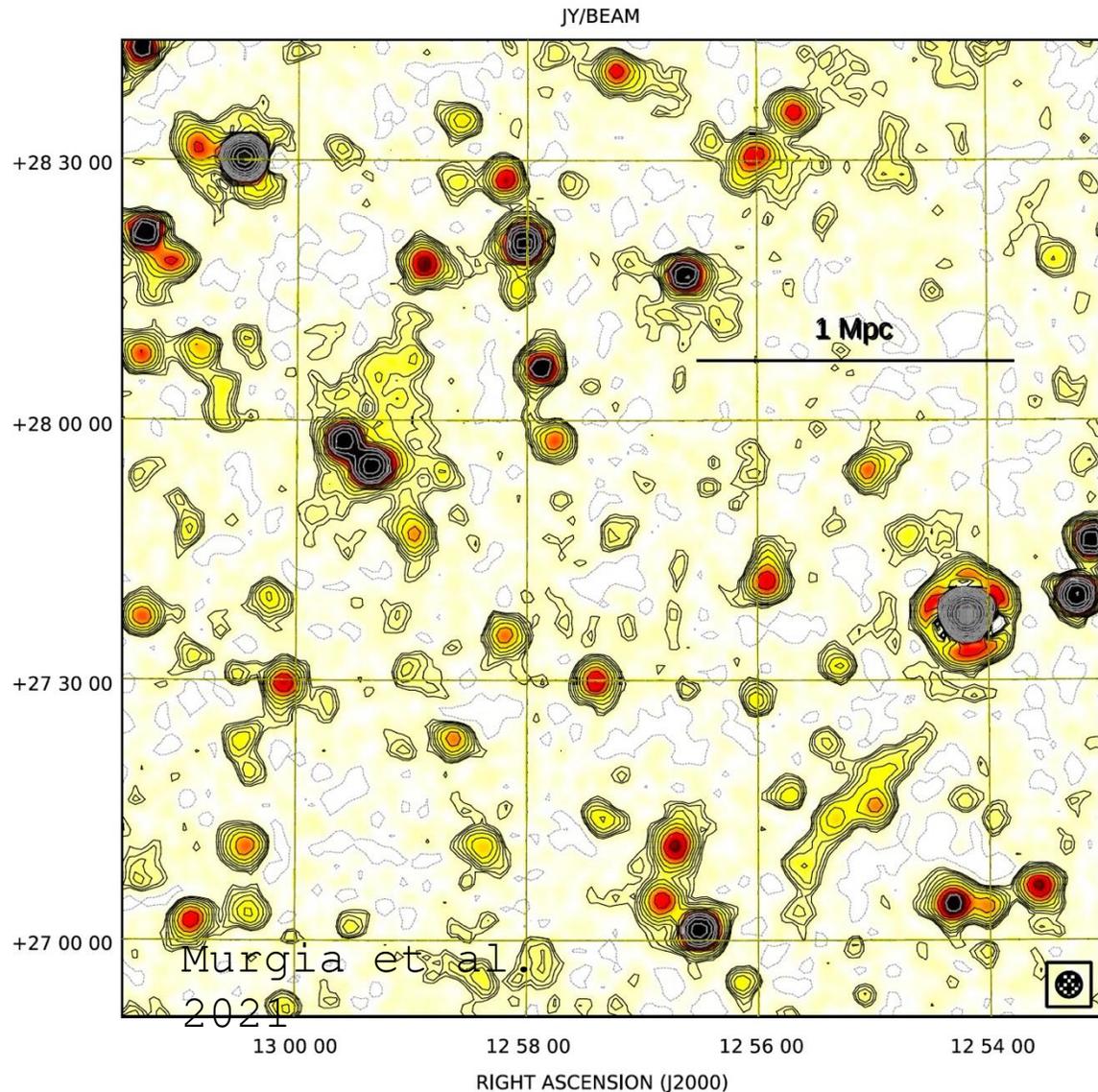
LOFAR observations of the radio halo in Coma: a step forward in the understanding of particle acceleration in clusters.

MeerKAT view of A3667 + simulations unveiled the complexity of the interplay between the thermal and non-thermal components in the most active regions of a merging cluster - examples of non-trivial magnetic properties of the ICM.

ASKAP, MerKAT, GMRT and XMM view of A3562: minor mergers have the potential to generate diffuse radio emission that carries important information on the formation of large-scale structures in the Universe.

Advanced simulations of cosmic magnetism towards detection of the radio signal from filaments in the cosmic web to distinguish possible magnetogenesis scenarios.

## Non thermal processes



LOFAR observations of the radio halo in Coma: a step forward in the understanding of particle acceleration in clusters.

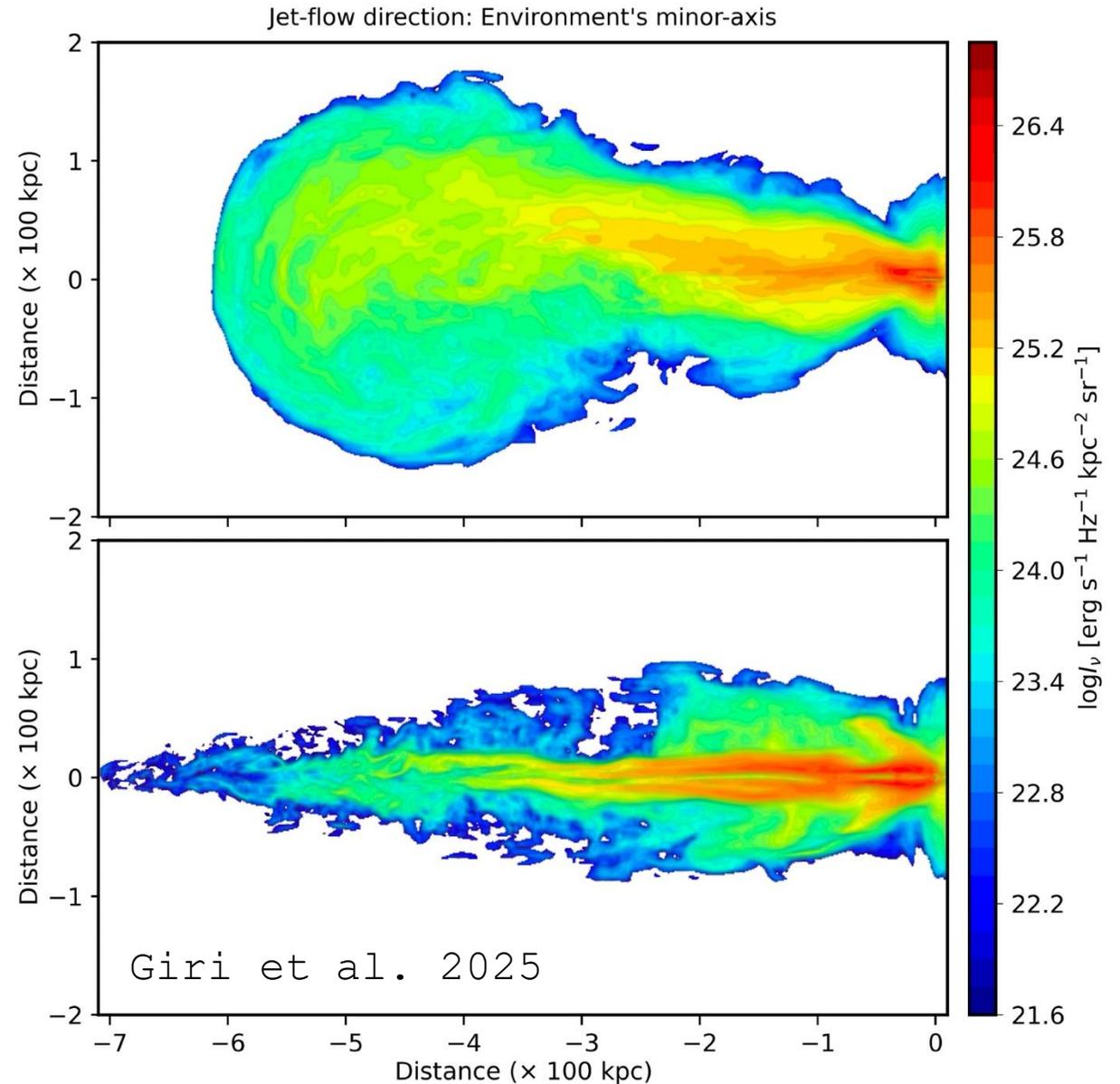
MeerKAT view of A3667 + simulations unveiled the complexity of the interplay between the thermal and non-thermal components in the most active regions of a merging cluster - examples of non-trivial magnetic properties of the ICM.

ASKAP, MerKAT, GMRT and XMM view of A3562: minor mergers have the potential to generate diffuse radio emission that carries important information on the formation of large-scale structures in the Universe.

Advanced simulations of cosmic magnetism towards detection of the radio signal from filaments in the cosmic web to distinguish possible magnetogenesis scenarios.  
[SRT 6 GHz observations of Coma: the highest frequency images available to date for radio sources in this galaxy cluster.](#)

# Non thermal processes

Probing the formation of megaparsec-scale giant radio galaxies II. Continuum and polarization behavior from magneto-hydrodynamic simulations

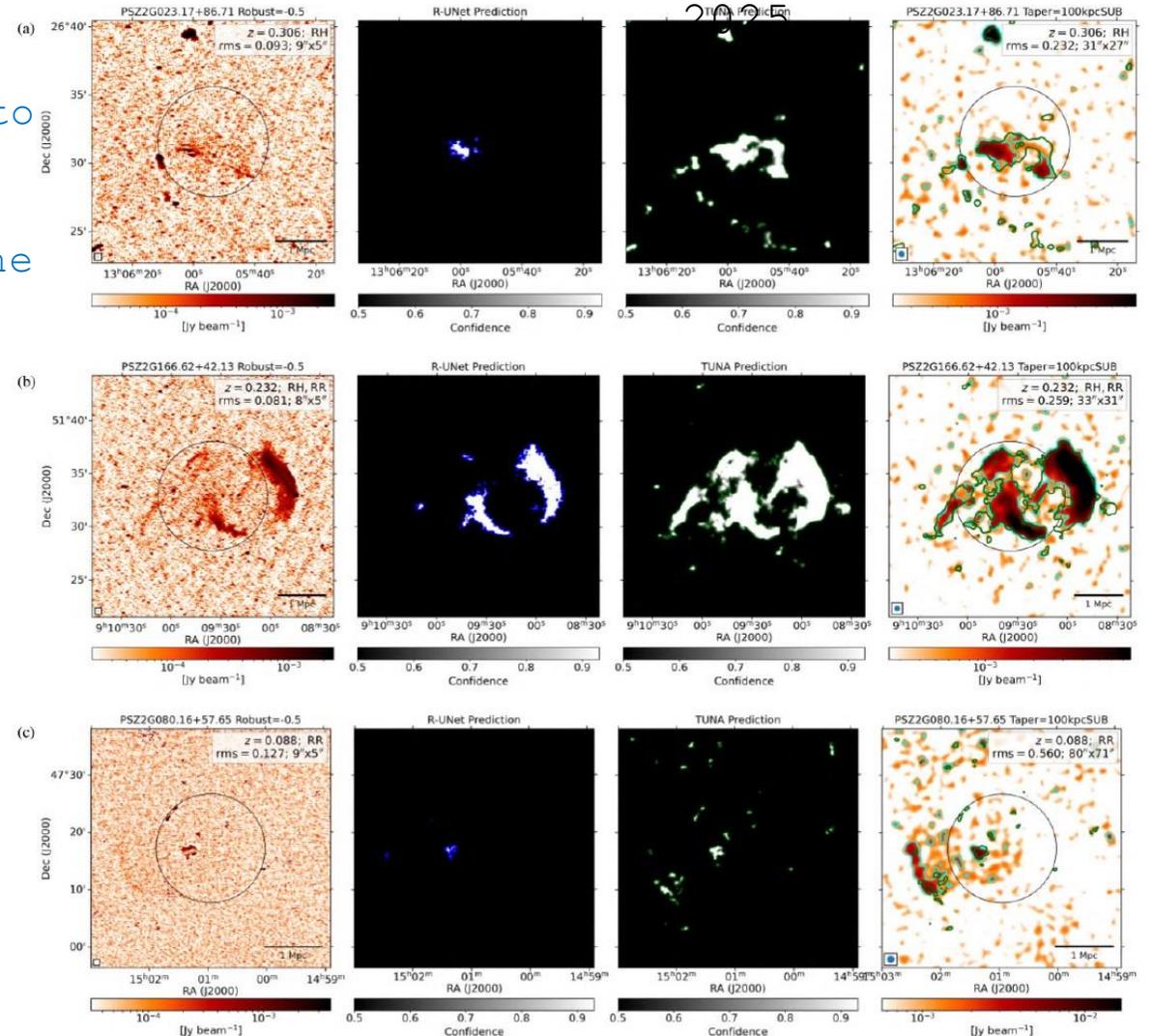


# Non thermal processes

Probing the formation of megaparsec-scale giant radio galaxies II. Continuum and polarization behavior from magneto-hydrodynamic simulations

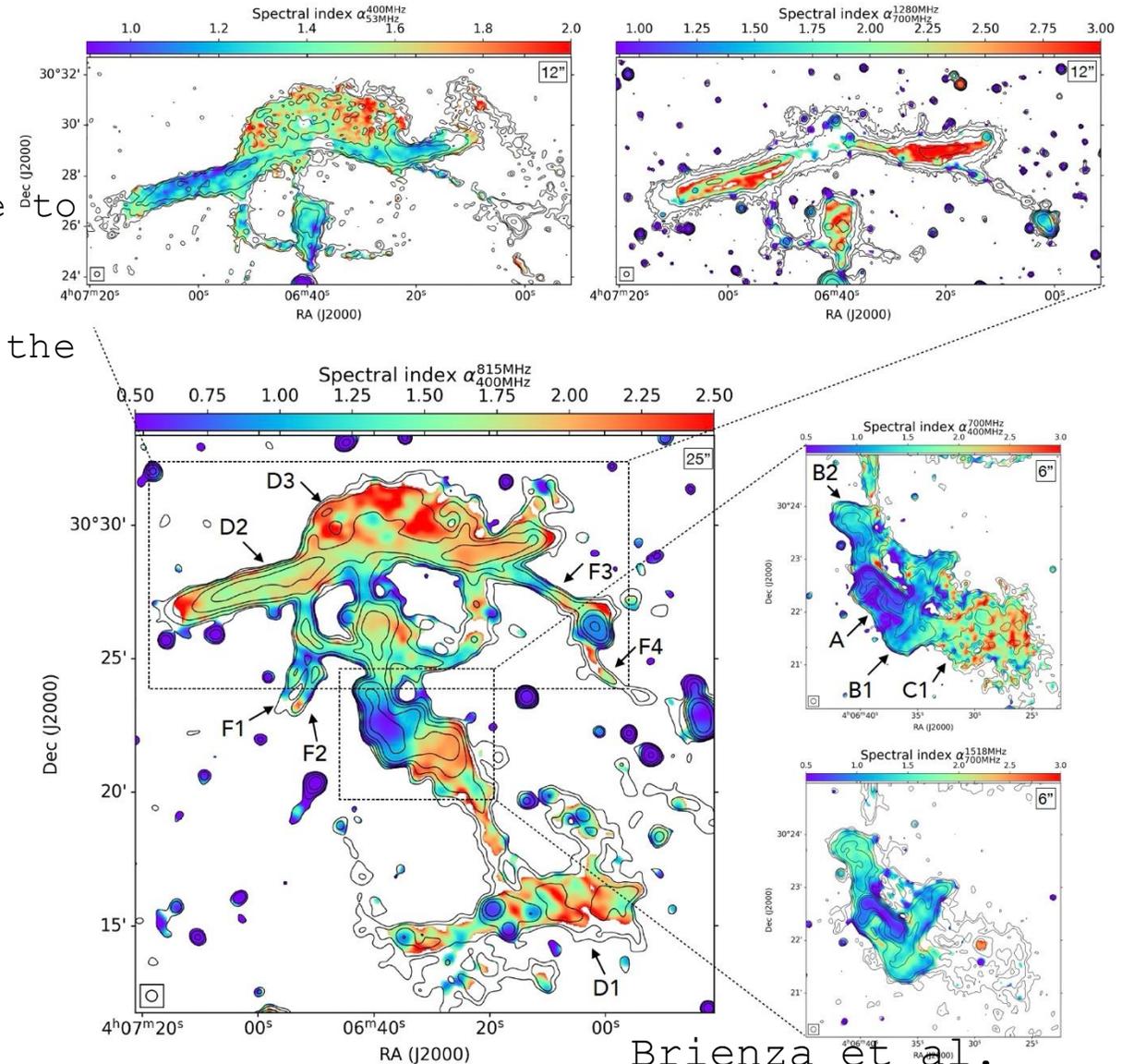
Vision transformers via TransUNet architecture to identify faint, diffuse radio showing significant advancement in accelerating discovery within the large data sets generated by next-generation radio telescopes.

Sanvitale et al.



# Non thermal processes

Probing the formation of megaparsec-scale giant radio galaxies II. Continuum and polarization behavior from magneto-hydrodynamic simulations  
Vision transformers via TransUNet architecture to identify faint, diffuse radio showing significant advancement in accelerating discovery within the large data sets generated by next-generation radio telescopes VLA and LOFAR observation of multiple radio bubbles from an AGN showing recurrent jet activity and maintenance mode of AGN feedback in galaxy groups.



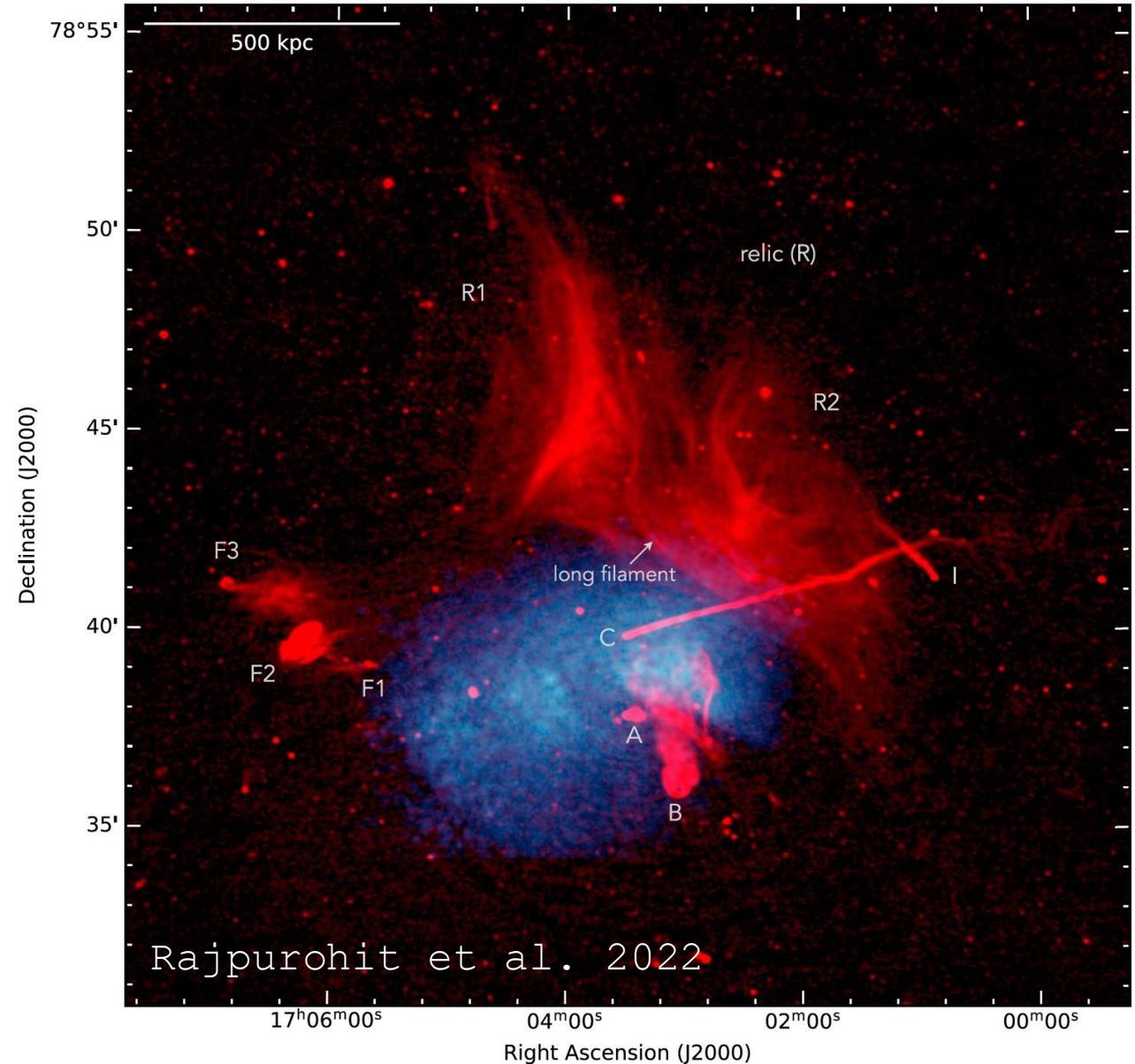
Brienza et al.

2025

# Non thermal processes

Probing the formation of megaparsec-scale giant radio galaxies II. Continuum and polarization behavior from magneto-hydrodynamic simulations  
Vision transformers via TransUNet architecture identify faint, diffuse radio showing significant advancement in accelerating discovery within large data sets generated by next-generation radio telescopes  
VLA and LOFAR observation of multiple radio bubbles from an AGN showing recurrent jet activity and maintenance mode of AGN feedback in galaxy groups.

uGMRT LOFAR and VLA observation of the complex filaments of magnetized relativistic plasma in A2256 tracing a complex shock front reaccelerating the electrons



# Non thermal processes

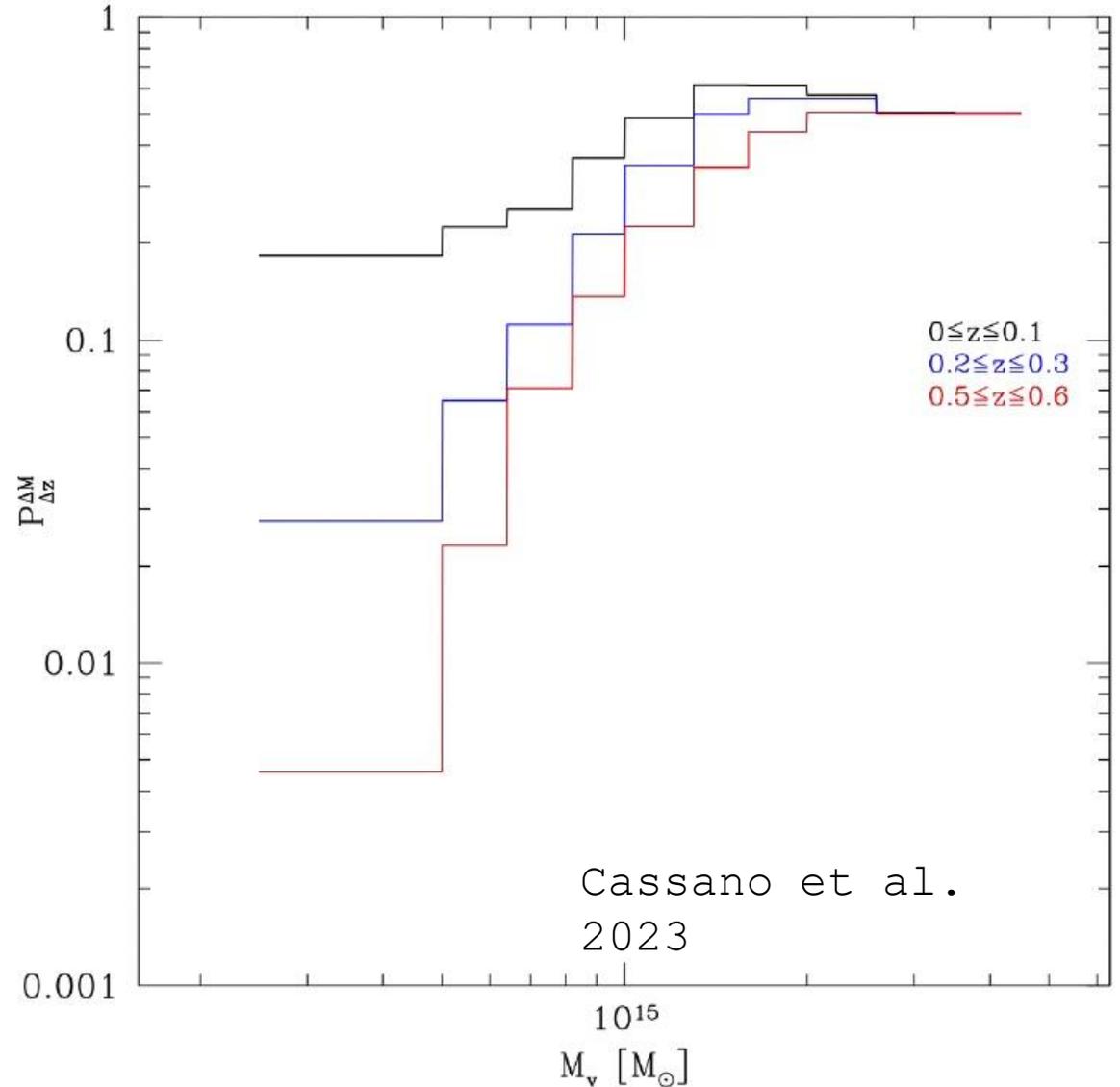
Probing the formation of megaparsec-scale giant radio galaxies II. Continuum and polarization behavior from magneto-hydrodynamic simulations

Vision transformers via TransUNet architecture identify

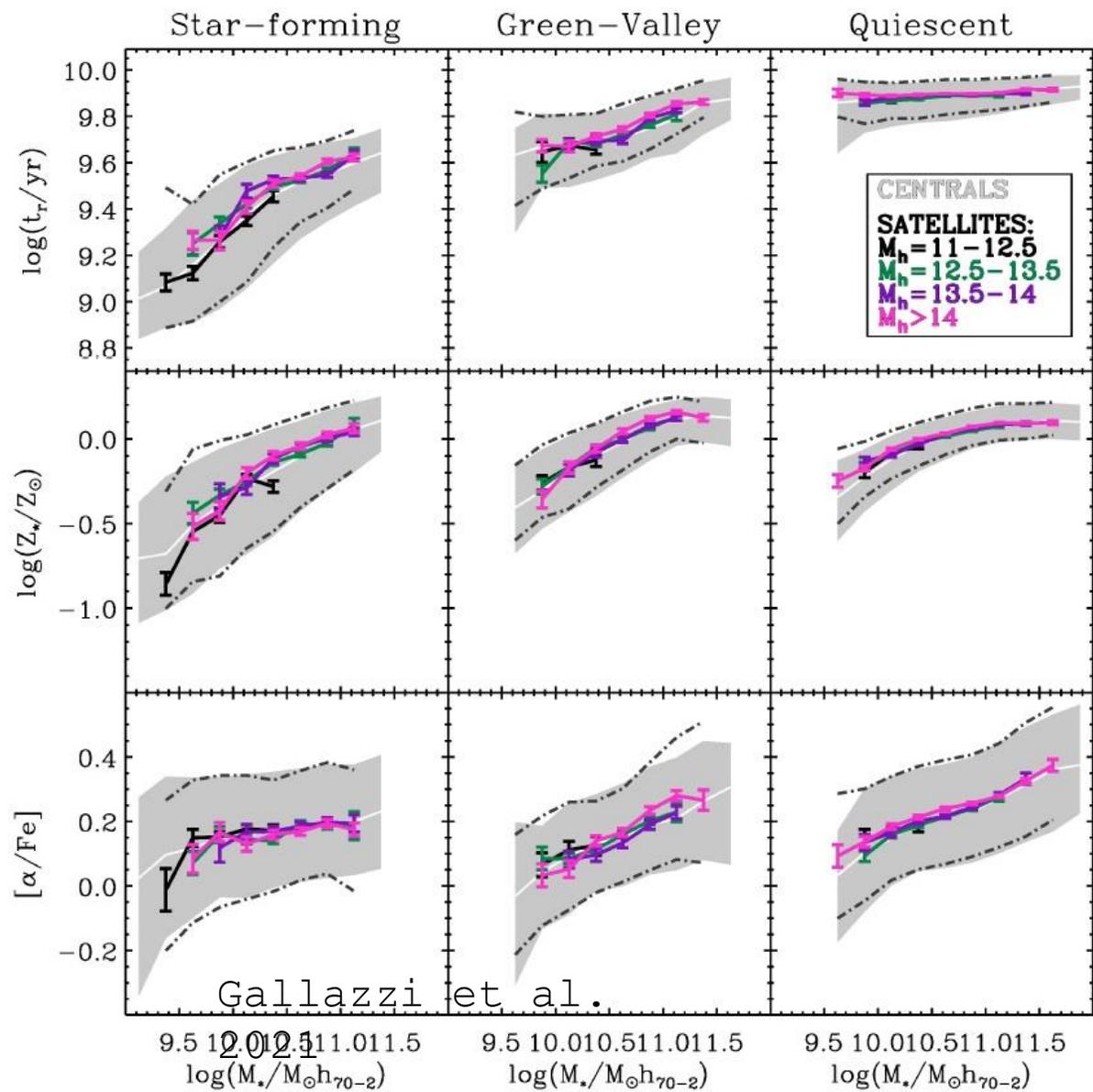
faint, diffuse radio showing significant advancement in accelerating discovery within large data sets generated by next-generation radio telescopes VLA and LOFAR observation of multiple radio bubbles from an AGN showing recurrent jet activity and maintenance mode of AGN feedback in galaxy groups.

uGMRT LOFAR and VLA observation of the complex filaments of magnetized relativistic plasma in A2256 tracing a complex shock front reaccelerating the electrons

The Planck clusters in the LOFAR sky: radio haloes are preferentially located in merging systems and their occurrence increases with mass



# Environment

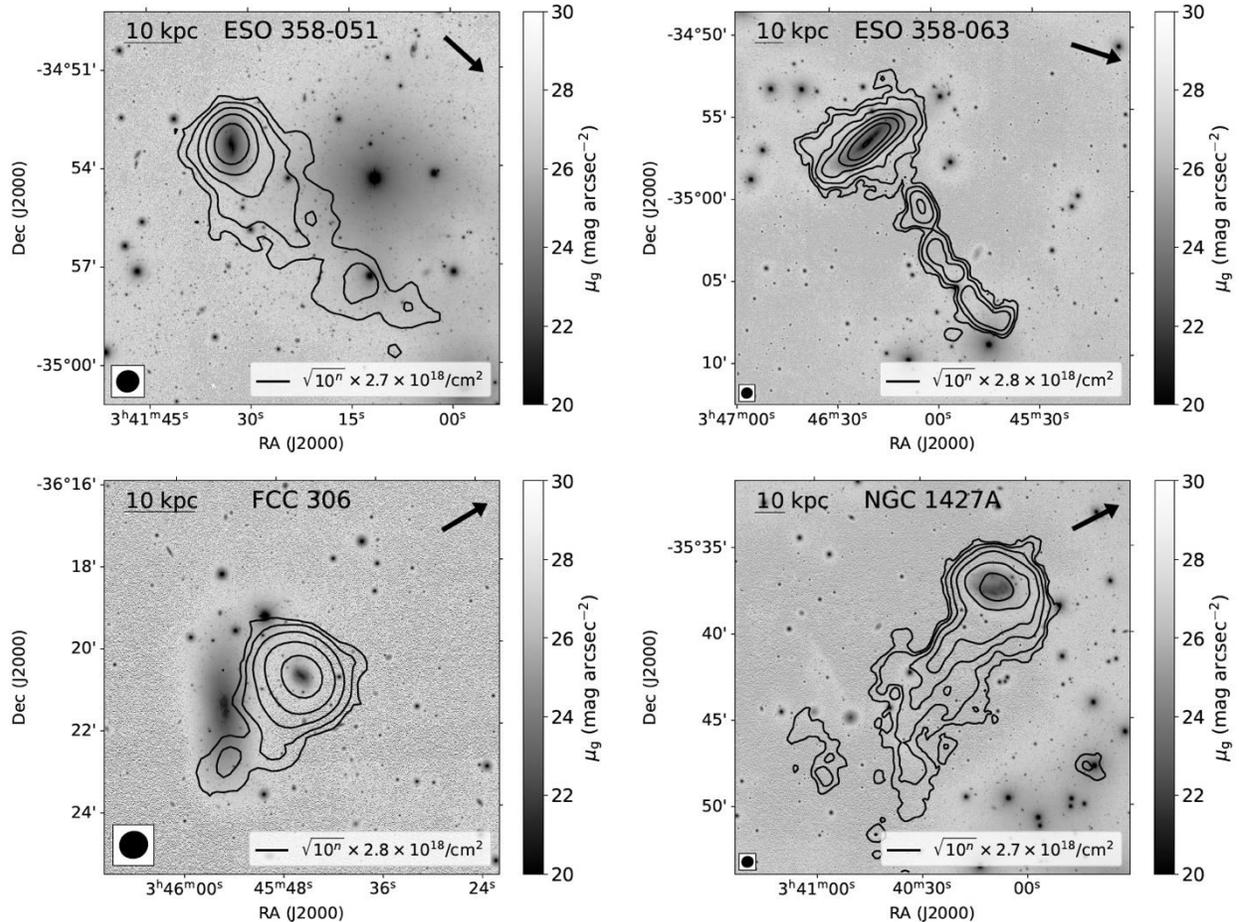


Galaxy evolution across environments as probed by the ages, stellar metallicities and  $\alpha/\text{Fe}$  of central and satellite galaxies

# Environment

Galaxy evolution across environments as probed by the ages, stellar metallicities and  $\alpha$ .Fe. of central and satellite galaxies

The MeerKAT Fornax Survey I. Survey description and first evidence of ram pressure in the Fornax galaxy cluster

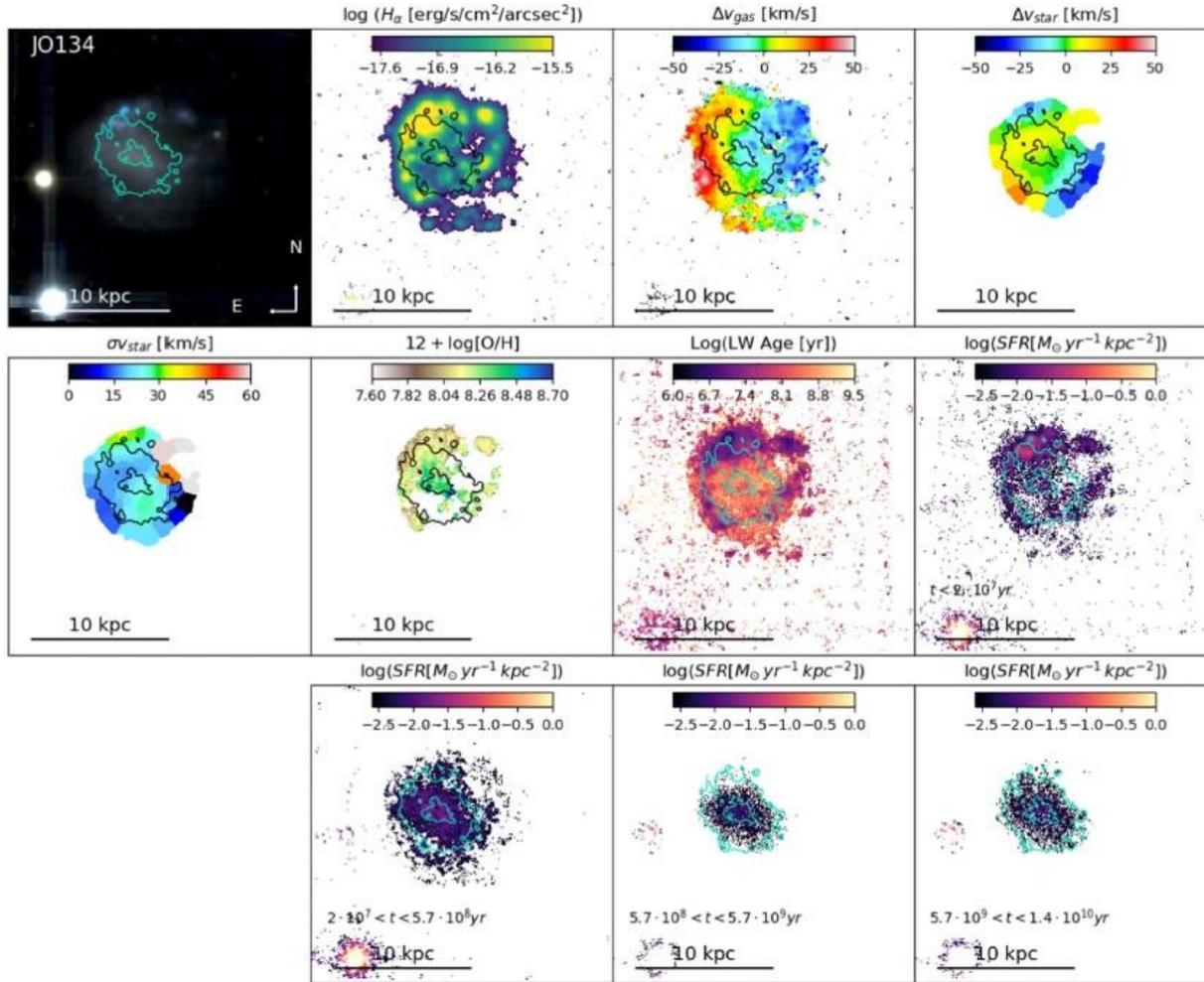


# Environment

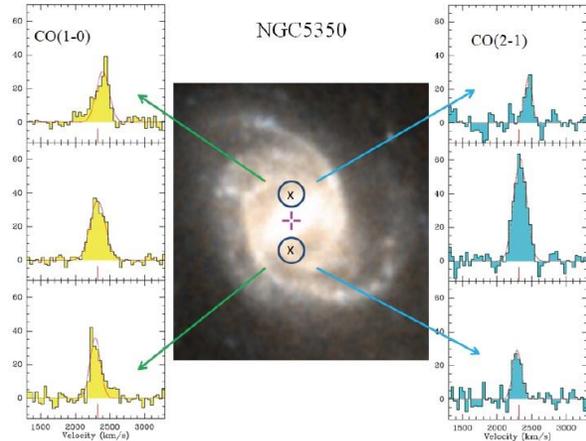
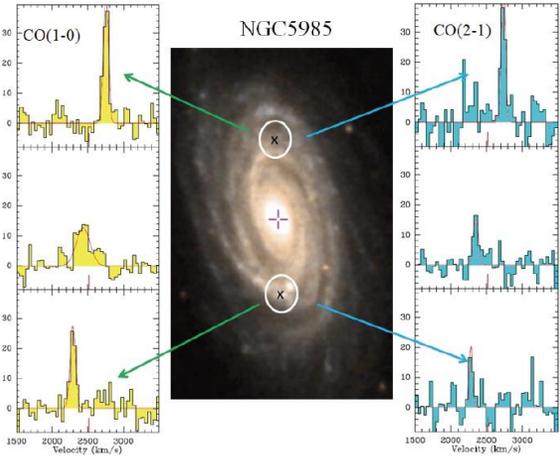
Galaxy evolution across environments as probed by the ages, stellar metallicities and  $\alpha$ .Fe. of central and satellite galaxies

The MeerKAT Fornax Survey I. Survey description and first evidence of ram pressure in the Fornax galaxy cluster

GASP. XXXIII. The Ability of Spatially Resolved Data to Distinguish among the different Physical Mechanisms affecting Galaxies in Low-density Environments



# Environment

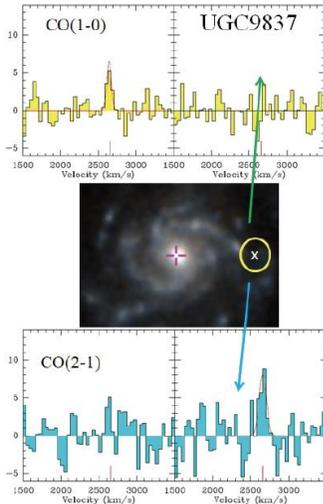
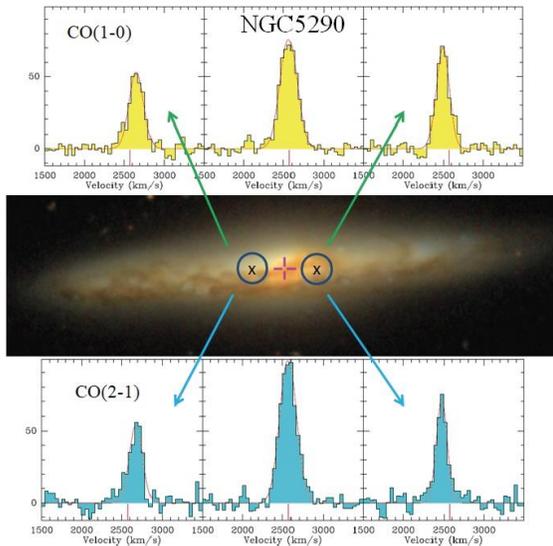


Galaxy evolution across environments as probed by the ages, stellar metallicities and  $\alpha$ .Fe. of central and satellite galaxies

The MeerKAT Fornax Survey I. Survey description and first evidence of ram pressure in the Fornax galaxy cluster

GASP. XXXIII. The Ability of Spatially Resolved Data to Distinguish among the different Physical Mechanisms affecting Galaxies in Low-density Environments

Virgo filaments I. Processing of gas in cosmological filaments around the Virgo cluster



# Environment

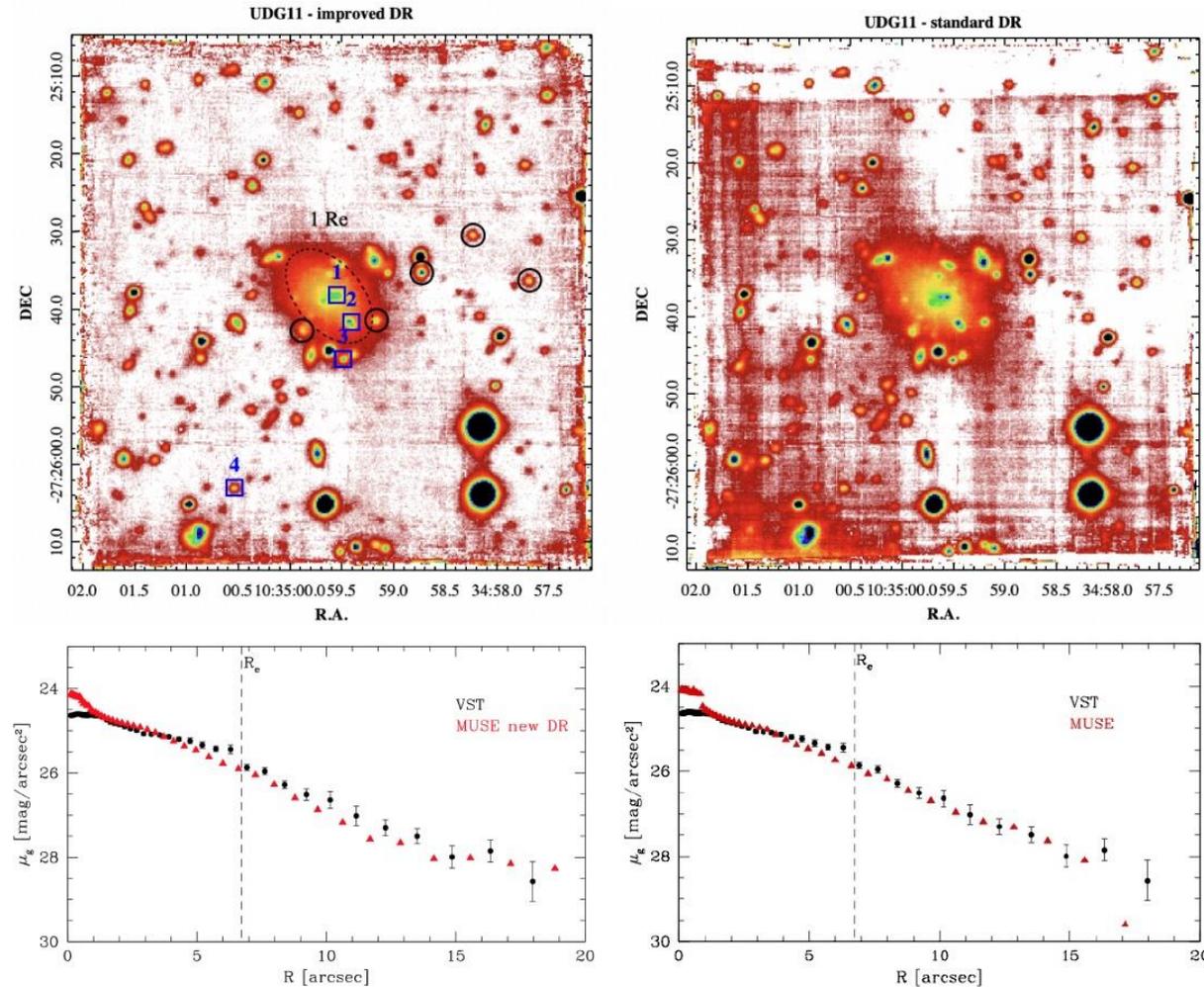
Galaxy evolution across environments as probed by the ages, stellar metallicities and  $\alpha$ .Fe. of central and satellite galaxies

The MeerKAT Fornax Survey I. Survey description and first evidence of ram pressure in the Fornax galaxy cluster

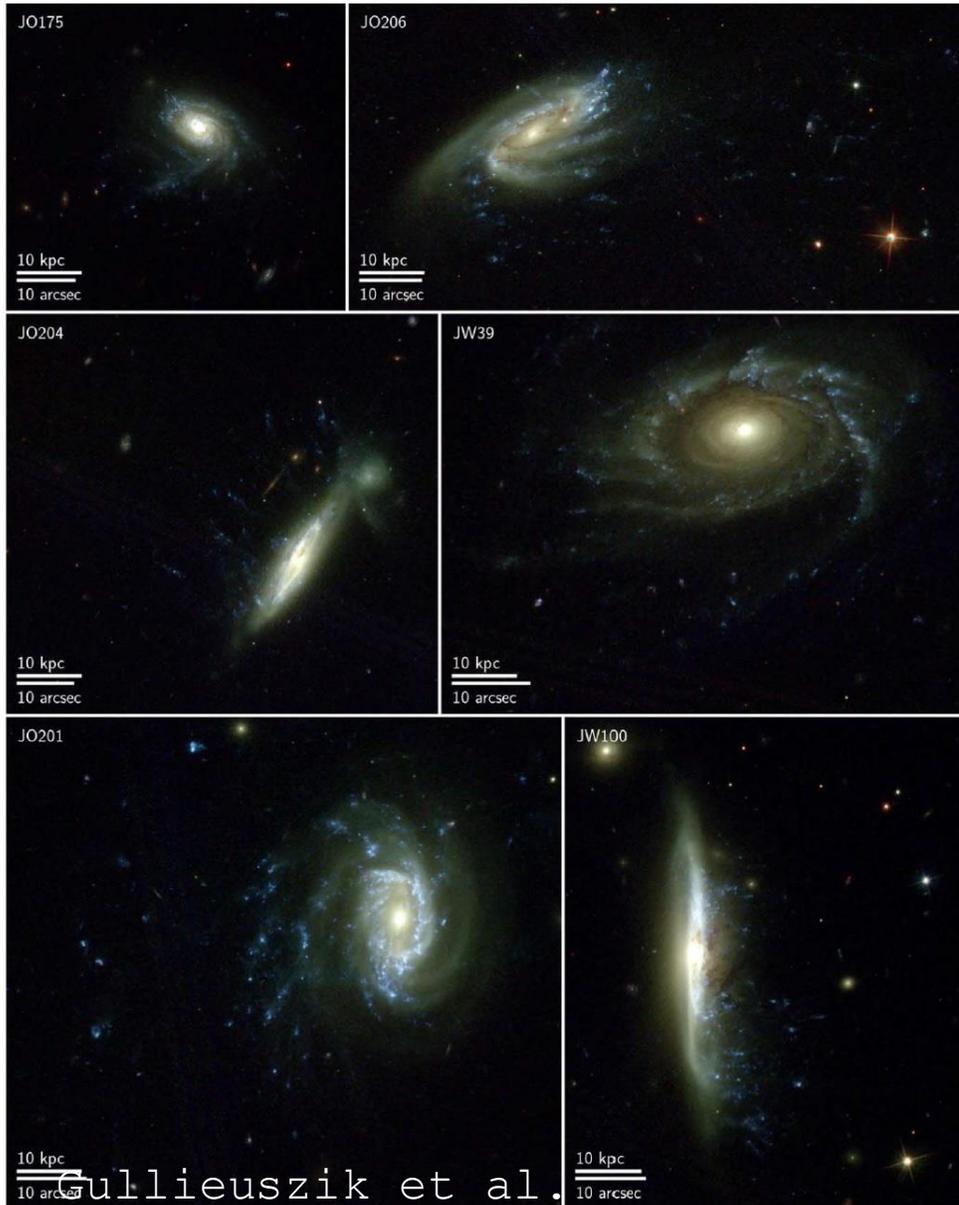
GASP. XXXIII. The Ability of Spatially Resolved Data to Distinguish among the different Physical Mechanisms affecting Galaxies in Low-density Environments

Virgo filaments I. Processing of gas in cosmological filaments around the Virgo cluster

Looking into the faintEst With MUSE (LEWIS): Exploring the nature of ultra-diffuse galaxies in the Hydra-I cluster



# Environment



Galaxy evolution across environments as probed by the ages, stellar metallicities and  $\alpha$ .Fe. of central and satellite galaxies

The MeerKAT Fornax Survey I. Survey description and first evidence of ram pressure in the Fornax galaxy cluster

GASP. XXXIII. The Ability of Spatially Resolved Data to Distinguish among the different Physical Mechanisms affecting Galaxies in Low-density Environments

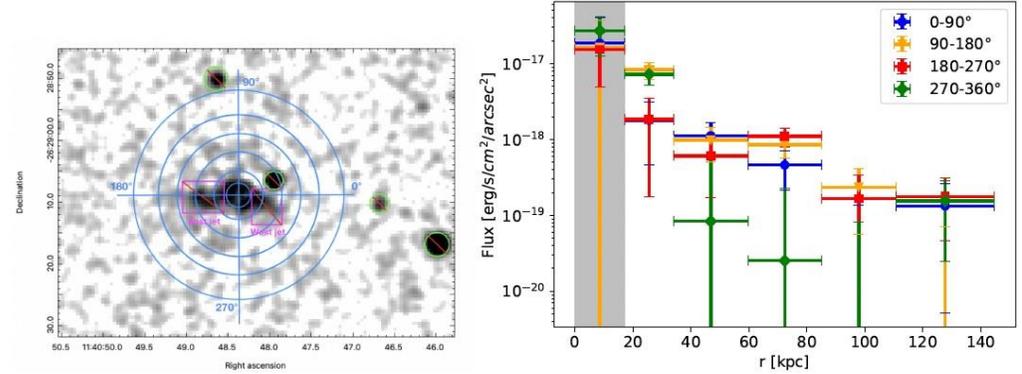
Virgo filaments I. Processing of gas in cosmological filaments around the Virgo cluster

Looking into the faintest With MUSE (LEWIS): Exploring the nature of ultra-diffuse galaxies in the Hydra-I cluster

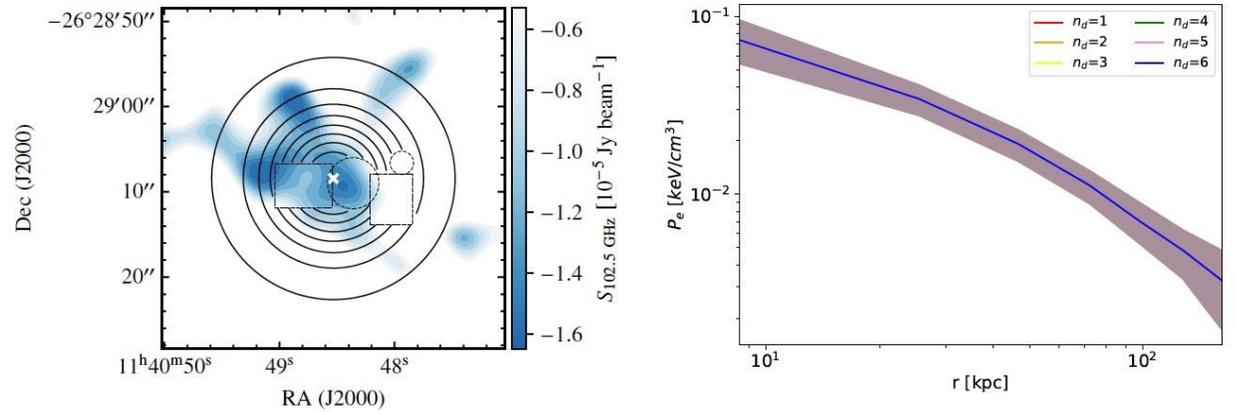
UV and H $\alpha$  HST Observations of Six GASP Jellyfish Galaxies

# Environment

Feeding and feedback processes in the Spiderweb proto-intracluster medium

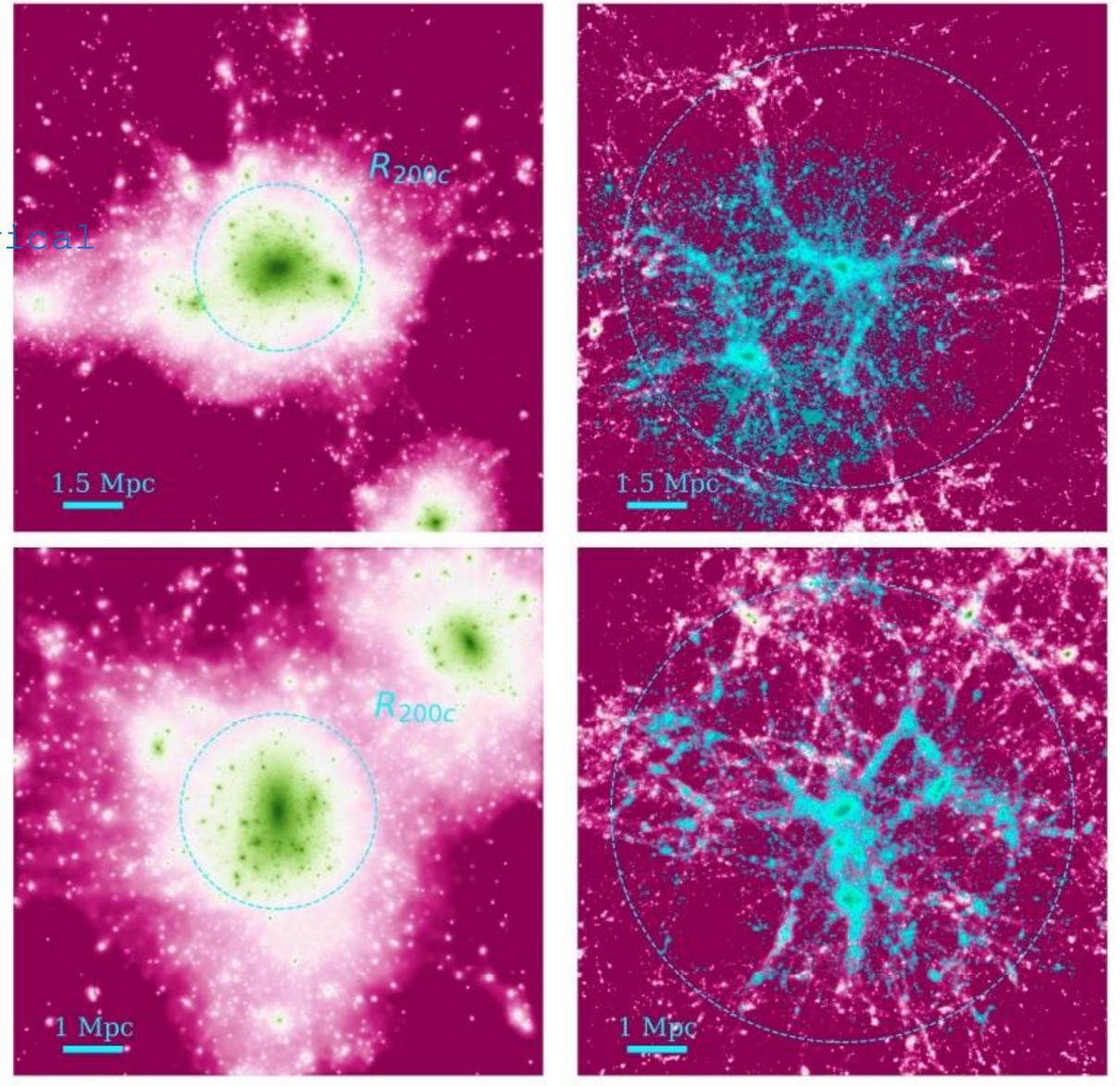


**Fig. 3.** AGN-subtracted soft band image of the Spiderweb protocluster (left). The blue concentric circles, which correspond to 2, 4, 7, 10, 13, and 17 arcsec, and the blue lines separate the quadrants within which we derived the surface brightness as a function of the angle. Magenta squares represent the eastern and western jet excluded regions, while the green circles represent the excluded unresolved sources in the field of view. Surface-brightness profiles as a function of the distance from the central radio source (right). The grey-shaded area represents the surface brightness values parametrized with  $n_d$ .



# Environment

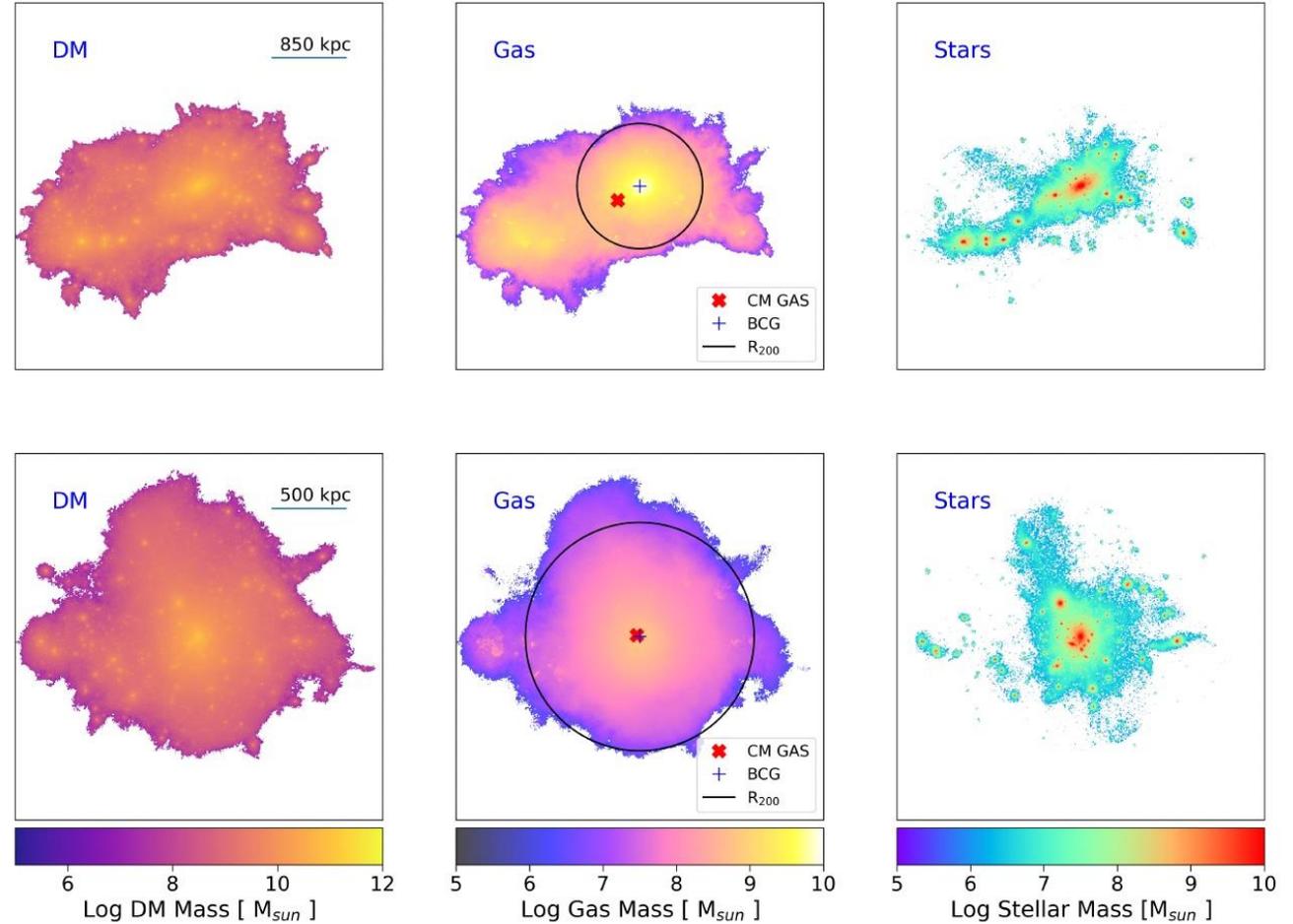
Feeding and feedback processes in the Spiderweb  
proto-intracluster medium  
Galaxy populations of ProtoClusters in cosmological hydrodynamical simulations



# Environment

Feeding and feedback processes in the Spiderweb  
proto-intracluster medium  
Galaxy populations of ProtoClusters in cosr  
hydrodynamical simulations

Differences in the physical properties of satellite galaxies within relaxed and disturbed galaxy groups and clusters in the Illustris TNG100 simulation



# Environment

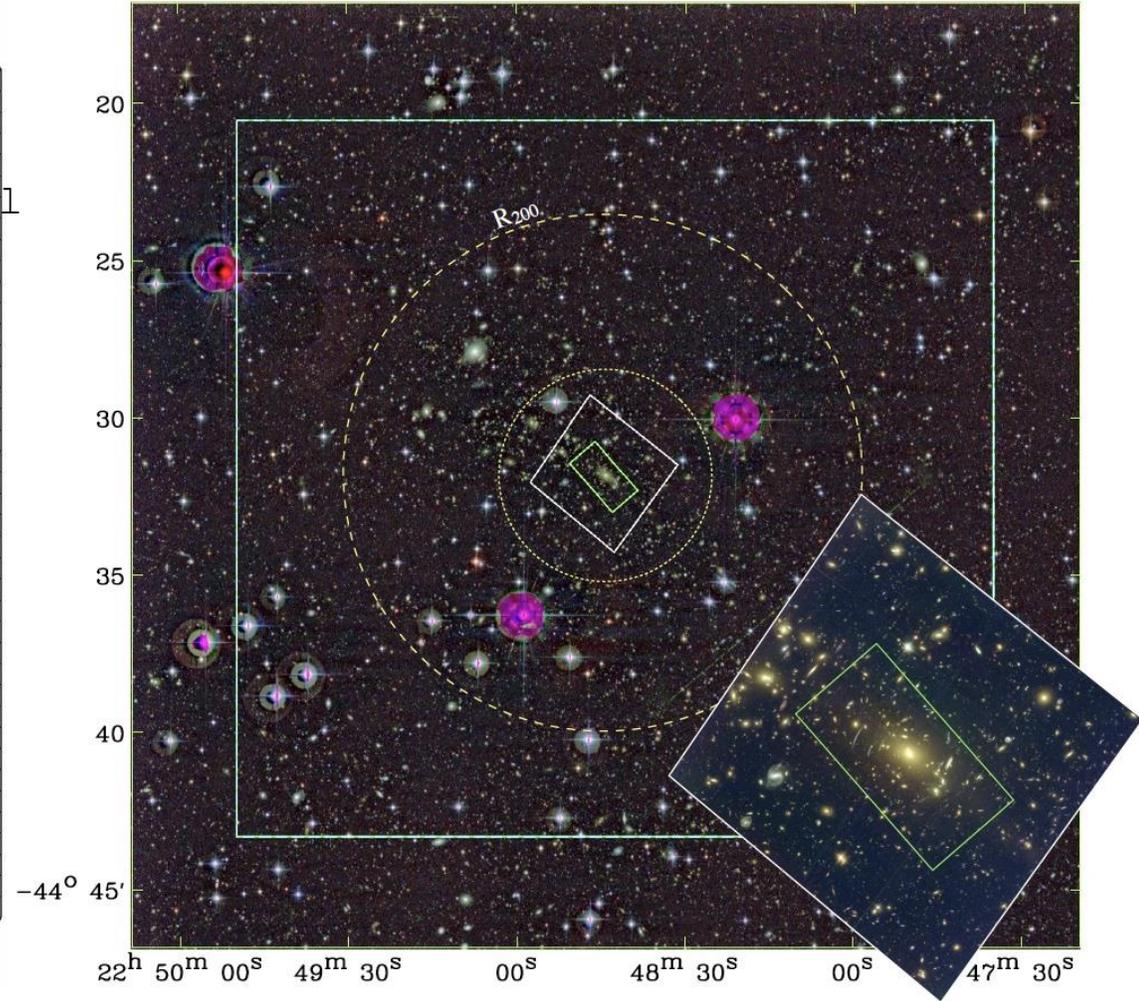
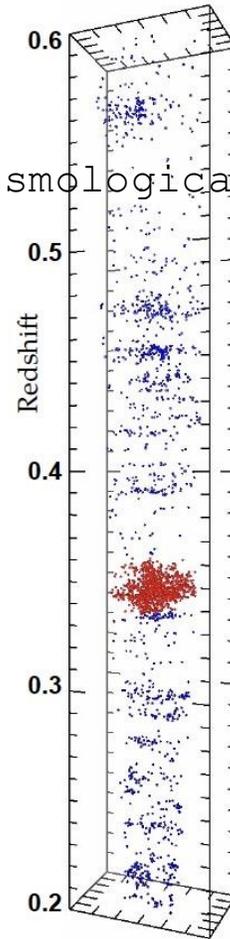
Feeding and feedback processes in the Spiderweb

proto-intracluster medium

Galaxy populations of ProtoClusters in cosmological hydrodynamical simulations

Differences in the physical properties of satellite galaxies within relaxed and disturbed galaxy groups and clusters in the Illustris TNG100 simulation

CLASH-VLT: Abell S106 - Cluster assembly history and spectroscopic catalogue. Identifying environmental versus mass quenching processes responsible for galaxy evolution in rich galaxy clusters.



# Environment

Feeding and feedback processes in the Spiderweb

proto-intracluster medium

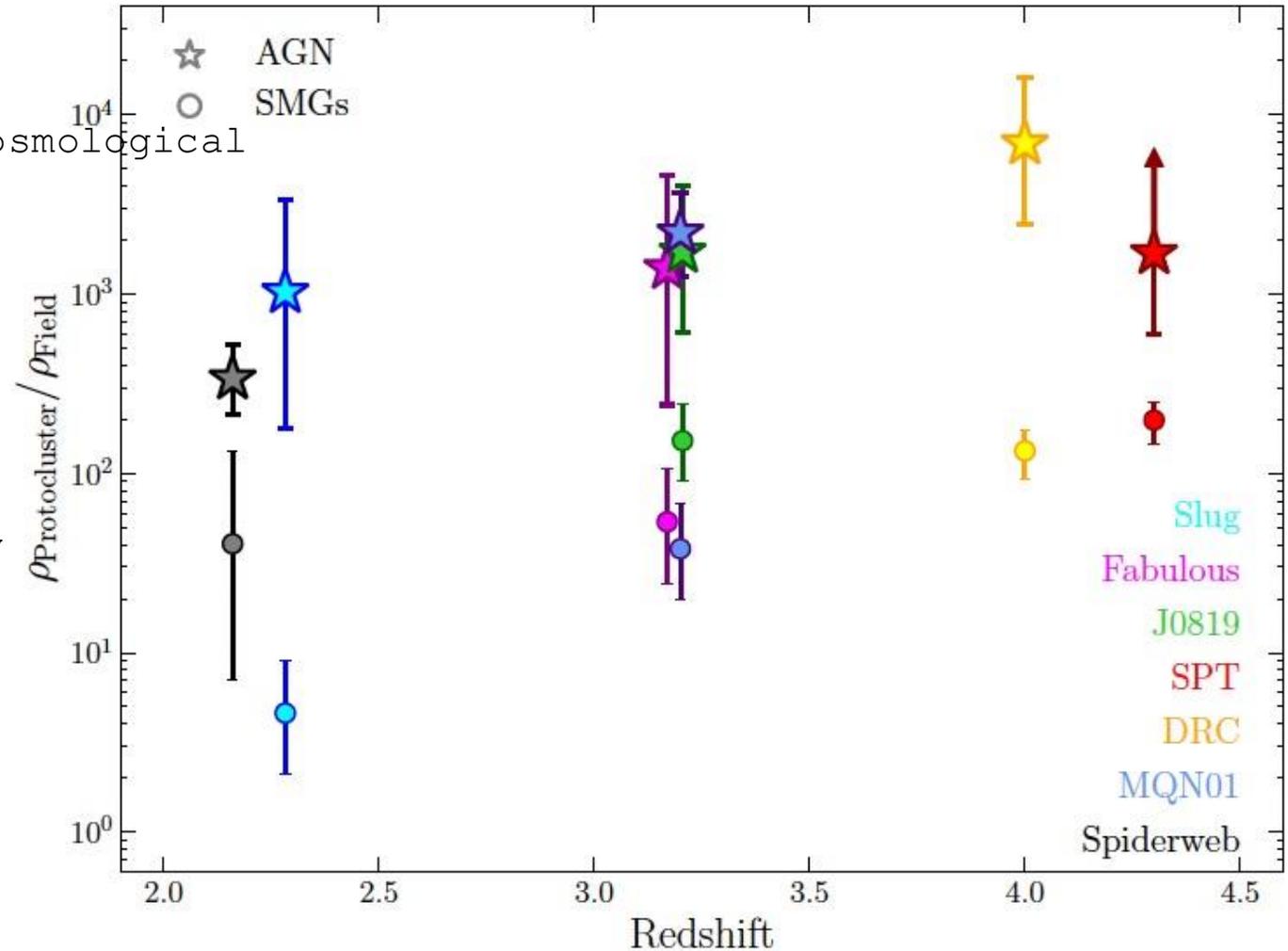
Galaxy populations of ProtoClusters in cosmological hydrodynamical simulations

Differences in the physical properties of satellite galaxies within relaxed and disturbed galaxy groups and clusters in the Illustris TNG100 simulation

CLASH-VLT: Abell S106 - Cluster assembly history and spectroscopic catalogue.

Identifying environmental versus mass quenching processes responsible for galaxy evolution in rich galaxy clusters.

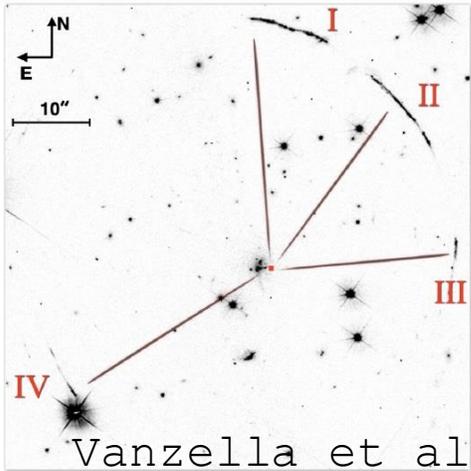
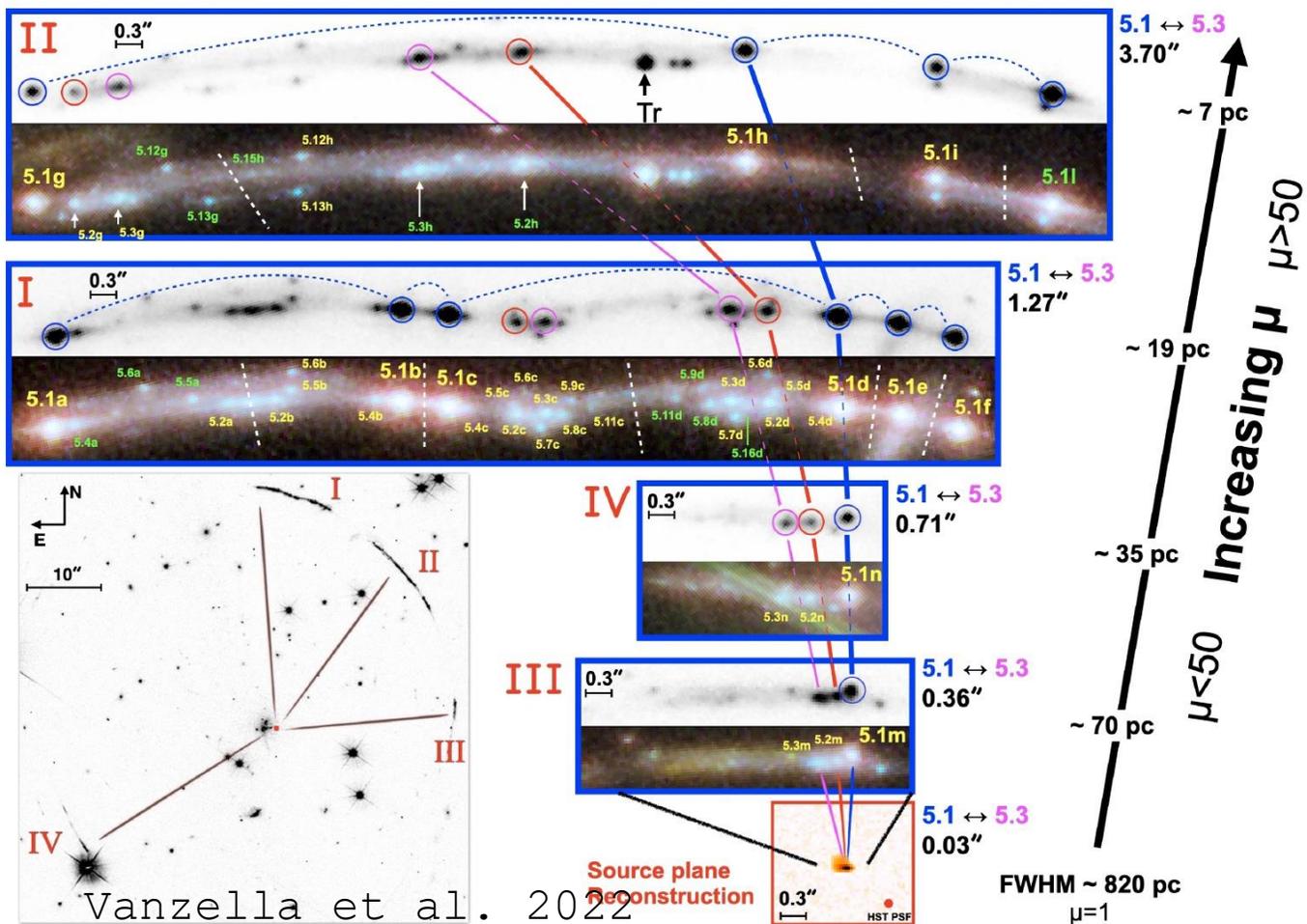
The properties of X-ray-selected active galactic nuclei in protoclusters pinpointed by enormous Lyman alpha nebulae



# Cosmology and Early Universe

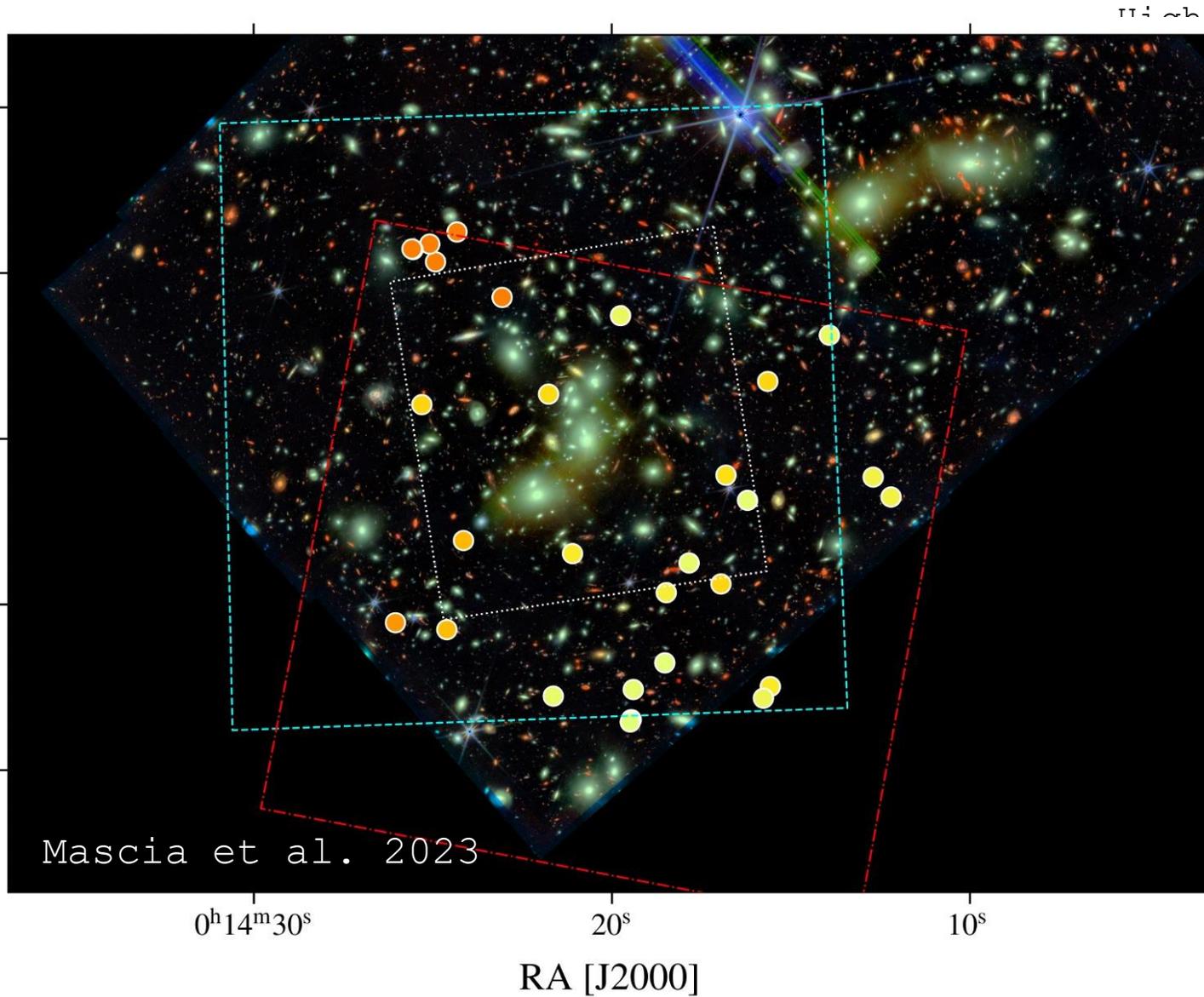
High star cluster formation efficiency in the strongly lensed Sunburst Lyman-continuum galaxy at  $z = 2.37$

A&A 659, A2 (2022)



Vanzella et al. 2022

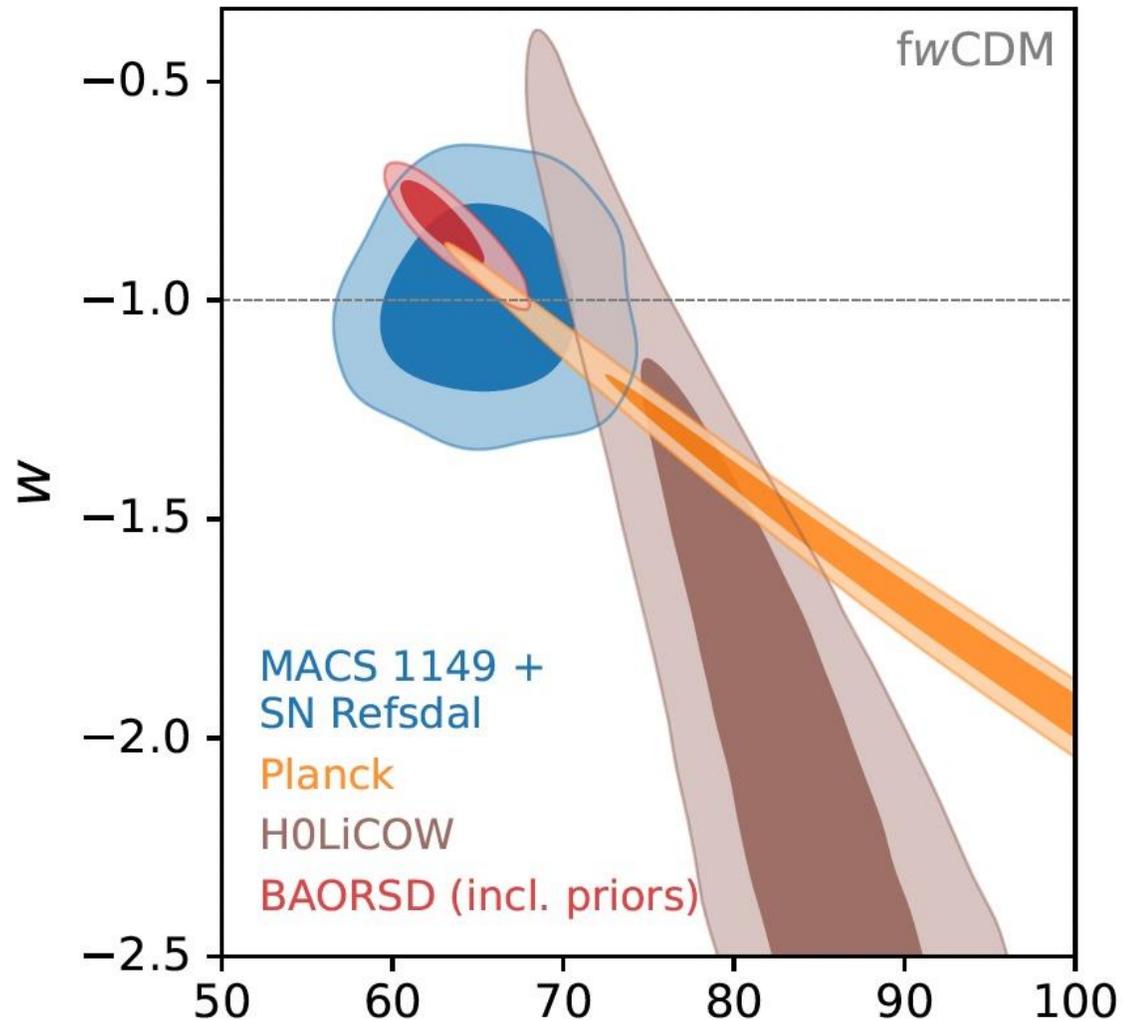
# Cosmology and Early Universe



High star cluster formation efficiency in strongly lensed Sunburst Lyman-continuum at  $z = 2.37$

Identify galaxies at  $4.5 < z < 8$  with significant Ly $\alpha$  escape fraction providing a substantial contribution to cosmic reionization.

# Cosmology and Early Universe



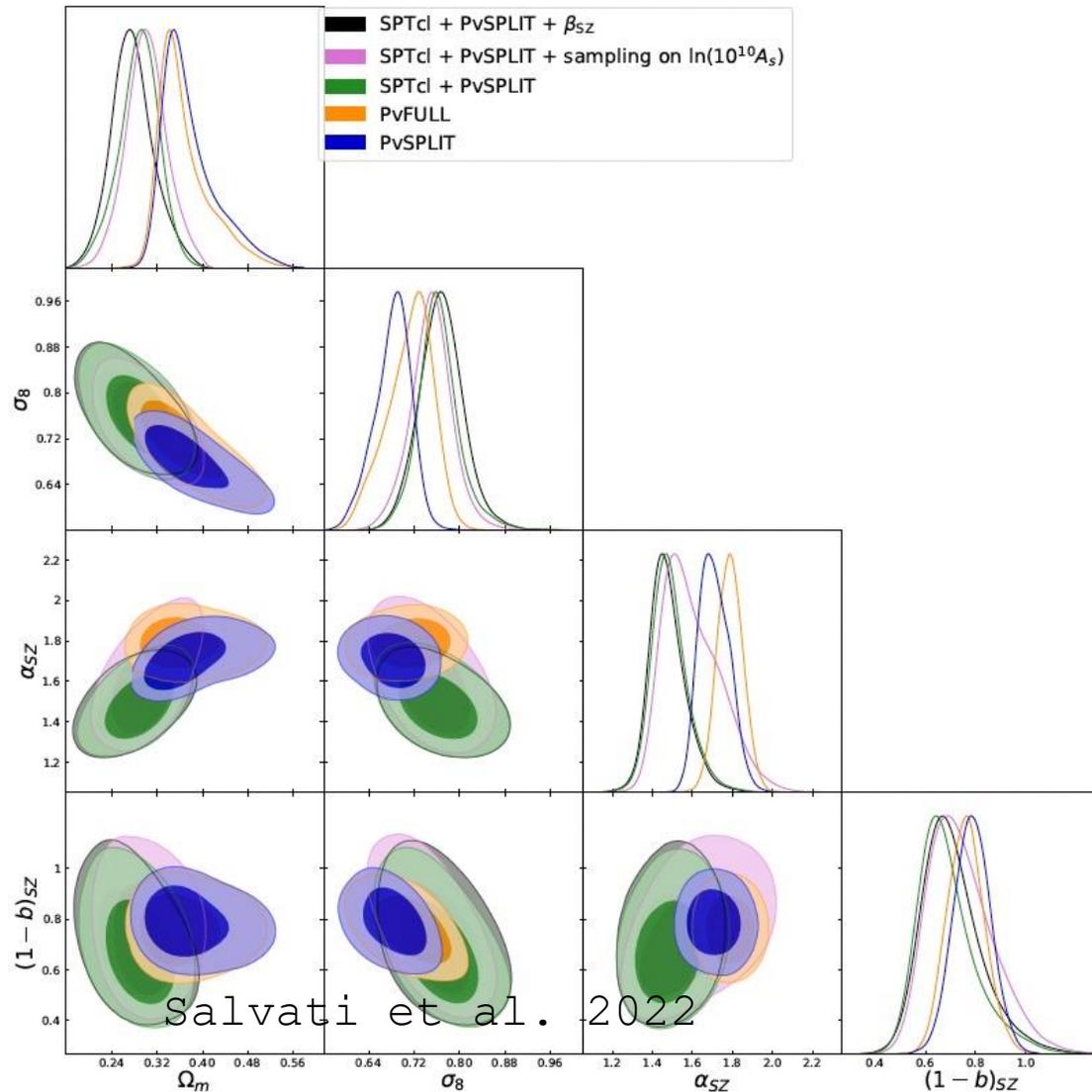
Grillo et al. 2021  $H_0$

High star cluster formation efficiency in the strongly lensed Sunburst Lyman-continuum galaxy at  $z = 2.37$

Identify galaxies at  $4.5 < z < 8$  with significant Ly $\alpha$  escape fraction providing a substantial contribution to cosmic reionization.

The combination of time delays in lens galaxy clusters with extensive photometric and spectroscopic information offers a novel and competitive cosmological tool.

# Cosmology and Early Universe



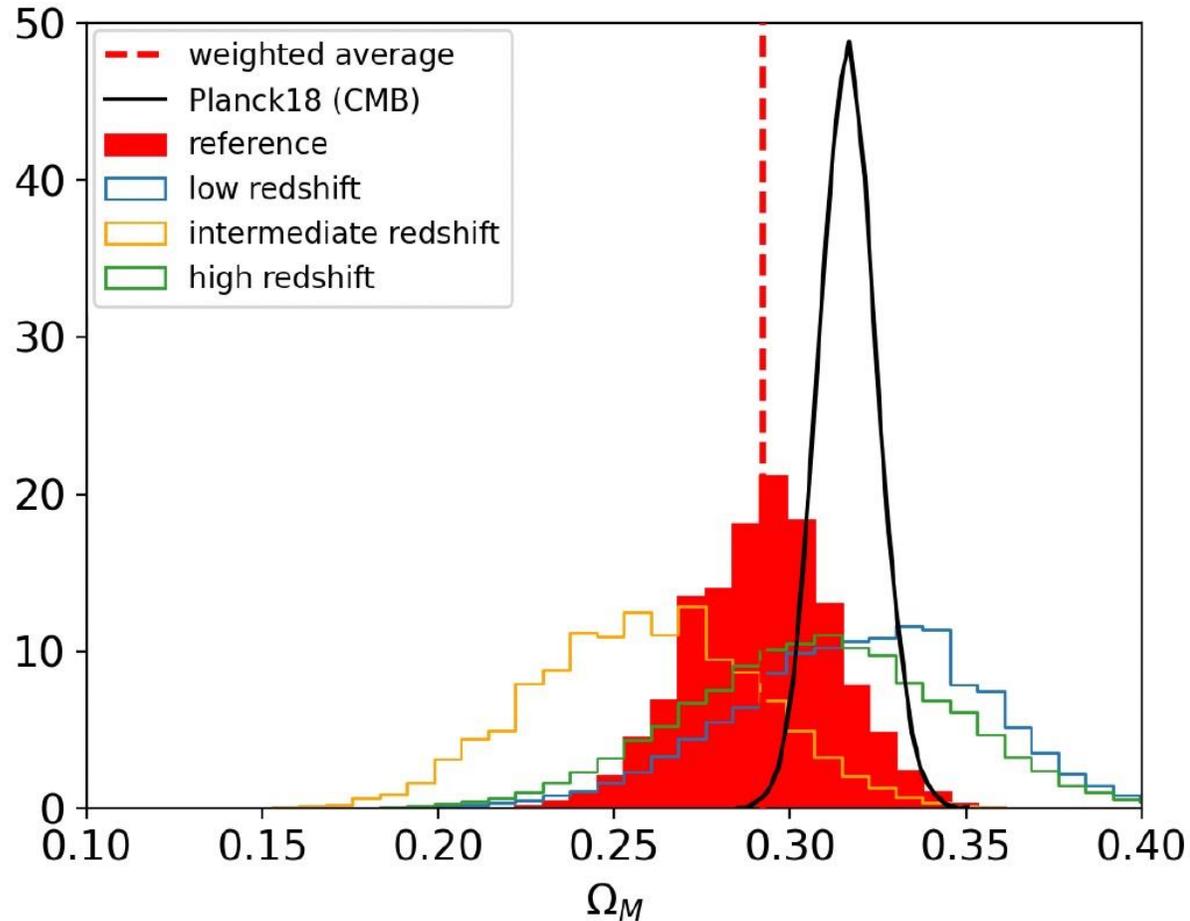
High star cluster formation efficiency in the strongly lensed Sunburst Lyman-continuum galaxy at  $z = 2.37$

Identify galaxies at  $4.5 < z < 8$  with significant Ly $\alpha$  escape fraction providing a substantial contribution to cosmic reionization.

The combination of time delays in lens galaxy clusters with extensive photometric and spectroscopic information offers a novel and competitive cosmological tool.

The first combined cosmological analysis of South Pole Telescope (SPT) and Planck cluster catalogs.

# Cosmology and Early Universe



Giocoli et al. 2022

High star cluster formation efficiency in the strongly lensed Sunburst Lyman-continuum galaxy at  $z = 2.37$

Identify galaxies at  $4.5 < z < 8$  with significant Ly $\alpha$  escape fraction providing a substantial contribution to cosmic reionization.

The combination of time delays in lens galaxy clusters with extensive photometric and spectroscopic information offers a novel and competitive cosmological tool.

The first combined cosmological analysis of South Pole Telescope (SPT) and Planck cluster catalogs.

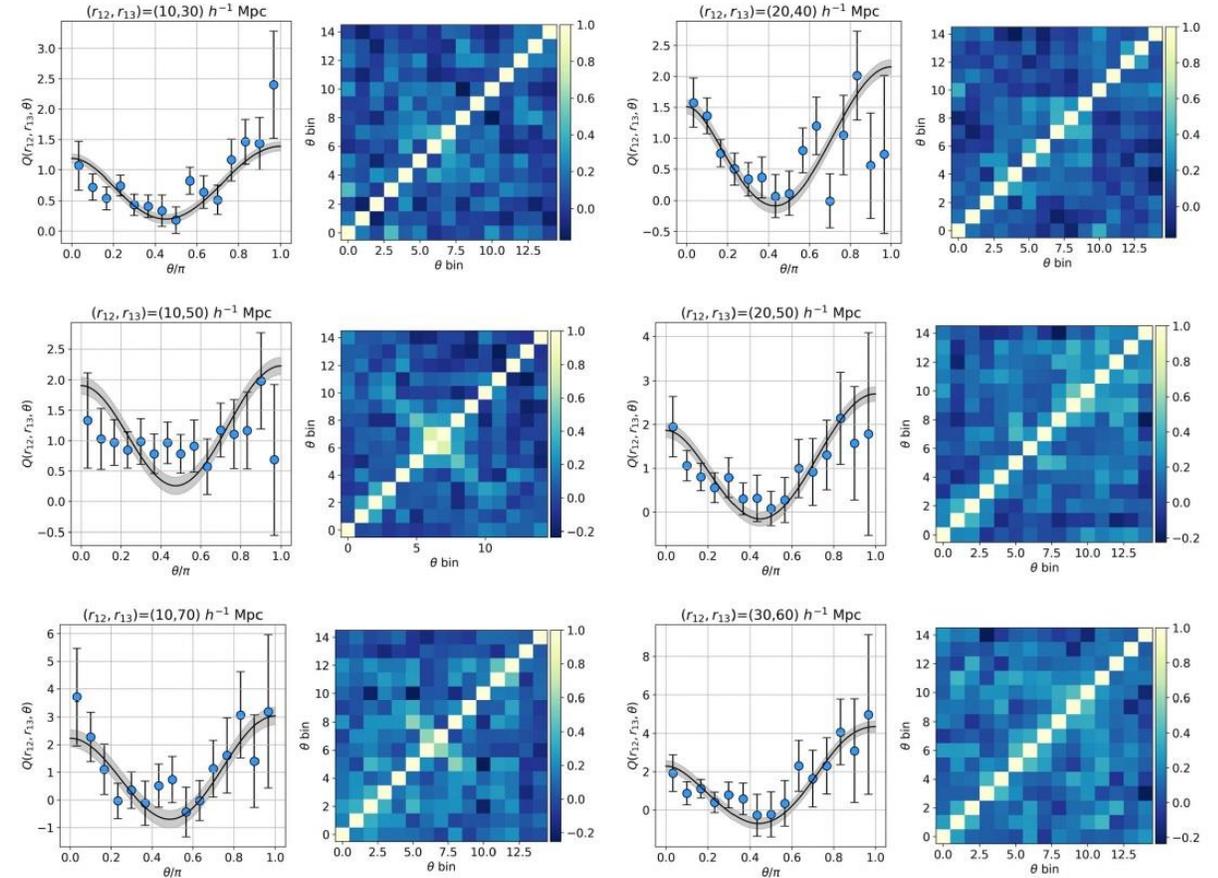
AMICO galaxy clusters in KiDS-DR3  
Cosmological constraints from large-scale stacked weak lensing profiles

# Cosmology and Early Universe

Cluster Clustering Cosmology. II. First Detection of the Baryon Acoustic Oscillations Peak in the Three-point Correlation Function of Galaxy Clusters

THE ASTROPHYSICAL JOURNAL, 919:144 (13pp), 2021 October 1

Moresco et al.

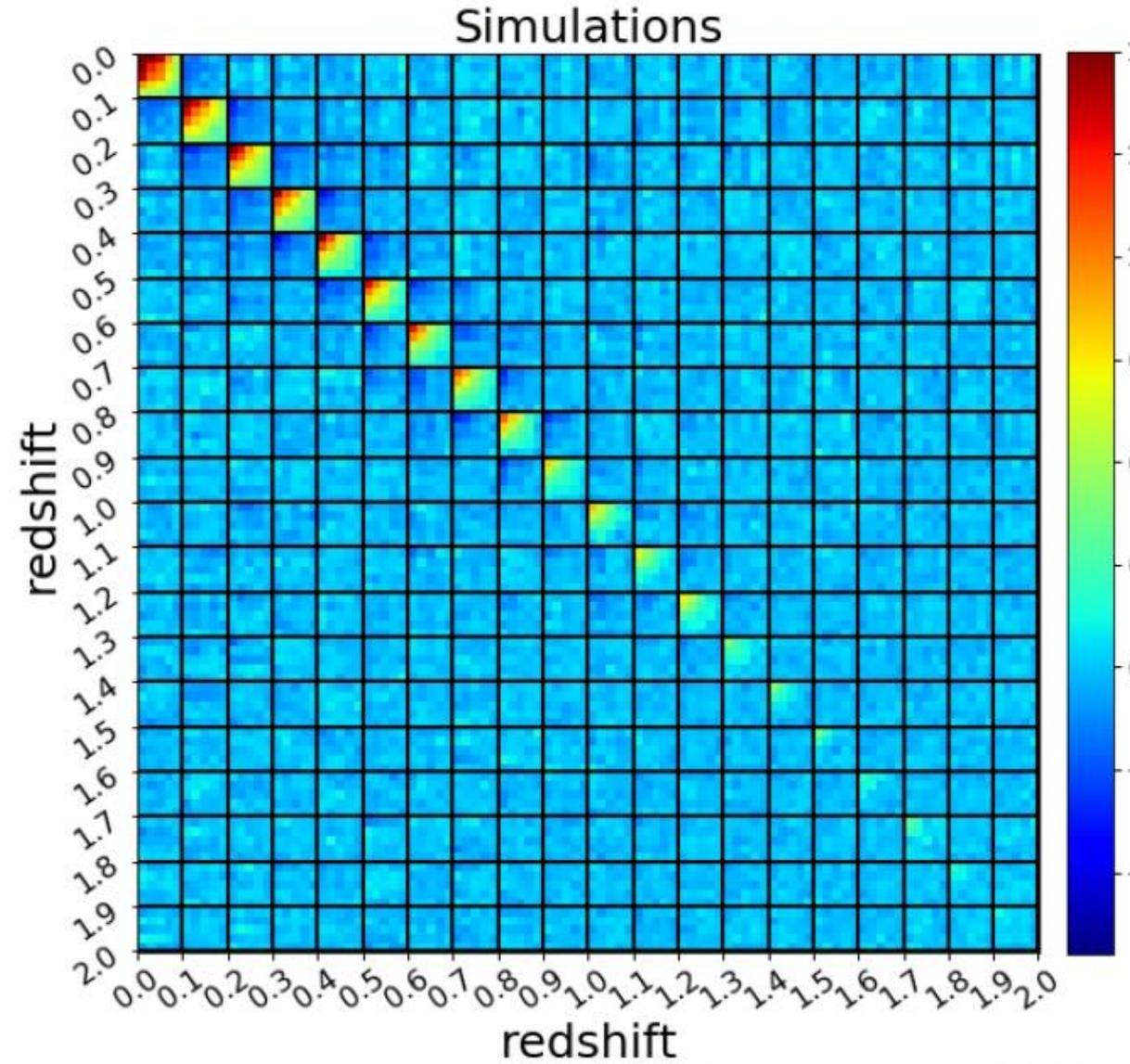


Moresco et al. 2021

# Cosmology and Early Universe

Cluster Clustering Cosmology. II. First  
Detection of the Baryon Acoustic  
Oscillations Peak in the Three-point  
Correlation Function of Galaxy Clusters

[Euclid: Effects of sample covariance on the  
number counts of galaxy clusters](#)



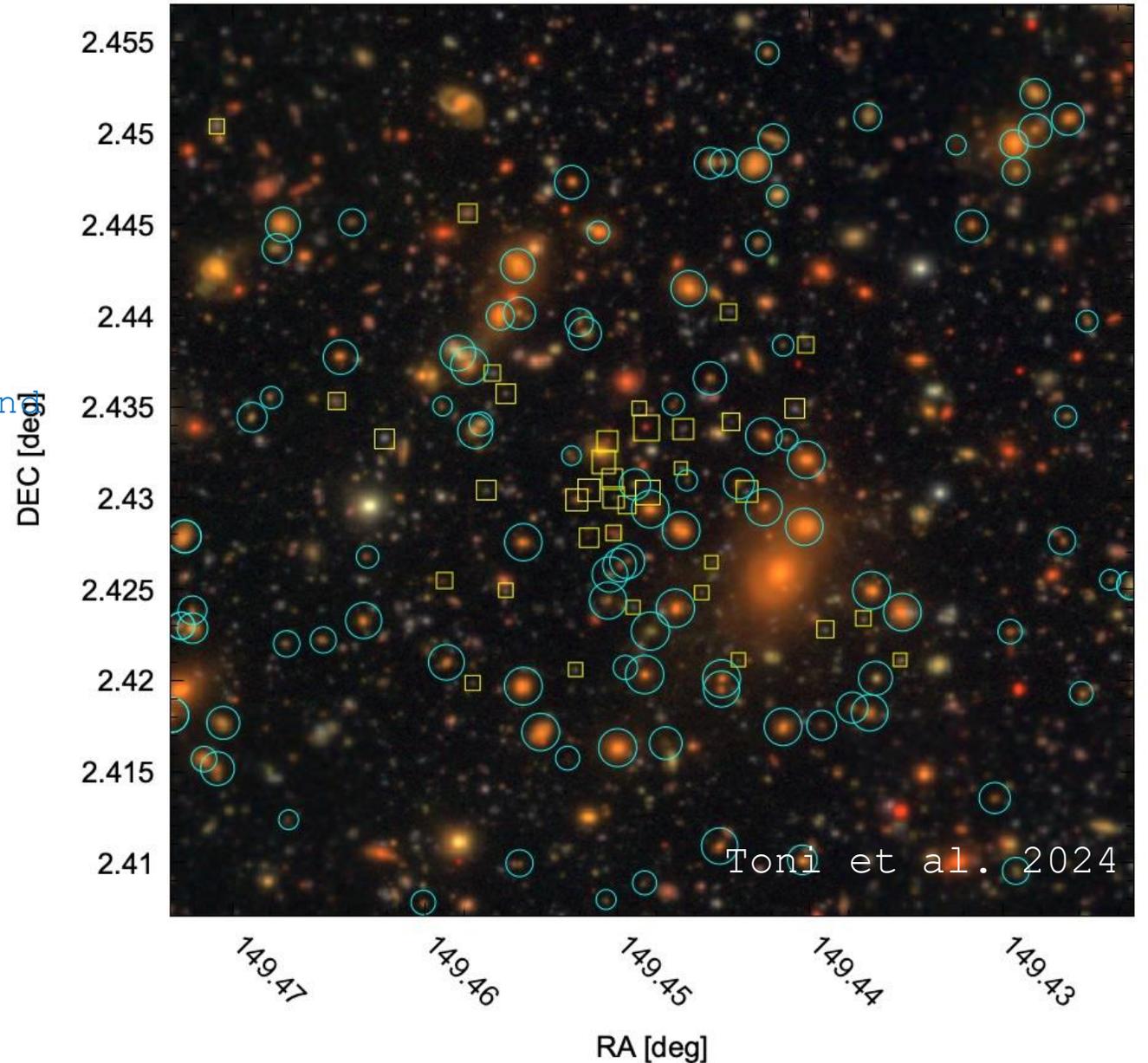
Fumagalli et al. 2021

# Cosmology and Early Universe

Cluster Clustering Cosmology. II. First  
Detection of the Baryon Acoustic  
Oscillations Peak in the Three-point  
Correlation Function of Galaxy Clusters

Euclid: Effects of sample covariance on the  
number counts of galaxy clusters

AMICO-COSMOS galaxy cluster and group  
catalogue up to  $z = 2$ : Sample properties and  
X-ray counterparts



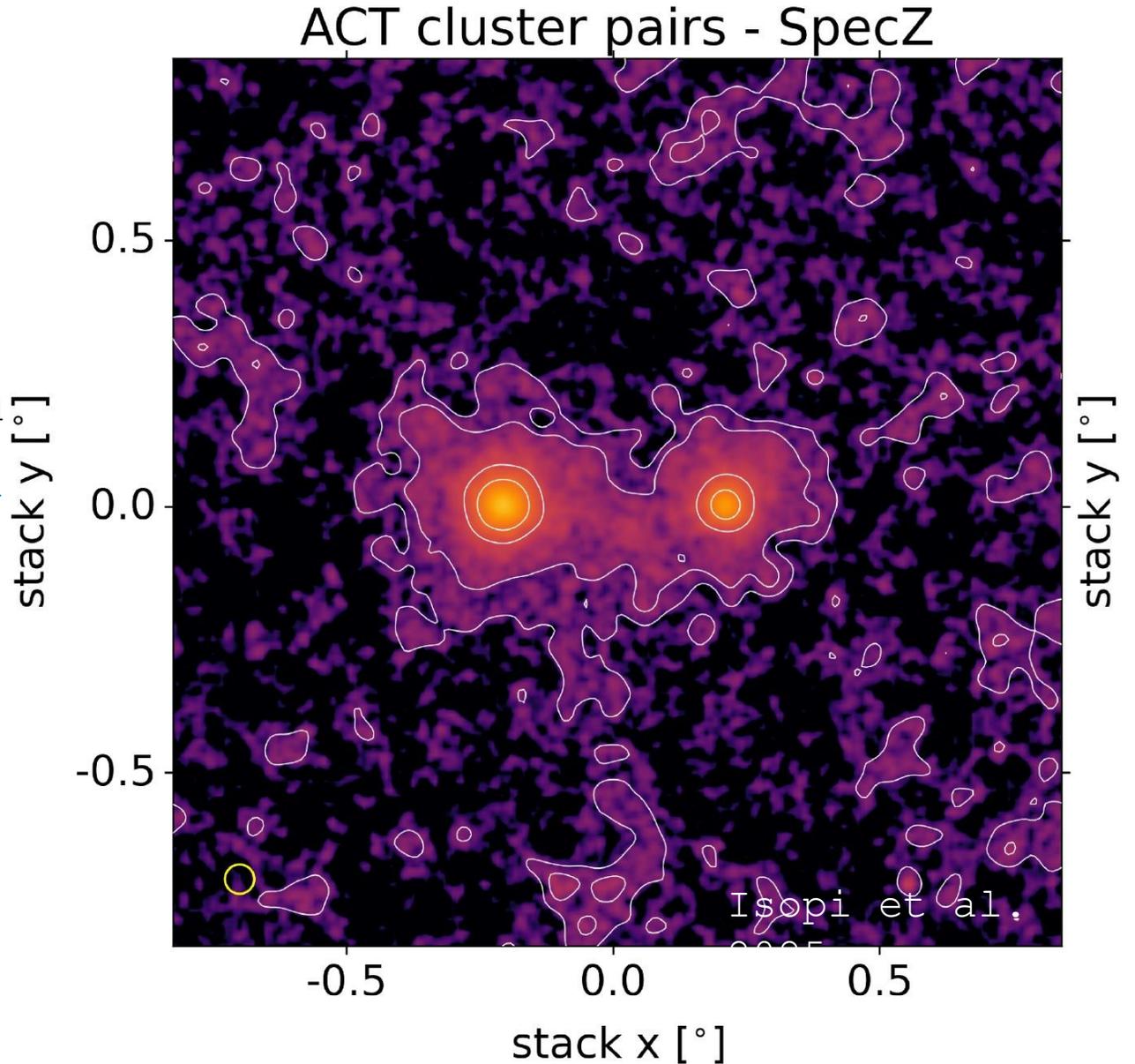
# Cosmology and Early Universe

Cluster Clustering Cosmology. II. First Detection of the Baryon Acoustic Oscillations Peak in the Three-point Correlation Function of Galaxy Clusters

Euclid: Effects of sample covariance on the number counts of galaxy clusters

AMICO-COSMOS galaxy cluster and group catalogue up to  $z = 2$ : Sample properties and X-ray counterparts

[The Atacama Cosmology Telescope: a census of bridges between galaxy clusters](#)



# Cosmology and Early Universe

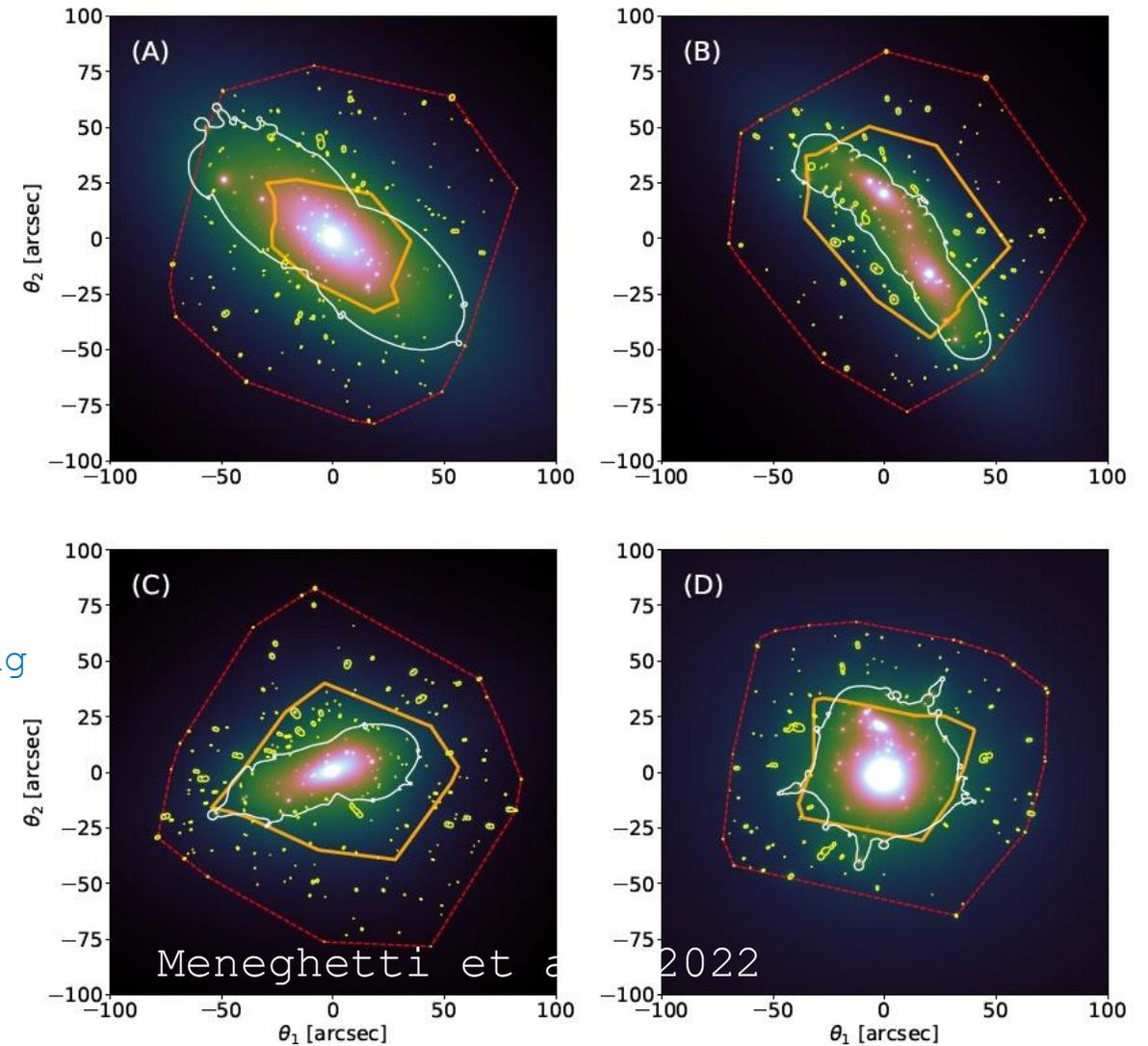
Cluster Clustering Cosmology. II. First  
Detection of the Baryon Acoustic  
Oscillations Peak in the Three-point  
Correlation Function of Galaxy Clusters

Euclid: Effects of sample covariance on the  
number counts of galaxy clusters

AMICO-COSMOS galaxy cluster and group  
catalogue up to  $z = 2$ : Sample properties and  
X-ray counterparts

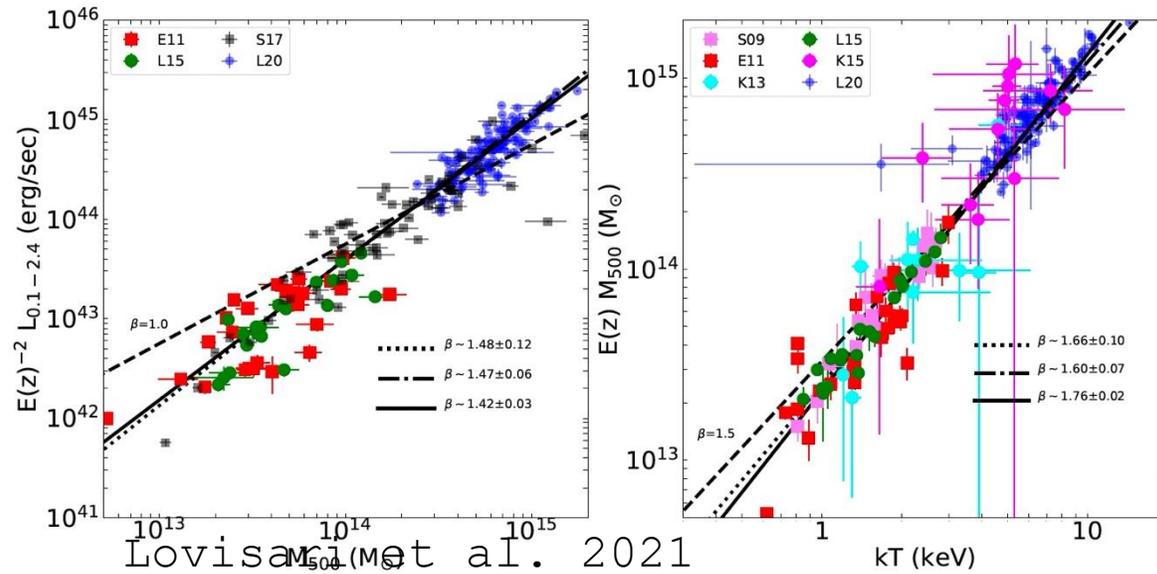
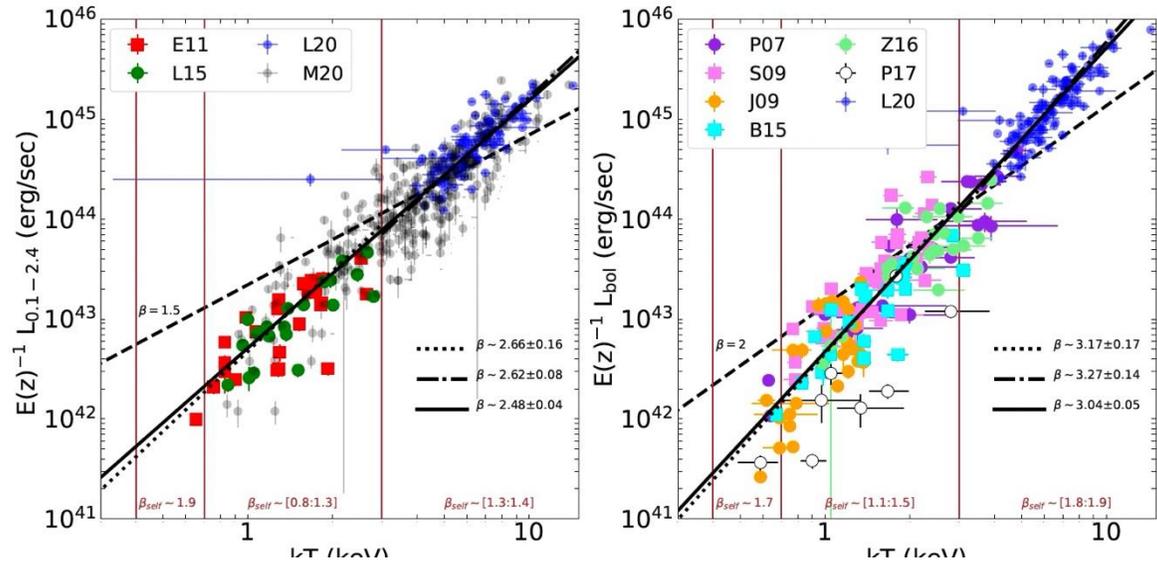
The Atacama Cosmology Telescope: a census of  
bridges between galaxy clusters

The probability of galaxy-galaxy strong lensing  
events in  
hydrodynamical simulations of galaxy clusters

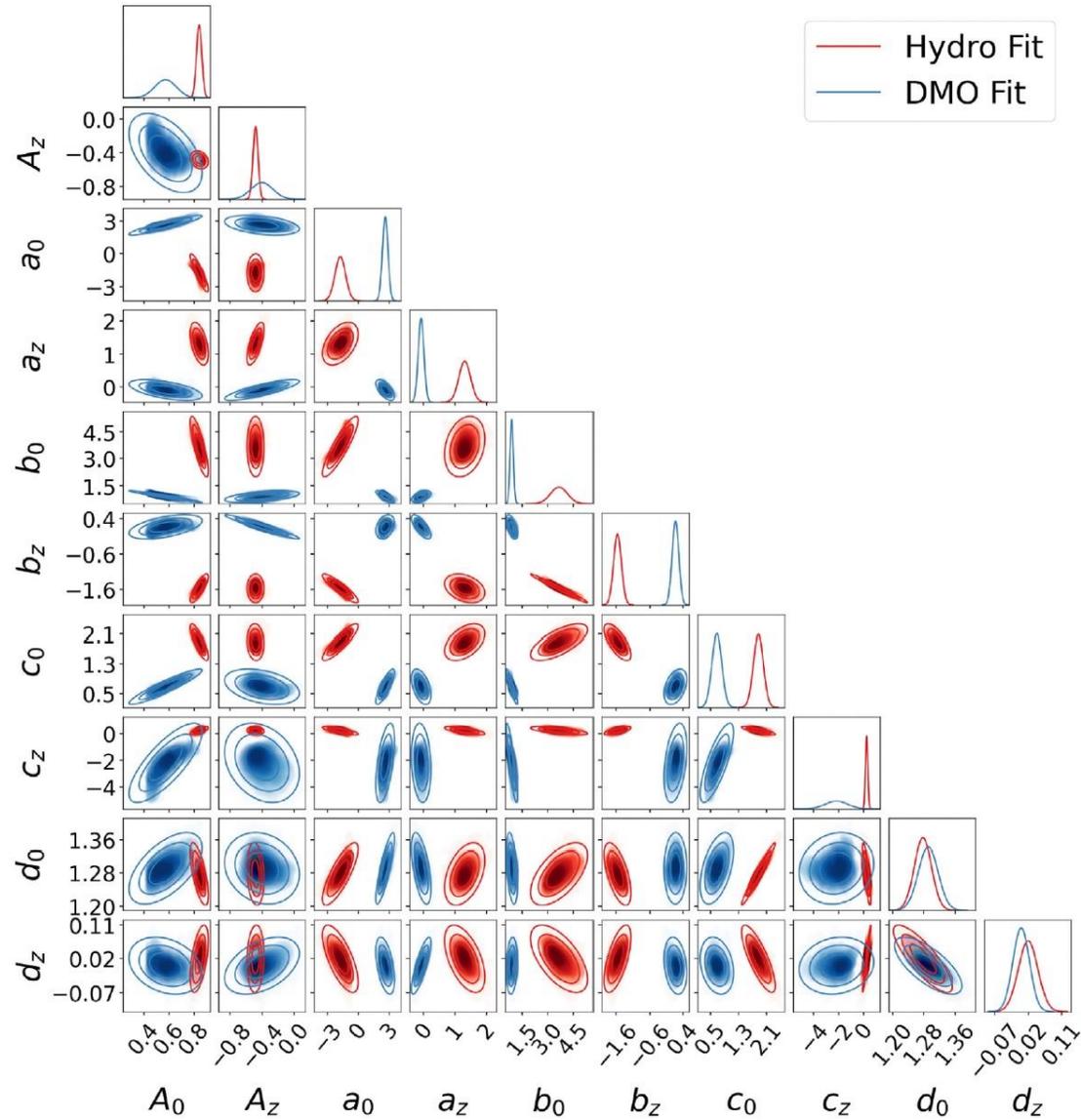


# Baryon distribution

Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups



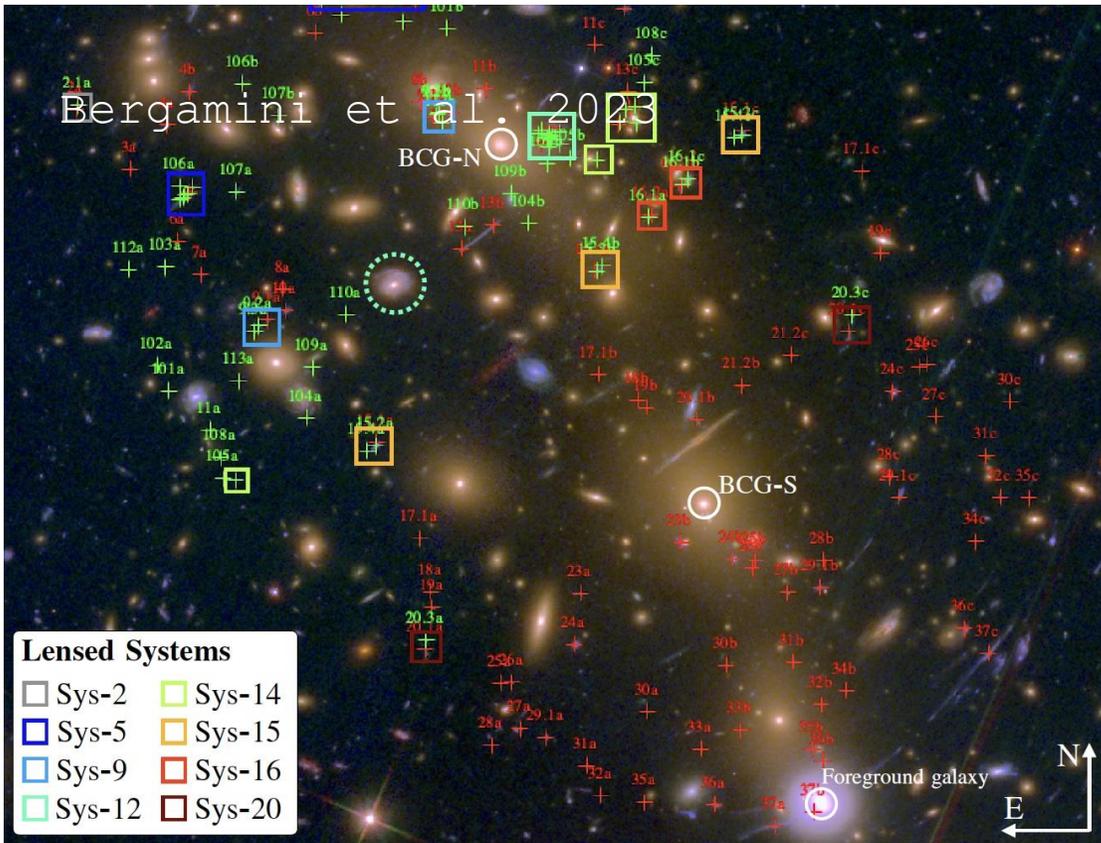
# Baryon distribution



Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups

On the impact of baryons on the halo mass function, bias, and cluster cosmology

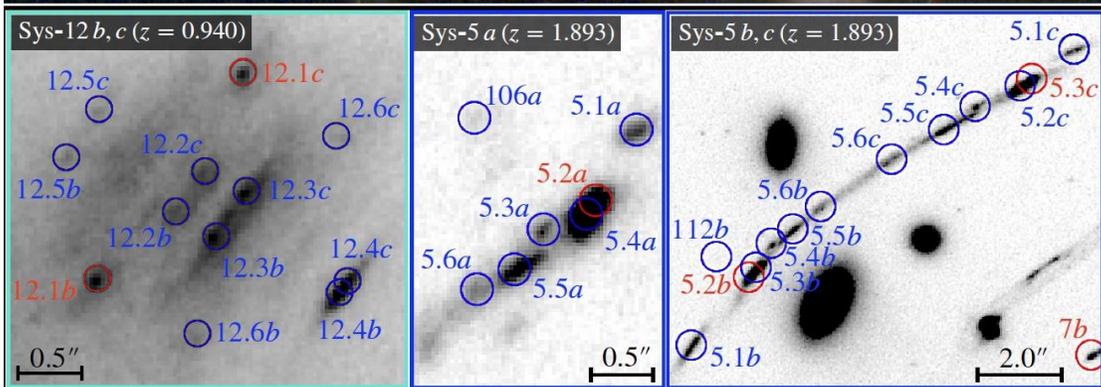
# Baryon distribution



Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups

On the impact of baryons on the halo mass function, bias, and cluster cosmology

A new high-precision strong lensing model of the galaxy cluster MACS J0416.1 - Robust characterization of the cluster mass distribution from VLT/MUSE deep observations

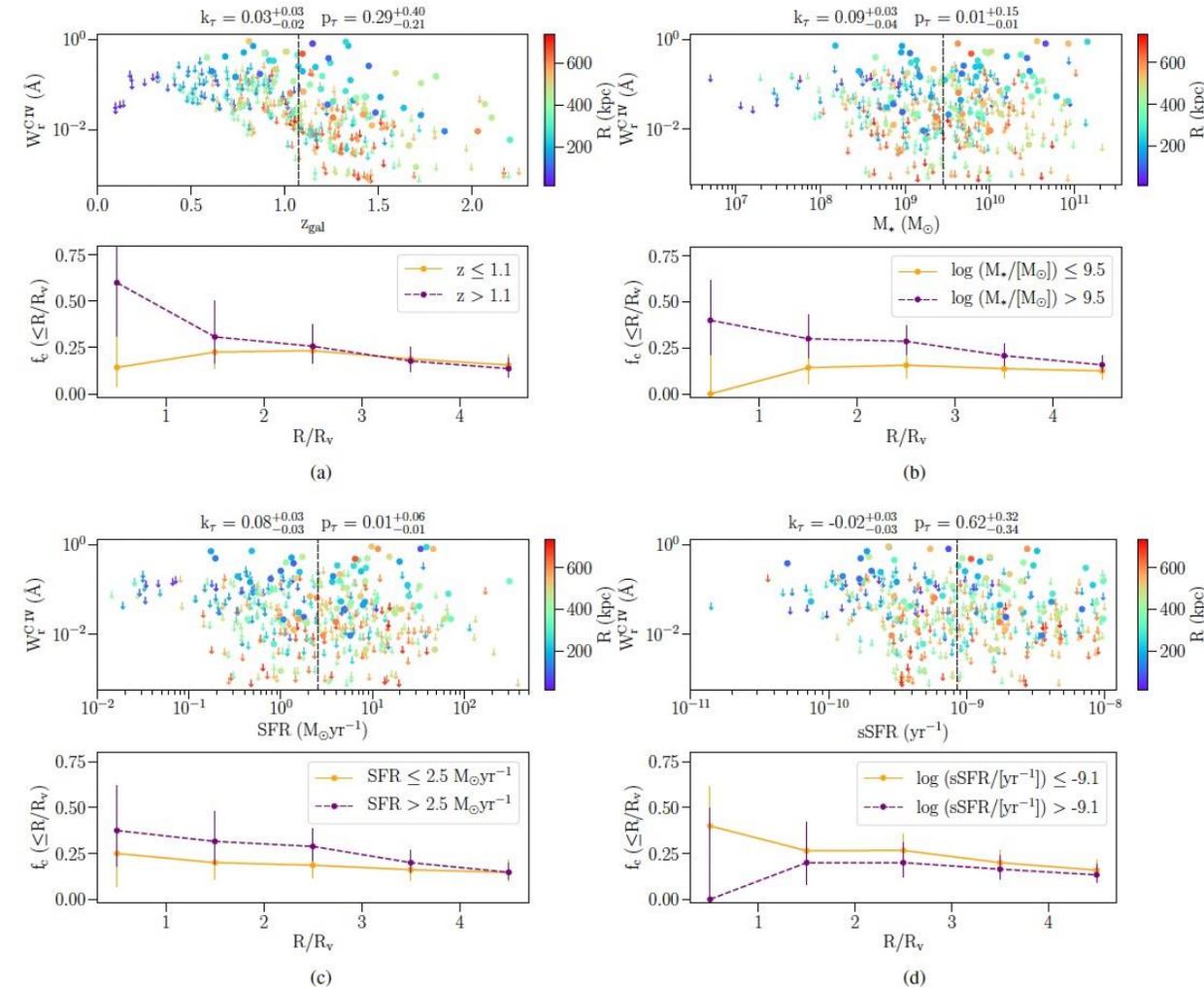


# Baryon distribution

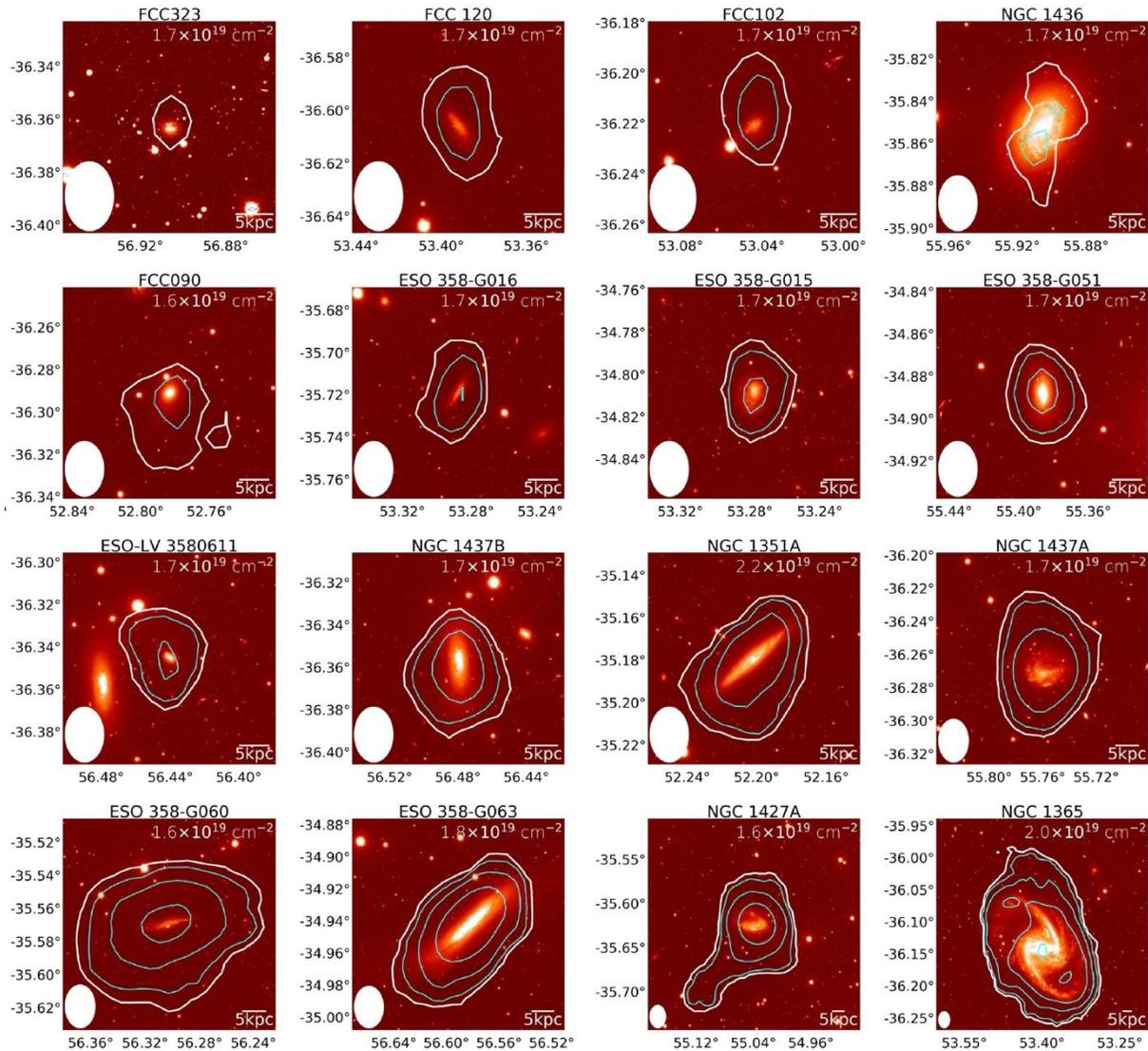
Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups

On the impact of baryons on the halo mass function, bias, and cluster cosmology

A new high-precision strong lensing model of the galaxy cluster MACS J0416.1 - Robust characterization of the cluster mass distribution from VLT/MUSE deep observations  
[Metal-enriched halo gas across galaxy overdensities over the last 10 billion years](#)



# Baryon distribution



Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups

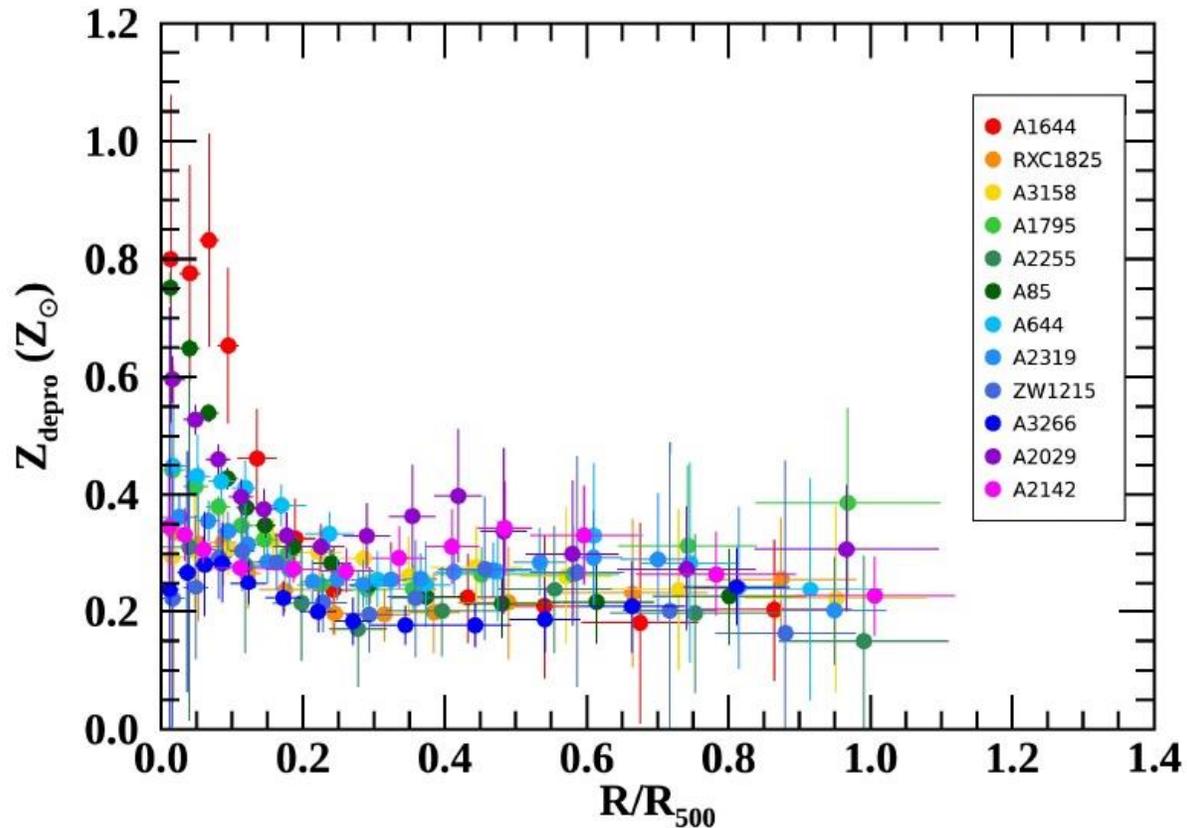
On the impact of baryons on the halo mass function, bias, and cluster cosmology

A new high-precision strong lensing model of the galaxy cluster MACS J0416.1 - Robust characterization of the cluster mass distribution from VLT/MUSE deep observations  
Metal-enriched halo gas across galaxy overdensities over the last 10 billion years

A blind ATCA Hi survey of the Fornax galaxy cluster

Properties of the Hi detections

# Baryon distribution



Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups

On the impact of baryons on the halo mass function, bias, and cluster cosmology

A new high-precision strong lensing model of the galaxy cluster MACS J0416.1 - Robust characterization of the cluster mass distribution from VLT/MUSE deep observations  
Metal-enriched halo gas across galaxy overdensities over the last 10 billion years

A blind ATCA Hi survey of the Fornax galaxy cluster

Properties of the Hi detections

[Iron in X-COP: Tracing enrichment in cluster outskirts with high accuracy abundance profiles](#)

# Baryon distribution

Review of various scaling relations between X-ray and optical properties of galaxy clusters and groups

On the impact of baryons on the halo mass function, bias, and cluster cosmology

A new high-precision strong lensing model of the galaxy cluster MACS J0416.1 - Robust characterization of the cluster mass distribution from VLT/MUSE deep observations  
Metal-enriched halo gas across galaxy overdensities over the last 10 billion years

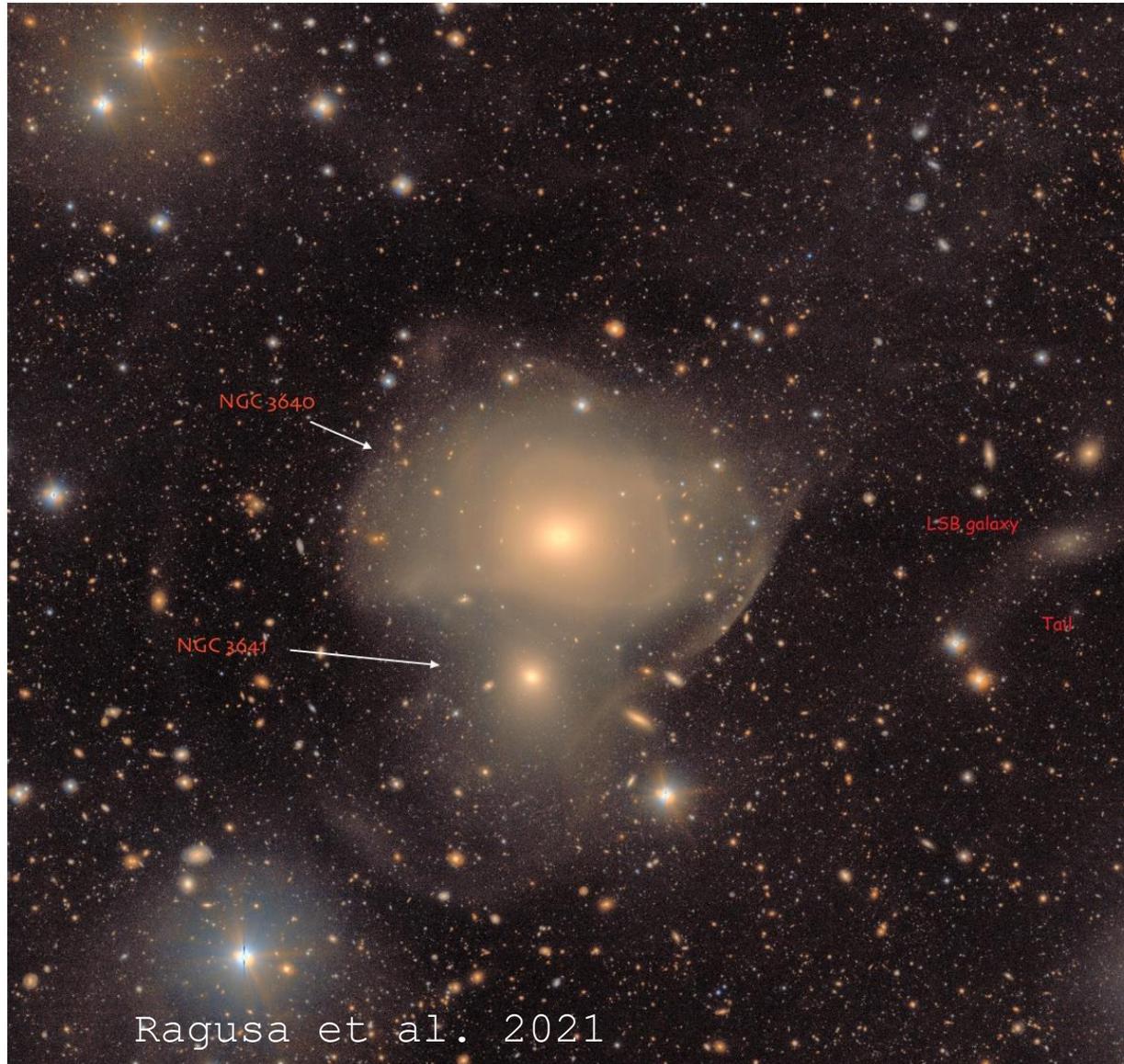
A blind ATCA Hi survey of the Fornax galaxy cluster

Properties of the Hi detections

Iron in X-COP: Tracing enrichment in cluster outskirts with high accuracy abundance profiles

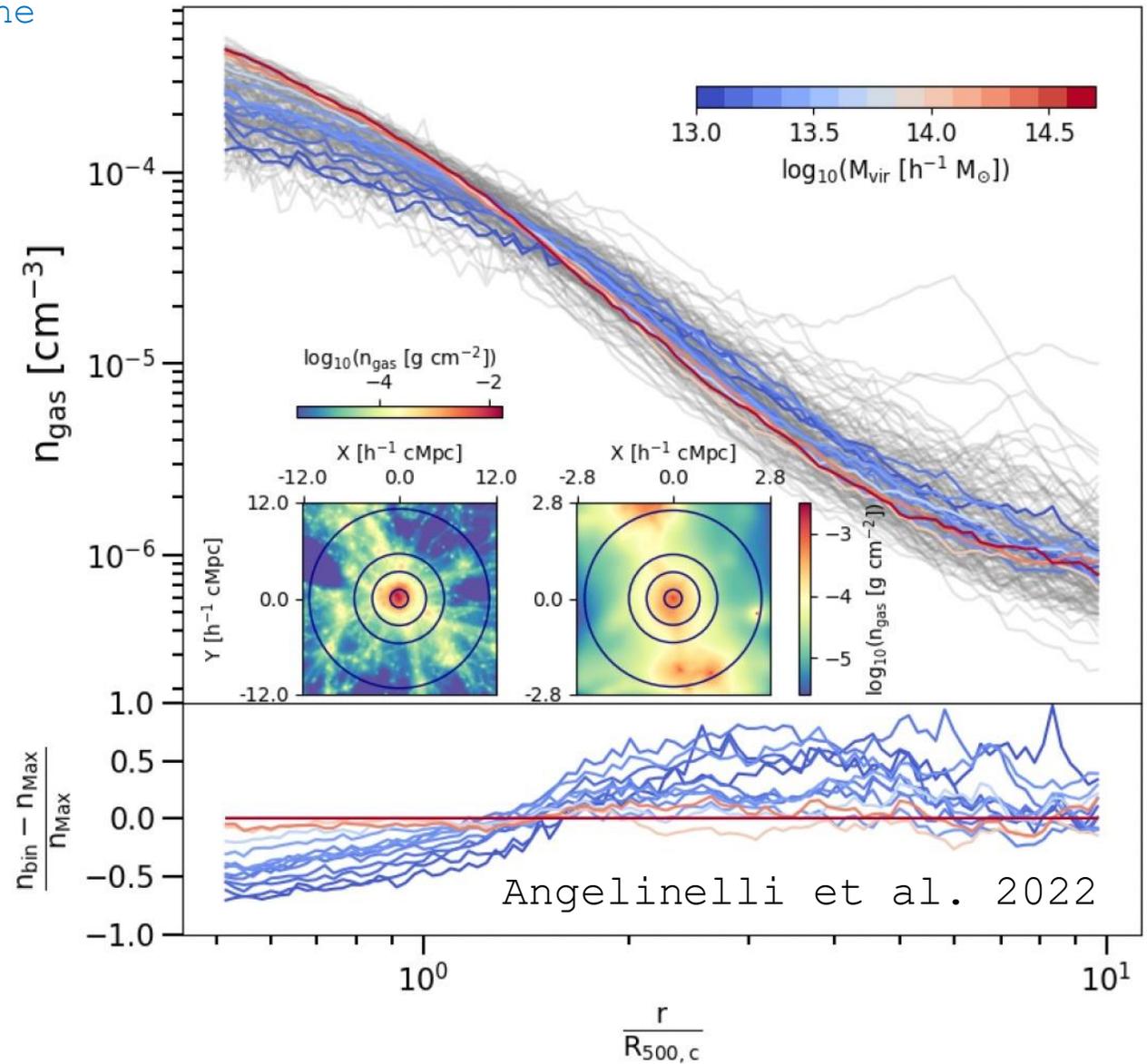
Does the virial mass drive the intra-cluster light?

Relationship between the ICL and  $M_{\text{vir}}$  from VEGAS



# Baryon distribution

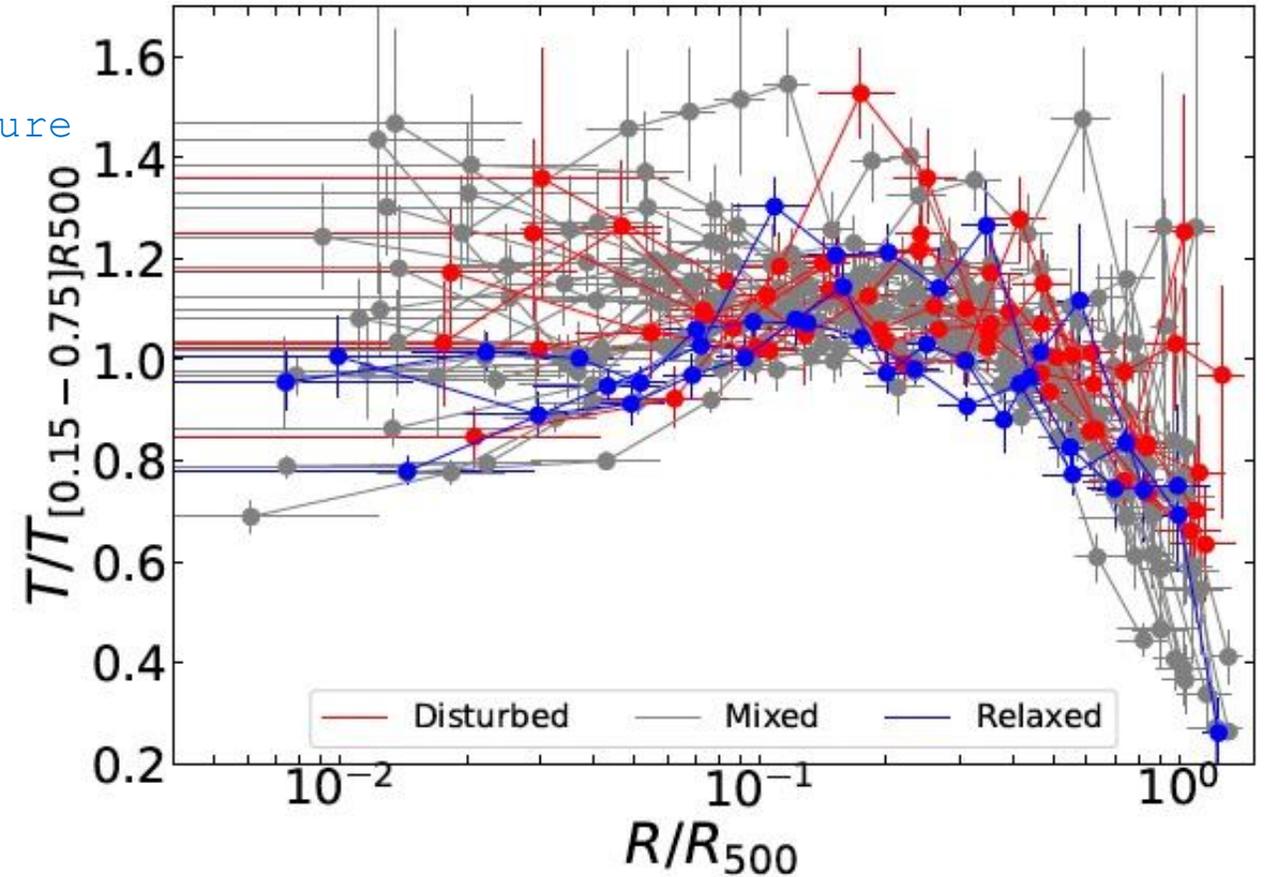
Mapping 'out-of-the-box' the properties of the baryons in massive halos



# Baryon distribution

Mapping 'out-of-the-box' the properties of the baryons in massive halos

CHEX-MATE: Robust reconstruction of temperature profiles in galaxy clusters with XMM-Newton



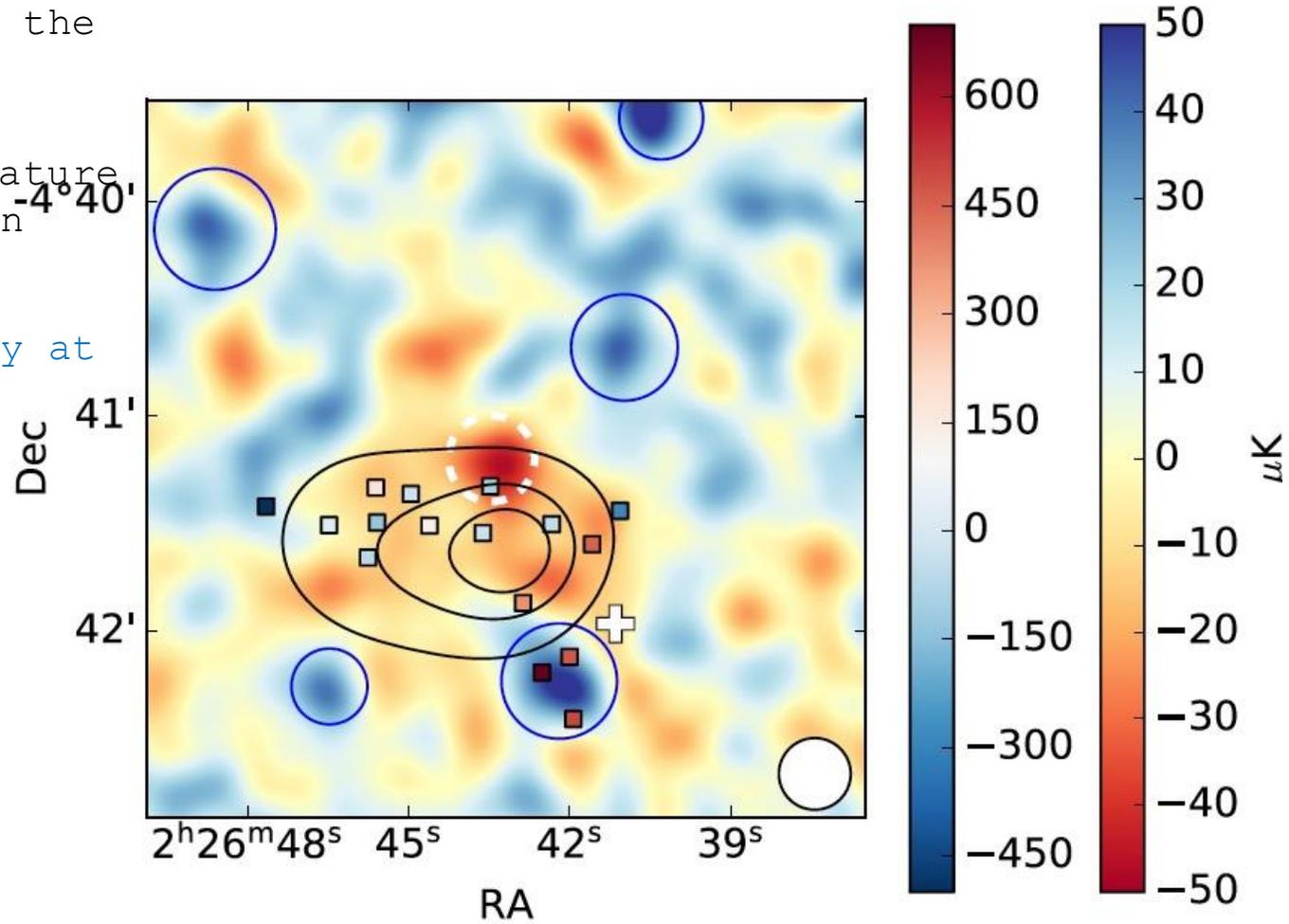
Rossetti et al. 2024

# Baryon distribution

Mapping 'out-of-the-box' the properties of the baryons in massive halos

CHEX-MATE: Robust reconstruction of temperature profiles in galaxy clusters with XMM-Newton

Witnessing the intracluster medium assembly at the cosmic noon in JKCS 041



Andreon et al. 2023

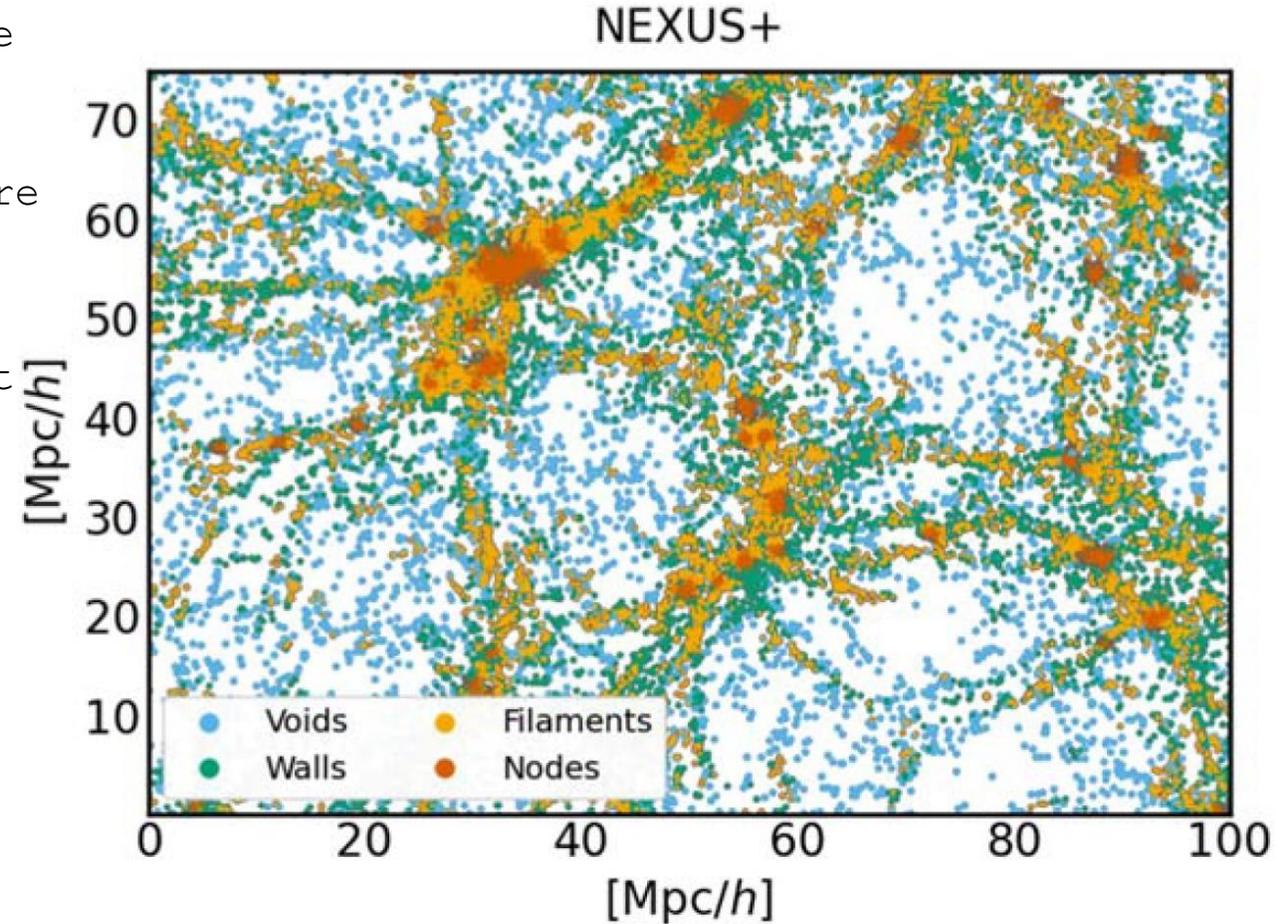
# Baryon distribution

Mapping 'out-of-the-box' the properties of the baryons in massive halos

CHEX-MATE: Robust reconstruction of temperature profiles in galaxy clusters with XMM-Newton

Witnessing the intracluster medium assembly at the cosmic noon in JKCS 041

Semi-analytic model (SAM) galaxy catalog to study star Formation and Dust content in the Cosmic Web



Parente et al. 2023

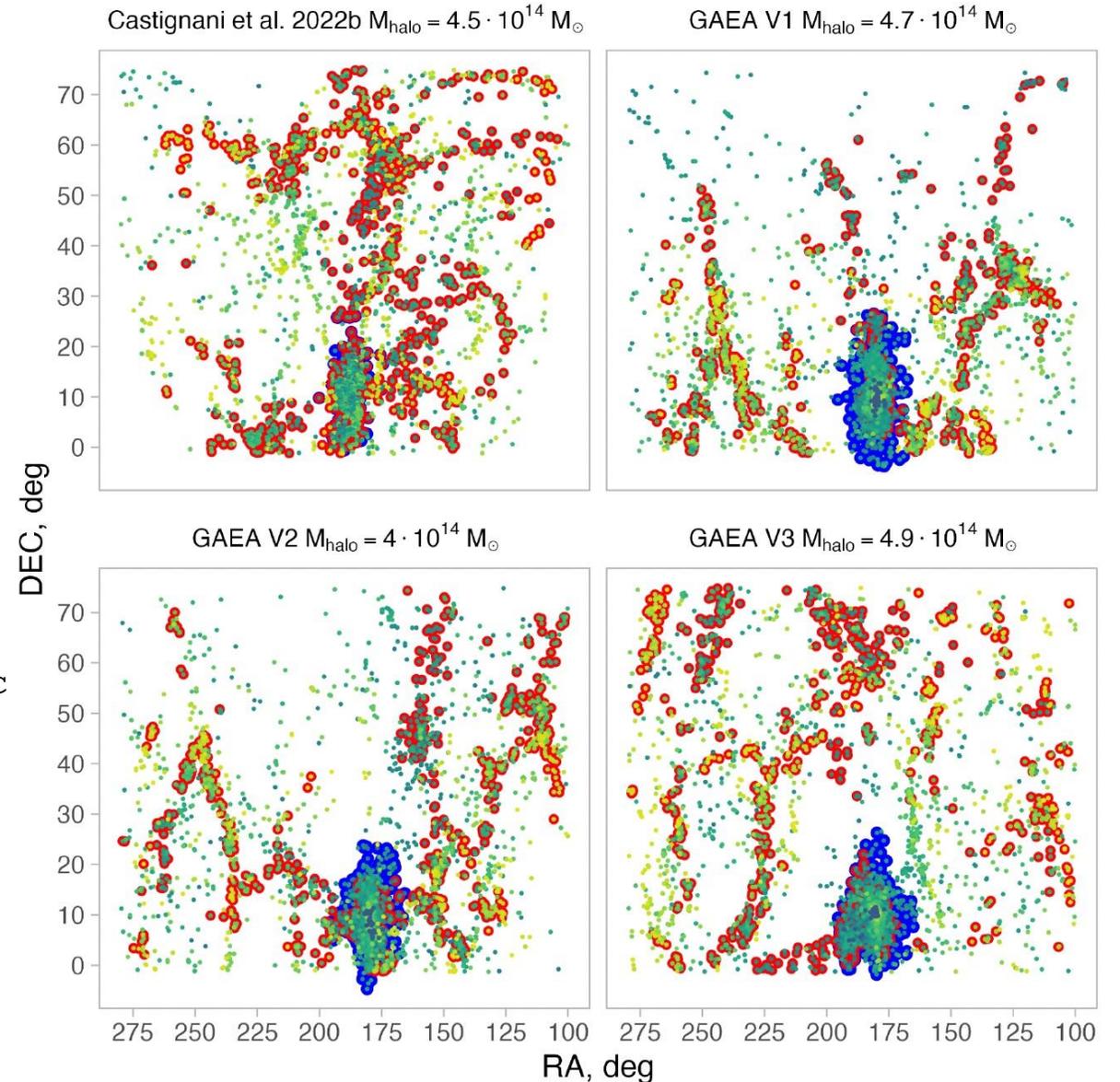
# Baryon distribution

Mapping 'out-of-the-box' the properties of baryons in massive halos

CHEX-MATE: Robust reconstruction of temperature profiles in galaxy clusters with XMM-Newton

Witnessing the intracluster medium assembly the cosmic noon in JKCS 041

Semi-analytic model (SAM) galaxy catalog to study star formation and dust content in the Cosmic Web  
Virgo Filaments III. The gas content of galaxies in filaments as predicted by the GAEA semi-analytic model



# Baryon distribution

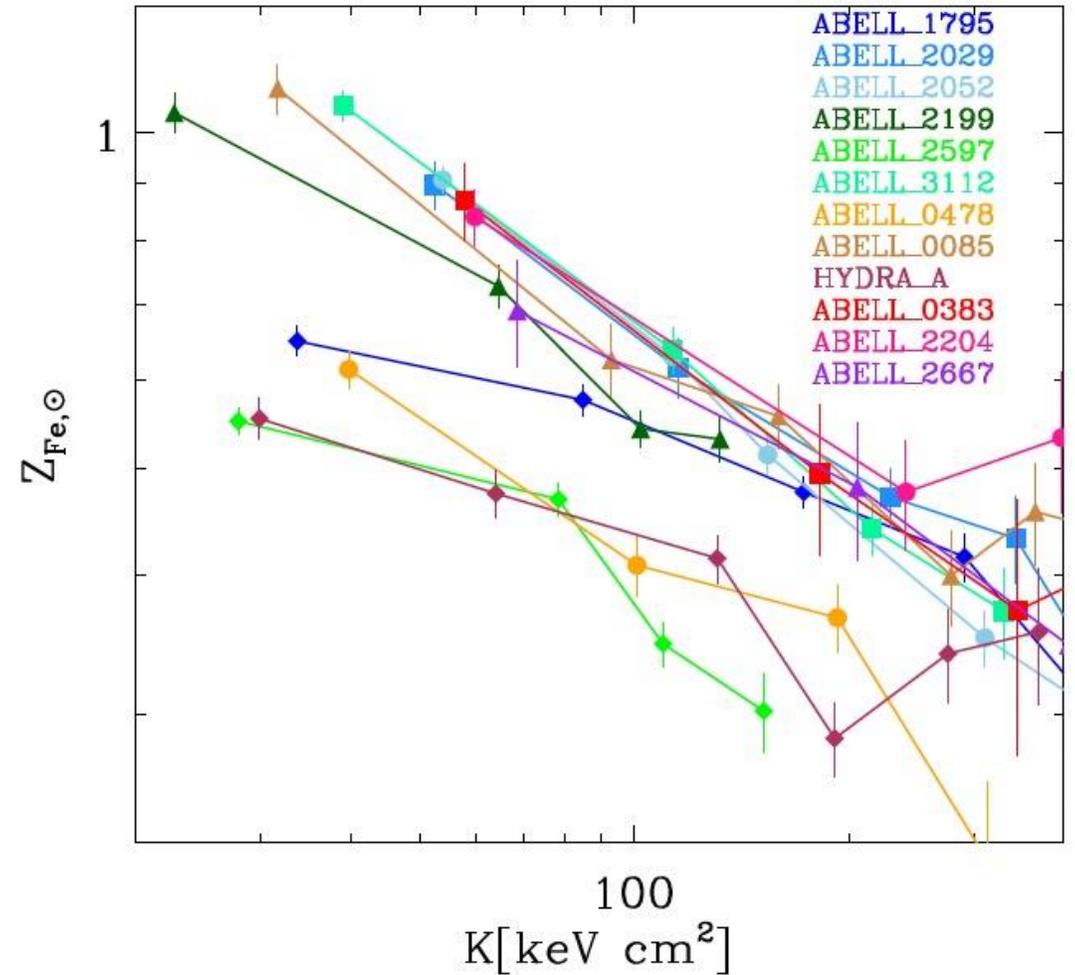
Mapping 'out-of-the-box' the properties of the baryons in massive halos

CHEX-MATE: Robust reconstruction of temperature profiles in galaxy clusters with XMM-Newton

Witnessing the intracluster medium assembly at the cosmic noon in JKCS 041

Semi-analytic model (SAM) galaxy catalog to study star Formation and Dust content in the Cosmic Web  
Virgo Filaments III. The gas content of galaxies in filaments as predicted by the GAEA semi-analytic model

Metal enrichment: The apex accretor perspective



# Baryon distribution

Mapping 'out-of-the-box' the properties of the baryons in massive halos

CHEX-MATE: Robust reconstruction of temperature profiles in galaxy clusters with XMM-Newton

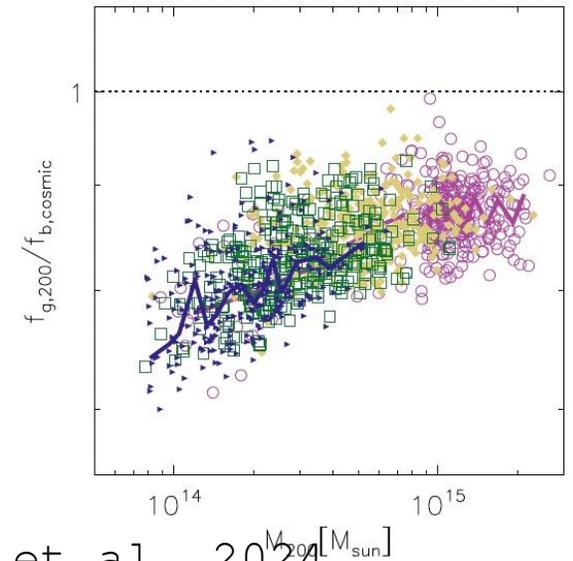
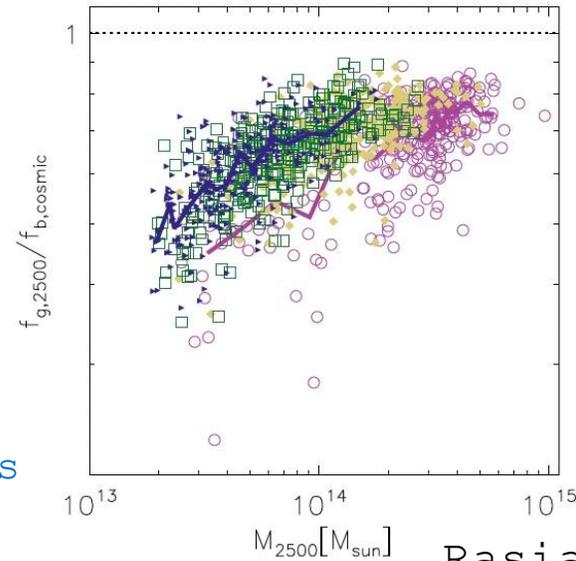
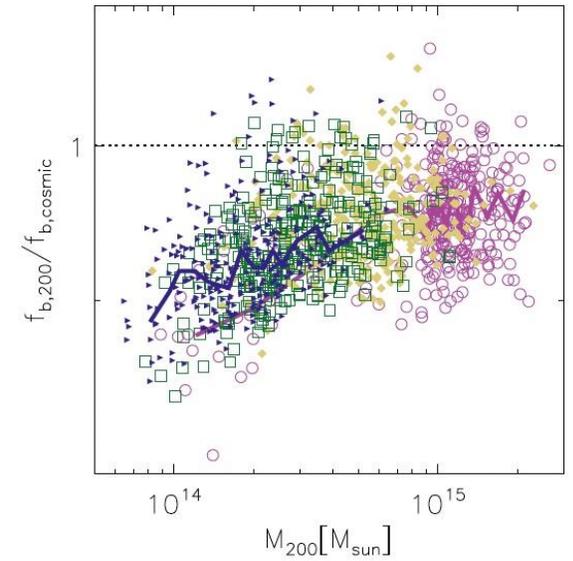
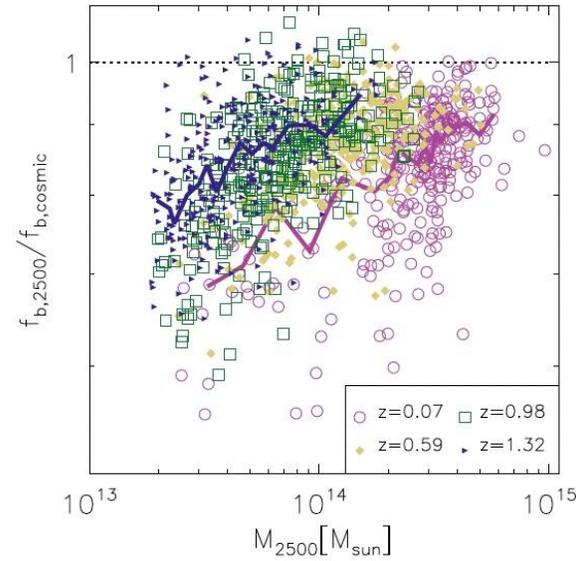
Witnessing the intracluster medium assembly at the cosmic noon in JKCS 041

Semi-analytic model (SAM) galaxy catalog to study

star Formation and Dust content in the Cosmic Web  
Virgo Filaments III. The gas content of galaxies in filaments as predicted by the GAEA semi-analytic model

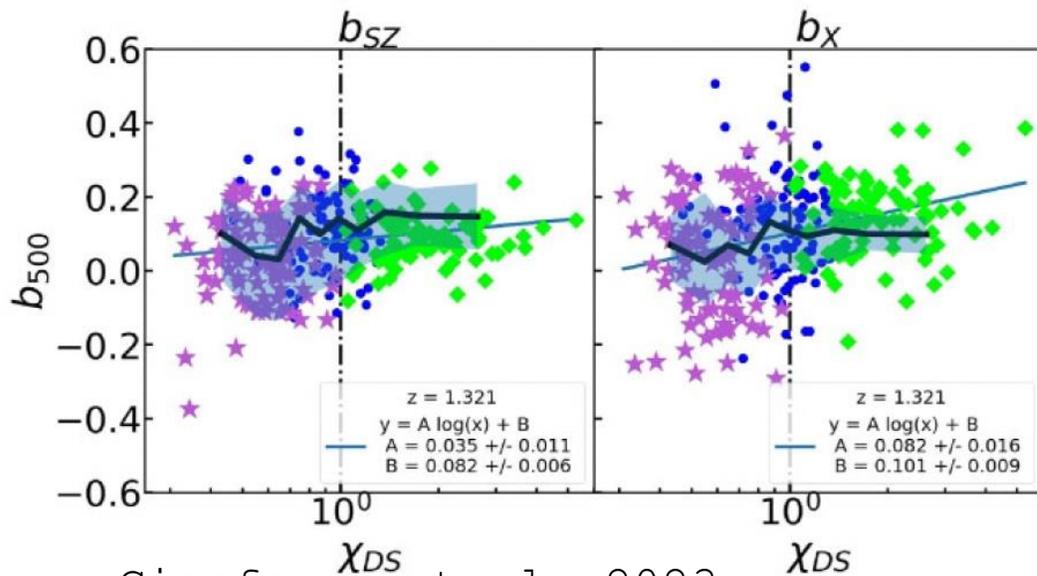
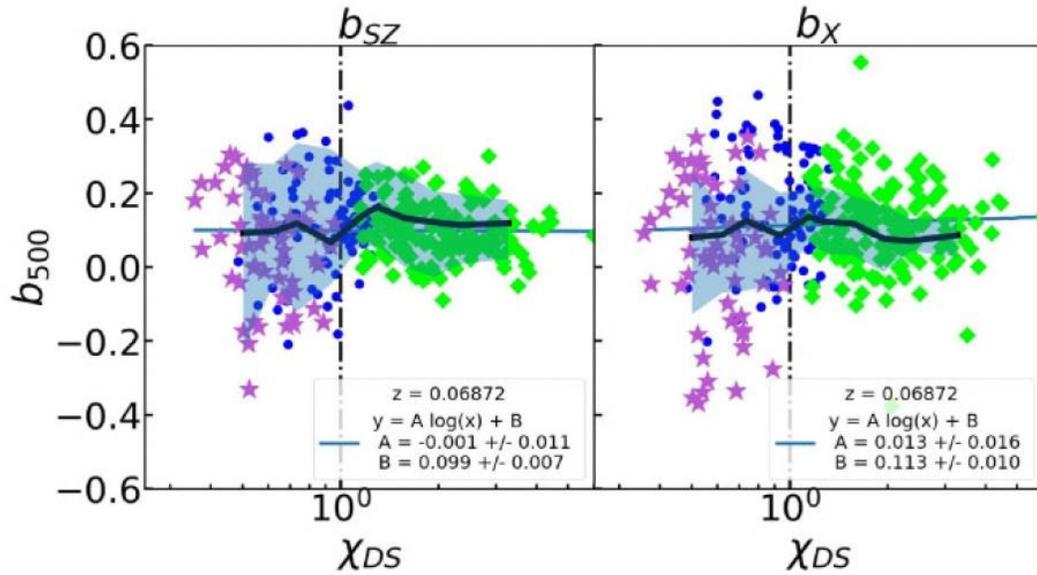
Metal enrichment: The apex accretor perspective

The Three Hundred Project: Modeling baryon and hot-gas fraction evolution in simulated clusters



# Dynamics

A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters



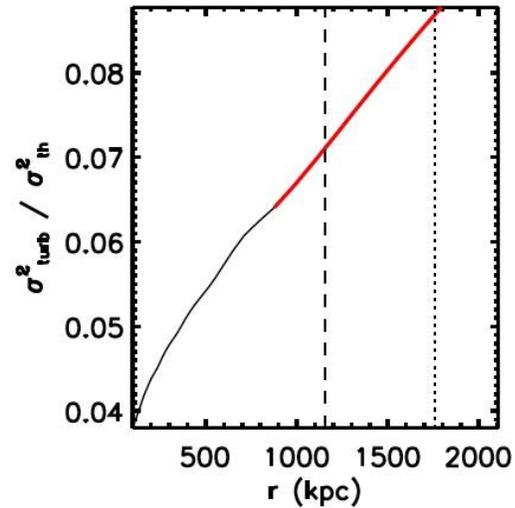
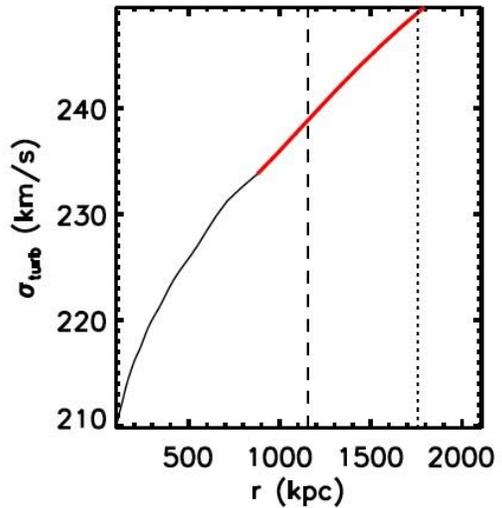
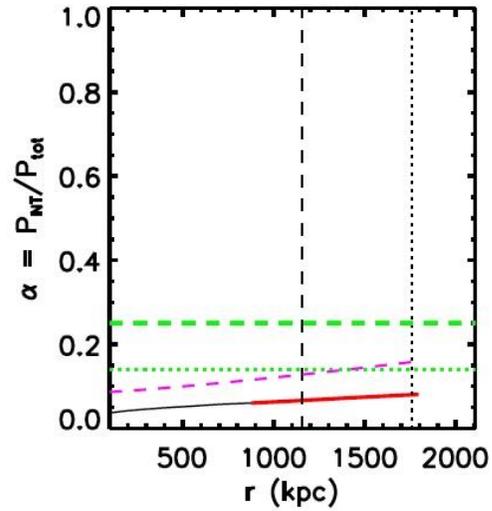
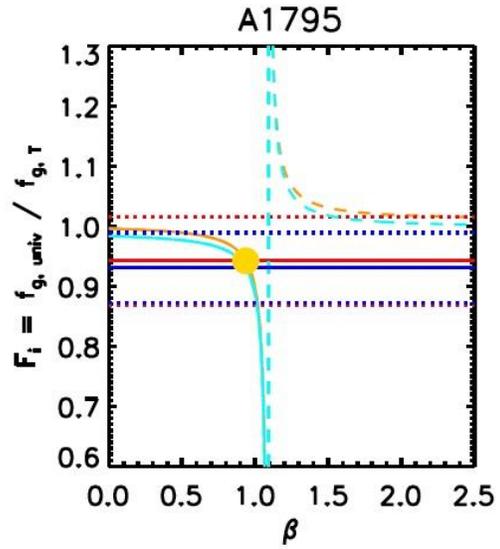
Gianfagna et al. 2023

I  
t  
t  
r

# Dynamics

A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters

Tracing the non-thermal pressure and hydrostatic bias in galaxy clusters

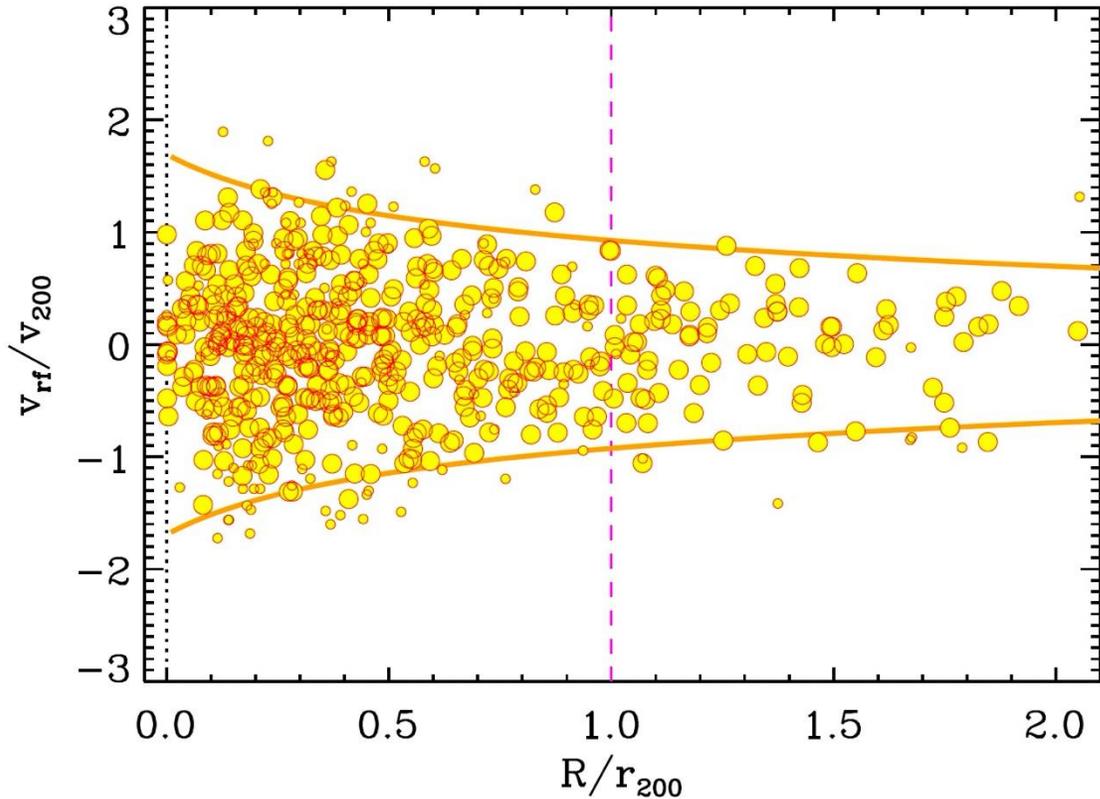


# Dynamics

A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters

Tracing the non-thermal pressure and hydrostatic bias in galaxy clusters

The GOGREEN survey: Internal dynamics of clusters of galaxies at redshift 0.9–1.4. The clusters in our sample have already reached a high degree of dynamical relaxation in excellent agreement with predictions of numerical simulations.



Biviano et al. 2021

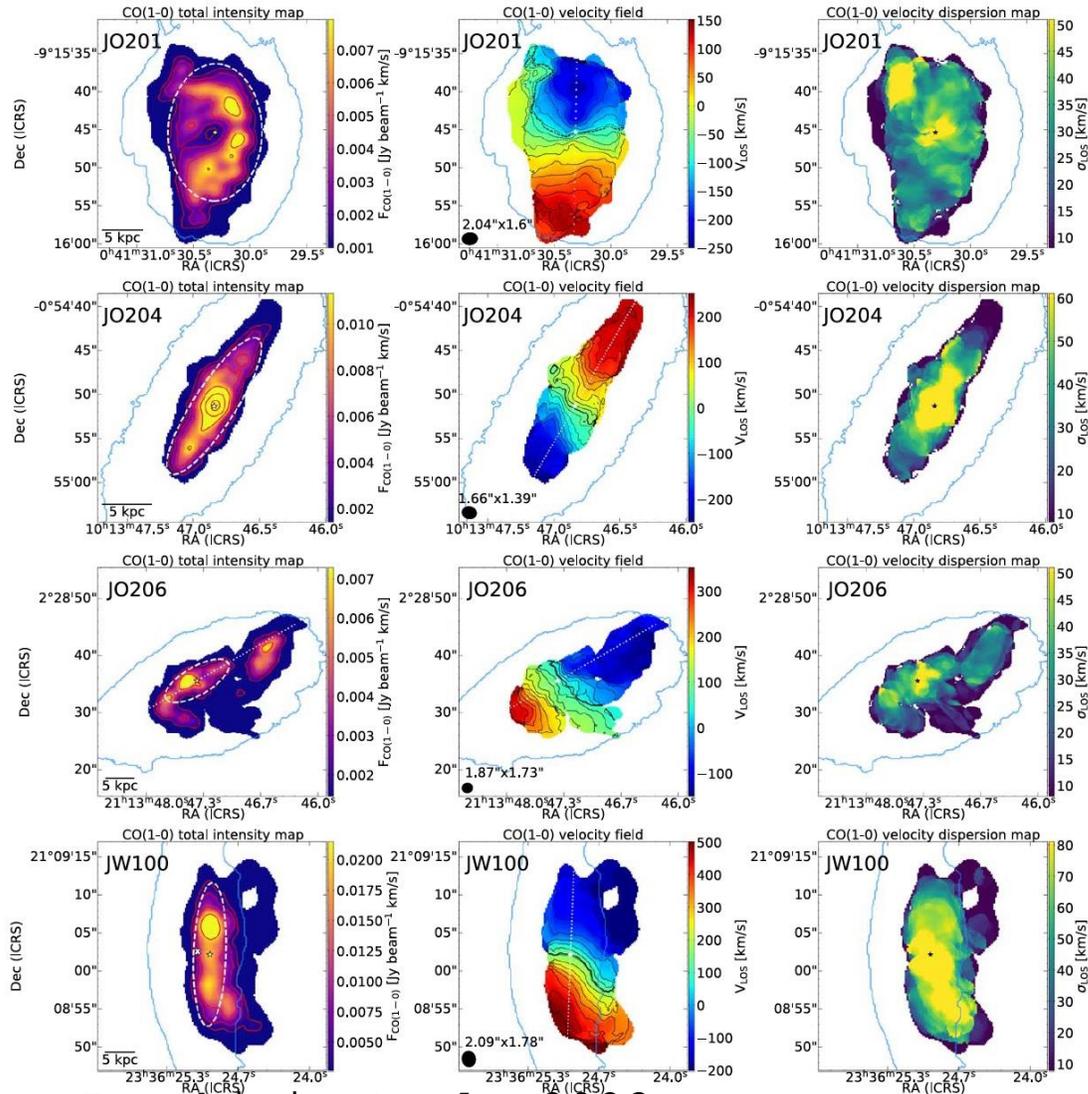
# Dynamics

A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters

Tracing the non-thermal pressure and hydrostatic bias in galaxy clusters

The GOGREEN survey: Internal dynamics of clusters of galaxies at redshift 0.9–1.4. The clusters in our sample have already reached a high degree of dynamical relaxation in excellent agreement with predictions of numerical simulations.

[3D Modeling of the Molecular Gas Kinematics in Optically Selected Jellyfish Galaxies](#)



Bacchini et al. 2023

# Dynamics

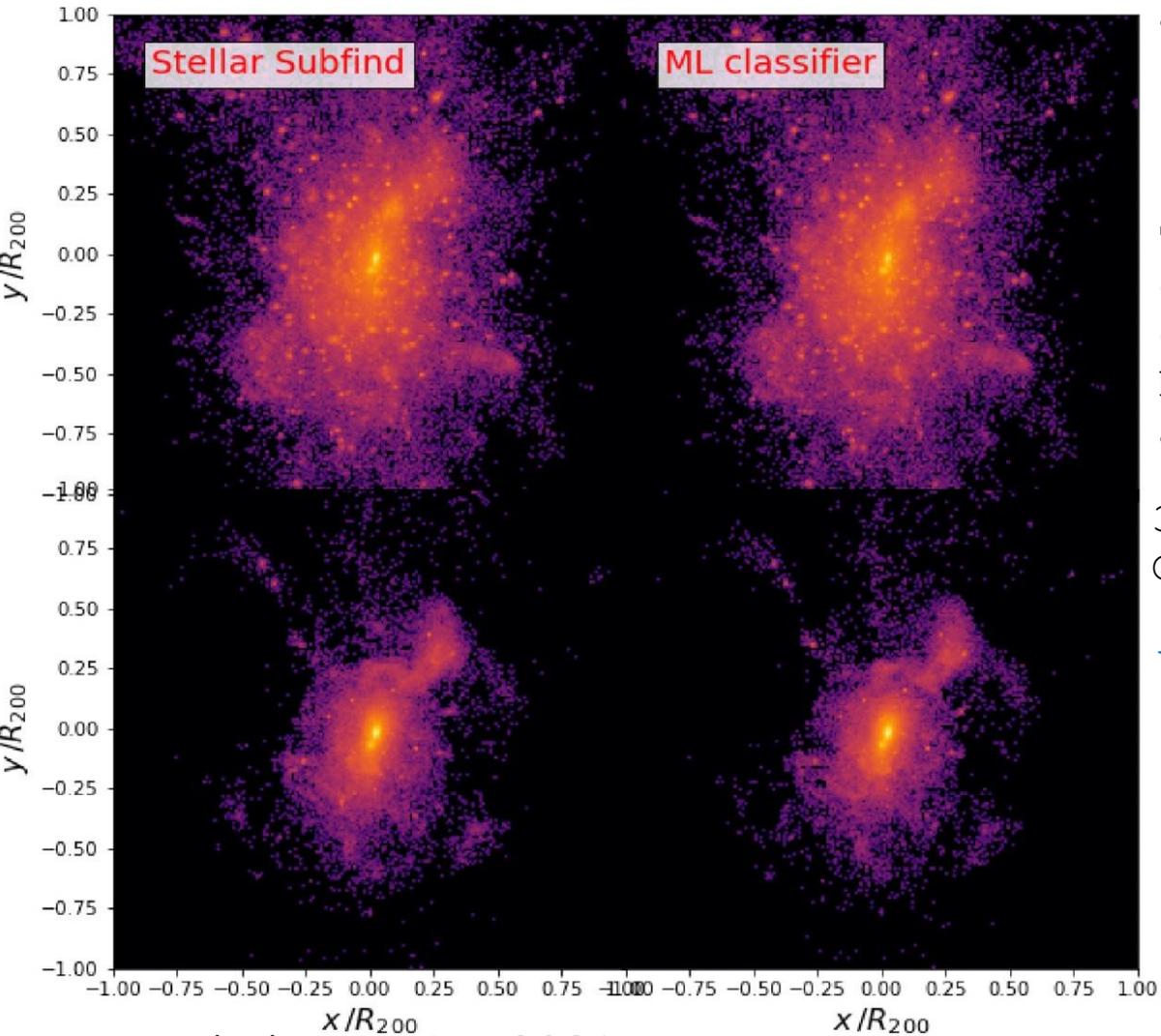
A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters

Tracing the non-thermal pressure and hydrostatic bias in galaxy clusters

The GOGREEN survey: Internal dynamics of clusters of galaxies at redshift 0.9–1.4. The clusters in our sample have already reached a high degree of dynamical relaxation in excellent agreement with predictions of numerical simulations.

3D Modeling of the Molecular Gas Kinematics in Optically Selected Jellyfish Galaxies

Velocity dispersion of brightest cluster galaxies in cosmological simulations



# Dynamics

A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters

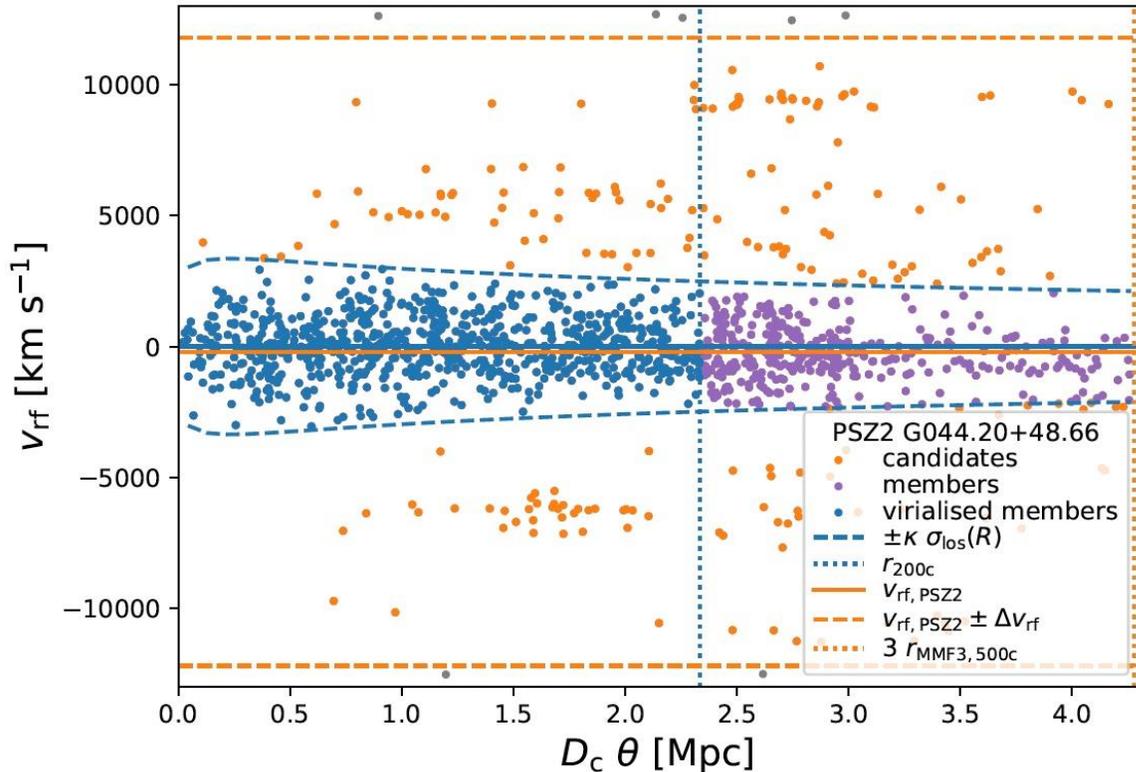
Tracing the non-thermal pressure and hydrostatic bias in galaxy clusters

The GOGREEN survey: Internal dynamics of clusters of galaxies at redshift 0.9–1.4. The clusters in our sample have already reached a high degree of dynamical relaxation in excellent agreement with predictions of numerical simulations.

3D Modeling of the Molecular Gas Kinematics in Optically Selected Jellyfish Galaxies

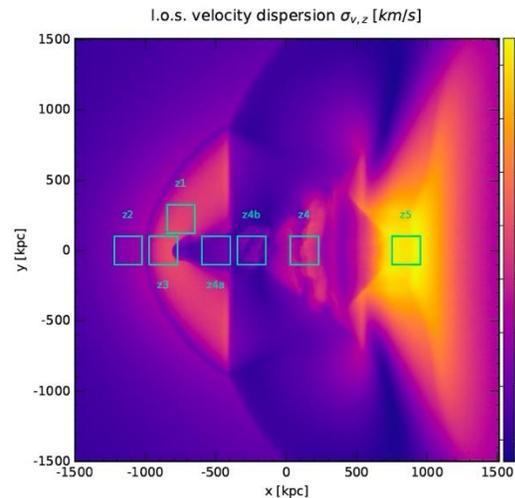
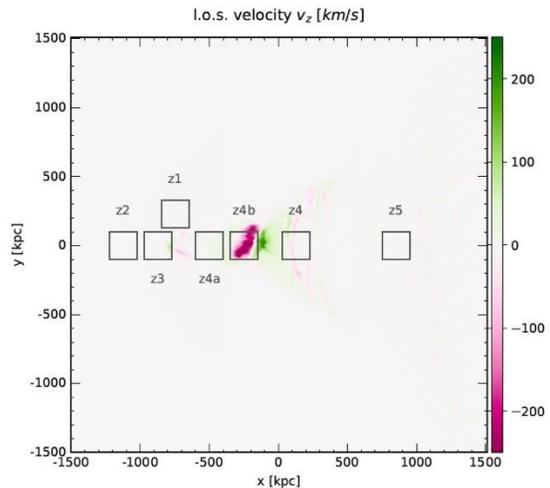
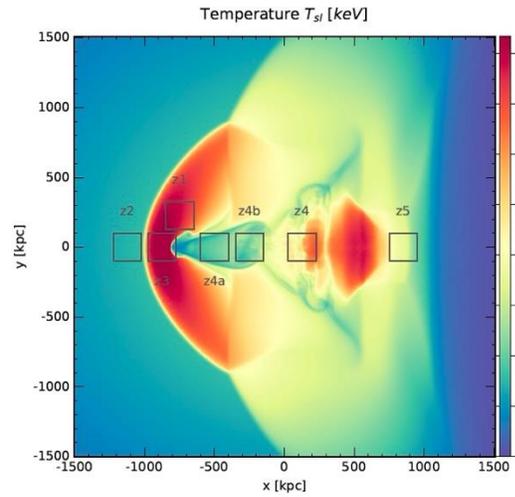
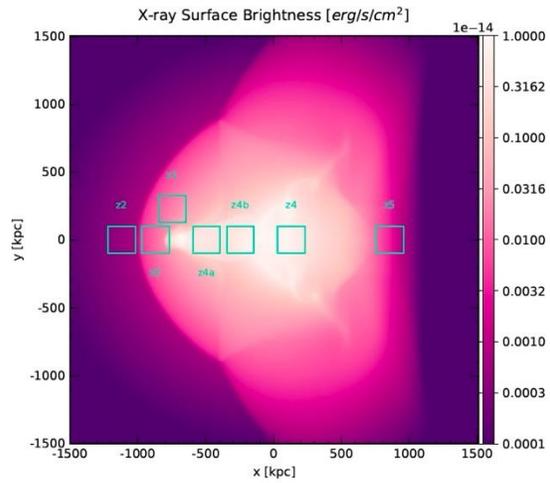
Velocity dispersion of brightest cluster galaxies in cosmological simulations

CHEX-MATE: Dynamical masses for a sample of 101 Planck Sunyaev-Zeldovich-selected galaxy clusters



Sereno et al. 2025

# Dynamics



A study of the hydrostatic mass bias dependence and evolution within The Three Hundred clusters

Tracing the non-thermal pressure and hydrostatic bias in galaxy clusters

The GOGREEN survey: Internal dynamics of clusters of galaxies at redshift 0.9-1.4. The clusters in our sample have already reached a high degree of dynamical relaxation in excellent agreement with predictions of numerical simulations.

3D Modeling of the Molecular Gas Kinematics in Optically Selected Jellyfish Galaxies

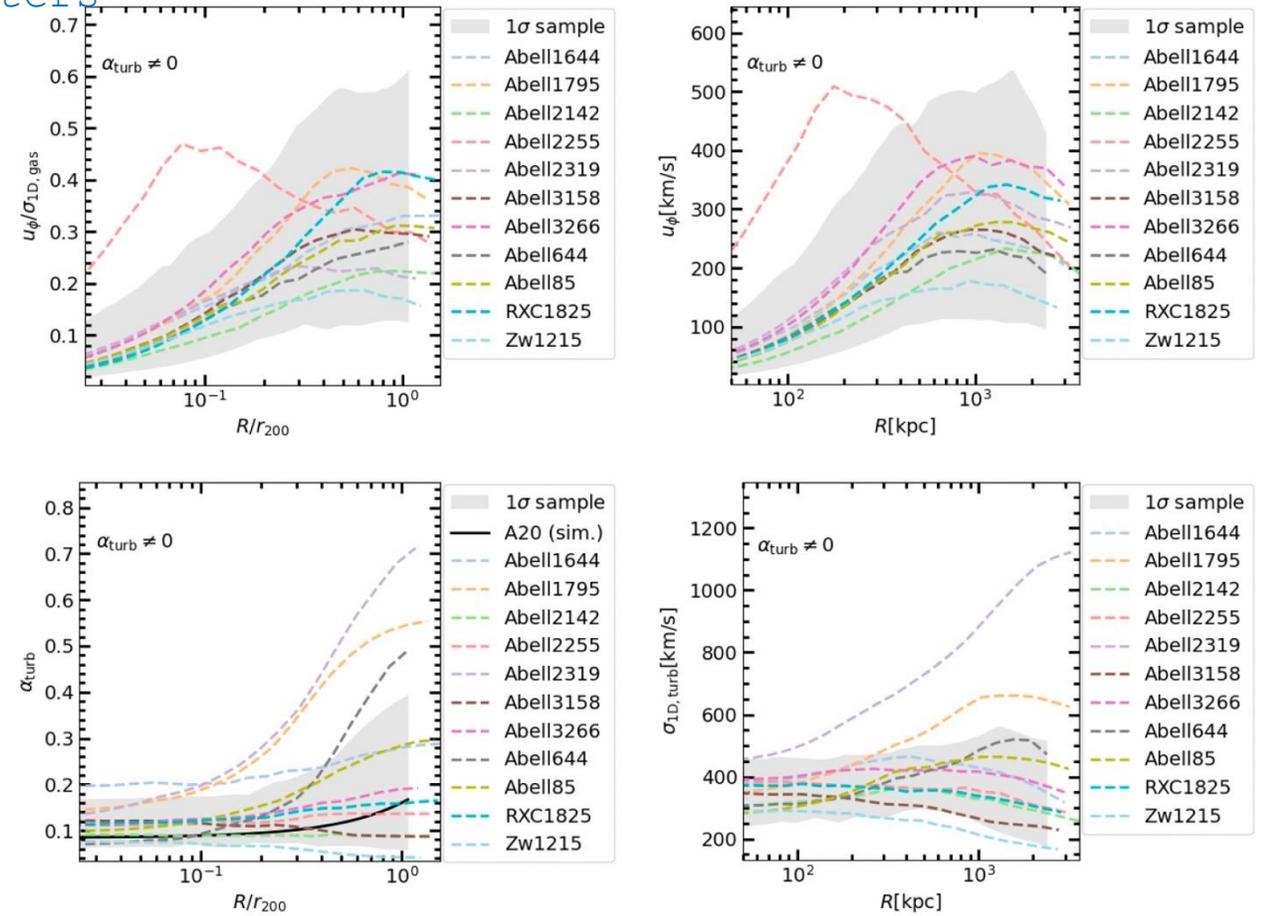
Velocity dispersion of brightest cluster galaxies in cosmological simulations

CHEX-MATE: Dynamical masses for a sample of 101 Planck Sunyaev-Zeldovich-selected galaxy clusters

The velocity structure of the intracluster medium during a major merger: Simulated microcalorimeter observations

# Dynamics

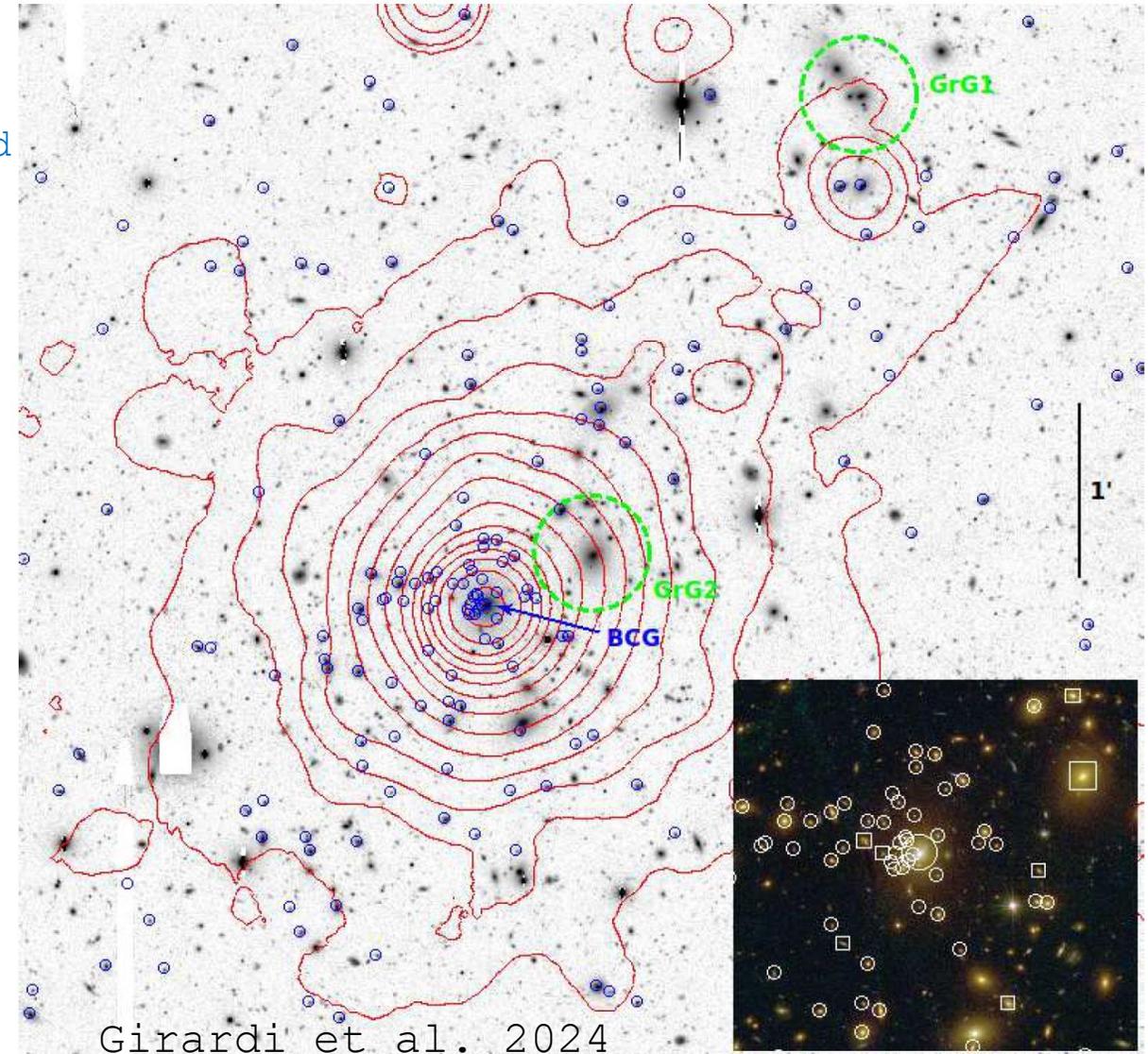
Searching for rotation in X-COP galaxy clusters



# Dynamics

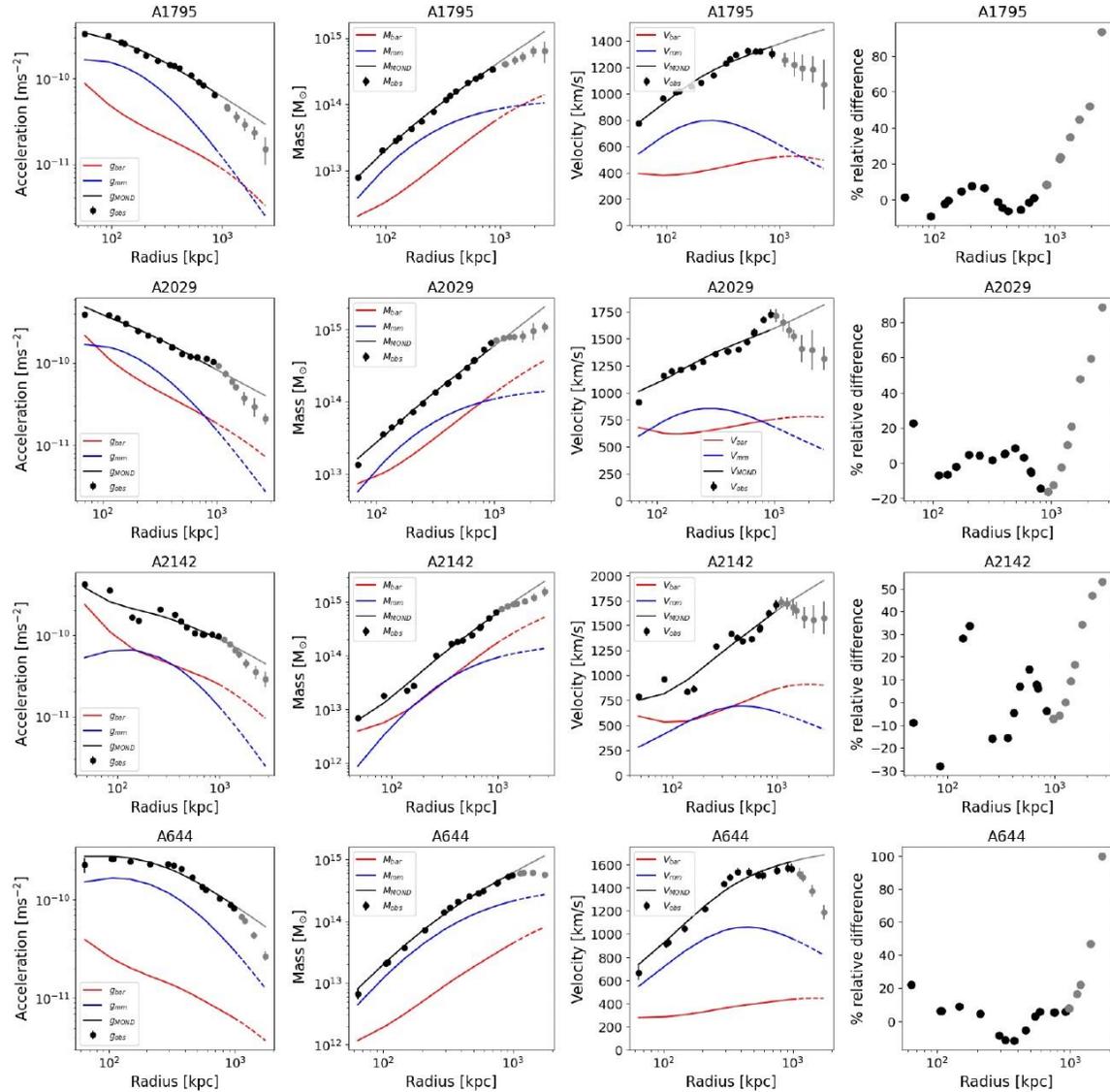
Searching for rotation in X-COP galaxy cluster

CLASH-VLT: Galaxy cluster MACS J0329-0211 and its surroundings using galaxies as kinematic tracers



# Fundamental Physics

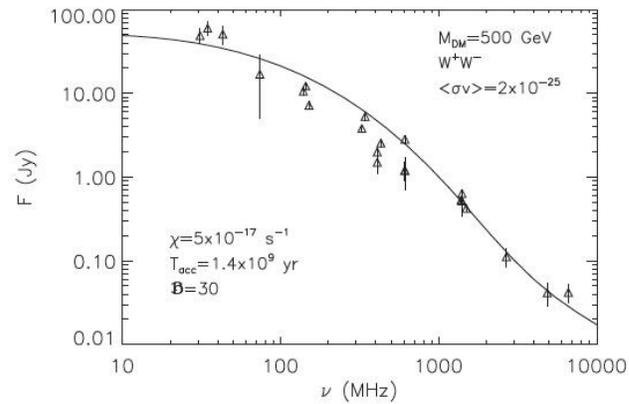
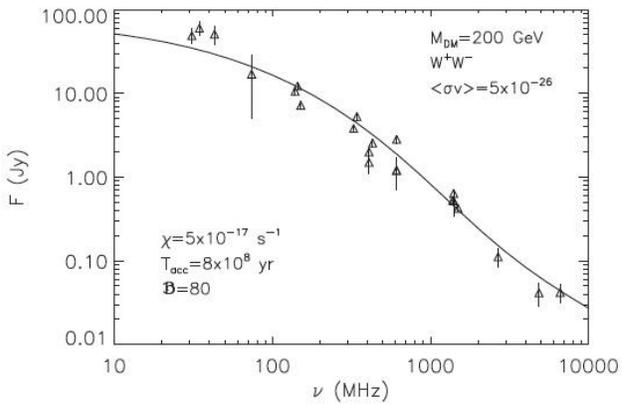
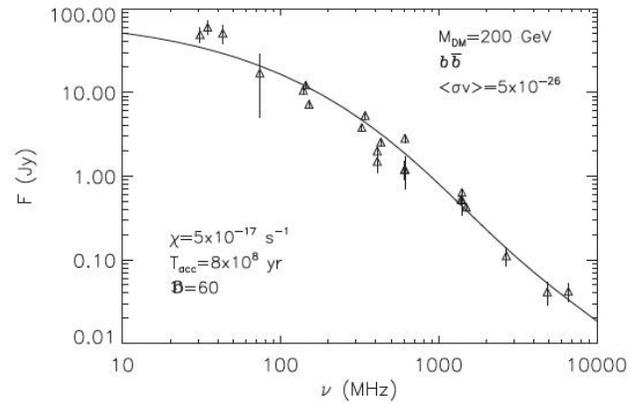
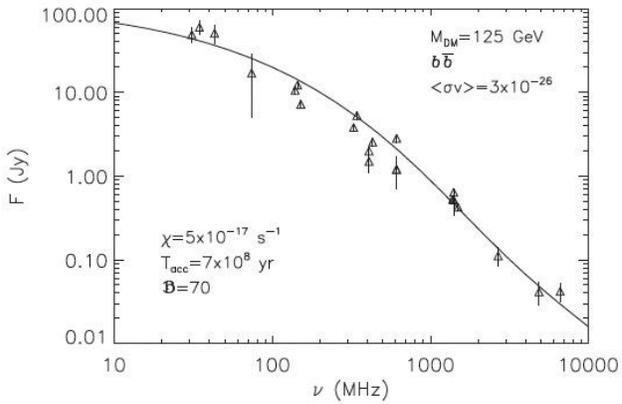
Galaxy clusters in Milgromian dynamics:  
Missing matter, hydrostatic bias, and the  
external field effect



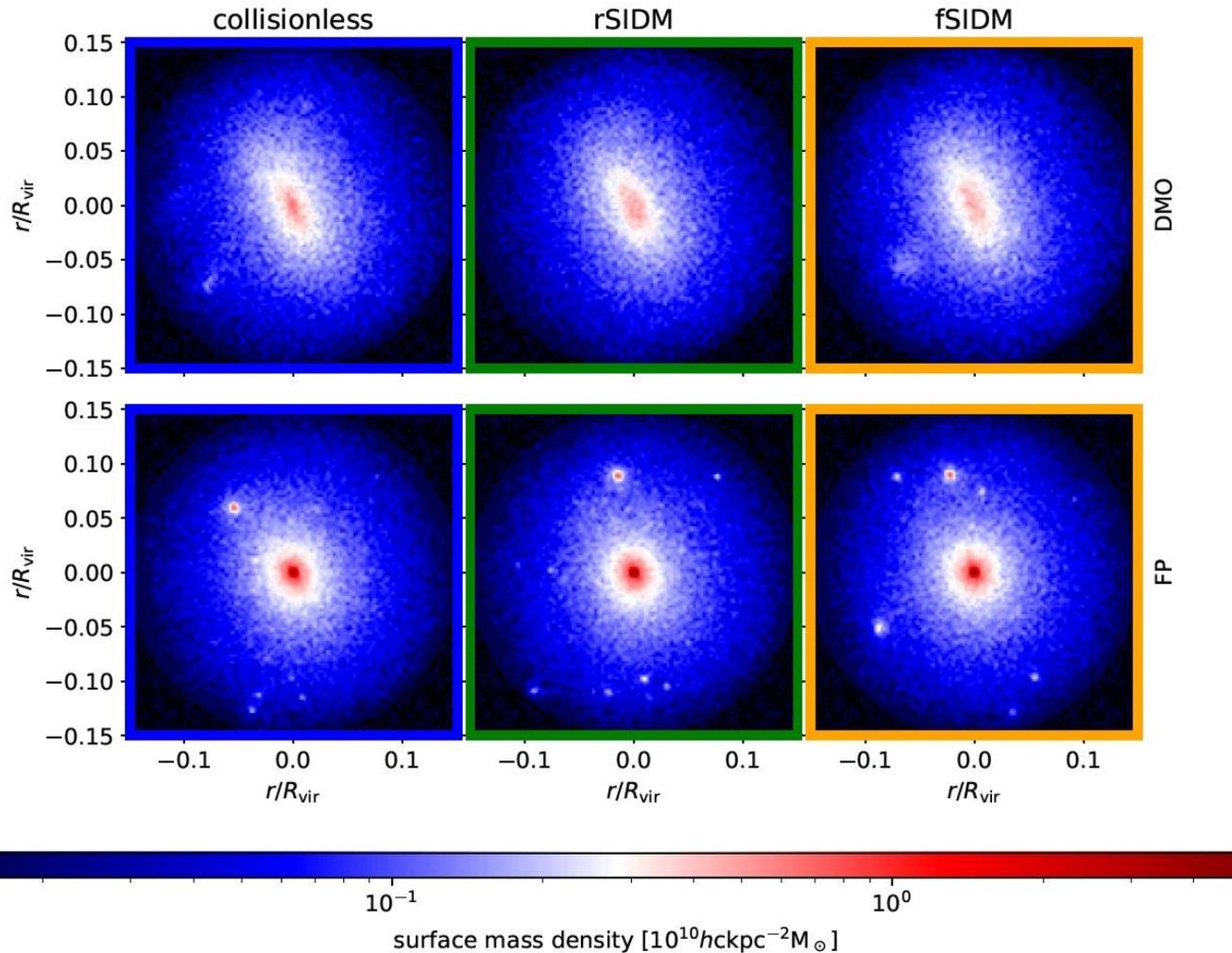
# Fundamental Physics

Galaxy clusters in Milgromian dynamics:  
Missing matter, hydrostatic bias, and the  
external field effect

Constraints on dark matter annihilation and  
turbulent reacceleration set by high-  
frequency observations of the radio halo in  
the Coma cluster with the Sardinia Radio  
Telescope

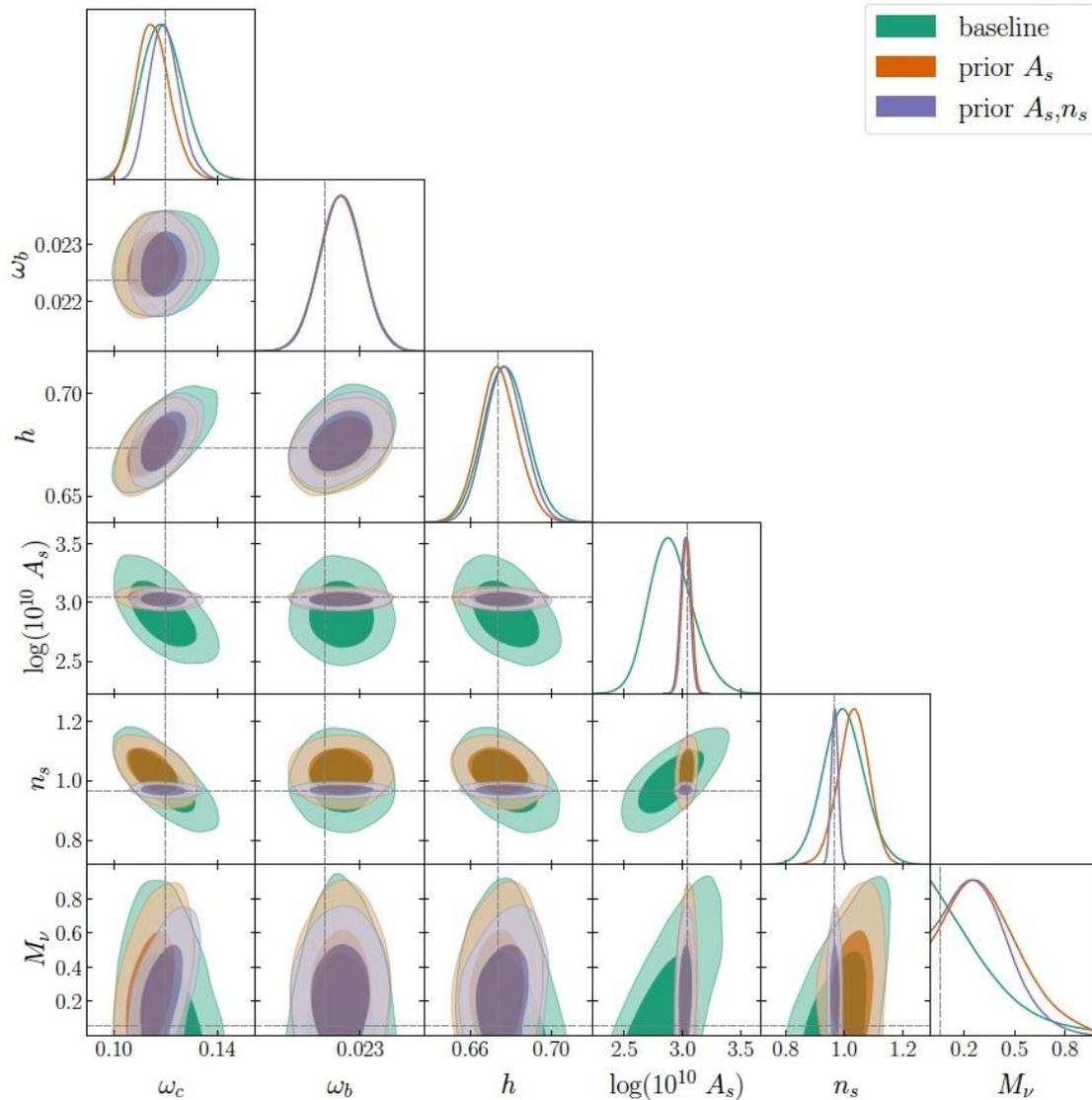


# Fundamental Physics



Galaxy clusters in Milgromian dynamics:  
Missing matter, hydrostatic bias, and the  
external field effect  
Constraints on dark matter annihilation and  
turbulent reacceleration set by high-  
frequency observations of the radio halo in  
the Coma cluster with the Sardinia Radio  
Telescope  
Dianoga SIDM: Galaxy cluster self-  
interacting dark matter simulations. SIDM  
models generate a broader range of subhalo  
concentration values.

# Fundamental Physics



Moretti et al. 2023

Galaxy clusters in Milgromian dynamics:  
Missing matter, hydrostatic bias, and the  
external field effect  
Constraints on dark matter annihilation and  
turbulent reacceleration set by high-  
frequency observations of the radio halo in  
the Coma cluster with the Sardinia Radio  
Telescope  
Dianoga SIDM: Galaxy cluster self-  
interacting dark matter simulations. SIDM  
models generate a broader range of subhalo  
concentration values.  
Modified gravity and massive neutrinos:  
constraints from the full shape analysis of  
BOSS galaxies and forecasts for Stage IV  
surveys