

# MeerKAT Galaxy Cluster Legacy Survey (MGCLS) HI

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Galaxies in the cluster environment differ from field or isolated galaxies, with ellipticals and lenticulars dominating in dense cluster environments and spirals in the field populations; hence, the morphology-density relation. We aim to explore how scaling relations and HI morphologies vary with cluster size and dynamical state. Given that almost 40% of galaxies reside in groups or clusters, the cluster environment plays a crucial role in galaxy evolution. The goal of this work is to explore galaxy properties and evolution across a variety of cluster environments using data from the MeerKAT Galaxy Cluster Legacy Survey (MGCLS).

**Table 1.** Global Properties of the MGCLS Galaxy Clusters

Cluster Name	RA (deg)	Dec (deg)	Redshift	Cluster State	$M_{500}$	$R_{500}$ (Mpc)	$R_{200}$ (Mpc)	$\sigma$ (Km/s)
J0431.4-6126-RXC-J0431.4-6126	67.85	-61.44	0.06	Merged Cluster	$4.56 \times 10^{14}$	1.15	2.49	1032.65
Abell-3562	203.40	-31.66	0.05	Shapley Supercluster	$2.37 \times 10^{14}$	0.93	1.77	769.00
J0351.1-8212-RXC-J0351.1-8212	57.79	-82.22	0.06	Relaxed Cluster	$2.19 \times 10^{14}$	0.90	1.91	794.15
Abell-4038	356.93	-28.14	0.03	Relaxed Cluster	$2.04 \times 10^{14}$	0.89	2.28	933.00
J0314.3-4525-RXC-J0314.3-4525	48.58	-45.42	0.07	Horologium-Reticulum Supercluster	$1.98 \times 10^{14}$	0.87	4.14	1728.71
Abell-168	18.80	0.33	0.04	Merged Cluster	$1.25 \times 10^{14}$	0.75	1.32	546.00
J0540.1-4050-RXC-J0540.1-4050	85.03	-40.84	0.04	Relaxed Cluster	$1.22 \times 10^{14}$	0.75	2.71	1115.48
J0757.7-5315	119.44	-53.26	0.04	Relaxed Cluster	$1.11 \times 10^{14}$	0.72	1.33	548.25
Abell-548	86.36	-25.94	0.04	Merged Cluster	$1.60 \times 10^{14}$	0.55	2.15	887.00
J0600.8-5835	90.20	-58.59	0.04	Relaxed Cluster	$4.32 \times 10^{13}$	0.53	2.39	982.37
Abell-194	21.42	-1.41	0.02	Relaxed Cluster	$3.98 \times 10^{13}$	0.52	1.03	421.00
J2319.2-6750	349.80	-67.84	0.03	Relaxed Cluster	$3.13 \times 10^{13}$	0.47	2.59	1062.38

## Results

- These clusters were classified into three categories: **merging**, **relaxed**, and **supermassive**.
- This poster shows one representative from each category, as well as one interesting candidate: a group of galaxies moving through the cluster at velocities greater than the cluster's escape velocity (Abell 4038).
- In the figures below,
  - The left panels show substructures identified using the Dressler-Shectman method (blue bubbles), regular-morphology galaxies (grey circles), one-sided-tailed galaxies (purple diamonds), and irregular-morphology galaxies (open circles).
  - The middle-left panel shows the Amod HI-offset plot for each cluster, with morphology shown as well.
  - The middle-right panel shows the Phase-space diagrams for each cluster, with the morphology shown as well.
  - The right panel shows the spatial distribution of the HI gas fraction as bubble plots.

