We present an improved weak-lensing (WL) study of the high-z (z=0.87) merging galaxy cluster ACT-CL J0102-4915 ("El Gordo"), the most massive system known to date at z > 0.6. El Gordo has been known to be an exceptionally massive and rare cluster for its redshift in the current ΛCDM cosmology. Previous multi-wavelength studies have also found that the cluster might be undergoing a merging event showing two distinctive mass clumps and radio relics. The previous WL study revealed a clear bimodal mass structure and found that the entire system is indeed massive (M_{200a} = (3.13 ± 0.56) × 10^{15} M_{sun}). This mass estimate, however, was obtained by extrapolation because the previous HST observation did not extend out to the virial radius of the cluster. In this work, we determine a more accurate mass estimate of the cluster using WL analysis utilizing a new set of WFC3/IR and wide-field ACS observations. While confirming the previous bimodal mass structure, we find that the new data yield a ~20% lower mass for the entire system (M_{200a} = (2.37 ± 0.28) × 10^{15} M_{sun}). We also discuss the rarity of the cluster in the ΛCDM paradigm and suggest an updated merging scenario based on our new measurement.

[구 GC-03] Discovery of a Radio Relic in the Massive Merging Cluster SPT-CL J2023-5535 from the ASKAP-EMU Pilot Survey

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The ASKAP-EMU survey is a deep wide-field radio continuum survey designed to cover the entire southern sky and a significant fraction of the northern sky up to +30°. Here, we report a discovery of a radio relic in the merging cluster SPT-CL J2023-5535 at z=0.23 from the ASKAP-EMU pilot 300 square degree survey (800-1088 MHz). The deep high-resolution data reveal a ~2 Mpc-scale radio halo elongated in the east-west direction, coincident with the intracluster gas. The radio relic is located at the western edge of this radio halo stretched ~0.5 Mpc in the north-south orientation. The integrated spectral index of the radio relic within the narrow bandwidth is $\alpha_{800\,MHz}^{1088\,MHz} = -0.76 \pm 0.06$. Our weak-lensing analysis shows that the system is massive ($M_{200} = 1.04 \pm 0.36 \times 10^{15} M_{\odot}$) and composed of at least three subclusters. We suggest a scenario, wherein the radio features arise from the collision between the eastern and middle subclusters. Furthermore, the direct link between the local AGN and the relic along with the discontinuities in X-ray observation hint us that we are looking at the site of re-acceleration.

[구 GC-04] Circumnuclear gas around the central AGN in a cool-core cluster, A1644-South

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We present the properties of circumnuclear gas associated with the AGN located in the center of Abell 1644-South. A1644-S is the main cluster in a merging system, which is also known for gas sloshing in its core as seen in X-ray. The X-ray emission of A1644-S shows a rapidly declining profile, indicating the presence of cooling gas flow.

This flow of cool gas may fuel the supermassive black hole embedded in the brightest cluster galaxy, leading to the activation of the central AGN. Indeed, we find a parsec-scale bipolar jet feature in the center of A1644-S in our recent KaVA observation, which implies that its central AGN is likely to have been (re)powered quite recently. In order to verify the hypothesis that cooling gas flow in the cluster core can (re)activate the central AGN, we probe the cold gas properties of the central 1 kpc region of A1644-S using the archival VLA and ALMA data. Based on the spatially resolved morphology and kinematics of HI and CO gas, we challenge to identify inflow/outflow gas streams and clumps. We study the role of circumnuclear cool gas in fueling the centrally located cluster AGN in the cool-core environment. We also discuss how the feedback due to the (re)powered AGN affects the surrounding medium.

[구 GC-05] Bar Formation and Enhancement of Star Formation in Disk Galaxies in Interacting Clusters

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A merger or interaction between galaxy clusters is one of the most violent events in the universe. Thus, an interacting cluster is an optimum laboratory to understand how galaxy properties are influenced by a drastic change of the large-scale environment. Here, we present the observational evidence that bars in disk galaxies can form by cluster-cluster interaction and the bar formation is associated with star-formation enhancement. We investigated 105 galaxy clusters at $0.015<z<0.060$ that are detected from the Sloan Digital Sky Survey data, and identified 16 interacting clusters. We find that the barred disk galaxy fraction is about 1.5 times higher in interacting clusters than in clusters with no obvious signs of interaction (42% versus 27%). For disk galaxies with $10.0<\log M_{star}<10.4$, the bar formation is accompanied by enhancement of star formation, so that the fraction of star-forming galaxies is about 1.2 times higher in interacting clusters than in non-interacting clusters. Our results indicate that cluster-cluster interaction is an important mechanism that can induce bars and star formation in disk galaxies.

[구 GC-06] YZiCS: On the Mass Segregation of Galaxies in Clusters

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Mass segregation, a tendency of more massive galaxies being distributed closer to the cluster center, is naturally expected from dynamical friction, but its presence is still controversial. Using deep optical observations of 14 Abell clusters (KYDISC) and a set of hydrodynamic simulations (YZiCS), we find in some cases a hint of mass segregation inside the virial radius. Segregation is visible more clearly when the massive galaxy fraction is used instead of mean stellar mass. The trend is more significant in the simulations than in the observations. To find out the mechanisms working on mass segregation, we look into the evolution of individual clusters simulated. We find that the degree of mass segregation is different for different clusters: the trend is visible only for low-mass clusters. We compare the masses of galaxies and their dark haloes at the time of infall and at the present epoch to quantify the amount of tidal stripping. We then conclude that satellites that get accreted at earlier epochs, or galaxies in more massive clusters go through more tidal stripping. These effects in combination result in a correlation between the host halo mass and the degree of stellar mass segregation. This is a work submitted to The Astrophysical Journal (under review).

[구 GC-07] Surface Brightness Fluctuation of Normal and Helium-enhanced Simple Stellar Populations

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