explained away by differing dust fraction, suggesting there are real differences in their stellar populations. SFRs derived from SED-fitting tend to be higher in unrelaxed systems. This could be partly because there is a greater fraction of BGGs with non-elliptical morphology, but also because unrelaxed systems are expected to have larger numbers of mergers, some of which may bring fuel for star formation. The SED-fitted stellar metallicities of BGGs in unrelaxed systems also tend to be higher, perhaps because the building blocks of the unrelaxed systems were more massive and had more time to enrich themselves. We find that the △M12 parameter is the most important parameter behind the observed differences in the relaxed/unrelaxed groups. We also find that groups selected to be unrelaxed using our criteria tend to have higher velocity offsets between the BGG and their group.

[초 GC-07] The rise and fall of dusty star formation in (proto-)clusters

Kyung-Soo Lee
Department of Physics and Astronomy
Purdue University

The formation and evolution of galaxies is known to be fundamentally linked to the local environment in which they reside. In the highest-density cluster environments, galaxies tend to be more massive, have lower star formation rates and dust content, and a higher fraction have elliptical morphologies. The stellar populations of these cluster galaxies are older implying that they formed the bulk of their stars much earlier and have since evolved passively. Quantifying the specific environmental factors that contribute to shaping cluster galaxies over the Hubble time and measuring their early evolution can only be accomplished by directly tracing the galaxy growth in young clusters and forming porto-clusters. In this talk, I will present a novel technique designed to map out the total dust obscured star formation relative to where existing stars lie. I will demonstrate that this technique can be used 1) to determine if/where/when the activity is heightened or suppressed in dense cluster environment; 2) to measure the total mass and spatial distribution of stellar populations; and 3) to better inform theoretical models. Our ongoing work to extend this analysis out to protoclusters (z~2-4) will be discussed.

[박 GC-08] Environments of Galaxies and Their Effects on Galaxy Properties

Yongmin Yoon[1], Myungshin Im[1]
[1]*Center for the Exploration of the Origin of the Universe, Astronomy Program, Department of Physics and Astronomy, Seoul National University*

In the history of universe, galaxies are consistently affected by surrounding medium and neighbor galaxies. These effects control galaxy evolution, making properties of galaxies diverse and dependent on environments. We investigate environments of various types of galaxies and how they affect galaxy properties, such as bar structures and galaxy sizes, etc. First, we present the observational evidence that bars can form from a cluster-cluster interaction. The evidence indicates that bars can form due to a large-scale violent phenomenon, and cluster-cluster interaction should be considered as an important channel for bar formation. Second, we discover for the first time that local early-type galaxies heavier than 1011.2 Msol show a clear environmental dependence in mass-size relation, in such a way that galaxies are as much as 20 - 40% larger in densest environments than in underdense environments. This result suggests that mergers played a significant role in the growth of massive galaxies in dense environments as expected in theory. Lastly, we investigate environments of the most massive galaxies and extremely massive quasars. By doing so, we find that massive galaxies are a much better signpost for galaxy clusters than massive quasars.

[구 GC-09] Searching for Dwarf Galaxies in Deep Images of NGC 1291 obtained with KMTNet

Woowon Byun[1,2], Minjin Kim[1,3], Yun-Kyeong Sheen[1], Hong Soo Park[1], Luis C. Ho[4,5], Joon Hyeop Lee[1,2], Hyunjin Jeong[1], Sang Chul Kim[1,2], Byeong-Gon Park[1,2], Kwang-Il Seon[1,2], Jongwan Ko[1,2]
[1]*Korea Astronomy and Space Science Institute,* [2]*University of Science and Technology, Korea,* [3]*Kyungpook National University,* [4]*Kavli Institute for Astronomy and Astrophysics, China,* [5]*Department of Astronomy, School of Physics, Peking University, China*

We present newly discovered dwarf galaxy candidates in deep wide-field images of NGC 1291 obtained with KMTNet. We identify 15 dwarf galaxy candidates by visual inspection within the virial radius of NGC 1291. Using imaging simulations, we demonstrate that our imaging data is complete up to 26 mag arcsec^{-2} or −10 abs.mag with > 70% of the completeness rate. We also apply automated detection method to find the dwarfs. However, the completeness and the reliability are relatively low compared to the visual inspection. We find that

structural and photometric properties of dwarf candidates such as effective radius, central surface brightness, Sérsic index, and absolute magnitude appear to be consistent with those of known dwarf galaxies in nearby groups and clusters, except for color. NGC 1291, residing in a relatively isolated environment, tends to accompany bluer dwarf galaxies (<B-V>≃0.58) than those in denser environment. It shows that the quenching of dwarfs is susceptible to the environment.

[구 GC-10] Cosmological Origin of Satellites around Isolated Dwarf Galaxies

Kyungwon Chun[1], Jihye Shin[2], Rory Smith[2], Sungsoo S. Kim[1,3]
[1]School of Space Research, Kyung Hee University
[2]Korea Astronomy and Space Science Institute
[3]Department of Astronomy & Space Science, Kyung Hee University

We trace the cosmological origin of satellites around isolated dwarf galaxies using a very high resolution (12 pc/h) cosmological hydrodynamic zoom simulation. To realistically describe the formation and evolution of small-mass stellar satellites, our model includes a full baryonic physics treatment. We find that the mini-halos form objects resembling dwarf galaxies. The majority of their star forming gas is accreted after reionization, thus the survival of a mini-halo's gas to reionization is not an important factor. Instead, the key factor seems to be the ability for a mini-halo to cool its recently accreted gas, which is more efficient in more massive halos. Although the host galaxy is only a dwarf galaxy itself, we find that ram pressure is an efficient means by which accreted mini-halos lose their gas content, both by interacting with hot halo gas but also in direct collisions with the gas disk of the host. The satellites are also disrupted by the tidal forces near the center of the host galaxy. Compared to the disrupted satellites, surviving satellites are relatively more massive, but tend to infall later into the host galaxy, thus reducing the time they are subjected to destructive environmental mechanisms and dynamical friction.

[구 GC-11] Discovery of the prominent radio relics in the cluster merger ZwCL J1447+2619

Wonki Lee, Hyeonghan Kim, Myungkook James Jee
Yonsei University
[2]Nature Astronomy, Springer Nature, 4 Crinan Street, N1 9XW London, United Kingdom

Diffuse radio emissions at the outskirt of merging galaxy clusters called radio relics provide a unique channel to understand the merger history. We present a recent discovery of double radio relics in the cluster merger ZwCL1447+2619 from our recent Giant Metrewave Radio Telescope observations. Both Band 3 (300-500 MHz) and Band 4 (550-850 MHz) data reveal a large (~1Mpc) and thin (~40kpc) radio relic ~1Mpc from the cluster X-ray center and a small radio relic (~0.3 Mpc) on the opposite side. These remarkable radio data together with Subaru weak-lensing analysis and Chandra X-ray observations enable us to reconstruct the merger scenario. Our preliminary analysis suggests that the cluster ZwCL J1447+2619 is a post-merger near its returning phase. In addition, using Keck DEIMOS spectroscopy, we find many "green" and "blue" member galaxies are located between the radio relics, a possible indication of merger shock-driven star formation activities.

[박 GC-12] Deep Impact: Molecular Gas Properties under Strong Ram Pressure Probed by High-Resolution Radio Interferometric Observations

Bumhyun Lee (이범현), Aeree Chung (정애리)
Yonsei University

Ram pressure stripping due to the intracluster medium (ICM) is an important environmental process, which causes star formation quenching by effectively removing cold interstellar gas from galaxies in dense environments. The evidence of diffuse atomic gas stripping has been reported in several HI imaging studies. However, it is still under debate whether molecular gas (i.e., a more direct ingredient for star formation) can be also affected and/or stripped by ram pressure. The goal of this thesis is to understand the impact of ram pressure on the molecular gas content of cluster galaxies and hence star formation activity. To achieve this, we conducted a series of detailed studies on the molecular gas properties of three Virgo spiral galaxies with clear signs of active HI gas stripping (NGC 4330, NGC 4402, and NGC 4522) based on high-resolution CO data obtained from the Submillimeter Array (SMA) and Atacama Large Millimeter/submillimeter Array (ALMA). As a result, we find the evidence that the molecular gas disk also gets affected by ram pressure in similar ways as HI even well inside of the stellar disk. In addition, we detected extraplanar 13CO clumps in one of the sample, which is the first case ever reported in ram pressure stripped galaxies. By analyzing multi-wavelength data (e.g., Hα, UV, HI, and CO), we discuss detailed processes of how ram pressure affects star formation activities and