z=1~2, massive galaxies start to dominantly form disk stars, while less massive galaxies do much later. Furthermore, massive galaxies are forming thinner and larger disks with time, and the preexistent disks are heated or even disrupted to become a part of dispersion-dominated component. Thus, the mass growth of spheroidal components at later epochs is dominated by disrupted stars with disk origins and accreted stars at large radii.

[구 GC-15] Environmental Dependence of High-redshift Galaxies in CFHTLS W2 Field

Insu Paek[1,2](백인수), Myungshin Im[1,2](임명신), Jae-Woo Kim[3](김재우), IMS team[1,2]
[1]Center for the Exploration of the Origin of the Universe, [2]Astronomy Program, Department of Physics & Astronomy, Seoul National University, [3]Korea Astronomy and Space Science Institute

Star formation activity of galaxies, along with color and morphology, show significant environmental dependence in local universe, where galaxies in dense environment tend to be more quiescent and redder. However, many studies show that such environmental dependence does not continue at higher redshifts beyond z~1. The question of how the environmental dependence of galactic properties have developed over time is crucial to understanding cosmic galactic evolution. By combining data from Canada-France-Hawaii Telescope Legacy Survey(CFHTLS), Infrared Medium-Deep Survey(IMS), and other surveys, the photometric redshifts of galaxies in CFHTLS W2 field were estimated by fitting spectral energy distribution. The distribution of galaxies was mapped in redshift bins of 0.05 interval from 0.6 to 1.4. For each redshift bin, the number density was mapped. The galaxies in high density regions were grouped into clusters using friend-of-friend method. The color of galaxies were analyzed to study the correlation with redshift as well as environmental difference between field galaxies and cluster member galaxies.

[구 GC-16] Search for Faint Quasars at z~5 using Medium-band Observations

Suhyun Shin[1,2], Myungshin Im[1,2], Yongjung Kim[1,2], Minhee Hyun[1,2], Yiseul Jeon[1,3], Tae-Geun Ji[10], Seoyeon Byeon[10], Woojin Park[10], Hojae Ahn[10], Yoon Chan Taak[1,2], Sophia Kim[1,2], Gu lim[1,2], Sungyong Hwang[1,2], Insu Paek[1,2], Gregory Paek[1,2], Minjin Kim[4,5], Dohyeong Kim[1,2], Jae-Woo Kim[4], Yongmin Yoon[1,2], Changsu Choi[1,2], Jueun Hong[1,2], Hyunsung David Jun[1,6], Marios Karouzos[7], Duho Kim[1,8], Ji Hoon Kim[9], Seong-Kook Lee[1,2], Soojong Pak[10], and Won-Kee Park[4]
[1]Center fore the Exploration of the Origin of the Universe (CEOU), [2]Astronomy Program, FPRD, Department of Physics & Astronomy, Seoul National University, [3]LOCOOP, Inc., [4]Korea Astronomy and Space Science Institute, [5]University of Science and Technology, [6]Korea Institute for Advanced Study, [7]Nature Astronomy, [8]Arizona State University, School of Earth and Space Exploration, [9]Subaru Telescope, National Astronomical Observatory of Japan, [10]School of Space Research and Institute of Natural Sciences, Kyung Hee University

Cosmic reionization era in the early universe was playing a leading part on making the present universe we know. However, we have not been able to reveal the main contributor to the cosmic reionization to date. Faint quasars have been mentioned as the alternative due to the uncertainty of the faint end slope of the quasars luminosity function. With the availability of the deep (~25mag) images from Subaru Hyper Suprime-Cam (HSC) Strategic Program survey, we have tried to find more quasar with low luminosity in the ELAIS-N1 field. Faint quasar candidates were selected from several multi-band color cut criteria based on the track of the simulated quasar at z ~ 5. The Infrared Medium-deep Survey (IMS) and The UKIRT Infrared Deep Sky Survey (UKIDSS) – Deep Extragalactic Survey (DXS) provide J band information which is used to cover the relatively long wavelength range of quasar spectra. To search the reliable candidates with possible Lyman break, medium-band observation was performed by the SED camera for QUasars in EArly uNiverse(SQUEAN) in the McDonald observatory and Seoul National University 4k Camera(SNUCAM) in the Maidanak observatory. Photometric redshifts of the observed candidates were estimated from chi-square minimization. Also, we predicted the importance of the faint quasar to the cosmic reionization from the expected number density of the faint quasar.

[구 GC-17] Big Data Astronomy: Large-scale Graph Analyses of Five Different Multiverses

Sungryong Hong
KIAS

By utilizing large-scale graph analytic tools in the modern Big Data platform, Apache Spark, we

investigate the topological structures of five different multiverses produced by cosmological n-body simulations with various cosmological initial conditions: (1) one standard universe, (2) two different dark energy states, and (3) two different dark matter densities.

For the Big Data calculations, we use a custom build of stand-alone Spark cluster at KIAS and Dataproc Compute Engine in Google Cloud Platform with the sample sizes ranging from 7 millions to 200 millions.

Among many graph statistics, we find that three simple graph measurements, denoted by (1) $n_\k$, (2) τ_Δ, and (3) $n_{S\ge5}$, can efficiently discern different topology in discrete point distributions. We denote this set of three graph diagnostics by kT5+.

These kT5+ statistics provide a quick look of various orders of n-points correlation functions in a computationally cheap way: (1) $n = 2$ by n_k, (2) $n = 3$ by τ_Δ, and (3) $n \ge 5$ by $n_{S\ge5}$.

[구 GC-18] Making the Invisible Visible: Dark Matter Mapping of the Merging Galaxy Cluster ZwCl 1447.2+2619 via Weak Lensing

Juheon Lee, Myungkook . James Jee
Department of Astronomy, Yonsei University, Republic of Korea

ZwCL 1447.2+2619 is a merging galaxy cluster at z=0.37 with clear substructures in X-ray emission and galaxy distribution. In addition, the system possesses distinct radio relics. In order to constrain the merger scenario, it is necessary to measure both the distribution and mass of the cluster dark matter. We perform a weak lensing analysis of ZwCL 1447.2+2619 using Subaru imaging data. After carefully addressing instrumental systematics, we detect significant lensing signals. In this talk, our methodology, weak lensing results, and possible merging scenarios will be presented.

[구 GC-19] A redshift survey of the nearby galaxy cluster Abell 2107: Global rotation of the cluster and its connection to large-scale structures in the universe

Hyunmi Song[1] (송현미), Ho Seong Hwang[2] (황호성), Changbom Park[2] (박창범), Rory Smith[1], Maret Einasto[3]
[1]*Korea Astronomy and Space Science Institute (한국천문연구원),* [2]*Korea Institute for Advanced Study (고등과학원),* [3]*Tartu observatory*

We present the results from a spectroscopic survey of the nearby galaxy cluster Abell 2107 at z=0.04 that has been known as a rotating cluster. By combining 978 new redshifts from the MMT/Hectospec observations with the data in the literature, we construct a large sample of 1968 galaxies with measured redshifts at R<60', which results in high (80%) and spatially uniform completeness at $m_{r,Petro,0}$<19.1. We use this sample to study the global rotation of the cluster and its connection to the large-scale structures in the universe. We first apply the caustic method to the sample and identify 285 member galaxies in Abell 2107 at R<60'. We then measure the rotation amplitude and the position angle of rotation axis. The member galaxies show strong global rotation at R<20' (V/σ~0.60-0.70) with a significance of >3.8 σ, which is confirmed by two independent methods. The rotation becomes weaker in outer regions. We find at least four filamentary structures at R<30h^{-1}Mpc smoothly connected to the cluster galaxies, which can suggest that the global rotation of the cluster is induced by the inflow of galaxies from the surrounding large-scale structures in the universe.

[구 GC-20] Environmental Dependence of Galaxy Properties in the Framework of the Cosmic Web

Ho Seong Hwang[1], Changbom Park[2], Christophe Pichon[2,3,4], Katarina Kraljic[4], Hyunmi Song[5], and Clotilde Laigle[6]
[1]*Quantum Universe Center, Korea Institute for Advanced Study, Republic of Korea*
[2]*School of Physics, Korea Institute for Advanced Study, Republic of Korea*
[3]*Institut d'Astrophysique de Paris, France*
[4]*Institute for Astronomy, University of Edinburgh, United Kingdom*
[5]*Korea Astronomy and Space Science Institute, Republic of Korea*
[6]*Sub-department of Astrophysics, University of Oxford, United Kingdom*

There is growing observational evidence from several galaxy surveys that the cosmic web plays an important role in shaping galaxy properties in addition to the effects of isotropic environment including local density. To study the distinctive effects of anisotropic and isotropic environments on galaxy properties, we simultaneously examine the galaxy properties as functions of anisotropic and isotropic environments using the SDSS data.