of the MW's DoS with a value of 0.183. Each satellite system has a specific orbital combination and thus has a particular distribution of its parameters (and thus flatness). The median of the distribution is set as the representative value of each system. And the representative value of the MW can be used as a new criterion for classifying the MW-like DoS. We reconstruct the orbital combination of the observed MW satellites using GAIA DR2 data and find the systems in the simulation that have representative values similar to the new criterion from the reconstructed MW system. This allows us a new interpretation on the rarity of MW-like DoS in cosmological simulations.

[구 GC-14] Dark Matter Deficient Galaxies Produced via High-velocity Galaxy Collisions In High-resolution Numerical Simulations

Eun-jin Shin[1], Minyong Jung[1], Goojin Kwon[2], Ji-hoon Kim[1], Joohyun Lee[1], Yongseok Jo[1], Boon Kiat Oh[1]
[1]Center for Theoretical Physics, Department of Physics and Astronomy, Seoul National University, Seoul 08826, Korea
[2]St John's College, University of Cambridge, Cambridge, CB2 TPI, United Kingdom

The recent discovery of diffuse dwarf galaxies that are deficient in dark matter appears to challenge the current paradigm of structure formation in our Universe. We describe the numerical experiments to determine if the so-called dark matter deficient galaxies (DMDGs) could be produced when two gas-rich, dwarf-sized galaxies collide with a high relative velocity of ~ 300km/s. Using idealized high-resolution simulations with both mesh-based and particle-based gravito-hydrodynamics codes, we find that DMDGs can form as high-velocity galaxy collisions separate dark matter from the warm disk gas which subsequently is compressed by shock and tidal interaction to form stars. Then using a large simulated universe ILLUSTRISTNG, we discover a number of high-velocity galaxy collision events in which DMDGs are expected to form. However, we did not find evidence that these types of collisions actually produced DMDGs in the ILLUSTRISTNG100-1 run. We argue that the resolution of the numerical experiment is critical to realize the "collision-induced" DMDG formation scenario. Our results demonstrate one of many routes in which galaxies could form with unconventional dark matter fractions.

[구 GC-15] Reverberation Mapping of Nearby AGN with Medium-band and LSGT

Joonho Kim, Myungshin Im, Changsu Choi, and Sungyong Hwang
Center for the Exploration of the Origin of the Universe (CEOU), Department of Physics and Astronomy, Seoul National University, Gwanak-gu, Seoul 08826, Korea

Reverberation mapping is one of the best ways to investigate the physical mechanism of broad-line regions around central supermassive black holes of active galactic nuclei (AGNs). It is usually used to estimate the masses of supermassive black holes. Although spectroscopic reverberation mapping has used to study dozens of AGN, spectroscopic monitoring campaign of large sample is expansive. Here, we present results of photometric reverberation mapping with medium-band photometry.

We monitored five nearby AGN which were already studied with H-alpha emission line. Observation has been performed for ~3 months with ~3 days cadence using three medium-band filters installed in LSGT (Lee Sang Gak Telescope; 0.43m).

We found 0.01-0.08 magnitude variations from differential photometry. Also time-lags between continuum light-curves and H-alpha emission line light-curves are found using JAVELIN software. The result shows that our study and previous studies are consistent within uncertainty range. In the near future, medium-band photometric reverberation mapping seems useful to study large AGN samples. We will present preliminary result of following study that report new time lag measurement of six AGNs in the similar way.

[구 GC-16] The Infrared Medium-deep Survey. VIII. Quasar Luminosity Function at z ~ 5

Yongjung Kim[1,2], Myungshin Im[2,3], Yiseul Jeon[4], Minjin Kim[5], Soojong Pak[2,6], Minhee Hyun[2,3], Yoon Chan Taak[2,3], Suhyun Shin[2,3], Gu Lim[2,3], Gregory S. H. Paek[2,3], Insu Paek[2,3], Linhua Jiang[1,7], Changsu Choi[2,3], Jueun Hong[2,3], Tae-Geun Ji[2,6], Hyunsung D. Jun[8], Marios Karouzos[9], Dohyeong Kim[1,2], Duho Kim[10], Jae-Woo Kim[10], Ji Hoon Kim[11], Hye-In Lee[2,6], Seong-Kook Lee[2,3], Won-Kee Park[10], Yongmin Yoon[8], Seoyeon Byeon[2,6], Sungyong Hwang[2,3], Joonho Kim[2,3], Sophia Kim[2,3], and Woojin Park[2,6]
[1]Kavli Institute for Astronomy and Astrophysics, Peking University, [2]Center for the Exploration of the Origin of the Universe (CEOU), Seoul National University, [3]Astronomy program, Dept. of Physics and Astronomy, Seoul National University, [4] FEROKA Inc., [5]Dept. of Astronomy and Atmospheric Science, College of Natural Science,

Kyungpook National University, [6]School of Space REsearch, Kyung Hee University, [7]Dept. of Astronomy, School of Physics, Peking University, [8]Korea Institute for Advanced Study [9]Nature Astronomy, [10]Korea Astronomy and Space Science Institute, [11]Metaspace Inc.

Faint z ~ 5 quasars with M1450 ~ -23 mag are known to be the potentially important contributors to the ultraviolet ionizing background in the post-reionization era. However, their number density has not been well determined, making it difficult to assess their role in the early ionization of the intergalactic medium (IGM). In this work, we present the updated results of our z ~ 5 quasar survey using the Infrared Medium-deep Survey (IMS), a near-infrared imaging survey covering an area of 85 square degrees. From our spectroscopic observations with the Gemini Multi-Object Spectrograph (GMOS) on the Gemini-South 8 m Telescope, we discovered eight new quasars at z ~ 5 with $-26.1 \leq$ M1450 ≤ -23.3. Combining our IMS faint quasars with the brighter Sloan Digital Sky Survey (SDSS) quasars, we derive, for the first time, the z ~ 5 quasar luminosity function (QLF) without any fixed parameters down to the magnitude limit of M1450 = -23 mag. We find that the faint-end slope of the QLF is very flat (-1.2) with a characteristic luminosity of -25.7 mag. The number density of z ~ 5 quasars from the QLF gives lower ionizing emissivity and ionizing photon density than those in previous works. These results imply that quasars are responsible for only 10-20% of the photons required to completely ionize the IGM at z ~ 5, disfavoring the idea that quasars alone could have ionized the IGM at z ~ 5.

[구 GC-17] The fate of an infalling circumgalactic gas clump and the growth of the central massive black hole in a high-redshift quasar

Yongseok Jo and Ji-hoon Kim
Seoul National University

Since the discovery of SMBHs at z > 6, the growth spurt of a BH in a relatively short time—a few hundred Myr—has been a challenging topic for many observers and theorists. Super-Eddington accretion, major and minor merger have been compelling candidate machanisms to account for such growth.

We introduce a passive scalar field to trace the infalling of circumgalactic gas clump onto high-z quasar. With the scalar field, we investigate e.g. where the most of the gas clump eventually reside in the host galaxy and how much gas is accreted onto the central massive black hole. In addition, we have studied the impact of thermal feedback of stars on the growth of black hole and the infalling gas. We will also discuss the future application of passive scalar field in e.g. minor and major mergers of high-z quasar.

[구 GC-18] The Nature of Submillimeter Galaxies in the North Ecliptic Pole SCUBA-2 Survey

Dongseob Lee, Hyunjin Shim
Department of Earth Science Education, Kyungpook National University

Submillimeter galaxies (SMGs) have played an important role in the understanding of galaxy evolution and cosmic star formation history at high redshift because they are known as being located at $z \sim 2$ and harbor a vigorous star formation. Therefore studying properties of SMGs can lead us to understand evolution of massive and actively star forming galaxies and distribution of cosmic star formation density. Recently we detected 548 SMGs near North Ecliptic Pole with JCMT/SCUBA-2 from the JCMT large program covering about 2 deg^2 so far. To derive their physical parameters, we compiled a multi-wavelength photometry ranging from optical (0.3 μm) to submillimeter (850 μm) by cross-identifying counterparts at different wavelengths. In order to find counterparts, we used either VLA-1.4 GHz image and/or Spitzer/IRAC 3.6 μm, 4.5 μm image. The number of SMGs with relatively robust counterparts is 349. In this talk, we present photometric redshifts, stellar mass, star formation rates, total infrared luminosity, and AGN fraction of these 349 SMGs derived through SED fitting analysis.

[구 GC-19] SCUBA-2 Observation of the JWST/GTO Time Domain Survey Field

Minhee Hyun[1], Ian Smail[2], Myungshin Im[1], Roger A. Windhorst[3], Rolf A. Jansen[3], Christopher N. A. Wilmer[4], William D. Cotton[5], Giovanni Fazio[6], Richard Perley[5], James J. Condon[5], Mark Swinbank[2], Seth Cohen[3], Li-Hwai Lin[7], Fangxia An[8], Hyunjin Shim[9] and JWST/GTO TDS team
[1]Center for the Exploration of the Origin of the Universe (CEOU), Seoul National University, ROK, [2]Centre for Extragalactic Astronomy, Department of Physics, Durham University, UK, [3]School of Earth & Space Exploration, Arizona State University, USA, [4]Steward Observatory, University of Arizona, USA, [5]National Radio Astronomy Observatory, USA, [6]Center for Astrophysics, Harvard & Smithsonian, USA, [7]Academia Sinica