bright or kinematically well-aligned galaxies do. Our results show that the rotation of a galaxy, particularly at its outskirt, may be significantly influenced by recent interactions with its neighbors.

[구 GC-05] The Spin-Orbit Alignment of Dark Matter Halo Pairs: Dependence on the Halo Mass and Environment

Sung-Ho An[1],Suk-Jin Yoon[1]
[1]Department of Astronomy & Center for Galaxy Evolution Research, Yonsei University

We present a statistical analysis on the spin-orbit alignment of dark matter halo pairs in cosmological simulations. The alignment is defined as the angular concurrence between the halo spin vector ($\vec{S}$) and the orbital angular momentum vector ($\vec{L}$) of the major companion. We identify interacting halo pairs with the mass ratios from 1:1 to 1:3, with the halo masses of $10.8 < \mathrm{Log}(M_{\mathrm{halo}}/M_{\mathrm{sun}}) < 13.0$, and with the separations smaller than a sum of their virial radii ($R_{12} < R_{1,\mathrm{vir}} + R_{2,\mathrm{vir}}$). Based on the total energy (E_{12}), the pairs are classified into flybys ($E_{12} > 0$) and mergers ($E_{12} \leq 0$). By measuring the angle (θ_{SL}) between $\vec{S}$ and $\vec{L}$, we confirm a strong spin-orbit alignment signal such that the halo spin is preferentially aligned with the orbital angular momentum of the major companion. We find that the signal of the spin-orbit alignment for the flyby is weaker than that for the merger. We also find an unexpected excess signal of the spin-orbit alignment at $\cos\theta_{\mathrm{SL}} \sim 0.25$. Both the strength of the spin-orbit alignment and the degree of the excess depend only on the environment. We conclude that the halo spin is determined by the accretion in a preferred direction set by the ambient environment.

[구 GC-06] Detection of Intrinsic Spin Alignments in Isolated Spiral Pairs

Hanwool Koo[1,2], Jounghun Lee[3]
[1]Korea Astronomy and Space Science Institute,
[2]University of Science and Technology (Korea),
[3]Seoul National University

Observational evidence for intrinsic galaxy alignments in isolated spiral pairs is presented. From the catalog of the galaxy groups identified by Tempel et al. in the flux-limited galaxy sample of the Sloan Digital Sky Survey Data Release 10, we select those groups consisting only of two spiral galaxies as isolated spiral pairs and investigate if and how strongly the spin axes of their two spiral members are aligned with each other. We detect a clear signal of intrinsic spin alignment in isolated spiral pairs, which leads to the rejection of the null hypothesis at the 99.9999% confidence level via the Rayleigh test. It is also found that those isolated pairs comprising two early-type spiral galaxies exhibit the strongest signal of intrinsic spin alignment and that the strength of the alignment signal depends on the angular separation distance as well as on the luminosity ratio of the member galaxies. Using the dark matter halos consisting of only two subhalos resolved in the EAGLE hydrodynamic simulations, we repeat the same analysis but fail to find any alignment tendency between the spin angular momentum vectors of the stellar components of the subhalos, which is in tension with the observational result. Several possible sources of this apparent inconsistency between the observational and the numerical results are discussed.

[석 GC-07] Understanding the physical environment of relativistic jet from 3C 279 using its spectral and temporal information

Sung-Min Yoo[1], Sang-Sung Lee[2,3], Hongjun An[1], Sang-Hyun Kim[2,3], Jee Won Lee[2], Jeffrey A. Hodgson[2] and Sincheol Kang[2,3]
[1]Department of Astronomy and Space Sciences, Chungbuk National University, Republic of Korea
[2]Korea Astronomy and Space Science Institute
[3]Korea University of Science and Technology

Blazars are a subclass of active galactic nuclei (AGNs) with relativistic jets aligned with our line of sight. The jet physics is yet to be understood, but can be studied with blazar variability (e.g., flares). The highly variable blazar 3C 279 has shown a general decline of its radio flux density since 2013, but the flux density has been increasing since 2017. To better understand physical properties of 3C 279 related with the flux variations, we analyze multi-frequency new radio data obtained with Korean VLBI Network (KVN), as well as archival data from Owens Valley Radio Observatory (OVRO) and Submillimeter Array (SMA). We measure the radio spectral variability and infer the relativistic jet properties of 3C 279. The high-cadence OVRO and SMA observations are used to construct detailed light curves of the source, and KVN data supplement the spectral coverage and allow us to locate the spectral break frequencies precisely. In this talk, we present our analysis results and interpret them using a blazar jet model.

[구 GC-08] BAT AGN Spectroscopic Survey – The parsec scale jet properties of the ultra hard X-ray selected local AGNs

Junhyun Baek[1], Aeree Chung[1], Kevin Schawinski[2], Kyuseok Oh[3], Ivy Wong[4], Michael Koss[5], and BASS team
[1]Department of Astronomy, Yonsei University, South Korea, [2]Institute for Particle Physics and Astrophysics, ETH Zurich, Switzerland, [3]Department of Astronomy, Kyoto University, Japan, [4]ICRAR, The University of Western Australia, Australia, [5]Eureka Scientific Inc., USA

We have conducted a 22 GHz very long baseline interferometry (VLBI) survey of 281 local ($z < 0.05$) active galactic nuclei (AGNs) selected from the *Swift* Burst Alert Telescope (BAT) 70-month ultra hard X-ray (14-195 keV) catalog. The main goal is to investigate the relation between the strengths of black hole accretion and the parsec-scale nuclear jet, which is expected to tightly correlate but has not been observationally confirmed yet. The BAT AGN Spectroscopic Survey (BASS) provides the least biased AGN sample against obscuration including both Seyfert types, hence it makes an ideal parent sample for studying the nuclear jet properties of an overall AGN population. Using the Korean VLBI Network (KVN), the KVN and VERA Array (KaVA), and the Very Long Baseline Array (VLBA), we observed 281 objects with a 22 GHz flux > 30 mJy, detecting 11 targets (~4% of VLBI detection rate). This implies that the fraction of X-ray AGNs which are currently ejecting a strong nuclear jet is very small. Although our 11 sources span a wide range of pc-scale morphological types, from compact to complex, they lie on a tight linear relation between accretion luminosity and nuclear jet luminosity. Our finding may indicate that the power of nuclear jet is directly responsible for the amount of black hole accretion. We also have probed the fundamental plane of black hole activity in VLBI scale (e.g., few milli-arcsecond). The results from our high-frequency VLBI radio study support that the change of jet luminosity and size follows what is predicted by the AGN evolution scenario based on the Eddington ratio (λ_{Edd}) – column density (N_H) plane, proposed by a previous study.

[구 GC-09] An observed link between AGN Eddington ratio and [NII] λ6583/Hα at 0.6<z<1.7

Kyuseok Oh[1,2], Yoshihiro Ueda[1], Masayuki Akiyama[3], Hyewon Suh[4], Michael Koss[5], Richard Mushotzky[6], Guenther Hasinger[7], Daichi Kashino[8], John Silverman[9]
[1]Kyoto University, [2]JSPS Fellow, [3]Tohoku University, [4]Subaru Telescope, [5]Eureka Scientific, [6]University of Maryland, [7]European Space Agency, [8]ETH Zurich, [9]Kavli Institute for the Physics and Mathematics of the Universe

We present the observed relationship between Eddington ratio (λEdd) and optical narrow-emission-line ratio ([NII] λ6583/Hα) of X-ray-selected unobscured active galactic nuclei (AGN) at $0.6 < z < 1.7$ using 27 near-infrared spectra from the Fiber Multi-Object Spectrograph mounted on the Subaru telescope along with 26 additional sources from the literature. We show that the λEdd and [NII] λ6583/Hα ratio at $0.6 < z < 1.7$ exhibits a similar distribution of λEdd−[NII] λ6583/Hα anti-correlation that has been found for local ($\langle z \rangle = 0.036$), hard X-ray selected AGN. The observed anti-correlation suggests that [N II] λ6583/Hα optical narrow-line ratio in the AGN host galaxy may carry important information about the accretion state of the central supermassive black hole, suggesting the observational hint of consistent relationship from local to $z \sim 1.7$. Further study is necessary to determine whether the λEdd−[N II] λ6583/Hα correlation in high-redshift still holds at $\log\lambda Edd < -2$ compared to local AGN.

[구 GC-10] Instantaneous AGN feedback at the central part of NGC 5728

Jaejin Shin[1], Jong-Hak Woo[1], Aeree Chung[2], Junhyun Baek[2], Kyuhyoun Cho[1], Daeun Kang[1], and Hyun-Jin Bae[1]
[1]Seoul National University, [2]Yonsei University

Using VLT/MUSE and ALMA data, we present a spatially-resolved analysis of the central part of NGC 5728. We find enhanced star formation (~1.8 $M_\odot$/yr/kpc2) at a region where AGN gas outflows intersect the star formation ring. In contrast, significantly weaker CO emission (~3.5 times) is found at the same region compared to other regions in ring, suggesting positive AGN feedback on star formation. On the other hand, we detect gas outflows outside of the spiral arms, implying that the inflowing gas in the arms is removed (i.e., negative feedback). Even though the positive and negative feedback are expected at the central part of NGC 5728, the impact of the AGN feedback in galaxy scale may be insignificant.

[구 GC-11] Probing the Feedback Process in Local Type-2 AGNs with Integral-Field Spectroscopy

Rongxin Luo[1], Jong-Hak Woo[1], Jaejin Shin[1], Daeun Kang[1], Hyun-Jin Bae[1], Marios Karouzos[2]
[1]Astronomy Program, Department of Physics and