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Feedback process is one of the most important topics in the study of AGNs since it plays a key role in linking the SMBHs and their host galaxies. In order to further understand the co-evolution of SMBHs and their host galaxies, we probe the feedback process in local type-2 AGNs with a series of integral-field-spectroscopy observations.

In the first part of my talk, I will introduce our GMOS observations of luminous type-2 AGNs at z < 0.1, which are selected using the integrated [O III] kinematics. Based on the dedicated emission-line diagnostics and kinematic studies, we identify the signatures of AGN-driven outflows and quantify the outflow size in the targets with extreme [O III] kinematics. For the targets without extreme [O III] kinematics, we find the presence of weak AGN-driven outflows, which are indicated by the significant differences between the kinematics of gas and stars.

Then, I will present our recent study of 40 type-2 AGNs based on the SNIFS IFU. By comparing the radial profile of velocity dispersion of gas and stars, we measure the size of AGN-driven outflows in these targets and extend the outflow size-AGN luminosity relation in our previous GMOS studies. We also discuss the feedback effect of AGN-driven outflows by connecting the outflow velocity and host galaxy properties. These results highlight the importance of spatially-resolved observation in investigating gas kinematics and identifying the signatures of AGN-driven outflows.

[구 GC-12] The Infrared Medium-deep Survey. VI. Discovery of Faint Quasars at z ~ 5 with a Medium-band-based Approach

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The faint quasars with M1450 > -24 mag are known to hold the key to the determination of the ultraviolet emissivity for the cosmic reionization. But only a few have been identified so far because of the limitations on the survey data. Here we present the first results of the z ~ 5 faint quasar survey with the Infrared Medium-deep Survey (IMS), which covers ~100 deg^2 areas in J band to the depths of J_{AB} ~ 23 mag. To improve selection methods, the medium-band follow-up imaging has been carried out using the SED camera for QUasars in Early uNiverse (SQUEAN) on the Otto Struve 2.1 m Telescope. The optical spectra of the candidates were obtained with 8 m class telescopes. We newly discovered 10 quasars with $-25 < M_{1450} < -23$ at z ~ 5, among which three have been missed in a previous survey using the same optical data over the same area, implying the necessity for improvements in high-redshift faint quasar selection. We derived photometric redshifts from the medium-band data and found that they have high accuracies of $\langle|\Delta z|/(1+z)\rangle = 0.016$. The medium-band-based approach allows us to rule out many of the interlopers that contaminate $\gtrsim$ 20% of the broadband-selected quasar candidates. These results suggest that the medium-band-based approach is a powerful way to identify z ~ 5 quasars and measure their redshifts at high accuracy (1%-2%). It is also a cost-effective way to understand the contribution of quasars to the cosmic reionization history.

[구 GC-13] Assembling the bulge from globular clusters: Evidence from sodium bimodality

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Recent investigations of the double red clump in the color-magnitude diagram of the Milky Way bulge cast serious doubts on the structure and formation origin of the outer bulge. Unlike previous interpretation based on an X-shaped bulge, stellar evolution models and CN-band observations have suggested that this feature is another manifestation of the multiple stellar population phenomenon observed in globular clusters (GCs). This new scenario requires a significant fraction of the outer bulge stars with chemical patterns uniquely observed in GCs. Here we show from homogeneous high-quality spectroscopic data that the red giant branch stars in the outer bulge (>5.5° from the Galactic center) are clearly divided into two groups according to Na abundance in the [Na/Fe] - [Fe/H] plane. The Na-rich stars are also enhanced in Al, while the differences in O and Mg are not observed between the two Na groups. The population ratio and the Na and Al differences between the two groups are also comparable with those observed in metal-rich GCs. Since these chemical patterns and characteristics are only explained by stars originated in GCs, this is compelling evidence that the outer bulge was mostly assembled from

disrupted proto-GCs in the early history of the Milky Way. We will also discuss the implications of this result on the formation of the early-type galaxies in general.

[구 GC-14] Stellar populations of the M87 globular cluster system

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Globular clusters (GCs) are one of the excellent tools to trace the assembly history of their host galaxies. Especially, the ages and abundances of the GCs give important clues about the star formation epochs and merging progenitors. We investigate the stellar population of the GCs in M87 based on a stacking analysis using about 900 MMT/Hectospec spectra of the GCs. We measure the ages, [Z/H], and [a/Fe] from the stacked spectra of the GCs within radial bins based on Lick indices. We find clear radial gradients for [Z/H] and [a/Fe] in the GC system. In addition to the radial trends, we investigate the stellar populations of the GC subgroups divided according to colors, radial velocities, and spatial locations. We discuss the formation history of M87 based on the stellar populations of the GCs.

[구 GC-15] How are S0 galaxies formed? A case of the Sombrero galaxy

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S0 galaxies are mostly known to be formed in dense environments from spiral progenitors. Recently, however, a new formation scenario has been suggested that field S0s can be formed from elliptical progenitors. The Sombrero galaxy (M104, NGC 4594) is a massive disk galaxy located in the field environment, and its morphological type has been controversial from Sa to E. Thus, it is an ideal target to test the new scenario. We trace the giant halo of M104 with globular clusters to test this scenario. From the wide images obtained with CFHT/MegaCam, we find a large number of globular clusters in this galaxy. We also confirm their membership by measuring the radial velocities from the spectra obtained with MMT/Hectospec. The color distribution of these globular clusters is bimodal, and blue (metal-poor) globular clusters are more spatially widely spread than red (metal-rich) globular clusters. This indicates that M104 hosts a giant metal-poor halo as well as an inner metal-rich halo. Combining this result with the fact that M104 is unusually massive and brighter than other spiral galaxies, we infer that M104 was indeed a massive elliptical galaxy that had formed a metal-rich halo by gas-rich mergers and a metal-poor halo by gas-poor mergers. In addition, we find young star clusters around the disk of M104, which shows that the disk formed after the spheroidal halos had formed. In conclusion, we suggest that M104 was originally a massive elliptical galaxy and was transformed to a lenticular galaxy by acquiring its disk later.

[구 GC-16] Passive spiral galaxies: a stepping stone to S0s?

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We investigate the stellar population properties of nine passive spiral galaxies in the CALIFA survey. They have NUV−r > 5 and no/weak nebular emission lines in their spectra. They lie in the redshift range of $0.001 < z < 0.021$ and have stellar mass range of $10.2 < \log(M\bigstar/M\odot) < 10.8$. We analyze the stellar populations out to two effective radius, using the best-fitting model to the measured absorption line-strength indices in the Lick/IDS system. We compare the passive spirals with S0s selected in the same mass range. S0s cover a wide range in age, metallicity, and [α/Fe], and stellar populations of the passive spirals are encompassed in the spread of the S0 properties. However, the distribution of passive spirals are skewed toward higher values of metallicity, lower [α/Fe], and younger ages at all radii. These results show that passive spirals are possibly related to S0s in their stellar populations. We infer that the diversity in the stellar populations of S0s may result from different evolutionary pathways of S0 formation, and passive spirals may be one of the possible channels.

[구 GC-17] A deep and High-resolution Study of Ultra-diffuse Galaxies in Distant Massive