KIAA / DoA 2019
Postdoc Science Days

Book of Abstracts

December 10th and 11th 2019

in the KIAA Auditorium

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Tuesday December 10th 2019:

9:35 - 11:15 Galaxy Formation and Evolution Session

Sub-mm observations of nearby merging galaxies

9:35 - 9:55 Tomonari Michiyama (道山知成)

Hello, my name is Tomonari Michiyama, a new pos-doc from November. As Ph.D. research, I have conducted sub-mm observes for nearby infrared luminous merging galaxies. In Michiyama et al., (2016), we show the enhancement of star formation efficiency in merging galaxies based on ASTE CO(3-2) survey for nearby galaxies, In Michiyama et al., (2018), we found dense gas outflows from one merging galaxies NGC 3256 using ALMA. In Michiyama et al., (2019 in prep), we investigate the star formation activity in the same galaxy NGC 3256 using hydrogen recombination line; Ha and Hb (using MUSE/VLT) and H40a using ALMA. Now I have on-going two projects. One is ALMA CO observation in the pair galaxy NGC5331 (observation was completed); trying to detect inflow gas motion during an early stage of the merger process. The second one is CI survey for nearby infrared luminous galaxies (observation is on-going), trying to quantify the uncertainty of empirical relation using molecular gas mass derived by CO observations. If you are interested in ALMA observation, please let me know and start collaborations!

Deep Impact: molecular gas properties under strong ram pressure

9:55 - 10:15 Bumhyun Lee (이 범 현)

Ram pressure stripping is an important environmental process, which causes star formation quenching by effectively removing cool interstellar gas from galaxies in high density environments. Although the observational evidence of diffuse atomic gas stripping has been reported by many HI imaging studies, it is still unclear whether molecular gas, a more direct ingredient for star formation, can also get stripped by ram pressure or not. In this talk, I will present the results of SMA CO data of three Virgo spirals (NGC 4330, NGC 4402, NGC 4522) that are experiencing active HI gas stripping. High-resolution SMA CO data of three Virgo galaxies have revealed a considerably asymmetric morphology, as found from HI observations. This result suggests that ram pressure can influence the molecular gas even inside the optical disk. By analyzing multi-wavelength data (e.g., Hα, UV, HI, and CO), we find a change in star formation activity in galaxies due to ram pressure. There is locally induced star formation along the ICM wind front. However, the extent of star-forming region decreases during HI gas stripping with changes in molecular gas properties owing to ram pressure.

The Roles of AGNs and Dynamical Process in Star Formation Quenching in Nearby Disk Galaxies

10:15 - 10:35 Kexin Guo (郭可欣)

We study how star formation is quenched in low-redshift disk galaxies with integral field spectroscopy. We select 131 face-on spiral galaxies with stellar mass greater than 3 × 10^10M_sun, and with spatially resolved spectrum from MaNGA DR13. We subdivide the sample into four groups based on the offset of their global specific star formation rate (SFR) from the Star-Forming Main Sequence and stack the radial profiles of stellar mass and SFR. By comparing the stacked profiles of quiescent and star-forming disk galaxies, we find that the decrease of the global star formation rate is caused by the suppression of star formation at all radii, but with a more significant drop from the center to the outer regions following an inside-out pattern. As the global specific SFR decreases, the central stellar mass, the fraction of disk galaxies hosting stellar bars and AGNs (including both LINERs ond Seyferts) all increase, indicating dynamical processes and AGN feedback are possible contributors to the inside-out quenching of star formation in the local Universe. However, if we include only Seyferts, or AGNs with EW(Hα) > 3Å, the increasing trend of AGN fraction with decreasing global sSFR disappears. Therefore, if AGN feedback is contributing to quenching, we suspect that it operates in the low-luminosity AGN mode, as indicated by the increasing large bulge mass of the more passive disk galaxies.

Correlation of structure and stellar properties of galaxies

10:35 - 10:55 Sonali Sachdeva

Establishing the correlation, or lack thereof, between the structure and stellar activity of galaxies is crucial to unravel their evolutionary histories. To that end, we have performed mass-based structural (bulge + disc) decomposition of all disc galaxies (1263) in the Herschel imaging area of the Stripe82 region using Ks-band images from the latest VICS82 survey. The resultant parameters are highly consistent with those obtained by Bottrell et al. (2019) in optical (ugriz) bands using deep co-added Sloan images. The match demonstrates that allowing bulge morphology to be fitted freely is essential for accurate decomposition. The scaling relations thus derived are used along with kinematics to select an indubitable class of classical (CB) and pseudo bulges (PB). The rest of the bulges (<20%) - which could not be stringently classified – are marked as “interim” bulges (IB). We find that del<mu_e> - bulge type indicator based on the Kormendy relation – exhibits a tight correlation with total stellar mass of the galaxy. The placement of the 3 bulge types indicates that mass increase in disc galaxies is accompanied by the transformation of their bulge morphologies from PB to IB to CB. Moreover, del<mu_e> exhibits a tight correlation with the global colour (Ks-r) where disc galaxies with PB occupy the blue end, CB occupy the red end and IB are intermittent to the two populations, suggesting that structural valley is the same as the green valley. Interestingly, although discs with IB are redder than those with PB, their SFR and sSFR is found to be similar, suggesting that either they are shrouded with dust or have composite populations. The overall trends suggest that morphological transformation is inherently involved in the quenching of galaxies with time.

Intrinsic structures of disk galaxies identified in kinematics

10:55 - 11:15 Min Du (杜敏)

Galaxies host a wide array of internal stellar components, which need to be decomposed accurately in order to understand their formation and evolution. Much can be learned from analyzing the large sets of realistic galaxies now available through state-of-the-art hydrodynamical cosmological simulations. We recently developed an automatic method, named auto-GMM, to decompose and classify structures in simulated galaxies based on stellar kinematics. We apply this method to the disk galaxies in IllustrisTNG. The basic properties of kinematic structures and their relations with structures decomposed by the morphological method are analyzed statistically. It helps to gain insights into the morphology of intrinsic structures in galaxies.

11:35 - 12:35 Pulsars and Radio Sources Session

How Can The Pulsar's Maximum Mass Reach ~3 $M_\odot$

11:35 - 11:55 Xuhao Wu (武旭浩)

The observation of massive pulsar J0218+4232 offer strong constraint, which require stiffer equation of state (EOS). In this letter we use the polytropic model to establish gravity-bound and self-bound two kinds of scenes about the pulsar. In the parameter space, the transition density ϱt (surface density ϱs) of gravity- bound system (self-bound system) and the polytropic exponent γ are the inputs of the EOS. We find that a smaller transition density, ϱt = 0.65 ~ 1.6 $\varrho 0$ ($\varrho 0$ is the saturation density) and a larger polytropic exponent γ = 3.0 ~ 4.1 are beneficial to 2.5 $M_\odot$ neutron star. While for strange star or strangeon star it becomes surface density ϱs = 1.0 ~ 2.0 $\varrho 0$ and γ = 1.2 ~ 2.5.

Pulsar-based timescales

11:55 - 12:15 Nicolas Caballero

Millisecond pulsars (MSPs) are used as tools for multiple physical and astrophysical applications, including efforts for direct nHz gravitational waves, testing gravity theories in the strong-field regime and studying the ionized interstellar medium. These applications are based on the MSP rotational stability which allows them to act as high-precision cosmic clocks. Naturally, the question of whether MSPs are good enough clocks to provide a new timescale arises. In this talk, I discuss the framework under which pulsar-based timescales are developed, present the most recent pulsar timescale which we have recently published in the framework of the International Pulsar Timing Array, and the usefulness of such a timescale in metrology-standards research.

The unique post-glitch behavior of the Crab pulsar as a possible signature of superfluid PBF

12:15 - 12:35 Wei Hua Wang (汪卫华)

Glitch has been considered as a probe of neutron star interior physics shortly after its first discovery in 1970s in the Vela pulsar. During all this years, two models developed and survived, namely the superfluid vortex model and the solid starquake model, the former one is more widely accepted because of its success in explaining the post-glitch recovery process, its consistence with the statistic linear glitch activity-rotation period first derivative relation, and cumulative distribution of glitch size and waiting time Possion.

The Crab pulsar is unique among all the glitch sources. It is the only one pulsar with accurate known age, and it shares similarity with other young pulsars, for example, the exponential post-glitch recovery, lack of radiative and pulse profile changes during the glitch process, and the wide range of relative glitch size (over 3 orders of magnitude). However, it also shows the day-long timescale delayed spin-ups (DSUs) and the permanent deviation from the predicted spin- down rate (persistent shifts) simultaneously, especially in relative large glitches in the Crab pulsar. These two unique phenomena have only been detected in the Crab pulsar, indicating some unknown physical difference between the very young Crab pulsar (965 years) and other young pulsars.

In this talk, I will briefly introduce the superfluid neutron pair breaking and forming picture to account for the physical difference between the Crab pulsar and other young pulsars, and to explain the DSUs and persistent shifts from this aspect.

13:40 - 15:00 ISM, Star-Formation, and Supernovae Session

CALIFA bar pattern speed: toward a bar scaling relation

13:40 - 14:00 Toky Randriamampandry

Bars are believed to be the main driver of secular evolution. In four decades, much effort has been dedicated to study their structures and dynamics. The pattern speed characterises the dynamics of the bar, but it is challenging to measure. The non-parametric method commonly known as “Tremaine & Weinberg method” is widely used to derive the bar pattern speed using stellar velocity maps combined with optical or near-infrared images. However, this method is highly sensitive to the errors over orientation parameters as well as the stellar population. An alternative is to use the “phase reversal method” (Font et al. 2011,2014) which relies on the change of sign of the radial flow produced by the density wave at the corotation radius. I will talk about our recent efforts to measure the bar pattern speed for a sample of 45 barred galaxies from CALIFA IFS survey. A new scaling relation is derived which can be used to predict the bar pattern speed for a large sample of galaxies using multiple regression technique. For the first time, we found that the bar size, star formation rate and the asymmetry parameter derived from optical images are the most significant parameters that determine the bar pattern speed.

The Origin of The Stellar Mass-Stellar Metallicity Relation In the Milky Way Satellites and Beyond

14:00 - 14:20 Moran Xia (夏默然)

Observations and semianalytical galaxy formation and evolution models (SAMs) have suggested the existence of a stellar mass-stellar metallicity relation (MZR), which is shown to be universal for different types of galaxies over a large range of stellar masses (M_*= 10^3-10^{11}M_{sun}) and dark matter (DM) halo masses (M_{halo}= 10^9-10^{15}h^{-1}M_{sun}). In our work, we construct a chemical evolution model to investigate the origin of the MZR, including both the effects of gas inflows and outflows in galaxies. We solve the MZR from the chemical evolution model, by assuming that the cold gas mass (M_{cold}) and the stellar feedback efficiency (beta) follow some power-law scaling relationships with M_* during the growth of a galaxy, i.e., M_{cold}prop M_*^{alpha_{gs}} and beta prop M_*^{alpha_{beta s}}. We use the SAM to obtain these power-law scaling relations, which appear to be roughly universal over a large range of stellar masses for both satellites and central galaxies within a large range of halo masses. The range of the MZRs produced by our models is in a narrow space, which provides support to the universality of the MZRs. The formation of the MZR is a result caused jointly by that the cold gas fraction decreases with increasing M_* and by that the stellar feedback efficiency decreases with increasing M_* in the galaxy growth, and the exponent in the MZR is around - alpha_{beta s} or 1-alpha_{gs}. The MZR represents an "average" evolutional track for the stellar metallicity of a galaxy. The comparison of our model with some previous models for the origin of MZRs is also discussed.

A spatially-resolved view of the gas kinematics in two star-forming galaxies at z~1.47 seen with ALMA and VLT-SINFONI

14:20 - 14:40 Juan Molina

In this talk, I present ALMA CO(J=2-1) observations of two main-sequence star- forming galaxies at z~1.47 taken from the HiZELS survey. These new observations are combined with earlier ALMA observations (sensitive to diffuse CO emission) and compared with the previous Hα-based study at matched spatial resolution (≈0”.15 ~ kpc-scales) . One target is marginally resolved in CO(2-1), showing complex dynamics with respect to the ionized gas traced by Hα. While the other source is spatially resolved, enabling a detailed exploration of its internal dynamical properties. In this system, both gaseous phases show similar spatial extension, rotation velocities and velocity dispersions, suggesting a rotational velocity to velocity dispersion ratio consistent with unity. By comparing the ionized and molecular gas tracers through the use of a two- dimensional kinematic model, the median galactic depletion time value is found to be in agreement with the average estimate observed in local star-forming galaxies at similar spatial scales. Through the use of a thick-disk dynamical model, the estimated dark matter fraction inside a galactocentric radius of 6 kpc is 0.6+/-0.1 for this system. This estimate is in agreement with the average dark matter fraction value derived from stacked rotation curve analysis of galaxies at similar redshift range.

The Metallicity Distribution of Type II SNe Hosts

14:40 - 15:00 John Graham

Adopting methodology previously applied to Gamma-Ray Burst host galaxies, we analyze the metallicity distribution of Type II SNe hosts. As this is a precision application of the methodology, we first complied a greatly expanded SNe sample by cross-referencing the Transniet Name Server SNe catalogue with the galaxies in the MPA-JHU emission line analysis of the SDSS. This provides a sample with approximately 1700 objects with metallicities in at least one diagnostic and about 1200 objects in the KK04 (Kobulnicky & Kewley 2004) diagnostic with over 300 of these being core-collapse SNe, reflecting the recent considerable improvement in SNe detection capabilities. Interestingly we find an interesting divergence in the metallicity distribution of the Type II SNe subtypes, with the Type IIb & IIn SNe preferring more metal rich environments than the standard Type II population (i.e. those with no subtype). However, the star- formation weighted metallicity distribution of typical SDSS galaxies tracks the metallicity distribution of all the Type II SNe combined (which can be clearly separated from metallicity distribution of the standard Type II population). From this we conclude that metallicity affects the Type II subtype but not the combined rate of Type II production. Ultimately we hope to use the agreement in the metallicity distribution between the Type II SNe and general galaxy population to place limits on the IMF variability as a function of metallicity since the Type II SNe and Halpha emission (used to estimate the SFR) probe different initial masses of ~12 and ~20 solar masses respectively.

15:20 - 17:00 Active Galactic Nuclei Session

HIgh-redshift Quasar Survey with Infrared Medium-deep Survey

15:20 - 15:40 Yongjung Kim (김 용정)

The faint quasars with $M_{1450} > -24$ 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 18 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 ~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.

Spatially and Kinematically Separated Broad Emission Line Regions in a Red Active Galaxy

15:40 - 16:00 Dohyeong Kim (김도형)

We report the Gemini Multi-Object Spectrograph (GMOS) Integral Field Unit (IFU) observation of double-peaked broad Ha line in a red active galaxy. Galaxy mergers are expected to produce multiple SMBHs in close separation, but detection of such close multiple SMBHs has been difficult. Our target is a red active galactic nucleus (AGN) that has been suggested as a merging supermassive black hole (SMBH) candidate due to its merging features in HST image and double-peaked broad emission lines (BELs) found in Hb, Ha, Pb, and Pa lines. Through the GMOS IFU observation, we confirm the existence of the kinematically separated BEL peaks by 3000km/s. More importantly, we find that the two BEL components are spatially separated by ~100 pc in projection. Plausible interpretations for the kinematically and spatially separated BELs are that the core is made of multiple SMBHs, among which one SMBH has been recently ejected via gravitational recoil or gravitational slingshot. Our result indicates that multiple SMBH system may be common in red AGNs and can be identified through high resolution IFU observations.

A Systematic Analysis of Stellar Population in the Host Galaxies of SDSS Type I QSOs

16:00 - 16:20 Jun Jie Jin (金骏杰)

We investigate the relationship between host galaxies' stellar content and active galactic nuclei (AGNs) for optically selected QSOs with $z < 0.5$. There is a total of 82 QSOs that we select from the Sloan Digital Sky Survey. These 82 QSOs have both Wide-field Infrared Survey Explorer data and measurable stellar content. With the help of the stellar population synthesis code STARLIGHT, we determine the luminosity fractions of AGNs, stellar population ages, and star formation histories (SFHs) of host galaxies. We find that there is a correlation between the SFH and AGN properties, which suggests a possible delay from star formation to AGN. This probably indicates that the AGN activity correlates with the star formation activity, which consistent with a coevolution scheme for black hole and host galaxies.

X-shaped Radio Galaxies: insight from optical host properties and Relationship to large scale environment

16:20 - 16:40 Ravi Joshi

We employ a new catalog of X-shaped radio galaxies (XRGs) from the FIRST and TGSS surveys, which essentially doubles their known number, to shed light upon their origin, which is actively debated. Diversion of the back-flowing synchrotron plasma from the two primary lobes, spin-flip of the central supermassive black-hole, and other processes linked to galaxy merger, such as a jet-shell interaction, as well as a dual-AGN scenario, are among the proposed mechanisms. We examine a sample of 106 XRGs, and investigate its host galaxies. For 41 of the XRGs it has been possible to determine the main axis of the parent optical galaxy, as well as the major and minor radio axes defined by two lobe pairs, namely, the primary and the secondary lobes. Although we confirm that in a large majority of cases the primary radio axis is aligned close to the major axis of the optical host galaxy, we also find several counter-examples. These are highlighted here, as they challenge the basic back-flow diversion model for the origin of the radio-wings. Comparison of the XRGs with well- defined sample of normal radio galaxies of FRII morphology reveals that: (i) XRGs tend to have slightly less massive central black holes than FRII RGs (average SMBH masses for the two types being log M_{BH} ~8.81 $M_{\odot}$ and 9.07 $M_{\odot}$, respectively); (ii) ~80% of XRGs exhibit red mid-IR colors, indicating a significant population of young stars and/or enhanced dust mass, probably on account of relatively recent galaxy merger(s). A comparison of the large-scale environment (i.e., within ~1 Mpc) around the XRGs and FRII radio sources shows that both populations inhabit similarly poor clustering environments while FRI RGs are in richer-environments. As a population, the observed properties of XRGs seem difficult to reconcile with a single dominant physical mechanism for their origin.

Enhanced Star Formation in the Host Galaxies of Type 2 Quasars

16:40 - 17:00 Dongyao Zhao (赵冬瑶)

Quasar is believed to be an important phase of galaxy evolution. In this work, we carry out a statistic study of host galaxies of a large sample of 887 type 2 quasars at $z<0.83$. We derive their stellar masses and rest-frame u-r colors by spectral energy distribution fits with applying the photometry of SDSS and WISE, and calculate their [O II] star formation rates. We find that majority of the host galaxies of type 2 quasars distribute in the blue cloud on color-mass diagram, and on/above the main-sequence on SFR-mass diagram. Astonishingly, more than 30% of them are in starburst, compared with the fraction of <1% of normal SF galaxies in starburst at low redshift. Our results also show that as host galaxies become more massive, they become redder evolving to the green valley and red sequence, and their SFRs decrease. Moreover, together with AGN properties of [O III] luminosity and Eddington ratio, we find clear correlations exhibiting that host galaxies with higher [O III] luminosity and Eddington ratio are bluer, and have higher SFRs. The correlations become stronger at higher redshift. Additionally, we identify a subsample of 111 host galaxies in mergers at $z\leq0.25$, with the aim of observationally testing the role of mergers at lower redshift. It seems that mergers could moderately enhance [O II] star formation rates and star formation efficiency for host galaxies of type 2 quasars, but take a very minor role in affecting other properties.

Wednesday December 11th 2019:

9:30 - 11:10 ISM and Star-Formation Session

QSO-Host Deblending Using Integral Field Spectroscopy and the SFR

9:30 - 9:50 David Fernandez

Currently, observations using Integral Field Unit (IFU) represent a synergy between the properties that can be obtained using spectroscopy and their spatial distribution. In the cases of AGNs, one crucial problem in spectroscopy studies is the strong contamination of the host galaxy by the presence of the bright nucleus. For that reason, many studies are limited to the outer part of the host galaxy. Therefore, alternative methods are required for the study of AGN and host galaxies using IFS. In this work, I present one method to separate the host galaxy and the AGN contribution in data-cubes. For this task, I use the spectral components of the AGN and the Point Spread Function. After the quasar-host deblending process, I present the case of the Star Formation Rate and their distribution in the galaxy for the quasar PG 0934+013 derived using the Halpha emission line. The result of SFR using recombination line is consistent with the SFR derived independently from far-infrared data.

Protostellar outflows in eleven massive protoclusters

9:50 - 10:10 Tapas Baug

Filamentary structures in Galactic molecular clouds have the ability to feed prestellar cores by swiftly flowing gas along their long-axis. Although filaments are identified with flowing gas that could aid the star formation, a direct implication of it would be identifying a correlation between the protostellar accretion and gas flow along the filaments. However, it is difficult to have a direct detection of accreting gas at core-scale, and thus, a solution to this problem could be finding correlation of the protostellar outflows associated with the filamentary structures. These outflows are generally launched by the rotating accretion disk of the protostar, and can be used to infer the orientation of the accretion disk. With the assumption that filaments enhance the flow of molecular gas onto protostellar accretion disks, one would ideally expect a preferred position angle of bipolar outflows with respect to the orientation of the long-axis of the filaments. We studied protostellar outflows in eleven massive Galactic protoclusters using ALMA CO (3-2) data. A total of 105 outflow lobes are identified in these eleven protoclusters. Seven of these eleven protoclusters are embedded in filaments. The plane of sky position angles between outflow axes and corresponding filaments are distributed in a random fashion, and do not show any hint of preferred orientation (i.e., orthogonal or parallel) with respect to filament long-axes. Identified outflow lobes also show no correlation with the large-scale magnetic field and Galactic plane position angles. Our study of CO (3-2) outflows of these protoclusters indicates that the protostellar accretion may not necessarily be aligned to the large-scale filaments or to the magnetic fields, but may depend on the evolutionary stage of the cluster.

The Star Formation Rate and Star Formation Efficiency of Quasar Host Galaxies at Low redshifts

10:10 - 10:30 Yanxia Xie (谢艳霞)

The tight correlation between the mass of supermassive black holes and the stellar velocity dispersion of galaxy bulges has been well-established in local quiescent galaxies, triggering numerous studies on the coevolution between black holes and their host galaxies. However, the origin of this relation remains elusive. Measurement of the interstellar medium content and star formation rate in active galaxies provides valuable insight into how effectively the host galaxies build their mass. Employing a new star formation rate (SFR) calibration developed by Xie & Ho (2019) based on polycyclic aromatic hydrocarbon (PAH) emission, we quantify the SFRs for the hosts of a sample of low-redshift quasars, and, in combination with measurements of gas content estimated from dust, we investigate their star formation efficiencies. A significant fraction of quasar hosts lies above the galaxy main sequence, possessing high star formation efficiencies similar to those of starburst galaxies, although many of the hosts have not undergone major mergers. AGN feedback may promote instead of suppressing star formation in these systems. While PAH emission effectively traces star formation in most objects, we find evidence that they may be destroyed in the most powerful quasars.

Dirt-cheap Gas Scaling Relations: Using Dust Absorption, Metallicity and Galaxy Size to Predict Gas Masses

10:30 - 10:50 Hassen Yesuf

I will present our new method to estimate gas masses in galaxies (https://arxiv.org/abs/1910.11542v1) and its application to test AGN feedback. We use novel survival analysis techniques to investigate the relationship between a number of the properties of galaxies and their atomic (M_HI) and molecular (M_H2) gas mass, with the aim of devising efficient, effective empirical estimators of the cold gas content in galaxies that can be applied to large optical galaxy surveys. We find that dust attenuation, AV, of both the continuum and nebular emission, shows significant partial correlations with M_H2, after controlling for the effect of star formation rate (SFR). The partial correlation between AV and M_HI, however, is weak. We also find that the stellar half-light radius, R50, shows significant partial correlations with both M_H2 and M_HI. We fit multiple regression to summarize the median, mean, and the 0.15/0.85 quantile multivariate relationships among M_H2, AV, metallicity, and/or R50. A linear combination of AV and metallicity (inferred from stellar mass) or AV and R50, can estimate molecular gas masses within ~ 2.5-3 times the observed masses. If SFR is used in addition, M_H2 can be predicted to within a factor < 2. In the application, we do PCA and clustering analysis to group bulge-dominated, isolated, and massive galaxies (log M = 10.4-10.7) in to four clusters that are evolutionary linked. The AGN fraction and strength, star formation and gas amount change as these groups evolve. Interestingly, the intermediate two groups have similar gas and stellar properties. One, however, is dominated by strong AGN hosts (66%) and while the other is dominated by star-forming galaxies (with only ~6% AGNs). The amount of molecular gas in these two groups is 10^9 M_Sun. This is a compelling evidence that AGN feedback does not affect cold gas in galaxies and quench star formation.

We can know more from gas around high redshift galaxies

10:50 - 11:10 Siwei Zou (邹思蔚)

By studying the gas properties around galaxies, we can reveal the star formation and galactic feedback process at high redshift. I will first present our work on strong MgII and FeII absorption systems from a GNIRS sample at z > 5.7. The result indicates the incidence density of MgII and FeII is consistent with star formation rate over cosmic time. I will also introduce their association with possible counterparts. In the second part, I will introduce an interesting Lyman limit system at z = 1.5 exhibits high carbon enhancement over iron and oxygen. It is plausibly the remnant of old stars opening a new window of detection of the first generation of stars.

11:40 - 12:40 Black Holes, Compact Objects, and GRBs Session

Neutron Star Structure with Lorentz violation and the Implication to Continuous Gravitational Waves

11:40 - 12:00 Rui Xu (徐睿)

Lorentz symmetry is a fundamental principle in modern physics. However, spontaneous violation of it has been suggested in the candidate theories of quantum gravity, like string theory and loop quantum gravity. The experimental tests of it range from terrestrial experiments to astrophysical observations. Here we consider the effect of Lorentz violation on the structure of neutron stars under a framework employing effective field theory. A set of hydrostatic equations with modifications from Lorentz violation are derived, and then the modifications are isolated and added to the Tolman- Oppenheimer-Volkoff (TOV) equation as the leading-order Lorentz-violation corrections in relativistic systems. A perturbation solution to the leading-order modified TOV equations is found. The quadrupole moments due to the anisotropy in the structure of neutron stars are calculated and used to estimate the quadrupole radiation of a spinning neutron star with the same deformation. The calculation puts forward a new test for Lorentz symmetry in the strong-field regime when continuous gravitational waves are observed in the future.

Probing inner accretion disk around a spinning black hole: Revisiting the Bardeen-Petterson effect

12:00 - 12:20 Chandrachur Chakraborty

Inner part of a thin accretion disk around a Kerr black hole can serve as an important tool to study the physics of the strong gravity regime. A tilt in such a disk with respect to the black hole spin axis is particularly useful for this purpose, as such a tilt can have a significant effect on the observed X-ray spectral and timing features via Lense-Thirring precession. However, the inner disk was predicted to become aligned with the spin direction of the black hole by the well- known Bardeen-Petterson effect. Here we calculate, both analytically and numerically, the radial profile of the thin accretion disk tilt angle in the viscous regime. We show that the inner disk may not be aligned at all for certain reasonable ranges of parameter values. This makes the inner accretion disk particularly promising to probe the black hole parameters, and the accretion process in the strong gravity region.

My expectations on the gravitational-wave event / gamma-ray burst association

12:20 - 12:40 Shuang Du (杜双)

I will introduce my expectations on the gravitational-wave event / gamma-ray burst association.
1. Constraining the speed of gravitational waves.
2. Constraining the physics of gamma-ray bursts.
3. Constraining the equation of state of neutron star. to predict the physical parameters of observed

13:40 - 15:00 Galaxy Clusters Session

Galaxy Evolution on the Sub-Galactic Scale at 1 < z < 6

13:40 - 14:00 Bingxiao Xu (徐冰笑)

We explore the highly lensed galaxies (giant arcs) and sub-galactic structures (star-forming clumps) over 1 < z < 6 using the Cluster Lensing And Supernova survey with Hubble (CLASH) survey. We detect 106 giant arcs in 20 massive galaxy clusters and measure their physical properties such as stellar mass, SFR, sSFR, color, etc, via the multi-wavelength photometries. We perform the image reconstruction on the source plane for these giant arcs using the reliable galaxy cluster mass models. We find that majorities of the lensed galaxies have irregular morphology and form stars actively. They follow the star-forming main sequence tightly and fall into the Blue Cloud region on the (NUV-r) VS stellar mass plane. We detect 213 clumps at rest-frame 2200 A from the reconstructed galaxy images and study their stellar mass, SFR, sSFR, UV luminosity function, stellar mass function and spatial distribution. The clumps at higher redshift typically have higher stellar mass surface density and SFR surface density than their counterparts at lower redshift. Unlike the results for galaxies, we do not find any significant evolution on the UV luminosity function, stellar mass function for clumps. We also find no or very weak evolution on the spatial distribution of clumps, which seems in disagreement with the clump migration scenario. Future larger clump sample is needed to reduce the uncertainties to justify whether such lack of evolution is intrinsic or due to the selection effects.

Observational Features and Diagnostic Tools for AGN Feedback in Galaxy Clusters

14:00 - 14:20 Yu Qiu (邱宇)

We use 3D radiation-hydrodynamic simulations to explore the joint role of quasar- and radio-mode feedback from supermassive black holes (SMBHs) in brightest cluster galaxies. In our simulations, the central AGN transitions between radiatively efficient and radiatively inefficient states on timescales of a few gigayears, as a function of its accretion rate. The timescale for this transition primarily depends on the dominant feedback mode at high SMBH accretion rates. Our simulations also reproduce the salient observational features of AGN feedback in cool-core clusters (CCCs), such as jet-inflated cavities, X-ray ripples, and spatially extended Hα filaments. In particular, we find that the spatial extent and total mass of the filaments show positive correlations with AGN feedback power and can therefore be used as probes for the AGN activity. We also find that the kinetic feedback power shows a statistically significant correlation with the component of the velocity dispersion along the jet axis, but not the components perpendicular to it. Our simulations suggest that observational features in CCCs can be used as independent diagnostic tools for AGN feedback, and if used jointly, can better constrain the accretion and feedback activity from SMBHs in galaxy clusters.

The X-ray detection of galaxy clusters

14:20 - 14:40 Weiwei Xu (徐伟伟)

Some indications for tension have long been identified between cosmological constraints obtained from galaxy clusters and primary cosmic microwave background (CMB) measurements. Typically, assuming the matter density and fluctuations, as parameterized with Omega_m and sigma_8, estimated from CMB measurements, many more clusters are expected than those actually observed. One possible explanation could be that certain types of galaxy groups or clusters were missed in samples constructed in previous surveys, resulting in a higher incompleteness than estimated. We aim to determine if a hypothetical class of very extended, low-surface-brightness galaxy groups or clusters have been missed in previous X-ray cluster surveys based on the ROSAT All-Sky Survey (RASS). We applied a dedicated source-detection algorithm sensitive also to unusual group or cluster surface-brightness distribution. We found a sample of ~1000 extended groups discovered in the RASS. It includes many known groups but also a number of new group candidates, which are not included in any previous X-ray or SZ cluster catalogs. Some has the X-ray fluxes above the nominal flux-limits of previous RASS cluster catalogs. We demonstrate that galaxy groups missed in previous RASS surveys are possibly due to the flat surface-brightness distributions of this potential new population. Analysis of the full sample has an effect on previous cosmological parameter constraints based on RASS cluster surveys. In addition, I also work on the detection of high-redshift extended clusters with the deep observation of Chandra and XMM-Newton, as well as the multiple-wavelength identification of galaxy clusters.

Environmental effects on the galaxy morphology transformation in intermediate-redshift massive clusters

14:40 - 15:00 Chao Ma (马超)

The intermediate-redshift rich galaxy clusters represent an excellent laboratory for studying the effects of local environment on the morphological transformation of galaxies from spirals to S0s. The HST Frontier Fields (HFF) program has targeted six massive cluster at redshift 0.35-0.54, which produced the deepest observations of clusters to date. We will use those multi-wavelength imaging to perform a comprehensive cluster galaxy structural decomposition. We have developed a series of tools to robustly measure the B/T and spiral arm strength for cluster disk galaxies. By comparing the properties of galaxy populations from different redshifts, we expected to examine how cluster environment influence the spiral-S0 transformation, probably proving us new insights for understanding overall galaxy evolution. In addition, we are working on exploiting multi-band simultaneous GALFIT decomposition of cluster fields using the HFF and CLASH images as training data, for more efficiently responding to the future CSST cluster survey.

15:20 - 16:40 Stellar Populations Session

Low-alpha stars in the Gaia-ESO survey: exotic travellers in our galaxy

15:20 - 15:40 Xiaoting Fu (符晓婷)

We exploit the large high-resolution spectroscopic survey Gaia-ESO and the Gaia astrometry to study the properties of the population of low-alpha stars, which are thought to be formed in dwarf galaxies and later accreted into the Milky Way. In total, we select 39 low-alpha stars belonging both to the Galactic bulge, disc, and the halo. They show significantly lower [Mg/Fe] abundance compared to other Galactic field stars with similar [Fe/H] but are similar to stars belonging to dwarf galaxies. By considering their kinematic and dynamical parameters, we conclude that half of them are likely to be associated with Gaia-Enceladus, which has recently been proposed as a major accreted component of the local halo. Seven of the selected low-alpha stars belong to, at least are locate in, the Galactic bulge. The origin of the rest low-alpha stars are still unknown.

High-resolution Spectroscopic Analysis of a Large Sample of Li-rich Giants Found By LAMOST

15:40 - 16:00 Yutao Zhou (周渝涛)

The discovery of Li-rich giants has introduced a new challenge for standard stellar evolution models. To resolve this issue, the number of this type of object has been rapidly increased through the development of worldwide surveys. Taking advantage of the Large Sky Area Multi-Object Fiber Spectroscopic Telescope survey, 44 new Li- rich giants are reported, which are confirmed with high-resolution observations. Based on the high-resolution and high signal-to- noise spectra, we derived the atmospheric parameters and elemental abundances with the spectral synthesis method. We performed a detailed analysis of their evolutionary stages, infrared excess, projected rotational velocity (v sin i), and stellar population. We find that (1) the Li-rich giants concentrate at the evolutionary status of the red giant branch bump, red clump, and asymptotic giant branch; (2) three of them are fast rotators and none exhibit infrared excess. Our results imply that the origins of Li enrichment are most likely to be associated with the extra mixing in the stellar interior, and the external sources might only make a minor contribution. Moreover, various Li-rich episodes take place at different evolutionary stages.

Probing stellar evolution and cosmic expansion with pulsating stars

16:00 - 16:20 Anupam Bhardwaj

I will present results on Cepheid, Mira and RR Lyrae pulsating variables with a focus on providing stringent constraints for the stellar evolution and pulsation models, and addressing current issues in the cosmic distance scale for precision cosmology. I will present new Mira Period-Luminosity-Color relations at maximum light that are significantly tighter than traditional mean-light relations, and discuss physical parameter estimation of Cepheid and RR Lyrae based on light curve morphology. I will also discuss ongoing CFHT RR Lyrae observations in globular clusters to constrain the metallicity dependence on their multiband pulsation properties.

Studying the Evolution of Disks with MaNGA

16:20 - 16:40 Shravan Shetty

For decades astronomers have observed a relation in between the age of stars in the milky Way and their velocity dispersion, i.e. old stars tend to be dynamically hotter than their younger counterparts. This relation, called the Stellar Age-Velocity Dispersion Relation (AVR), has been extensively studied for the Milky Way, and recently for M31 and M33, however the cause of this phenomena has remained elusive. In this talk we propose a new technique to explore the AVR in the disks of MaNGA galaxies wherein we can leverage the diverse range of galaxies to help demystify the origin of AVR and probe the evolutionary history of galaxy disks.

In this talk we will illustrate, using a Bayesian approach, that the individual spaxels of MaNGA datacubes contain information on the kinematics of the co- spatial young and old stellar populations in the galaxies. Hence if we measure the asymmetric drift of the two populations, we can use their difference as a probe of the strength of the AVR in these galaxy disks. Building upon this we will present a new technique we developed to robustly decompose the observed MaNGA spectra into young and old stellar components efficiently for large sets of galaxies. The technique was developed such that it is independent of any assumptions on the galaxy properties such as its AVR or light profile, and addresses issues such as that of template mismatch. Demonstrating the capability of the technique on real galaxies, we will then present the results of an analysis of a sample of galaxies that is representative of the observed parameter space of the asymmetric drift and Color-Magnitude Diagram covered by the MaNGA survey.

The chemical and dynamical evolution of the Milky Way disk

16:40 - 17:00 Chun Wang (王春)

I will present my recent works about the chemical and dynamical evolution of the Milky Way disk using LAMOST data and Gaia DR2 data.