

star,  $\lambda$  Ori. The derived excitation temperature ( $T_{\text{ex}}$ ) using  $^{12}\text{CO}$  emission shows a lower median value (20 K) than those of triggered star-forming regions (30 K). The lower MF and  $T_{\text{ex}}$  support our previous study that star formation was not triggered in the  $\lambda$  Orionis cloud. We aim to further investigate whether the Class 0/I YSOs in the  $\lambda$  Orionis cloud have less circumstellar materials and smaller accretion rates than in other filamentary clouds (e.g., Orion A & B), which might be attributed to negative feedback from the massive star in limiting accretion of protostars

### [포 IM-08] The Early Assembly History of the Milky Way with Extremely Metal-Poor ([Fe/H] < -3.0) Stars

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Extremely metal-poor (EMP; [Fe/H] < -3.0) stars are thought to be genuine second-generation of stars because they were born from relatively pristine gas chemically enriched by one or two supernovae. So, the EMP stars presumably originated from outside the Milky Way (MW) are important tracers for the early chemical evolution and assembly history of the MW. In this study, we present the preliminary results on the early assembly history of the MW inferred by associating the dynamical properties of our EMP stars with those of known substructures in the MW. We also explore the star formation history of the progenitor galaxies of our EMP stars by investigating the elemental abundances of the EMP stars associated with the substructure.

### [포 IM-09] Grain Growth Revealed by Multi-wavelength Analysis of Non-axisymmetric Substructures in the Protostellar Disk WL 17

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Disks around protostars are the birthplace of planets. The first step toward planet formation is grain growth from  $\mu\text{m}$ -sized grains to mm/cm-sized grains in a disk, particularly in

dense regions. In order to study whether grains grow and segregate at the protostellar stage, we investigate the ALMA Band 3 (3.1 mm) and 7 (0.87 mm) dust continuum observations of the protostellar disk WL 17 in  $\rho$  Ophiuchus L1688 cloud. As reported in a previous study, the Band 3 image shows substructures: a narrow ring and a large central hole. On the other hand, the Band 7 image shows different substructures: a non-axisymmetric ring and an off-center hole. The two-band observations provide a mean spectral index of 2.3, which suggests the presence of mm/cm-sized large grains. Its non-axisymmetric distribution may imply dust segregation between small and large grains. We perform radiative transfer modeling to examine the size and spatial distributions of dust grains in the WL 17 disk. The best-fit model suggests that large grains (>1 cm) exist in the disk, settling down toward the midplane, whereas small grains ( $\sim 10 \mu\text{m}$ ) well mixed with gas are distributed off-center and non-axisymmetrically in a thick layer. The low spectral index and the modeling results suggest that grains rapidly grow at the protostellar stage and that grains differently distribute depending on sizes, resulting in substructures varying with observed wavelengths. To understand the differential grain distributions and substructures, we discuss the effects of the protoplanet(s) expected inside the large hole and the possibility of gravitational instability.

### [포 IM-10] Spiral Magnetic Field Lines in a Hub-Filament Structure, Monoceros R2

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We present the results of polarization observations at submillimeter wavelengths towards Monoceros R2 (Mon R2). The polarized thermal dust emission was obtained from SCUBA-2/POL-2 at 450  $\mu\text{m}$  and 850  $\mu\text{m}$ , simultaneously. This observation is a part of the JCMT BISTRO survey project. The polarization angle distributions at 450  $\mu\text{m}$  and 850  $\mu\text{m}$  are similar and the mean value of angle differences at two wavelengths is 5.5 degrees. The Mon R2 is one of massive star-forming regions containing a clear hub-filamentary structure. The hub region shows star formation activities, and surrounding filaments provide channels for matters to move into the hub region. It is not well known the role of magnetic fields in a hub-filamentary structure. Some studies have shown well-ordered polarization segments along a filamentary structure and

magnetic field morphology traced by polarization segments is interpreted as to help gas flow along the filamentary structure. Our observations shows that filaments in Mon R2 have spiral structure and the magnetic field lines are parallel to the filaments. We interpret that the spiral structure can be formed by a rotation hub-filament system with gas flowing along the filaments to the hub. We found several dust clumps at the central part of the hub region of the Mon R2. They seems to be formed at locations where spiral field lines meet each other. These results show one observational example that a magnetic field play a role in gas flow.

## 외부은하/은하단

### [포 GC-01] Studies of AGN Variability from SNU AGN Monitoring Project (SAMP)

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We present optical variability of nearby luminous active galactic nucleus (AGN). We use the multi-epoch data of 46 AGNs obtained from 2015 to 2019 through SNU AGN Monitoring Project (SAMP), which was carried out for the reverberation mapping of luminous AGNs. We estimated variability amplitudes and time scales using the various types of analytic function, such as structure function and damped random walk. We present the comparisons between physical properties of AGNs and optical variability in order to unveil the origin of the variability of AGNs

### [포 GC-02] Stellar photometric Properties in the outskirt of NGC 5236

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In the hierarchical framework, galaxies grow through mergers and accretion. Those mechanisms leave faint features, such as stellar streams, shells and smooth stellar halos in the outskirts of galaxies. In order to search for those features in the nearby galaxies, we are conducting a KMTNet Nearby Galaxy Survey using the Korea Microlensing Telescope Network. We present a deep and wide-field imaging of NGC 5236, a barred spiral galaxy. In one-dimensional surface brightness profiles, we reach 28, 29 mag/arcsec<sup>2</sup> in the R- and B-band, respectively. We find that the outer disk of NGC 5236 can be well described with a single exponential profile up to 17 kpc (~3.8 Reff) indicating that the excess light due to the stellar halo is not clearly detected. B-R color gradually increases towards the outskirts of the galaxy. It may reveal that stellar properties in the outskirts are marginally distinctive from those in the central part.

### [포 GC-03] Mass models of the Large Magellanic Cloud: HI gas kinematics

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We perform disk-halo decomposition of the Large Magellanic Cloud (LMC) using a novel HI velocity field extraction method, aimed at better deriving its HI kinematics and thus the dark matter density profile. For this, we use two newly developed galaxy kinematic analysis tools, BAYGAUD and 2DBAT which have been used for the kinematic analysis of resolved galaxies from Australian Square Kilometre Array (ASKAP) observations like WALLABY which is an all-sky HI galaxy survey in southern sky. By applying BAYGAUD to the combined HI data cube of the LMC taken with the Australia Telescope Compact Array (ATCA) and Parkes radio telescopes, we decompose all the line-of-sight velocity profiles into an optimal number of Gaussian components based on Bayesian MCMC techniques. From this, we disentangle turbulent non-circular gas motions from the overall rotation of the galaxy. We then derive the rotation curve of the LMC by applying