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One of the key questions on star formation is how the organic molecules are synthesized and delivered to the planets and comets since they are the building blocks of prebiotic molecules such as amino acid, which is thought to contribute to bringing life on Earth. Recent astrochemical models and experiments have explained that complex organic molecules (COMs; molecules composed of six or more atoms) are produced on the dust grain mantles in cold and dense gas in prestellar cores. However, the chemical networks and the roles of physical conditions on chemistry are not still understood well. To address this question, hot (> 100 K) cores in high mass young stellar objects (M > 8 Msun) are great laboratories due to their strong emissions and larger samples than those of low-mass counterparts. In addition, CH_3OH masers, which have been mostly found in high mass star forming regions, can provide constraints due to their very unique emerging mechanisms. We investigate twelve high mass star forming regions in ALMA band 6 observation. They are associated with 44/95 GHz Class I and 6.7 GHz Class II CH3OH masers, implying that the active accretion processes are ongoing. For these previously unresolved regions, 66 continuum peaks are detected. Among them, we found 28 cores emitting COMs and specified 10 cores associated with 6.7 GHz Class II CH3OH masers. The chemical diversity of COMs is found in cores in terms of richness and complexity; we identified up to 19 COMs including oxygen- and nitrogen-bearing molecules and their isotopologues in a core. Oxygen-bearing molecules appear to be abundant and more complex than nitrogen-bearing species. On the other hand, the COMs detection rate steeply grows with the gas column density, which can be attributed to the effective COMs formation in dense cores.

[구 IS-05] Physical modeling of dust polarization spectrum by RAT alignment and disruption

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Dust polarization depends on the physical and mechanical properties of dust, as well as the properties of local environments. To understand how dust polarization varies with grain mechanical properties and the local environment, in this paper, we model the wavelength-dependence polarization of starlight and polarized dust emission by aligned grains by simultaneously taking into account grain alignment and rotational disruption by radiative torques (RATs). We explore a wide range of the local radiation field and grain mechanical properties characterized by tensile strength. We find that the maximum polarization and the peak wavelength shift to shorter wavelengths as the radiation strength U increases due to the enhanced alignment of small grains. Grain rotational disruption by RATs tends to decrease the optical-near infrared polarization but increases the ultraviolet polarization of starlight due to the conversion of large grains into smaller ones. In particular, we find that the submillimeter (submm) polarization degree at 850μm(P850) does not increase monotonically with the radiation strength or grain temperature (Td), but it depends on the tensile strength of grain materials. Our physical model of dust polarization can be tested with observations toward star-forming regions or molecular clouds irradiated by a nearby star, which have higher radiation intensity than the average interstellar radiation field. Finally, we compare our predictions of the P850-Td relationship with Planck data and find that the observed decrease of P850 with Td can be explained when grain disruption by RATs is accounted for, suggesting that interstellar grains unlikely to have a compact structure but perhaps a composite one. The variation of the submm polarization with U (or Td)can provide a valuable constraint on the internal structures of cosmic dust

[박 IS-06] GG Tauri A: gas properties and dynamics from the cavity to the outer disk

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I will presents the analysis of the gas properties of the protoplanetary disk surrounding the young low-mass (about $1.2M_{sun}$) triple star, GG Tau A. This work makes use of ALMA observations of rotational lines of CO (^{12}CO, ^{13}CO and $C^{18}O$) together NOEMA observations of a few dozens of other molecules.

While the CO emission gives information on the molecular layer close to the disk atmosphere, its less abundant isotopologues ^{13}CO and $C^{18}O$ bring information much deeper in the molecular layer.

I will present the analysis of the morphology and kinematics of the gas disk using the CO isotopologues. A radiative transfer model of the ring in CO isotopologues will also be presented. The subtraction of this model from the original data reveals the weak emission of the molecular gas lying inside the cavity. Thus, I am able to evaluate the properties of the gas inside the cavity, such as the gas dynamics, excitation conditions, and the amount of mass in the cavity. High angular resolution observations of CO reveals sprials induced by embedded planet(s) located near the 3:2:1 mean-motion resonance that help to explain the special morphology of the circumbinary disk. I also discuss some chemical properties of the GG Tau A disk. I report the first detection of H2S and C_2S in a protoplanetary disk. The molecule abundance relative to ^{13}CO of about twenties other molecules will also be given. In GG Tau A, the detections of rare molecules such as H_2S and C_2S have been probably possible because the disk is more massive (a factor about 3-5) than other disks where the molecules was searched. Such a large disk mass makes the system suitable to detect rare molecules and to study cold-chemistry in protoplanetary disks.

[박 IS-07] Study of Active Galactic Nuclei and Gravitational Wave Sources with Time-series Observation

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In this presentation, study of the energetic astronomical phenomena, active galactic nucleus (AGN) and gravitational wave (GW) source, with time-series observation will be reported. They emit large amounts of energy and play an important role in the history of the Universe. First, intra-night variability of AGNs is studied using Korea Microlensing Telescope Network (KMTNet). Second topic is photometric reverberation mapping which is applied for 11 AGNs with medium-bands and Lee Sang Gak Telescope. Last, three gravitational wave events were followed-up by various optical telescopes. Each topic will be specifically addressed in the presentation.

외부은하 / 은하단 / 우주론

[구 GS-01] FR-II radio jets and the acceleration of UHECRs

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To investigate the acceleration of ultra-high energy cosmic rays (UHECRs) in relativistic jets of FR-II galaxies, we simulate high-power jets with jet powers of Q~10^46erg/s in a stratified galaxy cluster halo using a state-of-art relativistic hydrodynamic (RHD) code we have recently developed. With the simulated jet-induced flow profiles, we then perform Monte-Carlo simulations, where the transport of high-energy particles is followed assuming large-angle scatterings in the flow-rest frame. We estimate the energy gains and acceleration times in the acceleration processes by shocks, shear, and turbulence. We present the results and discuss implications on the acceleration of UHECRs in FR II radio jets.

[구 GS-02] Faraday Rotation Measure and