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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

Cosmic Magnetic Field

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The Faraday rotation measure (RM) of extragalactic radio sources is one of tools that can explore the magnetic field in the cosmic web. We have investigated the statistical properties of the RM using the data of simulations for the large-scale structure formation of the universe. Various modelings for the cosmic magnetic field including the redshift dependence, and the intrinsic RM of radio sources have been considered. We here present the structure functions (SFs) of simulated RMs for small angular separations, and compare the SFs with observations, specifically those from the NRAO VLA Sky Survey (NVSS) and LOFAR Two-Metre Sky Survey (LoTSS). We then discuss the implications of our work.

[박 GC-03] Radiative Transfer in Highly Thick Media through Rayleigh and Raman Scattering with Atomic Hydrogen

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Hydrogen is the most abundant element in the universe, which is, in the cosmological context, attributed to its simplest structure consisting of a proton and an electron. Hydrogen interacts with an electromagnetic wave in astrophysical environments. Rayleigh scattering refers to elastic scattering, where the frequencies of the incident and scattered photons are the same. Rayleigh and resonance scattering is a critical role study Lyman Alpha objects in the early universe. The scattering causes the frequency and spatial diffusion of Lyα. In the case of Raman scattering, the energies of the incident and scattered photons are different. The photons near Lyβ convert to the optical photons near Hα through Raman scattering. The photon scattered by atomic hydrogen can carry both of the properties of the H I region and the emission region. I adopt a Monte Carlo approach to investigate the formation of the various spectral line features through Rayleigh and Raman scattering in highly thick media of atomic hydrogen. In this thesis, I present my works on radiative transfer involving the scattering processes between far UV photon and atomic hydrogen. I introduce scattering processes with atomic hydrogen and the spectral, spatial, and polarized information originating from the scattering.

[구 GC-04] Testing delayed AGN feedback using star formation rate measurements by SED fitting with JCMT/SCUBA-2 data

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The impact of AGN on star formation is one of the main questions in AGN-galaxy coevolution studies. However, direct evidence of AGN feedback is still rare. One of the main obstacles is that various star formation rate (SFR) indicators are contaminated by AGN contribution. We present IR-based SFR measurements of a sample of 52 local ($z<0.3$) AGNs, which were selected based on kinematical properties of ionized gas outflows, using SED analysis with JCMT/SCUBA-2 data. First, we will compare IR-based SFR with other SFR indicators to check the reliability of the SFR indicators. Second, we will discuss the contribution of Mid-IR emission from hot dust of AGN torus by comparing SED fitting results with and without including AGN dust component. Finally, we will report the correlation between specific SFR (sSFR) and AGN activity (e.g., outflow strength or Eddington ratio) as evidence of no instantaneous feedback and discuss the implications of these results

[구 GC-05] Preparing for low-surface-brightness science with the Rubin Observatory: characterisation of LSB tidal features from mock images

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Minor mergers leave behind long lived, but extremely faint and extended tidal features including tails, streams, loops and plumes. These act as a fossil record for the host galaxy's past interactions, allowing us to infer recent accretion histories and place constraints on the properties and nature of a galaxy's dark matter halo. However, shallow imaging or small homogeneous samples of past surveys have resulted in weak