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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