Tae Seog Yoon[6], and Won-Kee Park[3]
[1]School of Space Research, Kyung Hee University, [2]Subaru Telescope, National Astronomical Observatory of Japan, [3]Korea Astronomy and Space Science Institute, [4]Seoul National University, [5]National Youth Space Center, [6]Kyungpook National University

We present the results of high-resolution optical (R ~ 30,000) and near-infrared (R ~ 45,000) spectroscopic monitoring observations of a new FU Orionis-like young stellar object, 2MASS J06593158-0405277. FU Orionis objects (FUors) are well-studied examples of episodic accretion because of their outburst phenomenon. Recently, 2MASS J06593158-0405277 exhibited an outburst and was identified as a FUor. It provides an important opportunity to investigate the whole FUors phenomenon from its pre-outburst to its post-outburst phase. We monitored 2MASS J06593158-0405277 with the BOES and the IGRINS since Dec 25, 2014 (UT). We detected several wind and disk features and present here our analysis for time variations of those spectral lines.

[포IM-03] TRAO Key Science Program: mapping Turbulent properties In star-forming MolEcular clouds down to the Sonic scale (TIMES)

Hyeong-Sik Yun[1], Jeong-Eun Lee[1], Yunhee Choi[1], Seokho Lee[1], Giseon Baek[1], Yong-Hee Lee[1], Minho Choi[2], Hyunwoo Kang[2], Ken'ichi Tatematsu[3], Brandt A. L. Gaches[4], Mark H. Heyer[4], Neal J. Evans II[2,5], Stella S. R. Offner[5], Yao-Lun Yang[5]
[1]School of Space Research, Kyung Hee University, Republic of Korea, [2]Korea Astronomy and Space Science Institute, Republic of Korea, [3]National Astronomical Observatory of Japan, Japan, [4]Department of Astronomy, University of Massachusetts, Amherst, USA, [5]Department of Astronomy, University of Texas, Austin, USA

Turbulence is a phenomenon which largely determines the density and velocity fields in molecular clouds. Turbulence can produce density fluctuation which triggers a gravitational collapse, and it can also produce a non-thermal pressure against gravity. Therefore, turbulence controls the mode and tempo of star formation. However, despite many years of study, the properties of turbulence remain poorly understood. As part of the Taeduk Radio Astronomy Observatory (TRAO) Key Science Program (KSP), "mapping Turbulent properties In star-forming MolEcular clouds down to the Sonic scale (TIMES; PI: Jeong-Eun Lee)", we have mapped two star-forming clouds, the Orion A and the ρ Ophiuchus molecular clouds, in 3 sets of lines (13CO 1-0/C18O 1-0, HCN 1-0/HCO+ 1-0, and CS 2-1/N2H+ 1-0) using the TRAO 14-m telescope. We aim to map entire clouds with a high-velocity resolution (~0.05 km/s) to compare turbulent properties between two different star-forming environments. We will present the preliminary results using a statistical method, Principal Component Analysis (PCA), that is a useful tool to represent turbulent power spectrum.

[포IM-04] Differences between N-PDFs derived from Continuum and Molecular Emission Toward the Orion A Molecular Cloud

Yong-Hee Lee[1], Jeong-Eun Lee[1], Hyeong-Sik Yun[1], Jongsoo Kim[2], Yunhee Choi[1], Steve Mairs[3], Doug Johnstone[3]
[1]Kyung Hee University, School of Space Research. [2]Korea Astronomy and Space Science Institute, [3]NRC Herzberg Astronomy and Astrophysics.

The probability distribution function of column density (N-PDF) has been used for studying the characteristics of molecular clouds. In particular, the properties of N-PDF can reveal the nature of turbulence and gravity inside the molecular cloud. We use the dust continuum emission at 450 μm and 850 μm observed as part of the JCMT Gould Belt Survey (GBS) (Mairs et al. 2016), the 12CO J=1-0 line observed with the 45 m telescope at Nobeyama Radio Observatory (NRO) (Shimajiri et al. 2011), 13CO, C18O and HCO+ J=1-0 observed with the 13.7 m telescope at Taeduk Radio Astronomy Observatory (TRAO), as part of the TRAO key science project, "mapping Turbulent properties In star-forming MolEcular clouds down to the Sonic scale" (TIMES; PI: Jeong-Eun Lee). We here present the N-PDFs derived from the continuum and the molecular line emission toward the Orion A molecular cloud and compare their behaviors in order to investigate the chemical and optical depth effects on the N-PDF.

[포IM-05] Dichotomy of the Galactic Halo as Revealed by Carbon-Enhanced Metal-Poor Giants

Jaehun Jung[1], Young Sun Lee[2], Young Kwang Kim[2]
[1]Department of Astronomy, Space Science, and Geology, Chungnam National University, Daejeon 34134, South Korea
[2]Department of Astronomy and Space Science, Chungnam National University, Daejeon 34134, South Korea

We present distinct chemical and kinematic

properties associated with the inner and outer halos of the Milky Way, as identified by metal-poor stars from the Sloan Digital Sky Survey. In particular, using carbon-enhance metal-poor (CEMP) giants, we first map out the fractions of CEMP-no stars (without strongly enhanced neutron-capture elements) and CEMP-s stars (with a large enhancement of s-process elements) in the inner- and outer-halo populations, separated by their spatial distribution of carbonicity ([C/Fe]). The CEMP-no and CEMP-s objects are classified by their different levels of absolute carbon abundances, A(C). We investigate characteristics of rotational velocity and orbital eccentricity for these sub-classes within the halo populations. Distinct kinematic features and fractions between CEMP-no and CEMP-s stars identified in each halo region will provide important clues on the origin of the dichotomy of the Galactic halo.

[포IM-06] Gemini Observations of Planetary Nebula Candidates toward the Galactic Center

Jihye Hong[1], Deokkeun An[1], Janet P. Simpson[2], Kris Sellgren[3], Solange V. Ramirez[4], Angela S. Cotera[2]
[1]Ewha Womans University, [2]SETI Institute, [3]Ohio State University, [4]Caltech IPAC

We present high-resolution near infrared (IR) spectra of two candidate planetary nebulae (PNe) that were serendipitously found toward the Galactic center (GC). Our spectra obtained using GNIRS on Gemini North reveal strong Br ♑ and He I recombination lines. In one of the targets, we confidently detect Pa ♌ emission. Based on Br ♑ and Pa ♌ lines, we estimate a foreground reddening to be Av=27 mag, which confidently puts this object at the GC distance. Along with the presence of highly excited emission lines such as [S IV], [Ne III], [Ne V], and [O IV] detected in the mid-IR spectra from the Spitzer Space Telescope, and the extended emission in the Pa ♋ narrow-band image from the Hubble Space Telescope, this makes it the first spectroscopically confirmed PN in the GC.

[포IM-07] Correlation between Magnetic-field directions and intensity gradients in Orion A region

Jihye Hwang[1,2] Jongsoo Kim[1,2]
[1]Korea Astronomy and Space Science Institute, [2]Korea University of Science and Technology

Magnetic fields play an important role in star-forming processes by regulating gravitational collapse. In filamentary structures of star-forming regions, magnetic fields are likely to be aligned with minor axes of filamentary molecular clouds because matter freely moves along magnetic field lines. Orion A region, one of the well-known high-mass star forming regions, has long filament structure. In order to study magnetic field directions with respect to the filamentary structure in Orion A, we have analyzed 850 μm dust polarization observations obtained with the James Clerk Maxwell Telescope (JCMT). We found tight correlation of dust intensity gradients and magnetic field directions. It was estimated that 81% of magnetic field segments are aligned with density gradients within 40 degree. In conclusion, we confirmed most of magnetic field segments are perpendicular to the major axis of the filament in Orion A.

천문우주관측기술

[포AT-01] Automation of Kyung Hee Astronomical Observatory 76 cm Telescope

Seoyeon Byeon[1], Tae-Geun Ji[2], Hye-In Lee[2], Sunwoo Lee[2], Soojong Pak[2], Myungshin Im[3]
[1]Dept. of Astronomy and Space Science, Kyung Hee University, [2]School of Space Research, Kyung Hee University, [3]Center for the Exploration of the Origin of the Universe (CEOU), Astronomy program, Dept. of Physics & Astronomy, Seoul National University

We plan to automatize the operation of Kyung Hee Astronomical Observatory (KHAO) 76 cm Telescope by adapting KAOS30 (KHU Automatic Observing Software for McDonald 30 inch Telescope). The software is developed to improve the efficiency of the observation system for monitoring transients and variable sources. It has installed and operated at McDonald 30 inch telescope since 2017 August. KAOS76 (KHU Automatic Observing Software for KHAO 76 cm Telescope) consists of four packages: Telescope Control Package (TCP), Data Acquisition Package (DAP), Auto Focus Package (AFP), and Script Mode Package (SMP). Most of the packages can be configured by minimized modifications of the codes because it includes common libraries for FLI instruments and also ASCOM standard. TCP, DAP, and AFP control astronomical devices. SMP supports automatic observing in a script mode. TCP of KAOS76 can communicate with the TCS via ASCOM. Also, KAOS76 has an extra function to compensate the misalignment of the polar axis. In this poster, we show the current status of the