

별 형성

[구 SF-01] Dispersal of Molecular Clouds by UV Radiation Feedback from Massive StarsJeong-Gyu Kim¹(김정규), Woong-Tae Kim¹(김웅태), and Eve Ostriker²¹Seoul National University(서울대학교), ²Princeton University

We report the results of three-dimensional radiation hydrodynamic simulations of star cluster formation in turbulent molecular clouds, with primary attention to how stellar radiation feedback controls the lifetime and net star formation efficiency (SFE) of their natal clouds. We examine the combined effects of photoionization and radiation pressure for a wide range of cloud masses ($10^4 - 10^6$ Msun) and radii (2 - 80 pc). In all simulations, stars form in densest regions of filaments until feedback becomes strong enough to clear the remaining gas out of the system. We find that the SFE is primarily a function of the initial cloud surface density, Sigma, (SFE increasing from ~7% to ~50% as Sigma increases from ~30 Msun/pc² to ~10³ Msun/pc²), with weak dependence on the initial cloud mass. Control runs with the same initial conditions but without either radiation pressure or photoionization show that photoionization is the dominant feedback mechanism for clouds typical in normal disk galaxies, while they are equally important for more dense, compact clouds. For low-Sigma clouds, more than 80% of the initial cloud mass is lost by photoevaporation flows off the surface of dense clumps. The cloud becomes unbound within ~0.5-2.5 initial free-fall times after the first star-formation event, implying that cloud dispersal is rapid once massive star formation takes place. We briefly discuss implications and limitations of our work in relation to observations.

[구 SF-02] High-resolution near-IR Spectral Mapping of Multiple Outflows around LkHa 234 in NGC 7129 Star Forming RegionHeeyoung Oh¹(오희영), Tae-Soo Pyo²(표태수), Bon-Chul Koo¹(구본철), In-Soo Yuk³(육인수), Byeong-Gon Park^{3,4}(박병곤)¹Seoul National University (서울대학교),²Subaru Telescope, ³Korea Astronomy and Space Science Institute(천문연),⁴Korea University of Science and Technology(과학기술연합대학원대학교)

We present the observational study toward the multiple outflows around LkHa 234 star formation region. The high-resolution, near-IR spectral mapping using the Immersion Grating Infrared Spectrograph (IGRINS) allowed us to distinguish at least four separate outflows with the molecular hydrogen (H₂) and forbidden iron ([Fe II]) emission lines. The outflow associated with the radio continuum source VLA 3B is detected in both H₂ and [Fe II] emission, while the outflows driven by MM 1, VLA 2 sources were only detected in H₂, indicating the different physical conditions of outflows. We confirm the axis of VLA 3B jet, the position angle of ~240°. We firstly identified the redshifted, near-IR H₂ outflow associated with VLA 2, which is coincident with the previous detections of H₂O masers. From the H₂ line ratios, we interpret the gas properties of the shock excited blue- and redshifted components, and UV excited surrounding photodissociation region. We also discuss the origin of the high-velocity ($|VLSR| > 150 \text{ km s}^{-1}$) H₂ emission.

[구 SF-03] Magnetic Field Structure and Formation Scenario of the N159/N160 Star-Forming Complex in the Large Magellanic CloudJaeyeong Kim^{1,2}, Woong-Seob Jeong^{2,3}, Jeonghyun Pyo², Soojong Pak¹, Won-Kee Park², Jungmi Kwon^{4,5,6}, and Motohide Tamura⁷¹School of Space Research, Kyung Hee University, Korea,²Korea Astronomy and Space Science Institute, Korea,³Korea University of Science and Technology, Korea,⁴Department of Astronomy, Graduate School of Science, The University of Tokyo, Japan,⁵National Astronomical Observatory of Japan, Japan,⁶Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, Japan,⁷The University of Tokyo/National Astronomical Observatory of Japan/Astrobiology Center, Japan

The N159 and N160 ionized regions in the Large Magellanic Cloud are an important extragalactic star-forming complex. The physical environments and the star formation stages are different in N159 and N160. We performed near-infrared polarimetry to those star forming regions with IRSF/SIRPOL 1.4-m telescope. Near-infrared polarization enabled us to trace the detailed structure of

magnetic fields in star-forming regions. Through the polarimetric data of J, H, and Ks bands, we examined the magnetic field structures in the N159/N160 complex. In this presentation, we show complex distribution of the magnetic fields associated with dust and gas structures. We verify the local magnetic fields in each star-forming region, which appear to be related with local environments, such as interior and boundary of shell structure, star-forming HII regions, and boundaries between HII regions and dense dark clouds. We discuss the formation scenario of the N159/N160 complex suggested from the magnetic field structure.

[구 SF-04] Packages of Unified modeling for Radiative transfer, gas Energetics, and Chemistry (PUREC)

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Protoplanetary disks (PPDs) are a natural consequence of star formation and play crucial roles in planet formation. Atacama Large Millimeter/submillimeter Array (ALMA) has provided sub-mm data for the PPDs with a high angular resolution and sensitivity, and it makes us enable to study PPDs in detail. We have developed Packages of Unified modeling for Radiative transfer, gas Energetics, and Chemistry (PUREC), which consists of a self-consistent thermo-chemical model and line and continuum radiative transfer models, in order to interpret and predict the ALMA observations for PPDs. In this talk, we introduce capabilities of PUREC.

[구 SF-05] Sub-mm variability of a YSO (EC53) in Serpens main region : JCMT Transient survey

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Stars form through the gravitational collapse of molecular clouds. However, the rate at which a star gains most of its mass and the physics that drives the main phase of stellar growth is still unclear. The typical luminosity of observed protostars is smaller than what expected from the Shu's inside-out collapse model, which predicts a

constant mass accretion rate. The episodic accretion model has been suggested as a solution of this luminosity problem. The JCMT Transient survey is a long term monitoring program using JCMT/SCUBA-2 to detect accretion variability of protostars in the eight nearby star-forming regions. Recently, we found a rise of the 850 micron flux at a clump in the Serpens main region at the rate of ~17% relative to the mean flux over previous observations. The submm clump is associated with a class I protostar, EC53, which has been reported as a binary system with a periodic variability. In this talk, we will provide a brief overview of the JCMT Transient Survey project, present the detection of the variable source, and discuss about follow-up observations.

[구 SF-06] MIRIS Paschen- α Galactic Plane Survey : Comparison with WISE catalog and IPHAS H α data in Cepheus

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To see scientific potential of MIRIS Paschen- α (Pa α) Galactic Plane Survey (MIPAPS), we have selected a portion, Galactic longitude from +96° to 116°, and inspected Pa α detections for 212 sources in WISE H II region catalog. We also list up 35 Pa α large features and 32 Pa α point-like blobs, which have not been cataloged in WISE catalog. For all the sources, we have performed the photometry of Pa α emission line, and obtained their Pa α intensities and Pa α fluxes. For the quantitative comparison, we also make the H α mosaic image of the same region by using IPHAS data which have been globally calibrated and released recently. Comparing MIPAPS Pa α fluxes with the IPHAS H α fluxes enables us to estimate dust extinction and spectral types of ionizing sources. We present the results for some sources.

우주관측 및 기술

[구 ST-01] Feasibility Study of a Future Korean Space Telescope

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