별형성

[구 SF-01] Dispersal of Molecular Clouds by UV Radiation Feedback from Massive Stars

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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/pc^2 to ~10^3 Msun/pc^2), 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 LkHα 234 in NGC 7129 Star Forming Region

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We present the observational study toward the multiple outflows around LkHα 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 (H_2) 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 H_2, 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 H_2O masers. From the H_2 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 km s^{-1}) H_2 emission.

[구 SF-03] Magnetic Field Structure and Formation Scenario of the N159/N160 Star-Forming Complex in the Large Magellanic Cloud

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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