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Most galaxies are believed to evolve through mergers and accretions. In particular, minor mergers and gas accretion appear to play an important role in galaxy evolution in the present-day Universe. Tidally-disrupted debris from such processes remain as diffuse, low-surface brightness structures because the dynamical timescale in the outskirts is significantly longer than that in the central regions. Although these structures will give us useful insight into the mass assembly history of galaxies, it is difficult to detect them due to their faint surface brightness. In order to investigate the structural properties of outskirts in nearby galaxies, we conduct deep and wide-field imaging survey with KMTNet. We present our observing strategy and an optimal data reduction process to recover faint extended features in the images of KMTNet. Using the imaging data of NGC 1291 obtained from KMTNet, we find that a peak-to-peak sky gradient can be reduced less than 0.4-0.6% of the original sky level in the entire image. We also find that we can reach the surface brightness of $\mu_{(B,1\sigma)}$ ~ 29.5, $\mu_{(R,1\sigma)}$ ~ 28.5 mag arcsec^{-2} in one-dimensional profile, that is mainly limited by the uncertainty in the sky determination. It indicates that deep imaging data of KMTNet is suitable to study the extended faint features of nearby galaxies, such as stellar halos, outer disks, and dwarf companions.

성간물질

[박 IM-01] Destruction of Giant Molecular Clouds by UV Radiation Feedback from Massive Stars

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Star formation in galaxies predominantly takes place in giant molecular clouds (GMCs). While it is widely believed that UV radiation feedback from young massive stars can destroy natal GMCs by exciting HII regions and driving their expansion, our understanding on how this actually occurs remains incomplete. To quantitatively assess the effect of UV radiation feedback on cloud disruption, we conduct a series of theoretical studies on the dynamics of HII regions and its role in controlling the star formation efficiency (SFE) and lifetime of GMCs in a wide range of star-forming environments. We first develop a semi-analytic model for the expansion of spherical dusty HII regions driven by the combination of gas and radiation pressures, finding that GMCs in normal disk galaxies are destroyed by gas-pressure driven expansion with SFE < 10%, while more dense and massive clouds with higher SFE are disrupted primarily by radiation pressure. Next, we turn to radiation hydrodynamic simulations of GMC dispersal to allow for self-consistent star formation as well as inhomogeneous density and velocity structures arising from supersonic turbulence. For this, we develop an efficient parallel algorithm for ray tracing method, which enables us to probe a range of cloud masses and sizes. Our parameter study shows that the net SFE, lifetime (measured in units of free-fall time), and the importance of radiation pressure (relative to photoionization) increase primarily with the initial surface density of the cloud. Unlike in the idealized spherical model, we find that the dominant mass loss mechanism is photoevaporation rather than dynamical ejection and that a significant fraction of radiation escapes through low optical-depth channels. We will discuss the astronomical

[구 IM-02] Global distribution of far-ultraviolet emission from the highly ionized gas in the Milky Way

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One of the keys to interpreting the characteristics and evolution of interstellar medium in the Milky Way is to understand the distribution of hot gas (10^5–10^6 K). Gases in this phase are difficult to observe because they are in low density and lack of easily observable tracers. Hot gases are observed mainly in the emission of the FUV (912—1800 Å), EUV (80—912 Å), and X-rays (T>10^6 K) of which attenuation is very high. Of these, FUV emission lines originated from high-stage ions such as O VI and C IV can be the most effective tracers of hot gases. To determine the spatial distribution of O VI and C IV emissions, we have analyzed the spectra obtained from FIMS (Far-ultraviolet IMaging Spectrograph), which covers about 80 percent of the sky. The hot gas volume filling factor, which varies widely from 0.1

to 0.9 depending on the supernova explosion frequency and the evolution model, has been calculated from the O VI and C IV maps. The hot gas generation models has been verified from the global distribution of O VI and C IV emissions, and a new complementary model has been proposed in this study.

[구 IM-03] Unbiased spectroscopic study of the Cygnus Loop with LAMOST

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We present a spectroscopic study of the Galactic supernova remnant (SNR) Cygnus Loop using the fifth Data Release (DR5) of LAMOST. The LAMOST (Large Sky Area Multi-Object Fiber Spectroscopic Telescope) features both a large field-of-view (about 20 deg2) and a large aperture (~4 m in diameter), which allow us to obtain 4000 spectra simultaneously. Its wavelength coverage ranges from ~3700Å to 9000Å with a spectral resolution of R≈1800. The Cygnus Loop is a prototype of middle-aged SNRs, which has advantages of being bright, large in angular size (~3.8°x3°), and relatively unobscured by dust. Along the line of sight of the Cygnus Loop, 2747 LAMOST DR5 spectra are found in total, which are spatially distributed over the entire remnant. Among them, 778 spectra are selected based on the presence of emission lines (i.e., [O III]λ5007, Ha, and [S II]λλ 6717, 6731) for further visual inspection. About half of them (336 spectra) show clear spectral features to confirm their association with the remnant, 370 spectra show stellar features only, and 72 spectra are ambiguous and need further investigation. For those associated with the remnant, we identify emission lines and measure their intensities. Spectral properties considerably vary within the remnant, and we compare them with theoretical models to derive physical properties of the SNR such as electron density and temperature, and shock velocity. While some line ratios are in good agreement with model prediction, others cannot be explained by simple shock models with a range of shock velocities. We discuss these discrepancies between model predictions and the observations and finally highlight the powerfulness of the LAMOST data to investigate spatial variations of physical properties of the Cygnus Loop.

[구 IM-04] Internal structure of a massive star-forming region G33.92+0.11 revealed by the high resolution ALMA observations

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G33.92+0.11, classified as a core-halo UC HII region at a distance of 7.1 kpc, contains several sub-clumps (~20-200 solar masses) as identified by dust continuum emission. This source shows very complicated features associated with vigorous massive star-forming activities with a nearly face-on projection. The ambient gas is still accreting to the massive molecular clumps dynamically, while the whole cloud is under disruption by newly formed stars. Using the recent high resolution (< 0.2") ALMA observations, we investigate the detailed structure associated with the star-forming activities by comparing different chemical tracers. The sub-clumps having extremely complex morphologies still preserve cold dense gas together with the turbulent and dense warm gas resulted by newly formed stars and interaction with accreting gas. The accretion of the ambient gas may have occurred episodically to this source. Most recent star formation, which probably the third generation of star formation in this region, is taking place in the northern part (A5 clump). The relatively small mass (~ 1/3 of A1 or A2) and the lack of turbulent gas of this star-forming core may suggest that this core was formed already during the overall collapse of the whole cloud for the first star formation. We think that gravitational collapse of these sub-clumps appears as sequential star formation of this region. The later interaction with accreting gas may have not been a direct cause of the star formation activities of this source.

[구 IM-05] Magnetic Fields of the Youngest Protostellar System L1448 IRS 2 revealed by ALMA

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Magnetic fields affect star formation in a broad range of scales from parsec to hundreds au. In particular, interferometric observations and ideal magneto-hydrodynamic (MHD) simulations have