[구 KMT-09] DEEP-South: The Progress Report

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Deep Ecliptic Patrol of the Southern Sky (DEEP-South) observation is being made during the off-season for exoplanet survey, using Korea Microlensing Telescope Network (KMTNet). An optimal combination of its prime focus optics and the 0.3 billion pixel CCD provides a four square degrees field of view with 0.4 arcsec/pixel plate scale which is also best suited for small body studies. Normal operation of KMTNet started in October 2015, and a significant portion of the allocated telescope time for DEEP-South is dedicated to targeted observation, Opposition Census (OC), of near-Earth asteroids for physical and taxonomic characterization. This is effectively achieved through multiband, time series photometry using Johnson-Cousins BVRI filters.

Uninterrupted monitoring of the southern sky with KMTNet is optimized for spin characterization of a broad spectrum of asteroids ranging from the near-Earth space to the main-belt, including binaries, asteroids with satellites, slow/fast- and non-principal axis-rotators, and thus is expected to facilitate the debiasing of previously reported lightcurve observations. Our software subsystem consists of an automated observation scheduler, a pipelined data processing system for differential photometry, and an easy-to-use lightcurve analysis toolkit. Lightcurves, spin periods and provisional determination of class of asteroids to which the lightcurve belongs will be presented, using the dataset from first year operation of KMTNet. Our new taxonomic classification scheme for asteroids will also be summarized.

[구 KMT-10] DEEP-South: P/2000 XO8 shows its true colors (P/2000 XO8 본색을 드러내다)

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고전적인 소행성과 혜성의 경계는 무너지고 있다. 처음 발견했을 때는 소행성으로 분류됐던 천체도, 예기치 않은 활동성이 나타나면 혜성의 일원이 된다. 소행성은 충돌이나 회전가속에 의해 갑자기 활동성을 나타내기도 하지만, 강한 태양복사를 견디지 못하고 오랜 시간 간직해온 휘발성 물질을 우주 공간으로 흩뿌리기도 한다. 한국천문연구원 딥사우스 (DEEP-South) 팀은, 이렇게 태양 근방에서 혜성으로 탈바꿈할 것으로 예상되는 소행성으로 2000 XO8을 지목하고, 근일점을 막 지난 2017년 10월 말부터 KMTNet 망원경으로 약 한 달간 지속 관측을 하였다. 이 기간 동안 2000 XO8은 활동성이 급격히 증가하여 선명한 꼬리를 나타냈고, 이내 검출 한계 이하로 활동성이 줄어드는 것까지 확인하였다. 이번에 혜성으로 밝혀진 2000 XO8은 한국인 또는 한국 기관에서 새로 발견 및 동정한 것으로 알려진 혜성 중에 그 주기가 8.8년으로 가장 짧다. 이는 궤도장반경이 목성보다 안쪽에 위치한다는 점에서 이례적인 일이다. 우리는 궤도 실험을 통해 2000 XO8이 현 궤도에 자리 잡은 지 오래 되지 않았으며, 또 다른 주기 혜성 265P/LINEAR에서 쪼개져 나온 조각일 가능성을 제시하고자 한다.

[구 KMT-11] Transformation of Surface Brightness Profile Types of Dwarf Galaxies : KMTNet Supernova Program Data

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We investigate surface brightness profiles (SBPs) of dwarf galaxies in field, group, and cluster environments. Using images from the Korea Microlensing Telescope Network (KMTNet) Supernova Program (KSP) for the NGC 2784 group and SDSS for the Virgo cluster, SBP types are classified into profiles with single exponential (Type I), double exponential (Type II and Type III). Type II and Type III have smaller and larger outer sizes than inner sizes, respectively. SBP types of field dwarfs are compiled from a previous study. The distributions of SBP types are different in three environments. After comparing sizes of dwarfs in different environments, we suggest that since sizes of some dwarfs are changed due to the environmental effects, SBP types are able to be transformed. It makes that the distributions of SBP types in three environments are different.

[구 KMT-12] Optimal strategy for low surface brightness imaging with KMTNet

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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