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The key science goal of the KMTNet Supernova Program (KSP) is to detect and study the early explosions of supernovae using one fifth of the KMTNet time. The *BVI*-band observations of the nearby target fields mostly closer than 30 Mpc distance and the follow-up spectroscopy provide valuable information on the early phase of the supernovae. These data can also be used for the studies of optical transients such as novae, dwarf novae, variable stars, and active galactic nuclei. Stacked images of several hundred images obtained from the time domain observations can be used for the search of low surface brightness galaxies reaching 28 mag arcsec^{-2}. Results and status of the KSP including $\gtrsim$20 infant supernovae and $\gtrsim$100 faint dwarf galaxies will be presented in this talk.

[구 KMT-04] Thirty-Minute ToO (TMT) with KMTNet

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Current large observational projects perform both static and dynamic sky surveys. The Thirty-Minute Target of Opportunity (TMT) is the project focusing on the dynamic sky survey using Korea Microlensing Telescope Network (KMTNet) that is the best observing system to investigate the dynamic sky. TMT aims to perform and experiment on following components : 1) to select transient or variable sources having hour to day scale cadences for future science cases, 2) to optimize the observation strategy for these objects, 3) to provide automated photometric pipelines for the time series data, and 4) to test the data release environment for all astronomers. In the near future, it is expected that a huge number of events will be alerted through large area surveys such as LSST. Therefore, the TMT project will provide opportunities to prepare the future large survey era as well as to understand the nature of interesting astronomical events.

[구 KMT-05] Properties of High-Redshift Dust-Obscured Galaxies Revealed in the ADF-S

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The ADF-S (AKARI Deep Field – South) toward South Ecliptic Pole is one of the deep survey fields designed for the study of Extragalactic Background Light (EBL). The deep extragalactic survey was initiated by AKARI far-infrared deep observations. Other space missions (e.g., Euclid, NISS, SPHEREx) will perform the deep observations in the ADF-S. Based upon the recent optical survey with KMTNet, we can identify the optical counterparts for dusty star-forming galaxies such as ULIRG, DOG, SMG. Among them, the Dust-Obscured Galaxies (hereafter DOGs with f(24um)/f(R) > 1,000) in the heavily obscured system are expected to play an important role in the formation of most massive galaxies. We have newly discovered ~100 DOGs in ~12 sq. deg. of the ADF-S from our optical survey with KMTNet. We also confirmed that some of DOGs host the most luminous AGN for their black hole masses through the near-infrared spectroscopic follow-ups. Here, we report the properties of high-z hyperluminous DOGs in the ADF-S.

[구 KMT-06] Searching for Electromagnetic Counterpart of Gravitational Wave Source with KMTNet

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After first identification of electromagnetic counterpart of gravitational wave source (GW170817), era of multi-messenger astronomy has begun. For specifying coordinate, magnitude, and host galaxy information, optical follow-up observation of GW source becomes important. With following engineering run and O3 run of LIGO and VIRGO starting in March 2019, we present searching strategy for optical counterpart of GW source using KMTNet. 24 hours monitoring system and large field of view (4 square-degree) of KMTNet are advantage to discover a transient like GW event. By performing tiling observation of high

probability area in GW localization map, we expect to observe early light-curve of GW optical counterpart. After identification, follow-up observation with various KMTNet bands and other telescopes like Gemini and UKIRT will also be performed. We will study collision mechanism, progenitor, and characteristics of host galaxy using observation data of GW source.

KMTNet / 행성과학

[구 KP-01] Survey of Solar System Objects using KMTNet

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Solar system small bodies are unusual objects in astronomical survey data in that they are moving on the celestial sphere. In addition, even in a normal status, their magnitudes are changing over time, firstly because their relative positions with respect to the Sun and Earth are continually changing, secondly because they are rotating bodies with non-spherical shapes. Furthermore, some of them might exhibit unexpected activities, which could be caused by mass ejection or disintegration. Detections and observations of such activities are challenging due to their abrupt nature. Therefore, continuous monitoring observations of large number of Solar system small bodies are required to systematically obtain detailed/transient information about them. Since 2018/2019 winter, we have launched a new project using Korea Microlensing Telescope Network (KMTNet) for detecting such transient phenomena of Solar system objects. Our main goal is to monitor the magnitudes and detect sudden brightness changes. We also plan to discover interesting new objects, and monitor rotational brightness oscillations of asteroids. We intend to monitor the magnitudes of ~ 20,000 known Solar system small bodies per night, and acquire lightcurves of ~ 1,000 asteroids.

[구 KP-02] Ecliptic Survey for Unknown Asteroids with DEEP-South

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Eight hundred thousand asteroids in the solar system have been identified so far under extensive sky surveys. Kilometer to sub-km sized asteroids, however, are still waiting for discovery, and their size and orbital distribution will provide a better understanding of the collisional and dynamical evolution of the solar system.

In order to study the number of asteroids which is detectable with 1.6 m telescope and their orbital distribution, we conducted a small observation campaign as a part of Deep Ecliptic Patrol of the Southern Sky (DEEP-South) project, which is an asteroid survey in the southern hemisphere with Korea Microlensing Telescope Network (KMTNet). We observed the ecliptic plane near opposition (2°x2° field of view centering on α=22h40m31s, δ =-08°22′58″) in August 2018, and identified 464 moving objects by visual inspection.

As a result, 266 of 464 moving objects turn out to be previously unknown asteroids, and their signal to noise ratio is below two on numerous occasions. Most of the newly detected objects are main belt asteroids (MBAs), while three Hildas, one Jupiter trojan, and two Hungarias are also identified. In this meeting, we report the differences in the orbital distributions between the previously known asteroids and newly discovered ones using statistical methods. We also talk about the observational bias of this survey and suggest future works.

[구 KP-03] A Recent Dust Ejection from an Inner Mainbelt Asteroid

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Active asteroids are celestial bodies that distinctively have asteroid-like orbital elements but show comet-like activity. They exhibit the activities due to the sublimation of volatile ices, impacts with small objects or break-up by rapid rotations. As of 2019 February, 30 active asteroids are detected in the outer main belt (i.e., the semimajor axes a>2.5 au) while only 3 of them in the inner main belt (a<2.5 au), suggesting that sublimation of remaining icy volatiles can be one of the most