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DEEP-South Scheduling and Data reduction System (DS SDS) consists of two separate software subsystems: Headquarters (HQ) at Korea Astronomy and Space Science Institute (KASI), and SDS Data Reduction (DR) at Korea Institute of Science and Technology Information (KISTI). HQ runs the DS Scheduling System (DSS), DS database (DB), and Control and Monitoring (C&M) designed to monitor and manage overall SDS actions. DR hosts the Moving Object Detection Program (MODP), Asteroid Spin Analysis Package (ASAP) and Data Reduction Control & Monitor (DRCM). MODP and ASAP conduct data analysis while DRCM checks if they are working properly. The functions of SDS is three-fold: (1) DSS plans schedules for three KMTNet stations, (2) DR performs data analysis, and (3) C&M checks whether DSS and DR function properly. DSS prepares a list of targets, aids users in deciding observation priority, calculates exposure time, schedules nightly runs, and archives data using Database Management System (DBMS). MODP is designed to discover moving objects on CCD images, while ASAP performs photometry and reconstructs their lightcurves. Based on ASAP lightcurve analysis and/or MODP astrometry, DSS schedules follow-up runs to be conducted with a part of, or three KMTNet telescopes.

[ㄱ KMT-08] DEEP-South: Preliminary Lightcurve Analysis of Potentially Hazardous Asteroids (PHAs)

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Near Earth Asteroid (NEA) population has attracted keen attention not only from the scientific community but from the general public ever since their terrestrial impact risk achieved wide recognition. Potentially Hazardous Asteroids (PHAs), the subset of NEAs, recently became the center of interest of planetary defense folks and mining industry due to their proximity to, and the potential effects on planet Earth. However, we have

long been ignorant about either the physical properties or dynamical source regions of individual objects. For instance, their rotational periods are only known for five percent of the total population (The NEA Database of DLR, updated on Feb 2016).

The primary scientific objective of DEEP-South (DEep Ecliptic Patrol of the Southern sky) is to physically characterize 70 percent of km-class PHAs until 2019. In order to achieve this goal, we implemented an observation mode so-called "OC (Opposition Census)" targeting objects around opposition. OC observations were conducted during the period between Feb 2015 and Mar 2016, at CTIO in early periods, and at three KMTNet stations (CTIO, SSO and SAAO) since late July 2015, excluding the "bulge season" when the telescope time is exclusively used for exoplanet search. We present the preliminary lightcurves of 66 PHAs and 59 NEAs that we obtained during the OC runs.

[ㄱ KMT-09] DEEP-South: Photometric Study of NPA rotators 5247 Krolv and 14764 Kilauea

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The spin states of asteroids is regarded as an important clue to understand not only the physical property of an individual object but also the dynamical evolution of the of the population as a whole. Single asteroids can be broadly classified into two separate groups according to their rotational states: Principal Axis (PA) and Non-Principal Axis (NPA) rotators. To date, lightcurve observations have been carried out mostly for PA asteroids. However, discovery of NPA objects has recently been increased due to new observing techniques, and this is the reason why rotational properties of NPA rotators became an issue.

As a DEEP-South pilot study for NPA, we selected two targets, 5247 Krolv (1982 UP6) and 14764 Kilauea (7072 P-L) considering their Principal Axis Rotation (PAR) code and visibility. Observations were made between Jan. and Feb. 2016 for 17 nights employing Korea Microlensing Telescope Network (KMTNet) 1.6 m telescopes installed at SSO and SAAO using DEEP-South TO (Target of Opportunity) mode. To obtain

lightcurves, we conducted time-series photometry using Johnson-Cousins *R*-filter. Multi-band photometry was also made with *BVRI* filters at the same time, for taxonomy. Their preliminary lightcurves and approximate mineralogy will be presented.

[구 KMT-10] DEEP-South: Taxonomic Classification of Asteroids Based on Johnson-Cousins Photometric System

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Surface mineralogy of asteroids are inferred from photometric and spectroscopic observations with the wide range of wavelengths spanning from far-ultraviolet to mid- infrared. We classify mineralogy of those objects based on their spectral absorption features and spectral slopes. Based on overall spectral shapes, mineralogical classes are divided into three broad complexes: silicates (S), carbonaceous (C) and Vestoids (V), and the end-members that do not fit within the S, C and V broad-complexes. Each of them is subdivided into individual classes. Spectral classification of asteroidal objects has been simply represented by a combination of photometric colors. For a decade, photometric data of asteroids have been grouped and classified according to their SDSS colors converted from the spectral taxonomy. However, systematic studies for asteroid taxonomy based on Johnson-Cousins filters is few, and were conducted only with a small number of objects. In this paper, we present our preliminary results for taxonomic classification of Main Belt asteroids based on KMTNet Johnson-Cousins photometric color system.

[구 KMT-11] Multi-aperture Photometry Pipeline for DEEP-South Data

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We present a multi-aperture photometry pipeline for DEEP-South (Deep Ecliptic Patrol of the Southern Sky) time-series data, written in C. The pipeline is designed to do robust high-precision photometry and calibration of non-crowded fields with a varying point-spread function, allowing for the wholesale search and characterization of both temporal and spatial variabilities. Our time-series photometry method consists of three parts: (i) extracting all point sources with several pixel/blind parameters, (ii) determining the optimized aperture for each source where we consider whether the measured flux within the aperture is contaminated by unwanted artifacts, and (iii) correcting position-dependent variations in the PSF shape across the mosaic CCD. In order to provide faster access to the resultant catalogs, we also utilize an efficient indexing technique using compressed bitmap indices (FastBit). Lastly, we focus on the development and application of catalog-based searches that aid the identification of high-probable single events from the indexed database. This catalog-based approach is still useful to identify new point-sources or moving objects in non-crowded fields. The performance of the pipeline is being tested on various sets of time-series data available in several archives: DEEP-South asteroid survey and HAT-South/MMT exoplanet survey data sets.

남북천문협력

[초 CSNA-01] North Korea Science and Technology : Overview and Current Trends(북한의 과학기술 개관과 최근 동향 연구)

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북한의 과학기술은 전반 수준이 낮은 것으로 평가 받고 있으나 국방 및 기초과학 영역에서는 높게 평가받는 부분도 있다. 북한 정권의 과학기술 중시 사상에 따라 과학기술자의 우대 정책은 현 김정은 시대에 더 강조되고 있다. 북한의 과학기술은 현장 중심으로 진행되는 게 큰 특징이다. 식량과 에너지 문제 해소를 위한 과학기술자의 현장 동원 등과 함께, 이른바 강성국가 건설의 경제발전 핵심 전략으로 '최신 과학기술에 기초한 현대화 실현'을 강조하고 있다. 북한의 과학원통보 등 학술지와 국제 학술논문 그리고 발명 특허, 북한의 언론매체 등을 통해 북한의 과학기술에 대한 전반적인 활동 상황과 최근의 흐름을 살펴본다.

[구 CSNA-02] Cooperation Research Plan in