운데 몇몇 그림들이 별자리를 그린 것이라는 이론이 제기되었다. 본 논문에서는 동굴 그림 가운데 황소 전당에 그려진 벽화를 별자리로 동정해 보았다. 그 결과 이것들이 성좌화임을 발견했다. 그림은 흥미롭게도 별자리와 암흑성간운을 구별했는데 별자리는 윤곽선으로 그린 반면 검은 성간운은 검은 바탕의 그림으로 나타냈다. 그림은 벽화들의 특징과 구도 그리고 배열순서로 볼 때 전천 성좌도를 그린 것으로 동정되었는데 이는 당시 밤하늘에 보이는 별자리들과 암흑 성간운들의 구도와 배열의 일치에서 신뢰할 수 있었다. 벽화에는 황소자리, 플레이아데스, 오리온삼성, 오리온자리-쌍둥이자리, 사자자리-처녀자리-뱀자리, 천칭자리-사수자리-전갈자리가 그려져 있으며, 특히 은하중심의 사수자리에서 고물자리에 이르는 길다란 은하평면상의 검은 암흑성간운들의 특징적 나열을 들판을 뛰어가는 검은색 동물로 나타냈다. 척도를 감안해서 볼 때, 그림의 구도와 배열순서가 밤하늘에 보이는 것과 거의 같다 할만큼 사실적으로 그려져 있어서 구석기인들이 지적 능력이 오늘날 현대인들과 다를 바 없는 수준에 이르렀다고 추정된다.

[구 HS-02] Study for the observation record of constellation Crux in the ancient time of China and its deformation with the identification of the Chinese constellation 'Goru(庫婁)'

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남십자자리(Crux)는 현재 북반구 중위도 지역에서는 관측할 수 없는 별자리지만 고대 중국의 전통 별자리 체계가 성립되던 시기인 춘추전국시대만 하더라도 지평선 부근에서 쉽게 관측할 수 있는 별자리였다. 우리는 세차운동 계산을 통해 남십자자리가 출몰성에서 전몰성으로 변했음을 확인하였고, 고대 중국의 문헌 기록과 성표, 성도의 별자리 그림 분석을 통해 남십자자리의 밝은 4개의 별이 중국의 전통 별자리인 고루성(庫樓星)과 일치함을 확인하였다. 또한 남십자자리가 관측되던 시기와 관측되지 않던 시기에 각각 작성되었던 성표와 성도 분석을 통해 고루성의 별자리 모양이 점차 변형되어 갔음을 제시하였다. 마지막으로 서양의 천문기술이 중국에 전해 진 이후 진행된 동서양의 별자리 상호 비교 및 동정 결과들을 분석하여 중국의 전통 별자리 체계에서 어떻게 고루성이 완전히 배제되게 되었는지에 대한 논의를 포함, 본 연구의 초기 결과들을 발표할 예정이다.

[구 HS-03] DEEP-South: The Progress and the Plans of the First Year

Hong-Kyu Moon[1], Myung-Jin Kim[1], Dong-Goo Roh[1], Jintae Park[1], Hong-Suh Yim[1], Hee-Jae Lee[2], Young-Jun Choi[1], Young-Seok Oh[3], Young-Ho Bae[1], and DEEP-South Team[1]
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The wide-field and the round-the clock operation capabilities of the KMTNet enables the discovery, astrometry and follow-up physical characterization of asteroids and comets in a most efficient way. We collectively refer to the team members, partner organizations, the dedicated software subsystem, the computing facility and research activities as Deep Ecliptic Patrol of the Southern Sky (DEEP-South). Most of the telescope time for DEEP-South is devoted to targeted photometry of Near Earth Asteroids (NEAs) to push up the number of the population with known physical properties from several percent to several dozens of percent, in the long run. We primarily adopt Johnson R-band for lightcurve study, while we employ BVI filters for taxonomic classification and detection of any possible color variations of an object at the same time. In this presentation, the progress and new findings since the last KAS meeting will be outlined. We report DEEP-South preliminary lightcurves of several dozens of NEAs obtained at three KMTNet stations during the first year runs. We also present a physical model of asteroid (5247) Krylov, the very first Non principal Axis (NPA) rotator that has been confirmed in the main belt (MB). A new asteroid taxonomic classification scheme will be introduced with an emphasis on its utility in the LSST era. The progress on the current version of automated mover detection software will also be summarized.

[구 HS-04] DEEP-South: Performance of Moving Object Detection Program in Different Observation Modes

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We have five different types of observation modes with regard to the Deep Ecliptic Patrol of the Southern Sky (DEEP-South); Opposition Census (OC) for targeted photometry, Sweet Spot Survey (S1) for discovery and orbit characterization of Atens and Atiras, Ecliptic Survey (S2) for asteroid family studies and comet census, NEOWISE follow-up (NW) for near simultaneous albedo measurements in the visible bands, and Target of Opportunity (TO) observation for follow-up either

for unpredictable events or targets of special interests. Different exposures with such different modes result in a wide range of background noise level, the number of background stars and the mover's projected speed in each image. The Moving Object Detection Program (MODP) utilizes multiple mosaic images being taken for the same target fields at different epochs at the three KMTNet sites. MODP employs existing software packages such as SExtractor (Source-Extractor) and SCAMP (Software for Calibrating Astrometry and Photometry); SExtractor generates object catalogs, while SCAMP conducts precision astrometric calibration, then MODP determines if a point source is moving. This package creates animated stamp images for visual inspection with MPC reports, the latter for checking whether an object is known or unknown. We evaluate the astrometric accuracy and efficiency of MODP using the year one dataset obtained from DEEP-South operations.

[구 HS-05] DEEP-South: A New Taxonomic Classification of Asteroids

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Asteroid taxonomy dates back to the mid-1970's and is based mostly on broadband photometric and spectroscopic observations in the visible wavelength. Different taxonomic classes have long been characterized by spectral slope shortward of 0.75 microns and the absorption band in 1 micron, the principal components. In this way, taxonomic classes are grouped and divided into four broad complexes; silicates (S), carbonaceous (C), featureless (X), Vestoids (V), and the end-members that do not fit well within the S, C, X and V complexes. The past decade witnessed an explosion of data due to the advent of large-scale asteroid surveys such as SDSS. The classification scheme has recently been expanded with the analysis of the SDSS 4th Moving Object Catalog (MOC 4) data. However, the boundaries of each complex and subclass are rather ambiguously defined by hand. Furthermore, there are only few studies on asteroid taxonomy using Johnson-Cousins filters, and those were conducted on a small number of objects, with significant uncertainties. In this paper, we present our preliminary results for a new taxonomic classification of asteroids using SMASS, Bus and DeMeo (2014) and the SDSS MOC 4 datasets. This classification scheme is simply represented by a triplet of photometric colors, either in SDSS or in Johnson-Cousins photometric systems.

[구 HS-06] DEEP-South: The Photometric Study of Non-Principal Axis Rotator (5247) Krylov

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The number of discovery of asteroids with peculiar rotational states has recently increased, and hence a novel approach for lightcurve analysis is considered to be critical. In order to investigate objects such as Non-Principal Axis (NPA) rotator, we selected a NPA candidate, (5247) Kryolv as our target considering its Principal Axis Rotation (PAR) code and the visibility in early 2016. The observations of Krylov were made using Korea Microlensing Telescope Network (KMTNet) 1.6 m telescopes installed at the three southern sites with TO (Target of Opportunity) observation mode. We conducted R-band time-series photometry over a total of 51 nights from January to April 2016 with several exposures during each allocated run. The ensemble normalization photometry was employed using the AAVSO Photomtric All-Sky Survey (APASS) catalog for the standardization. We successfully confirmed its NPA spin state based on the deviation from the reduced lightcurve, and thus Krylov is recorded as the first NPA rotator of its kind in the main-belt, with its precession and rotation periods, P_φ= 81.18 h and P_Ψ= 67.17 h, respectively. In this paper, we present the spin direction, the 3D shape model and taxonomy of the newly confirmed NPA asteroid (5247) Krylov.

[구 SS-07] DEEP-South: Lightcurves of Near Earth Asteroids from Year One Operations

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