The DEEP-SOUTH: Round-the-clock physical characterization of near-Earth objects in the Southern Hemisphere

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1. Introduction: Korea Astronomy and Space Science Institute started a project to build a network of wide-field optical telescopes called the KMTNet (Korea Micro-lensing Telescope Network) in 2009 [1]. Its primary scientific goal is to discover, catalogue and characterize Earth-mass exoplanets in the southern hemisphere when the Galactic Bulge lies above the horizon. While in winter this network will be devoted to other key science programs. The "Deep Ecliptic Patrol of the Southern Sky (DEEP-SOUTH)" is one of such secondary science projects [2].

2. Facilities: The KMTNet consists of three identical 1.6-m prime focus optics and 18K×18K mosaic CCD cameras that result in 2×2 degrees field of view with a delivered image quality of less than 1.0 arcsec FWHM under atmospheric seeing of 0.75 arcsec in V- and I-bands. These telescopes will be located at CTIO in Chile, SAAO in South Africa, and SSO in Australia. The three stations are longitudinally well separated, and hence will have a benefit of 24-hour continuous monitoring of the southern sky. The wide-field and round-the-clock operation capabilities of the facility are ideal for discovery and physical characterization of asteroids and comets.

3. Future Plans: As of April 2014, more than 10,000 Near-Earth Objects (NEOs) have been catalogued by the Minor Planet Center; however their observational properties such as broadband colors and spin periods are known only for less than five percent of the catalogued objects. Based on time series observations with the KMTNet, orbits, absolute magnitudes (H), spin states, shapes and activity levels of asteroids and comets including NEOs will be systematically investigated at the same time. Their approximate surface mineralogy will also be discriminated using SDSS and Johnson Cousins BVRI colors. The DEEP-SOUTH has several observation modes; Opposition Census (OC) is focused on opposition in either side of the ecliptic, while Sweet spot Survey (SsS) is designed to discover the Atens, the Atiras and comets at morning and the evening twilight. The network will be partly used for follow-up astrometry of the Near-Earth Object Wide-field Infrared Survey Explorer (NEOWISE) and the GAIA missions (TO, Target of Opportunity mode). We were awarded 45 full nights per year at each telescope (and hence a total of 135 full nights per year for the network) in the next four years (2015–2018); we place high priority on targeted, time series photometric observations of km-sized NEAs. The first KMTNet telescope in CTIO will be put into operations in June 2014 and the whole network is scheduled to be on-line in late 2014. The KMTNet Chile telescope is expected to start DEEP-SOUTH test runs in coming August.

References: [1] Park et al. (2012) Proc. SPIE 8444, 47. [2] Moon et al. (2012) ACM 2012 Abstract 6481.