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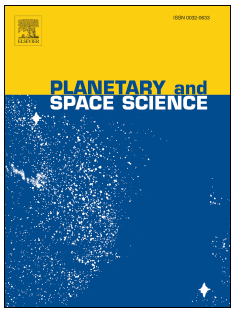

Photometric survey and taxonomic identifications of 92 near-Earth asteroids

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PII: S0032-0633(17)30161-7

DOI: 10.1016/j.pss.2017.12.019

Reference: PSS 4453

To appear in: *Planetary and Space Science*

Received Date: 17 May 2017

Revised Date: 18 December 2017

Accepted Date: 31 December 2017

Please cite this article as: Lin, C.-H., Ip, W.-H., Lin, Z.-Y., Cheng, Y.-C., Lin, H.-W., Chang, C.-K., Photometric survey and taxonomic identifications of 92 near-Earth asteroids, *Planetary and Space Science* (2018), doi: 10.1016/j.pss.2017.12.019.

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Photometric Survey and Taxonomic Identifications of 92 Near-Earth Asteroids

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Abstract

A photometric survey of near-Earth asteroids (NEAs) was conducted from 2012 through 2014 at Lulin Observatory, Taiwan. The measurements of the color indices, B-V, V-R, and V-I allow the classification of 92 NEAs into seven taxonomic types. Of these samples, 39 of them are new classifications. The fractional abundances of these taxonomic complexes are: A ~ 3%, C~6.5%, D~8%, Q~26%, S~37%, V~6.5%, and X~13%. This result is similar to that of Thomas et al. (2011) even though the populations of the D- and X-complex with low albedos are under-represented. The ratio of the C-cluster to the total population of S+C clusters are 0.22±0.06 for H ≤ 17.0 and 0.31±0.06 for H > 17.0, indicating a slightly higher fraction of dark-object population with sizes smaller than 1 km.

Keywords: Near-Earth asteroids, Photometry, taxonomy

1. Introduction

The asteroidal population is characterized by different chemical compositions and taxonomic types at different heliocentric distances. The S-type asteroids can be found most often in the inner asteroid belt while the C-type asteroids dominate the outer belt population (Tholen, 1984; Bus and Binzel, 2002; DeMeo et al., 2009; DeMeo and Carry, 2013). The Near-Earth Asteroids (NEAs) with orbits near or crossing the Earth's orbit are products of collisional fragmentation of main belt parent bodies. How these small pieces of km to sub-km size range can be transported from the main belt to the Mars and Earth crossing orbits via the 3:1 mean motion resonance, ν6 secular resonance, or the Yarkovsky effect has been investigated in detail by a number of authors (Bottke et al., 2002; Morbidelli et al., 2003; Greenstreet et al., 2012; Granvik et al., 2016). The taxonomic mapping of NEAs can therefore provide important information on their source regions and evolutionary histories (DeMeo and Carry, 2014; Carry et al., 2016).

On the basis of the Bus-system (Bus et al., 1999), several observational studies have shown that the S, Q, X and C-complexes in total account for about 90% of the NEA population while the rest is comprised of the A, D and V types (Dandy, 2003; Binzel et al., 2004; de Leon et al., 2010; Ye, 2011; Thomas et al., 2011).

The C-type and D-type NEAs are of special interest because of their volatile contents (Nichols, 1993; Reddy et al., 2012a). The C-type NEAs are likely originated from the outer main belt which is known to be the reservoir of asteroids of carbonaceous composition (Bus & Binzel, 2002, DeMeo and Carry, 2014) and the so-called main belt comets with active outgassing phenomenon (Hsieh and Jewitt, 2006; Bertini, 2011). At the same time, the D-type and P-type

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