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INFRARED PHOTOMETRY FOR NEAR-EARTH OBJECTS FROM SPITZER - THE FULL SAMPLE

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The IRAC camera on the Spitzer Space Telescope observed 2175 Near Earth Objects (NEOs) during its Warm Mission phase, across three large surveys and a small number of dedicated small projects. We present the final reprocessing of the NEO data and infrared photometry in the 3.6 μ and 4.5 μ regimes [1]. The window of observation has allowed for a small number of complete light curves to be constructed along with a greater number of partial light curves. For the 43 objects for which we have full light curves we determine period and amplitude. Additionally we use the full sample of partial light curves to update our estimated shape distribution for Near Earth Objects from prior studies [2] for better comparison with upcoming work to determine the shape distribution of main-belt asteroids of similar size. By combining Spitzer infrared photometry with optical photometry from PanSTARRS we also present improved albedo and diameter estimates (Figure 1) for objects observed during the same period using the Near-Earth Asteroid Thermal Model (NEATM) [3].

For those 19 objects with diameters greater than 200m and whose light curves display significant amplitude and/or "super-fast" rotation (P $<$ 2.2 h) we derive the minimum cohesive strength required for these objects to resist rotational fission - an example light curve for one such object is given as Figure 2. Most of these results fall in the tens to hundreds of Pascals range which is in keeping with previous studies [4] but we report a significantly larger strength for the potentially hazardous asteroid 2002 TW55 suggesting an increased likelihood that the object is monolithic rather than an aggregate. These results are of great relevance to planetary defense as shape, strength, size and spin are key parameters when planning defense measures.

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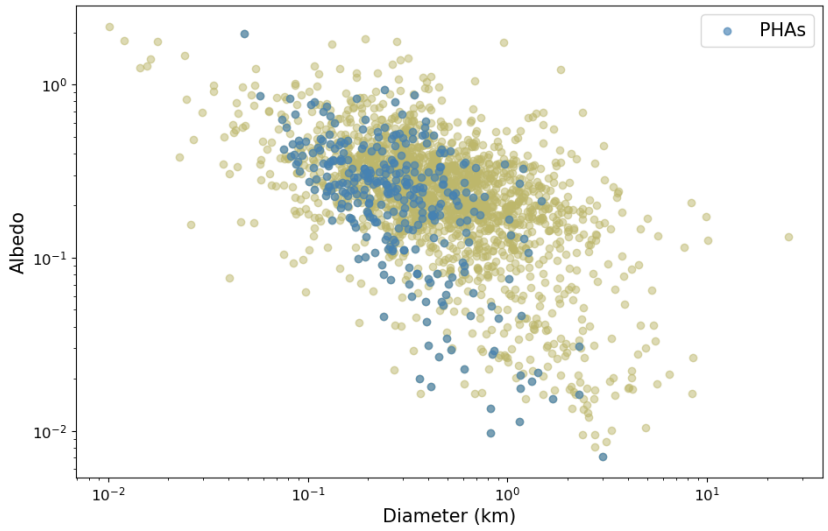

Figure 1: Albedo vs. Diameter derived for all Near-Earth Objects observed by Spitzer - those objects considered as PHAs are marked as blue data points.

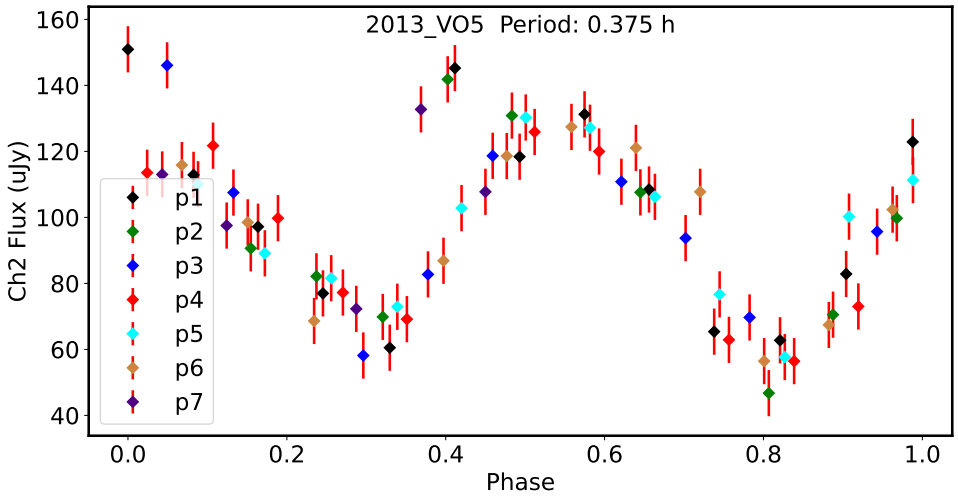

Figure 2: Folded light curve for potentially hazardous asteroid 2013 VO5

Comments:
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References

[1] J. L. Hora, A. Allen, D. E. Trilling, H. Smith, A. McNeill, Infrared Fluxes and Light Curves of Near-Earth Objects: The full Spitzer Sample, submitted to AAS journals (2024).

[2] A. McNeill, J. L. Hora, A. Gustafsson, D. E. Trilling, M. Mommert, Constraining the Shape Distribution of Near-Earth Objects from Partial Light Curves, The Astronomical Journal 157 (2019) 164.

[3] A. Allen, D. Trilling, J. Hora, H. Smith, A. Lopez-Oquendo, Characterization of Near-Earth Objects Observed by Spitzer, in: AAS/Division for Planetary Sciences Meeting Abstracts #55, volume 55 of *AAS/Division for Planetary Sciences Meeting Abstracts*, p. 412.07.

[4] R. Strauss, A. McNeill, D. E. Trilling, F. Valdes, P. H. Bernardinelli, C. Fuentes, D. W. Gerdes, M. J. Holman, M. Jurić, H. W. Lin, L. Markwardt, M. Mommert, K. J. Napier, W. J. Oldroyd, M. J. Payne, A. S. Rivkin, H. E. Schlichting, S. S. Sheppard, H. Smotherman, C. A. Trujillo, F. C. Adams, C. O. Chandler, The DECam Ecliptic Exploration Project (DEEP). VII. The Strengths of Three Superfast Rotating Main-belt Asteroids from a Preliminary Search of DEEP Data, The Astronomical Journal 168 (2024) 184.