CCD PHOTOMETRIC OBSERVATIONS OF 2005 YU55 DURING THE 2011 NOVEMBER FLYBY.

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Introduction: The 2011 November flyby of near-Earth asteroid 2005 YU55 presented a distinct challenge for those doing CCD photometry. In many case, the large rate of sky motion on the date of closest approach, Nov. 9, required frequent repositioning of the telescope to keep the asteroid within the field of view. Complicating this was that the asteroid was not exactly where predicted, which required computing coordinates for a time a few minutes removed from the actual time of observation. Fortunately, the asteroid's sky motion slowed considerably so that only two days later, the telescope had to repositioned just once or twice over an observing run of 6-8 hours.

For most observers, differential photometry was used to measure the asteroid, meaning that a set of comparison stars served as the reference for the measurements. Because of the large sky motion on Nov 9 (and less so Nov 10), any given set of comparison stars was soon "out of the picture" and a new set was required. Matching these individual data sets to one another required calibrating the data to an internal system. Five observers used a set of formula to convert 2MASS J-K magnitudes to the BVRI system[1]. These data sets were the easiest to merge into a master data set since the data were all close to a common system. The other observers calibrated magnitudes using other catalogs. These were merged with the maser data set by visual inspection after an initial period solution was found using the data set based on the 2MASS-BVRI magnitudes.

Period Analysis: Our ininitial analysis found a period of $P \sim 16.3$ h, which was supported by quick analysis of the radar images obtained during the flyby[2]. However, subsequent analysis of the radar data pointed to a longer period of about 19.3 h[2]. Using this as a starting point, the zero points of the photometric data were adjusted to force a solution between 19-20 h, which lead to finding a bimodal curve (Fig. 1) with $P = 19.31 \pm 0.02$ h, $A = 0.20 \pm 0.02$ mag. The need for the forced adjustments, some up to 0.4 mag, cannot be fully explained. Because of the two well-defined but non-commensurate solutions, the possibility that the asteroid is in non-principal axis rotation should be considered. We hope that radar data analysis, not completed at the time of this writing, will resolve the ambiguities.

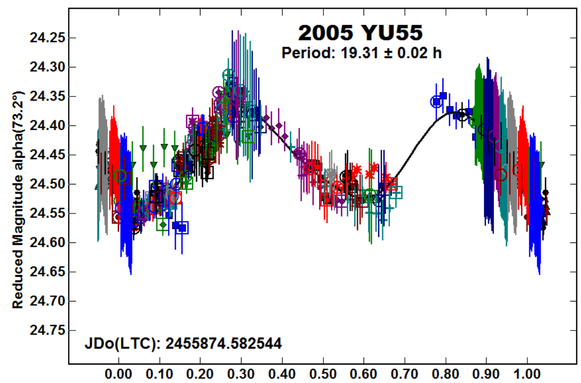

Figure 1. 2005 YU55 data phased to 19.31 h.

H-G Parameters: The combined data set included observations with a phase angle range of 11°-70°. Using the average magnitude of the lightcurve on givien dates, we found $H_R = 20.887 \pm 0.042$ and $G = -0.147 \pm 0.014$, the latter is consistent with a very dark (low albeo) asteroid, i.e., type C or similar. Assuming V-R = 0.38[3], this lead to $H = 21.27 \pm 0.05$. Both values are similar to those found by Hicks et al. [4] and Bodewits, D. et. al. [5].

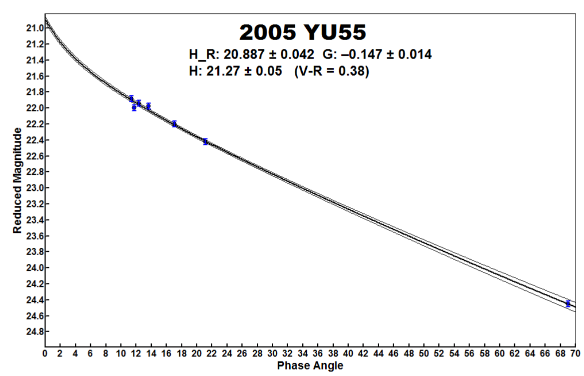

Figure 2. H-G plot for 2005 YU55.

References:

[1] Warner, B.D. (2007) *Minor Planet Bul. 34*, 113-119. [2] M. Brozovic, private communications. [3] Dandy, C.L. et al. (2003) *Icarus 163*, 363-373. [4] Hicks, M. et al. (2011) *Astronomer's Telegram 3763*. [5] Bodewits, D. et. al. (2011) *CBET 2937*.