

#### PERIOD DETERMINATION FOR 1660 WOOD

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Lightcurve analysis for asteroid 1660 Wood was performed in collaboration with observers in Australia and Uruguay from observations obtained during the asteroid's favorable opposition in 2012. The synodic rotation period was found to be  $6.8090 \pm 0.0002$  h and the lightcurve amplitude was  $0.14 \pm 0.03$  mag.

The main-belt asteroid 1660 Wood was named after the British/South African astronomer Harry Edwin Wood. With no previously reported lightcurve parameters, it was selected from the "Potential Lightcurve Targets" list on the Collaborative Asteroid Lightcurve Link (CALL) site (Warner, 2011) as a particularly favorable target for observation. Oey and Alvarez independently worked on this target from opposite sides of the world.

Unfiltered CCD photometric images of 1660 Wood were taken at Kingsgrove Observatory, Australia (MPC E19), and Observatorio Los Algarrobos, Salto, Uruguay (MPC I38), from 2012 January 02 to February 12. Oey used a 0.25-m  $f/11$  Meade LX-3 with a self-guiding ST-9XE SBIG CCD camera resulting in an image scale of

1.45 arcsec/pix. Alvarez used a 0.30-m *f*/6.9 Meade LX-200R with a NABG QSI516wsg camera resulting in an image scale of 1.77 arcsec/pix, guided with a SX Lodestar. All images were dark and flat field corrected and then measured using *MPO Canopus* v10 (Bdw Publishing), applying a differential photometry technique. The data were light-time corrected. Period analysis was also done with *MPO Canopus*, which incorporates the Fourier analysis algorithm developed by Harris (Harris *et al.*, 1989).

Due to the contamination from a large number of faint back ground stars, numerous data points had to be excluded from the analysis. However, this still left a very dense data set of 2170 data points obtained during the 15 observing sessions. All sessions were done with Comp Star Selector (CSS) method in *MPO Canopus* as described in Stephens (2008). With a reported error of 0.03-0.05 mag, the zero points still needed to be arbitrarily adjusted to fit into the bimodal shape of the light curve.

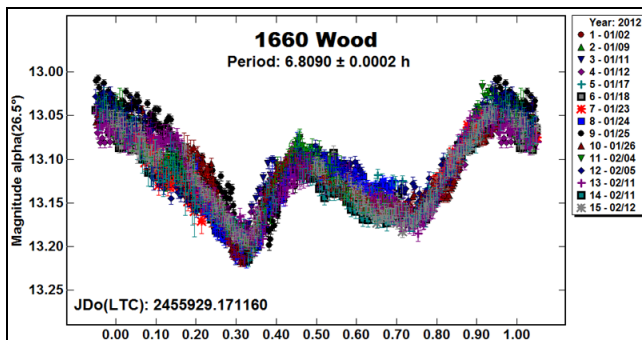
Over the span of observations, the phase angle varied from 26.5° to 24.6°. The phase angle bisector (PAB) longitude changed from 121.3° to 130.8° and the latitude from -31.3° to -31.9°. Analysis of the data found a synodic rotational period for 1660 Wood of  $P = 6.8090 \pm 0.0002$  h and an amplitude of  $A = 0.14 \pm 0.03$  mag.

#### References

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Stephens, R.D. (2008). "Long period asteroids observed from GMARS and SANTANA observatories." *Minor Planet Bulletin* 35, 21-22.

Warner, B.D. (2011). "Potential Lightcurve Targets 2012 January-March." [http://www.minorplanetobserver.com/astlc/targets\\_1q\\_2012.htm](http://www.minorplanetobserver.com/astlc/targets_1q_2012.htm)



#### ROTATION PERIOD DETERMINATION FOR 5143 HERACLES

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The Earth crossing minor planet 5143 Heracles made in late 2011 its closest approach to Earth since discovery. A consortium of observers found a synodic rotation period near 2.706 hours and amplitude increasing from  $0.08 \pm 0.02$  magnitudes at phase angle 20 degrees to  $0.18 \pm 0.03$  magnitudes at phase angle 87 degrees, with 3 unequal maxima and minima per cycle. Magnitude parameters  $H = 14.10 \pm 0.04$  and  $G = 0.08 \pm 0.02$  are found, and the color index  $V-R = 0.42 \pm 0.07$ . For an asteroid of taxonomic class Q, a suggested albedo  $p_v = 0.20 \pm 0.05$  yields estimated diameter  $D = 4.5 \pm 0.7$  km. Three possible binary events were recorded, but these are insufficient for binary detection to be secure. Retrograde rotation is suggested.

Minor planet 5143 Heracles is an Apollo type object that made in late 2011 its closest approach to Earth since discovery. To illustrate the circumstances of the approach we provide a diagram (Figure 1) showing the path in the sky, and another diagram (Figure 2) showing phase angle and Earth distance Delta, both