LIGHT CURVE OF 147 PROTOGENEIA

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The light-curve rotation period of asteroid 147 Protogeneia is 7.8528 ± .0008, and its phase curve indicates absolute magnitude H= 8.87, and slope parameter G= 0.38.

Altimira Observatory is located in southern California. Details of the observatory and its equipment are available at http://www.geocities.com/oca_bob. For the study reported here, CCD images of the target asteroids were taken through Johnson-Cousins B, V, and R filters. Nightly zero-points were determined by measuring Landolt standard fields, and using either comparison stars or the Hardie (1962) method for extinction determination. Results were put onto the standard system with transformation coefficients that had been previously determined for this equipment.

Five nights from 11/5/04 to 12/19/04 were devoted to this object, covering solar phase angles from 0.7 degrees (waxing) to 14 degrees (waning).

No previous light curve has been reported for this asteroid. My data indicating a rotation period P= 7.8525 ± 0.0008 hours, is shown in Figure 1.

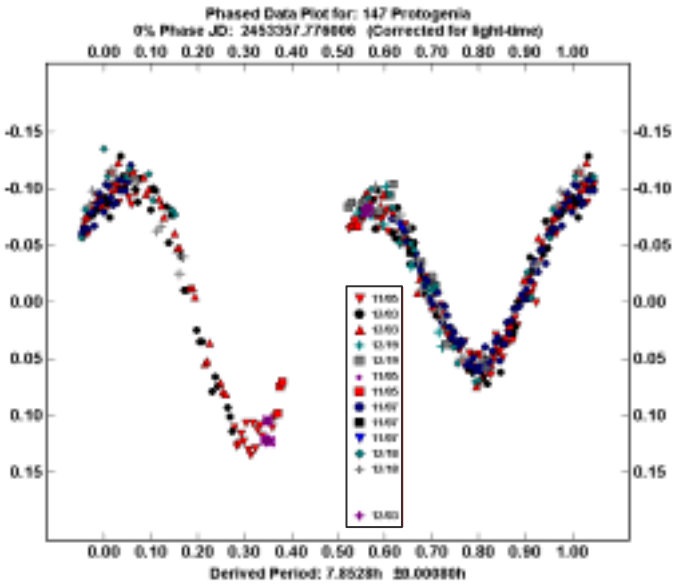

Figure 2: Light curve of 147 Protogeneia, wrapped to period P= 7.8528 hours

Standard V-band magnitude was determined on five nights. This data was corrected for asteroid rotational orientation (to put it onto the "delta mag = 0.0" line of the light curve), and corrected to "reduced" magnitudes by:

$V_R = V - 5 \cdot \log (D \cdot R)$

where Earth distance =D and Sun distance =R (both measured in AU's).

The Small Bodies Node reports absolute magnitude (zero phase and 1AU distance from Sun and Earth) H= 8.27, based on an assumed slope parameter G= 0.15. My data, shown in Figure 2, is quite different: I show a substantially fainter absolute magnitude and a shallower slope. The best fit to my data is

H= 8.87 and G= 0.38.

Zellner et al (1985) report a single data point V= 13.010 at solar phase angle α = 1.00 degrees, with R= 3.057 AU and D= 2.048 AU, which translates to a reduced magnitude V(1,α) = 13.010 - 5*log(RD) = 9.027. This data point, which is plotted as an open circle in Figure 2, is quite consistent with my data, considering the uncertain rotational position in that one data point.

Lagerkvist et al (1987) report a single night's observation of V= 12.38, at solar phase angle α = 1.74 degrees, with R= 3.0564 AU and D= 2.0505 AU, which translates to a reduced magnitude V(1,α) = 12.38 -5*log(RD) = 8.395. This contradictory data point, which is plotted as an open square in Figure 2, is close to the Small Bodies Node' reported parameters.

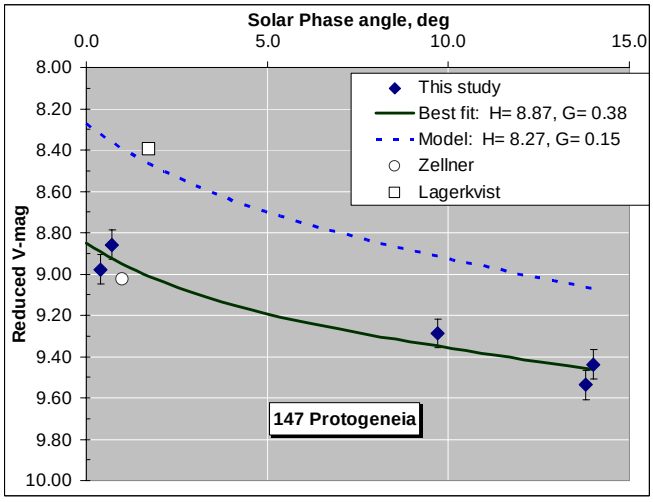

Figure 3: Phase curve of 147 Protogeneia. Small Bodies Node reported parameters are shown as the dashed curve. My data points are shown with error bars (± .07 mag), and best fit to my data is the solid curve. Zellner's (1985) single data point is shown as an open circle. Lagerkvist's (1987) single night is shown as an open square.

References

Hardie, R. (1962). "Photoelectric Reductions". in Hiltner W., ed *Astronomical Techniques*, Univ of Chicago Press.

Lagerkvist, C.I, Hahn, G., Magnussen, P., Rickman, H.(1987) "Physical studies of asteroids XVI – Photoelectric photometry of 17 asteroids", *Astronomy and Astrophysics Supplement Series* vol 70, no1, July 1987, p 21-32.

Small Bodies Node of the NASA Planetary Data System, at http://pdssbn.astro.umd.edu/

Zellner, et al. (1985) "Eight Color Asteroid Survey", *Icarus* **61**, 355 ff.

Acknowledgements

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