## ROTATIONAL PERIOD OF ASTEROID 6479 LEOCONNOLLY

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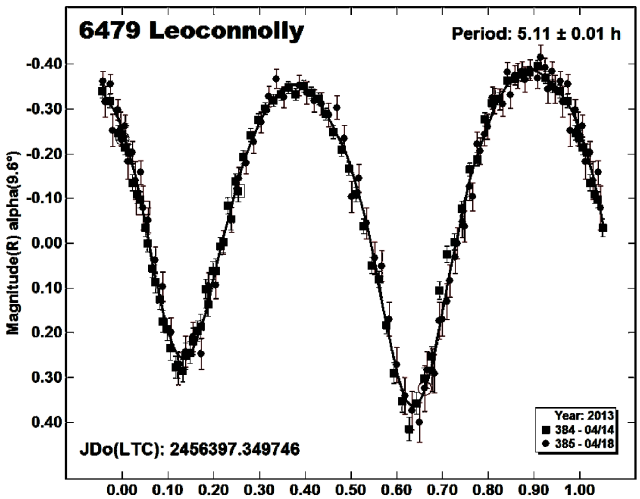
Photometric observations of the main-belt asteroid 6479 Leoconnolly were made over two nights in 2013 April. Lightcurve analysis shows a synodic period of 5.11 ± 0.01 h with an amplitude of 0.75 ± 0.03 mag.

The main-belt asteroid 6479 Leoconnolly was selected from the "Potential Lightcurve Targets" web site (Warner, 2012a). Observations on two nights were carried out from Balzaretto Observatory (A81) in Rome, Italy, using a 0.20-m Schmidt-Cassegrain (SCT) reduced to *f*/5.5 and a SBIG ST7-XME CCD camera. All unfiltered images were calibrated with dark and flat-field frames. Differential photometry and period analysis was done using *MPO Canopus* (Warner, 2012b).

The derived synodic period was $P$ = 5.11 ± 0.01 h with an amplitude of $A$ = 0.75 ± 0.03 mag.




The lightcurve of 6479 Leoconnolly with a period of 5.11 ± 0.01 h and an amplitude of 0.75 ± 0.03 mag.

References

Warner, B.D. (2012a). "Potential Lightcurve Targets." *http://www.MinorPlanet.info/PHP/call_OppLCDBQuery.php*

Warner, B.D. (2012b). MPO Software, *MPO Canopus* version 10.4.1.9. Bdw Publishing. *http://minorplanetobserver.com/*

## ROTATION PERIOD DETERMINATION FOR 730 ATHANASIA

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The synodic rotation period and amplitude have been found for 730 Athanasia 5.7345 ± 0.0002 hours, 0.14 ± 0.02 magnitudes, with a slightly unsymmetrical bimodal lightcurve. The period spectrum between 2.5 hours and 12.5 hours is presented, and the plausibility of all local minima in the period spectrum as potential alias periods is investigated.

Observations to produce these determinations have been made at the Organ Mesa Observatory with a 35.4 cm Meade LX200 GPS S-C and SBIG STL 1001-E CCD, unguided, clear filter, 60 second exposures. Photometric measurement and lightcurve construction are with *MPO Canopus* software. To reduce the number of points on the lightcurves and make them easier to read data points have been binned in sets of 3 with maximum time difference 5 minutes.

Warner et al. (2013) state no previous observations of 730 Athanasia. At its 2013 June opposition this object was very faint, about V magnitude 15.3, but much brighter than at any time for the next 10 years. Its observation was therefore accorded high priority by the author. For an object this faint the lightcurves are necessarily noisy. For a very faint object in a moderately dense Milky Way star field contamination of the measuring aperture by background stars is a problem. Star subtraction routines were used for measuring all sessions. However for stars of brightness comparable to that of the asteroid star subtraction may not be complete. Significant upward bumps of a time duration comparable to that required for the target measuring aperture to cross a star were found in several cases. A search of the original images showed that at the corresponding times the target did pass close to stars. The affected data points were deleted from the data set. Also there may have been stars too faint to be apparent in visual inspection of the images, and therefore which were not included in the star subtraction routine. These would also produce upward bumps in the lightcurve. However, no bumps are clearly apparent.

Observations were obtained on 10 nights 2013 May 9 - June 12. Data from these provide a good fit to a slightly asymmetric bimodal lightcurve phased to period 5.7345 ± 0.0002 hours, amplitude 0.14 ± 0.02 magnitudes. Several small clusters of discordant data points appear, but these do not show any systematic trend. They are a consequence of the low SN ratio of data for a very faint object, with possible contributions from very faint field stars.

For a difficult target a careful search for possible alias periods should be made. A period spectrum between 2.5 hours and 12.5 hours, including the half period and double period to the suggested 5.7345 hour solution, is shown. It contains many local minima, each of which was carefully examined. All of those except the half period, 3/2 period, and double period contain misfits sufficient to rule them out. Lightcurves phased to 5.7345 hours and 8.6016 hours are presented, which show two and three maxima and

minima per cycle, respectively. The lightcurve of the most likely period, 5.7345 hours, is a slightly asymmetric bimodal one. If the two halves were nearly identical this would be strong evidence in favor of the half period. The lightcurve is noisier due to the faintness of the target than for a typical medium amplitude lightcurve for a brighter target. And the symmetry is greater than in many asteroid lightcurves for which the bimodal solution is considered secure. Each of the ten sessions covered most of the bimodal lightcurve; so there is multiple coverage of all phases. The overall trend shows sufficient asymmetry that the half period seems highly unlikely. And the scatter in the half period, 2.8672 hours, lightcurve is significantly greater than for the bimodal lightcurve

The two halves of the quadrimodal lightcurve for the double period at 11.469 hours are nearly identical. This rotation period requires a shape model irregular but also symmetric over a 180 degree rotation. The probability of such a shape model for a real asteroid is not exactly zero, but is extremely small and may be reasonably rejected. The double period lightcurve shows that adjacent maxima have different heights but alternate maxima have the same height. This provides further evidence against the half period with only one maximum and minimum per cycle, in which case all maxima in the double period lightcurve would have the same height.

The lightcurve phased to 8.6016 hours contains three maxima and minima with a noise level only very slightly greater than that in the bimodal lightcurve. Two of the maxima are nearly identical and would require a possible but very unlikely shape model symmetrical over a 120 degree rotation to represent the actual period.

The noise in the data for this very faint object has been significantly compensated by the large number of data points and multiple coverage of all phases. This improves the reliability of the most likely period of 5.7345 hours.

Acknowledgment

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Reference:

Warner, B.D., Harris, A.W., and Pravec, P., "Asteroid Lightcurve Data Files, Revised 2013 March 1." *http://www.minorplanet.info/lightcurvedatabase.html*