

THE LIGHTCURVE OF MINOR PLANET 3014 HUANGSUSHU

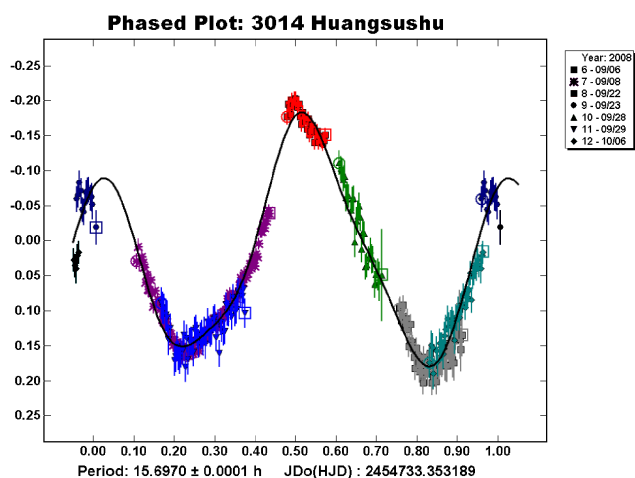
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Lightcurves of 3014 Huangsushu obtained in 2008
September reveal a rotation period of 15.6970 ± 0.0001 h and amplitude of about 0.35 mag.

Our lightcurve of 3014 Huangsushu is the second attempt of asteroid photometry observations from Osservatorio (ARAR) Don Molesì, Bastia, Ravenna, Italy (MPC 197). The target was selected from the list of asteroid photometry opportunities published by Warner *et al.* (2008). This list didn't show any available information about 3014 Huangsushu. In addition, no information was found on the Minor Planet Center "Minor Planet Lightcurve Parameters" web page, which is based on Harris and Warner (2006).

The observations were obtained with a Newton telescope D = 0.42 m and F = 2.250 m. The CCD camera was an Apogee Alta U260e with 60 s exposure times (S/N >100) and Schuler Clear filter. The observations were performed on the nights of 2008 Sept. 6, 8, 22, 23, 28, 29, and Oct. 6. All the measurements are compatible with a bimodal modulation. A total of 1015 measurements were made with the mean error for any single measurement varying from about 0.01 to 0.03 mag. The data were binned 3x3 before analysis and plotting in the lightcurve. Analysis of the combined data sets was made using *MPO Canopus*. The derived synodic rotation period is 15.697 ± 0.0001 h; the measured amplitude is about 0.35 mag.



UT Date	R.A.	Dec.	V
2008 Sept 06	23 26 12.6	-04 40 01	+14.4
2008 Sept 08	23 24 38.8	-04 51 53	+14.3
2008 Sept 22	23 13 59.7	-06 10 04	+14.6
2008 Sept 23	23 13 19.1	-06 14 55	+14.6
2008 Sept 28	23 10 14.2	-06 36 46	+14.8
2008 Sept 29	23 09 41.4	-06 40 36	+14.9
2008 Oct 06	23 06 37.6	-07 02 00	+15.1

References

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PERIOD DETERMINATIONS FOR 634 UTE AND 805 HORMUTHIA

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Synodic rotation periods and amplitudes have been found for 634 Ute 11.7554 ± 0.0003 h, 0.17 ± 0.02 mag; and for 805 Hormuthia 9.510 ± 0.001 h, 0.05 ± 0.02 mag.

634 Ute. The only previous lightcurve is by Rene Roy and presented by Behrend (2008), which shows a period of 11.8 h and amplitude 0.13 ± 0.01 mag but with only 75% phase coverage. New observations on 22 nights by Pilcher were made from 2008 Apr. 17 through July 1 at the Organ Mesa Observatory. The equipment consisted of a Meade 35-cm LX200 GPS S-C, SBIG STL 1001-E CCD, and clear filter. Exposures were 60-s unguided. Image measurement using differential photometry and lightcurve analysis were done with *MPO Canopus*. Additional observations by Benishek on five nights, 2008 May 27 through June 2, were made at the Belgrade Observatory, about 127 degrees east in longitude from Organ Mesa, with a Meade 16" LX200 GPS f/10 S-C and Apogee AP47p CCD.

The first observations made by Pilcher on 2008 Apr. 17-19, a month before opposition, showed corresponding phases about 23.5 h apart, slightly less than an Earth commensurability. Subsequent observations were made at intervals of 3 to 7 days, each showing a phase slightly farther to the right on the lightcurve. The shape of any lightcurve changes slowly with phase angle, and can be appreciable during the interval of three weeks between sampling of the same portion of the lightcurve for a hypothetical 11.75 h period. This can make the 11.75 h period masquerade as a quadrimodal lightcurve with a 23.5 h period. Although Pilcher continued to obtain frequent lightcurves, the ambiguity between periods of 11.7554 h and 23.5111 h could not be resolved.

With a presumed 11.75 hour period, Benishek's five lightcurves show the same phase (position in the lightcurve) as Pilcher's on June 2-9 and overlapping in time should look identical. With a

presumed 23.5 h period, these lightcurves would be of separated by one-half cycle. If the two sets of lightcurves are distinctly different, this is strong evidence for the quadrimodal longer period. Actually they look identical within observational error, which is evidence in favor of the shorter period but not conclusive. The two halves of the lightcurve phased to the longer period look almost the same, which again is evidence in favor of the shorter period with the usual bimodal lightcurve. The shorter period lightcurve, 11.7554 ± 0.0003 h and amplitude 0.17 ± 0.02 mag, binned in sets of five data points separated by no more than ten minutes to make it more readable, is included here.

P. Pravec (private communications) kindly evaluated the complete observation set and stated that “It [the period of 634 Ute] is 11.7554 ± 0.0002 h, $U = 3$. A period twice as long has low signal in odd harmonics and is therefore physically unlikely.” The authors also noted that for the longer period the coefficients of the odd harmonics were much smaller than for the even harmonics.

805 Hormuthia. Behrend (2008) states a period > 8 h and amplitude > 0.1 mag. Benishek obtained lightcurves on 13 nights, 2008 June 23 through July 11. Period determination was rendered difficult by a commensurability, and Pilcher at Organ Mesa Observatory obtained three additional lightcurves July 15-29 in an attempt to resolve the ambiguity. The period spectrum between 9.2 and 19.2 h shows four minima, of which we favor a solution of 9.510 ± 0.001 h, amplitude 0.05 ± 0.02 mag, and whose lightcurve binned in sets of three data points separated by no more than five minutes is included here. The minima are evenly spaced and the maxima look sufficiently different to rule out a monomodal solution of half this period. An 11.815 h period shows minima unevenly spaced at phases 0.0 and 0.6, respectively, in which the data points are more spread out in the better-observed broad maximum. However subsets of lightcurves including the data within the broad maxima show only 4.75 h between minima. The broad maximum is an artifact and we reject this solution. A 14.266 h period shows three maxima, two of which have identical shapes within observational error, and a 19.012 h period shows a quadrimodal lightcurve with the two halves appearing nearly identical to each other and to the 9.510 h lightcurve. These both imply shape models sufficiently symmetric that we consider them unrealistic for real asteroids. Hence we claim the 9.510 h period is the correct one.

Acknowledgments

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References

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