2007MPBu...34..104W

ASTEROID LIGHTCURVE ANALYSIS AT THE PALMER DIVIDE OBSERVATORY – MARCH – MAY 2007

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(Received: 1 July)

Lightcurves for 12 asteroids were obtained at the Palmer Divide Observatory from March through May 2007: 28 Bellona, 56 Melete, 148 Gallia, 223 Rosa, 273 Atropos, 747 Winchester, 3940 Larion, (5384) 1957 VA, 5390 Huichiming, 6029 Edithrand, (15822) 1994 TV15, and (29515) 1997 YL7. In addition, a revised period is given for 10261 Nikdollezhal'.

Observations of 12 asteroids were made at the Palmer Divide Observatory from March through May 2007. One of four telescopes/camera combinations was used: 0.5m Ritchey-Chretien/FLI IMG-1001E, 0.35m SCT/FLI IMG-1001E, 0.35m SCT/ST-9E, or 0.35m SCT/STL-1001E. The scale for each was about 2.5 arcseconds/pixel. Exposure times were 20–300s. Observations were made with a Clear filter. Guiding was used when exposures exceeded 60 seconds. All images were measured using MPO Canopus, which employs differential aperture photometry to determine the values used for analysis. Period analysis was also done using Canopus, which incorporates the Fourier analysis algorithm developed by Harris (1989).

The results are summarized in the table below, as are individual plots. The data and curves are presented without comment except when warranted. Column 3 gives the full range of dates of observations; column 4 gives the number of data points used in the analysis. Column 5 gives the range of phase angles. If there are three values in the column, the phase angle reached a minimum with the middle value being the minimum. Columns 6 and 7 give the range of values, or average if the range was relatively small, for the Phase Angle Bisector (PAB) longitude and latitude respectively. Columns 8 and 10 give the period and amplitude of the curve while columns 9 and 11 give the respective errors in hour and magnitudes. An "(H)" follows the name of an asteroid in the table if it is a member of the Hungaria group or family.

28 Bellona. This asteroid was worked to determine which of two periods that had been previously reported, 16.523 hr (Van Houten-Groenveld 1979) and 15.695 (Harris 1983), was correct – if either. The data obtained during this apparition yield a period 15.707 ± 0.002 hr, in good agreement with the Harris period. The attempt to fit the data to the longer period was decidedly worse and so that solution was rejected.

56 Melete. Harris (1979) reported a period of 13.7 hr, while Belskya (1993) and Behrend (2007) both reported a period near 18.1 hr. The data obtained at PDO fit a period of 18.151 ± 0.002 hr, in agreement with the longer solution.

148 Gallia. The only previously reported period for this asteroid was 20.664 hr by Surdej (1979). The PDO data yield a period of 20.666 ± 0.002 hr. The amplitude of 0.21 mag is less than the 0.32 mag reported by Surdej.

223 Rosa. Based on the lightcurve data base from Harris et al (2007), no previous period had been reported for this asteroid. The plot shows the data phased to a period of 9.91 ± 0.06 hr and shows a monomodal curve. A fit of slightly lesser quality can be made assuming a bimodal curve and period of 19.83 ± 0.06 hr. The low amplitude allows for the possibility that the viewing aspect was nearly pole-on, which would make the monomodal curve a more acceptable solution.

273 Atropos. Tedesco (1979) reported a period of 20 hr. While the data obtained at PDO cover only a small section of the total lightcurve, the best solution is 23.852 ± 0.003 hr., based on an assumption of a bimodal curve. The attempt to fit the data to a period near Tedesco's clearly indicated that it was in need of revision.

747 Winchester. This asteroid was observed primarily to add to existing lightcurves in order to allow shape and spin axis modeling. Previously reported periods were 8.0 hr (Harris 1980); 9.40 hr (Zappala 1983); 9.402 hr (Michalowski 1993); and 9.334 hr (Behrend 2007).

3940 Larion. The author worked this asteroid in 2004 but could not find a period due to noisy data and low amplitude. Despite a

#	Name	Date Range (mm/dd) 2007	Data Pts	Phase	L_{PAB}	B_{PAB}	Per (h)	PE	Amp (m)	AE
28	Bellona	04/28-05/10	645	8.9,12.8	201.0	10.5	15.707	0.002	0.27	0.03
56	Melete	04/28-05/13	859	7.9,14.5	201.7	2.5	18.151	0.002	0.15	0.02
148	Gallia	04/28-05/11	773	12.2,14.6	187.2	22.6	20.666	0.002	0.21	0.02
223	Rosa	03/26-04/15	178	5.3,12.2	172.1	1.8	9.91/19.83	0.06	0.06	0.01
273	Atropos	04/28-05/09	557	13.7,16.6	208.7	23.0	23.852	0.003	0.60	0.03
747	Winchester	03/23-04/14	607	7.7,5.9	200.4	19.8	9.4146	0.0002	0.16	0.02
3940	Larion (H)	05/18-19	95	20.2	258.0	27.2	4.04	0.01	0.04	0.01
(5384)	1957 VA (H)	03/23-04/15	319	21.3,17.7	194.2	25.2	12.5121	0.0005	0.74	0.03
5390	Huichiming (H)	05/11-19	449	15.5	221.4	22.6	33.6	0.1	0.25	0.03
6029	Edithrand (H)	03/13-18	220	23.4	172.2	34.1	14.472	0.005	0.15	0.03
10261	Nikdollezhal'	09/14-10/08 (2004)	639	7.0,5.1,11.5	359.8	7.1	16.747	0.004	0.07	0.02
(15822)	1994 TV15 (H)	05/12-19	174	14.8,17.9	213.5	16.1	2.9597	0.0004	0.26	0.03
(29515)	1997 YL7	03/21-04/15	147	11.1	174.4	19.9	12.231	0.001	0.67	0.03

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low amplitude in 2007, the data appear to allow a solution of 4.04 ± 0.01 hr. However, the 2004 data do not fit this period. The Phase Angle Bisector (PAB) values were similar during the two apparitions, and, unfortunately, the PAB longitude will differ by about 180° at the next opposition in late 2008. The PAB latitude will differ by nearly 60° but only by going from +30 to -30°.

5390 Huichiming. The phased plot is against the period of 33.6 ± 0.1 hr and shows a bimodal curve. This was checked by looking at the plot for the half-period (16.8 hr, monomodal curve). The relatively large amplitude and individual runs preclude the shorter solution and so the period is not considered to be ambiguous.

10261 Nikdollezhal'. The author previously reported a period of 12.56 hr for this asteroid (Warner 2005). A chance re-analysis of the original data showed that solution was most likely incorrect and that a considerably better fit of the data was obtained with a period of 16.747 ± 0.004 hr, 4/3 of the previous value.

Acknowledgements

Funding for observations at the Palmer Divide Observatory is provided by NASA grant NNG06GI32G, by National Science Foundation grant AST-0607505, and by a Gene Shoemaker NEO Grant from the Planetary Society.

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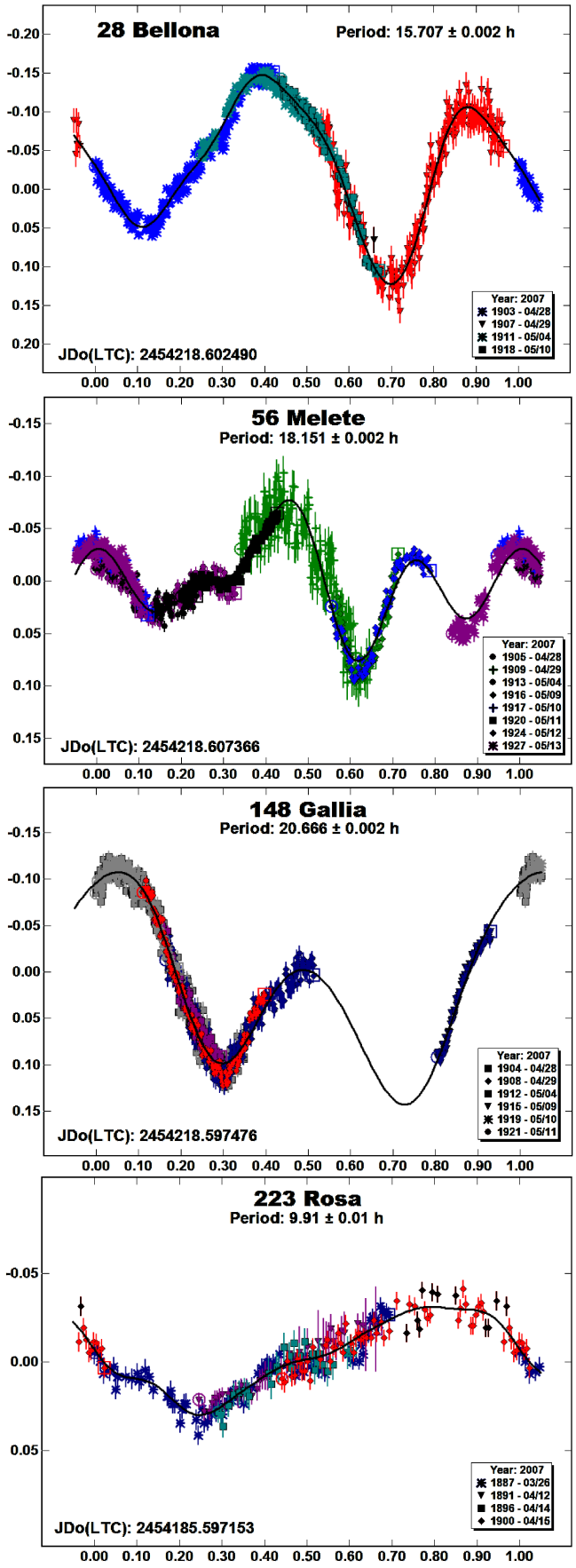

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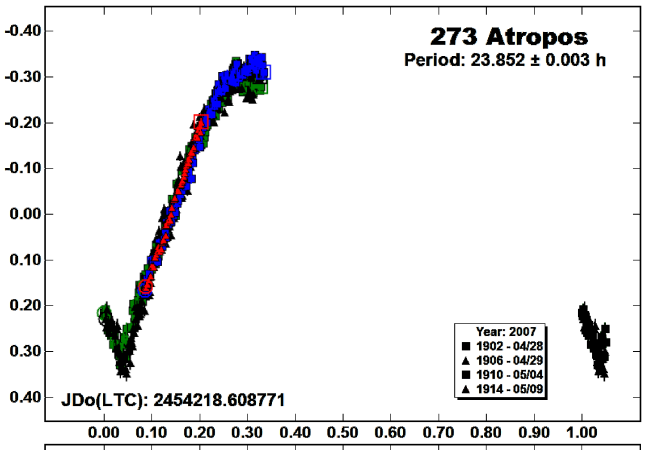

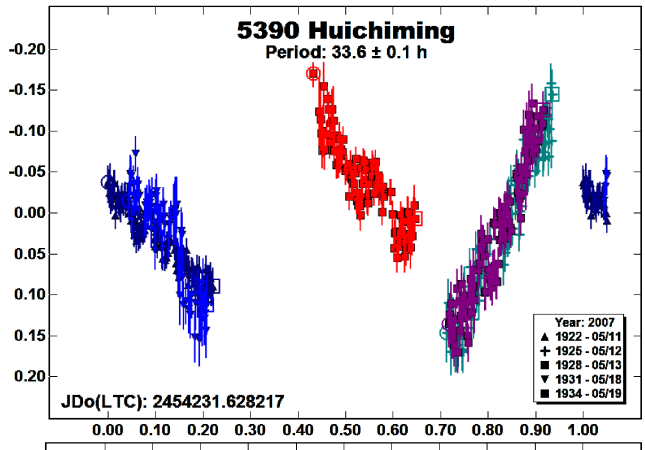

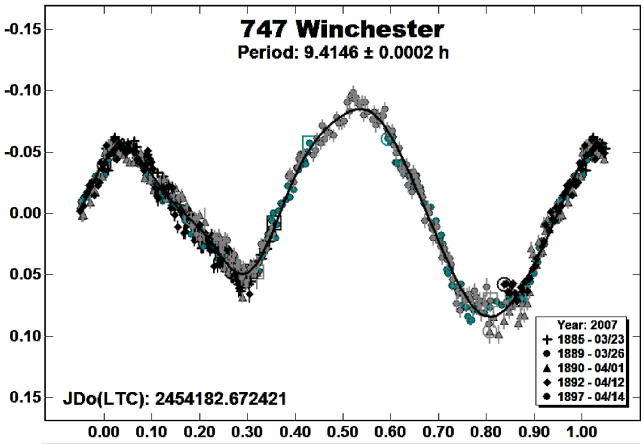

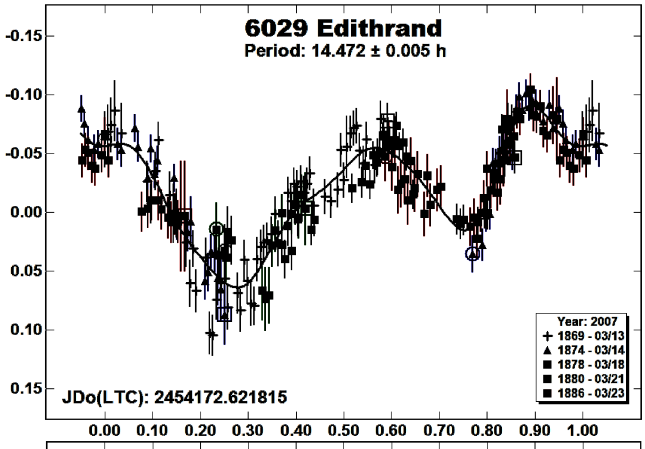

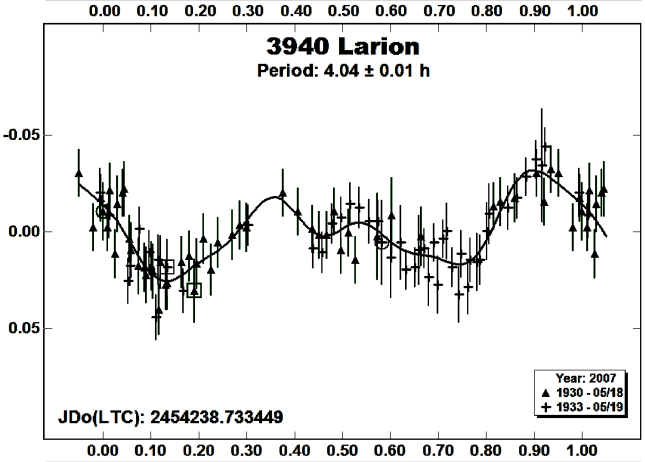

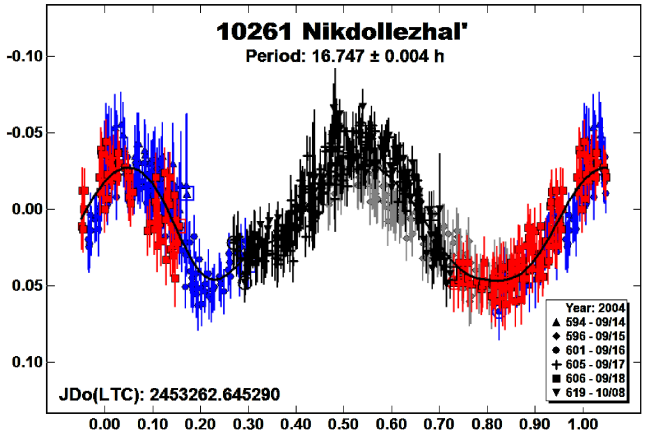

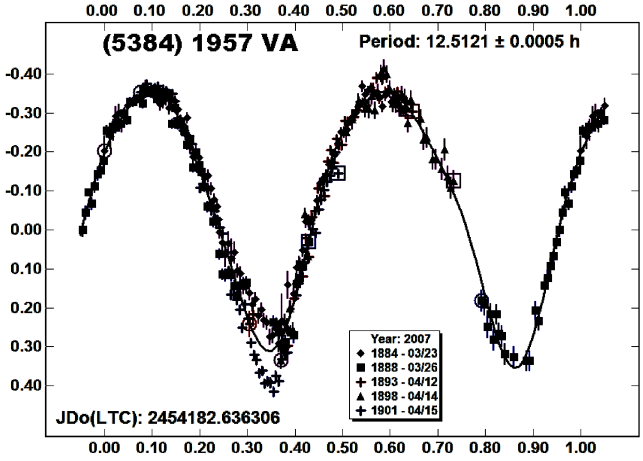

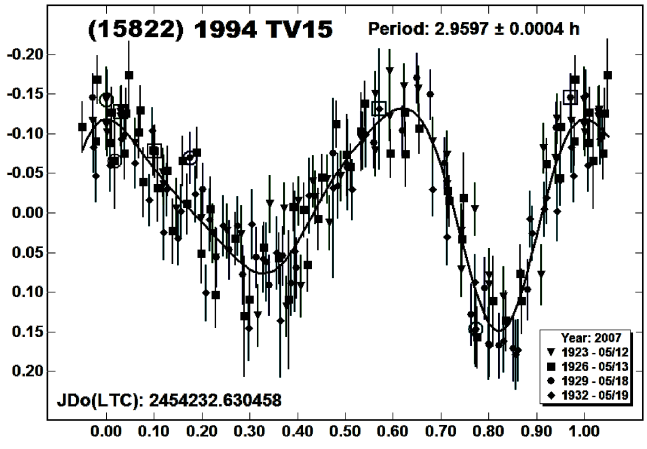

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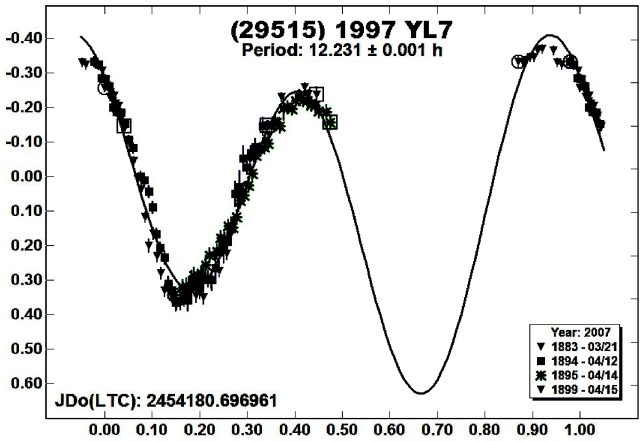

LIGHTCURVES OF MINOR PLANETS 559 NANON AND 1602 INDIANA

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(Received: 24 April)

Lightcurves of 559 Nanon reveal a rotation period of 10.059 ± 0.001 hr and amplitude of 0.26 ± 0.03 mag. Lightcurves of 1602 Indiana reveal a rotation period of 2.601 ± 0.001 hr and an amplitude of 0.17 ± 0.03 mag.

Photometric data were collected using a 36 cm Celestron C-14, a SBIG ST-10XME camera, and clear filter at Stonegate Observatory. The camera was binned 2X2 with a resultant image scale of 1.3 arc-seconds per pixel. The camera temperature was held at –15C for all measurements. All image exposures were 60 seconds and unguided.

559 Nanon. This asteroid was chosen as an opportunity for low phase angle opposition study (Warner et al, 2007). However, extensive periods of clouds prevented getting useful data during the low phase portion. Data for 559 Nanon were collected on every available clear night from January 17 through March 12, 2007, resulting in seven data sets. During this time, 559 Nanon started at magnitude 13 and phase angle 0.7° and ended at magnitude 14.2 and phase angle 18.6°. In all, 1127 data points were collected. The photometric data were obtained using MPO Canopus (Warner 2006). A period of 10.059 ±0.001 hours was determined. This matches closely the pervious result by Behrend (2007) of 10.061±0.001 hours.

1602 Indiana. Data were collected from March 23 through April 20, 2007, resulting in five data sets and 715 data points. 1602 Indiana started at magnitude 14.8 and dropped to magnitude 15.6 on the final night. The photometric data were also obtained using MPO Canopus. A period of 2.601 ± 0.001 hours was determined. In checking references (*Minor Planet Bulletin*) there are no previously reported data on period or lightcurve characteristics.

Acknowledgments

The author appreciates the help from Brian Warner on Canopus period analysis and his continued encouragement on asteroid photometric studies.

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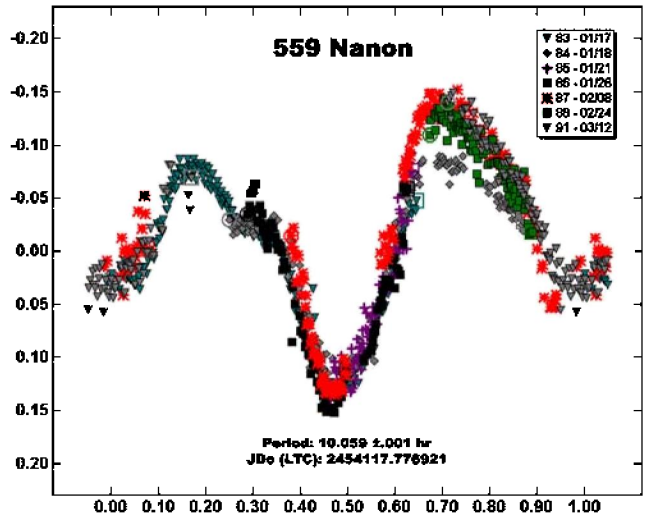

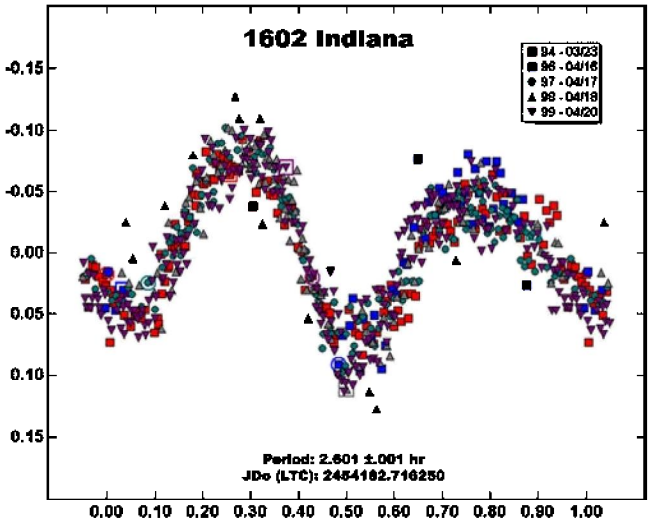

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