

LIGHTCURVE ANALYSIS OF MAIN BELT ASTEROIDS 292 LUDOVICA AND 1317 SILVRETTA

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Photometric data were taken during 2009 December through 2010 April for main-belt asteroids 292 Ludovica and 1317 Silvretta. For 292 Ludovica, data analysis revealed a synodic period of 8.90 ± 0.05 h and amplitude of 0.35 ± 0.05 mag; for 1317 Silvretta, a synodic period of 7.07 ± 0.05 h and amplitude of 0.45 ± 0.05 mag were found.

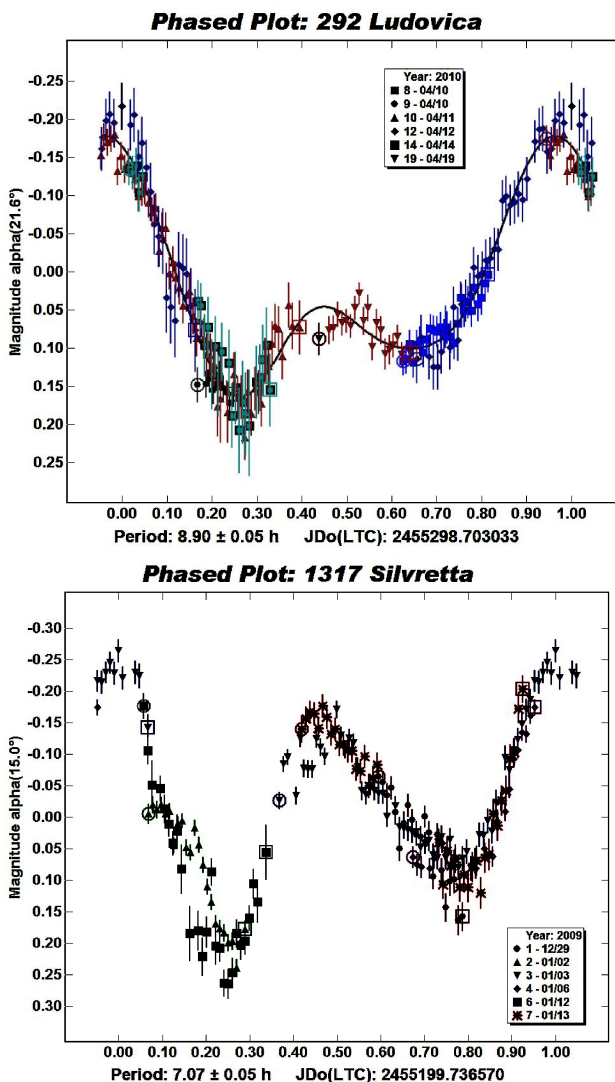
Observations were made at Shadowbox Observatory of main-belt asteroids 292 Ludovica in 2010 April and 1317 Silvretta in 2009 December and 2010 January. All observations were made with a 0.3-m Schmidt-Cassegrain (SCT) operating at $f/6.1$ on a German Equatorial mount (GEM). The imager was an SBIG ST9 working at 1x1 binning, which resulted in an image scale of 2.2 arc seconds/pixel. An SBIG AO-8 adaptive optics unit was employed. All images were taken through a Johnson V-band filter. The camera temperature was set in a range of -15°C to -40°C depending on ambient air temperature. Image acquisition and reduction were done with *CCDSOft*. Images were reduced with master dark and sky-flat frames. The GEM required that imaging be halted around target transit time in order to move the telescope to the other side of the pier. In order to avoid the “meridian flip” problem (Miles and Warner 2009), a new photometry session was started after each meridian flip. Other than this interruption, the camera took continuous exposures, pausing only to download each image. Exposures were 240 s for both objects.

Observations were reduced using differential photometry. Period analysis was done with *MPO Canopus*, incorporating the Fourier analysis algorithm developed by Harris et al. (1989). A minimum of two comparison stars from the UCAC3 catalog were used on each image.

292 Ludovica. This asteroid was observed from 2010 April 10-14 in support of a call for lightcurves of asteroids occulting stars on the Collaborative Asteroid Lightcurve Link website (CALL, Warner et al., 2010) to assist in determining the rotation phase at the time of a stellar occultation. In this case, Ludovica occulted SAO 61409 at about 03:29 UT on 2010 April 10. Previous observations of this object include those of Binzel (1987), who reported a rotational period of $8.93 \text{ h} \pm 0.02 \text{ h}$ and an amplitude of 0.35 mag. A total of 189 data points were analyzed to find the lightcurve parameters, which were $P = 8.90 \pm 0.05 \text{ h}$ and $A = 0.35 \pm 0.05 \text{ mag}$.

1317 Silvretta. This asteroid was observed on 2009 December 29 and between 2010 January 2-13. It was selected as a target of opportunity due to another target being unavailable. A quick check of the asteroid lightcurve parameters data file on the CALL site (Warner et al. 2010) revealed a wide difference in the published rotation periods. Schober and Schroll (1983) reported a period of 7.048 h, while Behrend (2010) reported a period of 3.86 h. The classical assumption is that asteroid lightcurves are bimodal for

objects having lightcurve amplitude of 0.2 mag or more (Binzel 1987). If the 3.86 h period reported by Behrend were correct, one would expect to see at least all 4 extrema in any observing session longer than 3.86 h. The author obtained one session ~5 hours in length showing an amplitude of 0.3 magnitude. During that time, only three extrema were noted. Thus, the 3.86 hour period offered by Behrend can be ruled out. The results of Schober (7.048 h) fall within the margin of error of the author's, $7.07 \pm 0.05 \text{ h}$. A total of 203 data points comprised the data set used for analysis.



Acknowledgements

This paper makes use of data products from The Third U.S. Naval Observatory CCD Astrograph Catalog (UCAC2).

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GENERAL REPORT OF POSITION OBSERVATIONS BY THE ALPO MINOR PLANETS SECTION FOR THE YEAR 2009

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Observations of positions of minor planets by members of the Minor Planets Section in calendar year 2009 are summarized.

During the year 2009 a total of 1344 positions of 318 different minor planets were reported by members of the Minor Planets Section. Of these 325 are CCD images (denoted C), 60 are precise photographic measures (denoted P), and all the rest are approximate visual positions.

The summary lists minor planets in numerical order, the observer and telescope aperture (in cm), UT dates of the observations, and the total number of observations in that period. The year is 2009 in each case.

Positional observations were contributed by the following observers:

Observer, Instrument	Location	Planets	Positions
Arlia, Saverio 20 cm f/6 reflector	Buenos Aires, Argentina	5	60P
Bookamer, Richard E. 41 cm reflector	Sebastian, Florida USA	38	130
Faure, Gerard 20 cm Celestron,	Col de l'Arzelier, France	72	394 (265C)
Garrett, Lawrence 32 cm f/6 reflector	Fairfax, Vermont, USA	12	26
Harvey, G. Roger 74 cm Newtonian	Concord, North Carolina, USA	119	432
Hudgens, Ben 40 cm f/4.5 Dobsonian 63 cm f/4.5 Dobsonian	Stephenville, Texas, USA and environs	85	182
Martinez, Luis 28 cm f/6.3 SCT	Casa Grande AZ, USA	14	60C
Pryal, Jim 20 cm f/10 SCT 12 cm f/8.33 refractor	Federal Way, WA USA and environs	14	41
Watson, William W. 20 cm Celestron	Tonawanda, NY USA and vicinity.	6	19

MINOR PLANET	OBSERVER & APERTURE (cm)	OBSERVING PERIOD (2006)	NO. OBS.
1 Ceres	Pryal, 12 Watson, 20	Feb 19-Apr 30 Mar 1-16	7 5
3 Juno	Pryal, 12	Sep 12-13	2
33 Polyhymnia	Pryal, 20	Jul 20-22	4
53 Kalypso	Watson, 20	Nov 12-Dec 13	3
54 Alexandra	Arlia, 20	Apr 1-27	15P
70 Panopaea	Pryal, 20	May 21-24	3
81 Terpsichore	Garrett, 32	Nov 19	2
88 Thisbe	Faure, 20	Aug 24-25	2
103 Hera	Pryal, 20	May 21-24	4
140 Siwa	Pryal, 20	Jul 29	2
148 Gallia	Arlia, 20	Sep 16-Nov 12	26P
161 Athor	Watson, 20	Sep 13-20	3
164 Eva	Arlia, 20 Watson, 20	Nov 20 Nov 13-18	2P 2
165 Loreley	Pryal, 20	Aug 20-21	2
176 Iduna	Arlia, 20	Jun 20-23	3P
200 Dynamene	Garrett, 32	May 25	2
212 Medea	Garrett, 32	Oct 10	2
215 Oenone	Garrett, 32	May 25	2
244 Sita	Garrett, 32	Oct 20	2
257 Silesia	Garrett, 32	Oct 20	2
269 Justitia	Pryal, 20	May 21	2
288 Glauke	Bookamer, 41	Feb 13	3
319 Leona	Hudgens, 40	Jul 25	2
330 Adalberta	Hudgens, 40	Aug 11-17	3
383 Janina	Bookamer, 41	Dec 8	3
385 Ilmatar	Watson, 20	Feb 3-18	3
393 Lampetia	Martinez, 28	Sep 14-15	2C
394 Arduina	Harvey, 73	Nov 28	3
395 Delia	Bookamer, 41	Jul 20	3
397 Vienna	Garrett, 32 Pryal, 20	Oct 17 Aug 20-21	2 2
422 Berolina	Watson, 20	Sep 13-19	3
424 Gratia	Faure, 20	May 17	2
433 Eros	Pryal, 20	Aug 20-21	2
451 Patientia	Pryal, 20	May 21-24	4
457 Alleghenia	Hudgens, 40	Nov 12	2
554 Peraga	Martinez, 28	Jun 18-19	2C
572 Rebekka	Bookamer, 41	Aug 20	3
583 Klotilde	Bookamer, 41	Jan 14	2
588 Achilles	Hudgens, 40	Oct 20	2
589 Croatia	Bookamer, 41	Dec 8	2
605 Juvisia	Bookamer, 41	Sep 8	3
610 Valeska	Hudgens, 40	Oct 20	2
630 Euphemia	Bookamer, 41	Feb 26	3
656 Beagle	Bookamer, 41	Jan 16	3
664 Judith	Bookamer, 41	Mar 13	3
681 Gorgo	Hudgens, 40	Sep 21	2
686 Gersuind	Martinez, 28	Sep 19-20	6C