

Number	Name	2023/mm/dd	Phase	L _{PAB}	B _{PAB}	Period(h)	P.E	Amp	A.E.
357	Ninina	05/04 - 06/26	*10.7, 9.6	251	17	36.00	0.01	0.08	0.01

Table II. Observing circumstances and results. The phase angle is given for the first and last date, and the * indicates that a minimum (second value) was reached between these dates. LPAB and BPAB are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris et al., 1984).

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LIGHTCURVES ANALYSIS OF THREE MAIN-BELT ASTEROIDS: 3602 LAZZARO, 10468 ITACURUBA AND (53437) 1999 WL2

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We present rotational lightcurves for three main-belt asteroids, 3602 Lazzaro, 10468 Itacuruba and (53437) 1999 WL2, obtained at the Observatório Astronômico do Sertão de Itaparica (OASI, MPC code Y28). For 3602 Lazzaro, we found a rotation period of 4.933 ± 0.002 h, for 10468 Itacuruba a period of 13.040 ± 0.002 h and for (53437) 1999 WL2 a period of 8.573 ± 0.004 h.

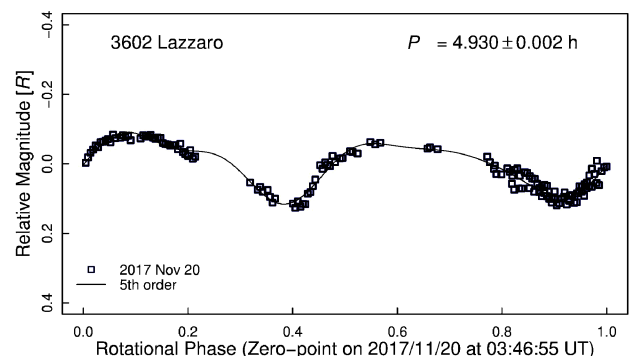
CCD photometric observations of three main-belt asteroids, 3602 Lazzaro, 10468 Itacuruba and (53437) 1999 WL2, were carried out at the Observatório Astronômico do Sertão de Itaparica (MPC code Y28, Nova Itacuruba). Images were obtained with the 1.0-m f/8 telescope (Astro Optik, Germany) of the IMPACTON project and a CCD Astra Apogee Instruments (2048×2048 pixels) that was binned 2×2. This configuration gave a field-of-view of 11.8×11.8 arcmin and an image scale of 0.343 arcsec/pix. More

details on the available instrumentation at OASI are given in Rondón et al. (2020). All the observations were performed using sidereal tracking and an R-Johnson-Cousins filter. The exposure time varied depending on the asteroid's brightness and sky motion.

For the three asteroids, data processing and differential photometry measurements were performed using *MaxIm DL* package following the standard procedures of flat-field correction and sky subtraction. Relative magnitudes were computed to obtain the lightcurves and the rotation periods were determined using a Fourier series analysis method (Harris et al., 1989). In the figures below is given, for each asteroid, the composite lightcurve with different colors representing different nights and the line best fit.

The observational circumstances for each observed asteroid are given in Table I along with the results, which are discussed individually below. In this table we give for each obtained rotation period a reliability code (Warner et al., 2009).

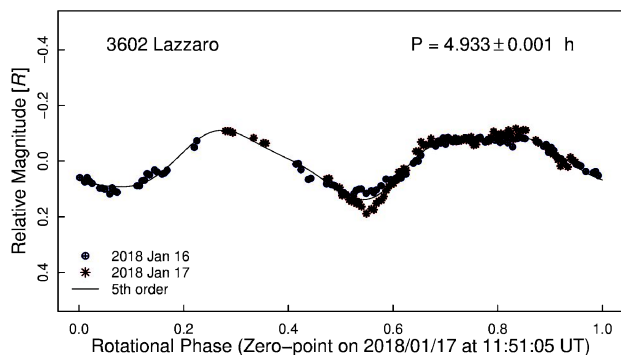
3602 Lazzaro. This asteroid was discovered at Siding Spring Observatory, Australia, by S.J. Bus on 1981 February 28. It has about 4.0 km of diameter and an albedo of 0.27 (Masiero et al., 2012). Lazzaro was observed on one night in April 2017 and two nights in January 2018. The April lightcurve fits a synodic period of $P = 4.930 \pm 0.002$ h. It has a small dispersion and small amplitude of 0.19 ± 0.01 mag, but it lacks a few points for complete coverage.



Number	Name	yyyy mm/dd	Exp	Phase	L _{PAB}	B _{PAB}	Period	P.E	Amp	A.E.	U
3602	Lazzaro	2017 11/20	90	10.5, 10.4	75	-1	4.930	0.002	0.19	0.01	2
		2018 01/16-01/17	100	21.5	80	-3	4.933	0.001	0.25	0.02	3
10468	Itacuruba	2017 04/20-05/02	100	9.5, 3.2	225	-3.4	13.04	0.002	0.25	0.02	1
53437	1999 WL2	2014 05/23-05/31	100	20.0, 19.6	220	2.5	8.573	0.004	1.00	0.01	3

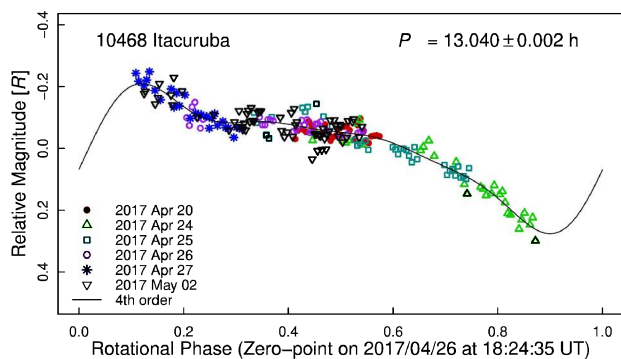
Table I. Observing circumstances. Exp is average exposure time, seconds. The phase angle (α) is given at the start and end of each date range, unless it reached a minimum, which is the second of three values. If a single value is given, the phase angle did not change significantly and the average value is given. L_{PAB} and B_{PAB} are each the average phase angle bisector longitude and latitude. The U rating is our estimate and not necessarily the one assigned in the asteroid lightcurve database (Warner et al., 2009).

On the other hand, the January lightcurve has a better coverage, with two well-defined maxima and minima. It fits a period of $P = 4.933 \pm 0.001$ h, using a 5th-order Fourier fit, with a small amplitude of 0.25 ± 0.02 mag. Although this value has been determined from just two nights of observations, we consider the rotational period well-established. Previous result was reported by Waszczak et al. (2015), which found a rotational period of 4.9390 ± 0.0009 h, but it is based on incomplete data. In any case, their result is in good agreement with ours.

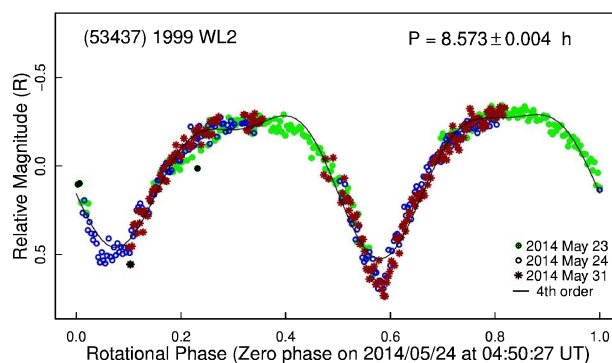


10468 Itacuruba. This main-belt asteroid was discovered at Siding Spring Observatory, Australia, by S.J. Bus on 1981 March. It was observed for about 23 hours from 20 April to 02 May 2017. With a diameter of about 2.0 km to 7.0 km, Itacuruba is also the name of the city in the state of Pernambuco, Brazil, where the site of the Observatório Astronômico do Sertão de Itaparica (OASI) is located. A Fourier analysis indicated a period of $P = 13.040 \pm 0.002$ h, but this is based on incomplete coverage as seen in the monomodal lightcurve reported here.

Thus, it is possible that the true rotational period of Itacuruba is double the result reported by us. It is worth mentioning that we found no previously reported results for this asteroid in the Asteroid Lightcurve Database (Warner et al., 2009), or other resources.



(53437) 1999 WL2. This asteroid was observed for about 20 hours on three nights from 23 to 31 May 2014. According to Mainzer et al. (2011), this asteroid has 2.28 km and an albedo of 0.26. The 4th-order Fourier fit to the data revealed a period of $P = 8.573 \pm 0.004$ h. The composite lightcurve reported here has two maxima and minima and an amplitude of 1.0 ± 0.02 mag which suggests an elongated shape, with $a/b \geq 2.5$. Previous result, based on less than full coverage, was reported by Pal et al. (2020), which found a rotational period of 8.57357 ± 0.00005 h.



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