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BROAD-BAND MONITORING OF 1777 GEHRELS

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Over the course of four nights in 2026 February, broad-band monitoring of 1777 Gehrels was conducted through a Johnson V filter. We find a best-fit rotation period of 2.836 ± 0.001 h, which agrees very well with previous measurements, and a V-band amplitude of variability of ΔV=0.19 ± 0.01 mag, which is on the low end of previously reported measurements. A few observations were also collected in B and R on a single night, and we find B-V=0.89 ± 0.10 mag and V-R=0.47 ± 0.05 mag, which is typical for stony asteroids.

Asteroid 1777 Gehrels is an Sq-type stony asteroid (JPL, 2026) in the middle main belt. It was discovered by Cornelis van Houten, Ingrid van Houten-Greoneveld, and Tom Gehrels in 1960 at Palomar Observatory as part of the Palomar-Leiden Survey (IAU Minor Planet Center, 2026). Its name honors Tom Gehrels, one of the survey's principal investigators.

Students enrolled in the *Observational Techniques and Instrumentation* class at Georgia State University monitored 1777 Gehrels over the course of four nights between 2026 February 06-14 (UT dates here and throughout). Observations were collected with the Miller Telescope, a 24-inch Planewave f/6.5 Corrected Dall-Kirkham Astrograph, at GSU's Hard Labor Creek Observatory in Rutledge, GA. The telescope was equipped with an FLI ProLine CCD and a set of Johnson-Cousins filters. Each image covered a field of view of 26.3 arcmin × 26.3 arcmin, with a pixel scale of 0.77 arcsec. Exposure times were generally 120-240 s, and most images were acquired through a *V* filter, although a few images were also acquired in *B* and *R* on February 06. The weather conditions were mixed throughout the observation period, ranging from clear to partly cloudy, and the moon phase ranged from waning gibbous to waning crescent. All observations were acquired at airmasses < 2.4.

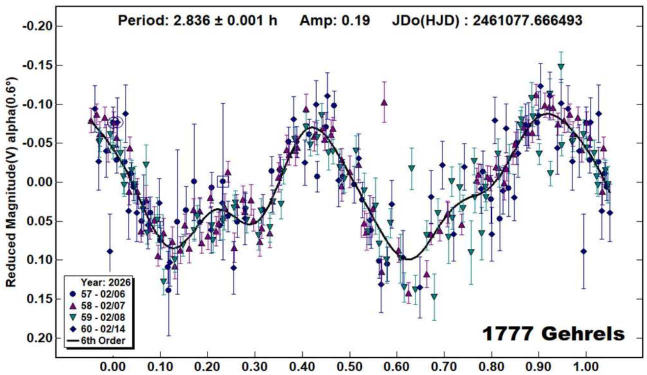
The images were reduced in *IRAF* and included bias subtraction, dark subtraction, and flat fielding. Aperture photometry was carried out in *IRAF*, with measurements of the asteroid and 3 field stars acquired from each reduced image. The measured instrumental magnitudes were converted to calibrated Vega magnitudes using *V*-band and *B*-band measurements of the field stars from the AAVSO Photometric All-Sky Survey (Henden et al., 2009). To calibrate the *R*-band photometry, we used the transformation equations of Jordi et al. (2006) for Population I stars. We first determined the effective *R* magnitudes for the field stars using the Sloan *r′* magnitudes and the *g′*-*r′* colors from APASS, then we applied the typical correction factor to our measurements of the asteroid. Based on our photometry, 1777 Gehrels has a color that is typical of stony-type asteroids (Dandy et al., 2003), with *B*-*V*=0.89 ± 0.10 mag and *V*-*R*=0.47 ± 0.05 mag.

To determine the rotation period and amplitude of variability for 1777 Gehrels, we used *MPO Canopus*, which implements the Fourier Analysis of Light Curves (FALC) algorithm of Harris et al. (1989). After cleaning extreme outliers, we were left with 253 total data points. We explored fitting orders between 4 and 8 for the period search (an order of 6 was adopted for the plot above), and we find that neither the best-fit period nor the amplitude of variability are sensitive to the choice of order. Based on this analysis, we adopt a final rotation period of 2.836 ± 0.001 h and a *V*-band variability amplitude of 0.19 ± 0.01 mag. Our measured rotation period agrees very well with previous measurements

Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1777	Gehrels	2026 02/06-02/14	*0.6,3.8	137	1.2	2.836	0.001	0.19	0.01	9105

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).

reported by Wisniewski et al. (1997), Stephens et al. (2005), Behrend (2026web), Pravec (2026), Klinglesmith (2017), and Ďurech et al. (2020). The amplitude of variation that we measure is on the low end of previous measurements: 0.19 ± 0.01 mag compared to a range of 0.21 mag (Pravec, 2026) to 0.29 mag (Behrend, 2026web).



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LIGHTCURVES, SYNODIC ROTATION PERIOD AND SPIN OF TROJAN ASTEROID (2893) PEIROOS

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For Jupiter Trojan asteroid (2893) Peiroos, we present updated estimates of the synodic rotation period (P), the pole orientation in the ecliptic coordinate system, the axis ratios B/A and C/A and the lightcurve amplitudes for the observation epochs 2011.6 and 2023.8.

2893 Peiroos (1975 QD) is a Jupiter Trojan asteroid situated in the L_5 Lagrange cloud (Stephens and Warner, 2019). It was discovered on 1975 August 30 by the Felix Aguilar Observatory (CASLEO) (Minor Planet Center Database, 2025). The asteroid has an estimated diameter of 86.884 km (Mainzer et al., 2019). Its orbit has a semi-major axis of 5.137 AU, an eccentricity of 0.0761 and an inclination of 14.67º. Its absolute magnitude is 9.00 (Jet Propulsion Laboratory, 2025 Nov 21). The synodic rotation period of 2893 Peiroos obtained from The Asteroid Lightcurve Database (LCDB; Warner et al., 2009) is 8.945 h. The pole orientation of 2893 Peiroos reported by Hanuš et al. (2023) and expressed in ecliptic coordinates is $(\lambda_0, \beta_0) = (78^\circ, 72^\circ)$, where λ_0 is the pole-longitude and β_0 is the pole-latitude.

We report photometric observations of 2893 Peiroos from six nights, distributed on 2011 August 3, 4 and 7, and 2023 November 5, 6 and 7. Observations were made remotely from the Complejo Astronómico El Leoncito (CASLEO) (San Juan, Argentina, MPC code 829) through the 2.15m Jorge Sahade telescope and a Roper VersArray CCD Camera in Reducer Focal Mode with a binning of 2 × 2. The images from 2011 August were registered through a R filter while the images from 2023 November were captured with a V Filter, in both cases with a 180-s exposure time. These reports bring the observation interval to more than 12 years, i.e. approximately the orbital period of the objects. The previous known interval of 4 and a half years is augmented for almost 8 years.

Methodology

The images were analyzed and reduced through the *Image Reduction and Analysis Facility* (IRAF). To visualize and manipulate the images we used the *Smithsonian Astrophysical Observatory Deep Space Nine* (DS9) program. As a result of the photometric reduction, we obtained the differential magnitude of 2893 Peiroos for each observation with respect to a comparison star selected for each opposition. The brightness measured in the oppositions of 2011 August was corrected by the color index V-R from Chatelain et al. (2016). We retrieved the mean brightness of each comparison star in the magbands G, G_{BP} and G_{RP} from the *Gaia Early Data Release 3* (EDR3) catalog (Gaia Collaboration, DPAC, 2020), using digitized images displayed in the *Aladin* software (Bonnarel, 2000). By means of a third-degree polynomial transformation provided by the EDR3 catalog we computed the V-band magnitude of the comparison stars in the Johnson-Cousins photometric System, and so the standard apparent magnitude of 2893 Peiroos was obtained as:

$$m_{Peiroos} = (m_{Peiroos,\ inst} - m_{star,\ inst}) + m_{star,\ cat} \qquad (1)$$

In Equation (1) $m_{Peiroos}$ is its standard V-band apparent magnitude, $m_{Peiroos,\ inst}$ is its instrumental magnitude (corrected by the aforementioned V-R color index whether necessary), $m_{star,\ inst}$ is the V-band instrumental magnitude of the comparison star and $m_{star,\ cat}$ is its standard V-band magnitude.

The V-band apparent standard magnitude, the solar phase angle, and the phase angle bisector longitude (L_{PAB}) and latitude (B_{PAB}) for the approximate mid date from the oppositions between the years 2015 and 2020 were retrieved from *ALCDEF* database. This data was combined with our own data to estimate the rotational parameters and to model its shape. To compute the reduced magnitude and the geocentric and heliocentric distance of the asteroid, we used the values provided by the JPL *Horizons* System. With the respective ephemerides (cartesian coordinates of the Earth and of 2893 Peiroos with respect to the Sun) we computed the asteroidal position vectors from the Earth and the Sun at an approximate mid date for each night. The absolute magnitude was

Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Obs.
2893	Peiroos	2011 08/03-08/07	1.7, 2.0	315	-7	8.94	0.04	0.30	0.04	CASLEO
2893	Peiroos	2023 11/05-11/07	11.5,11.6	328	-11	8.950	0.008	0.41	0.03	CASLEO

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Amplitude error (A.E.) is calculated as √2 x (lightcurve RMS residual). Obs. is the observatory involved. CASLEO: Complejo Astronómico El Leoncito.

computed with the three-parameter H, G_1, G_2 photometric phase function from Penttilä et al. (2016). H is the mean absolute magnitude, and G_1, G_2 are parameters that describe the general shape of the phase function. To compute them we used the online calculator by Penttilä et al. (2016). The parameters were estimated by a minimum squared method through which the phase function was fitted. To fit the phase function, we adopted the linear unconstrained fit from Muinonen et al. (2010) (see Figure 1 of Taube et al., 2026). To compare models with a different number of parameters, we needed to penalize the (weighted) sum of squared errors (SSE) with the number of parameters p. In Penttilä et al. (2016) this is performed using the Bayesian Information criterion (BIC). The smaller the value of the BIC, the more preferred the model. For 2893 Peiroos, the model which satisfies this condition is the one-dimensional H(D), in which only the parameter H is fitted

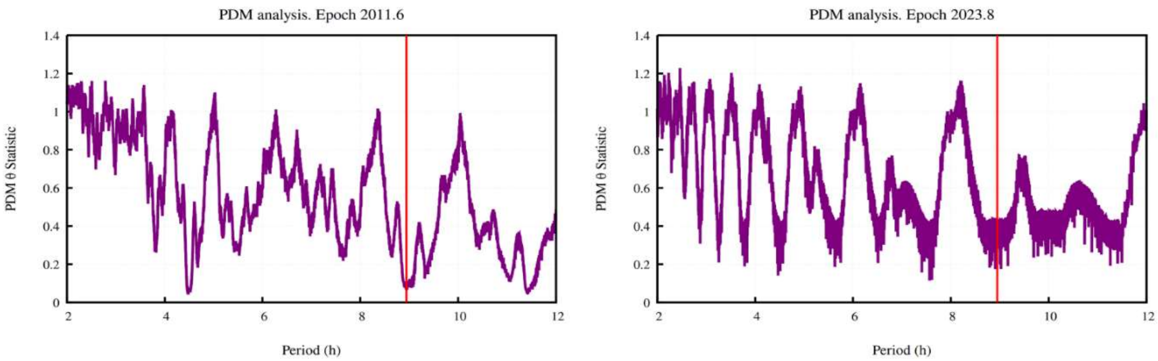

Figure 1: Phase Dispersion Minimization analysis of 2893 Peiroos for the observation epochs 2011.6 and 2023.8. The red vertical line indicates the most probable estimate of the synodic period which minimizes the statistic function and was therefore used for the local lightcurve phasing and Fourier fit.

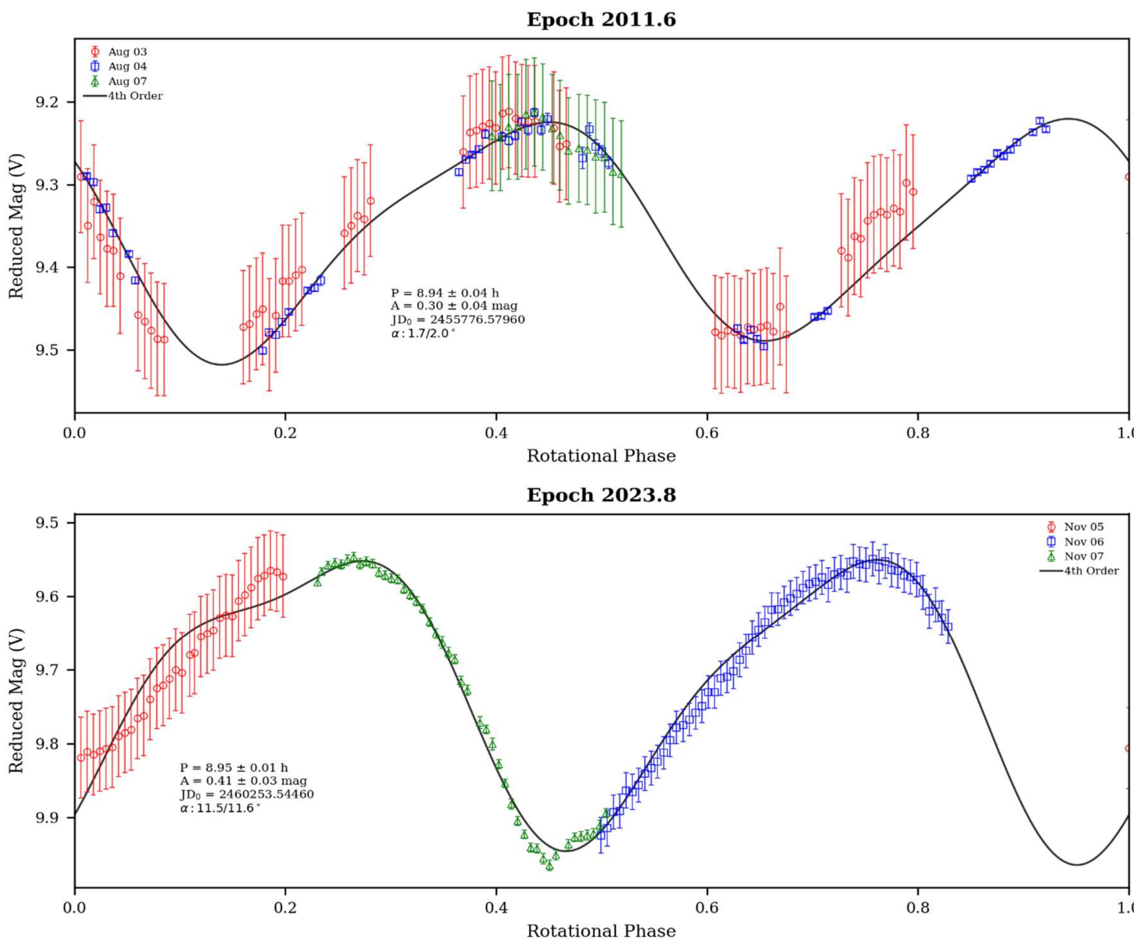

Figure 2: V-band reduced magnitude lightcurves folded for the observation epochs 2011.6 and 2023.8. Inside the plot area the following information is added: the synodic period estimated by the PDM technique, the peak-to-peak amplitude of the Fourier model lightcurve, the Julian Date of the first data point, and the solar phase angle for the first and last date.

and the values adopted for G_1, G_2 correspond to the means associated to the D taxonomic class. Our correspondent values are: H=9.2114, G1=0.9617 and G2=0.01645. These parameters are broadly consistent with those reported by Mahlke et al. (2021) (H=9.229, G1=0.856, G2=0.050), and especially the magnitude parameter H is coherent with a D spectral type. From the linear unconstrained fit k=-0.03294 is the photometric slope, WRMS=0.4314 is the weighted root mean square and the BIC=-37.18.

With the absolute magnitude parameter H and the geometric albedo p_v=0.048 in the V band reported by the WISE mission, we estimated empirically the effective diameter of the object D_{eff}=87.22 km. This value is consistent with the estimates previously reported in ALCDEF: D_{eff}=87.46 km (Tedesco et al., 2004), D_{eff}=86.88 km (Mainzer et al., 2011), D_{eff}=86.76 km (Usui et al., 2011), and D_{eff}=86.884 km (Mainzer et al., 2019).

For period analysis we generated one periodogram per observation epoch (2011.6 and 2023.8) through the Phase Dispersion Minimization technique (Stellingwerf, 1978), allowing for a local estimation of the synodic period. These periodograms are shown in Figure 1. We searched for a synodic period between 2 h and 12 h with a time step equal to 0.002 h. Our sample comprised the absolute magnitudes corresponding to each observation given in Julian Date (JD). The mean synodic period was computed as the unweighted arithmetic mean of the individual epoch measurements, with the associated uncertainty computed as the standard error of the mean in order to reflect the dispersion among epochs. The resulting estimate is P = 8.948 ± 0.003 h. This mean value is in excellent agreement with the individual epoch estimates, with differences falling within the combined uncertainties and the expected synodic variations due to changing viewing geometry. It lies at 0.2σ for 2011.6, 0.15σ for 2015.9, 0.19σ for 2016.9, 0.22σ for 2017.9, 0.07σ for 2019.1, 0.04σ for 2020.3 and 0.23σ for 2023.8.

The previous values of the rotation period reported in ALCDEF are: 1) P = 8.99 ± 0.01 h (Stephens et al., 2016), 2) P = 8.951 ± 0.002 h (Stephens, 2017), 3) P = 8.936 ± 0.004 h (Stephens and Warner, 2018), 4) P = 8.945 ± 0.001 h (Stephens and Warner, 2019), 5) P = 8.946 ± 0.002 h (Stephens and Warner, 2020) and 6) P = 8.949 ± 0.005 h (McNeill et al., 2021). See Table I of observing circumstances and results. According to the quoted errors the difference of our period estimate (P = 8.948 ± 0.003 h), quantified using a z-score function, is statistically consistent (within the 95% confidence interval) with 2), 4), 5) and 6), lying at 0.83σ for 2), 0.95σ for 4), 0.55σ for 5) and 0.17σ for 6). However, the period difference with respect to 1) and 3), given by 4.02σ and 2.4σ respectively, is not considered statistically consistent.

We computed the V-band reduced magnitude lightcurves and phased them, for each observation epoch, according to the local specific period estimated by the PDM technique. Subsequently, a 4th-order Fourier series was fitted to the phased data in order to derive the lightcurve peak-to-peak amplitudes and its associated uncertainty. The epoch-specific periods estimated by the PDM technique and the lightcurve amplitudes are shown in Table I. The folded lightcurves are shown in Figure 2. The differing amplitudes derived from the Fourier fit between the epochs 2011.6 and 2023.8 indicate that 2893 Peiroos was observed at different viewing geometries (i.e, changing aspect angles). The lightcurves from these epochs are dominated by a bimodal shape. The regularity of the lightcurves, combined with amplitudes reaching up to Δm ~ 0.41 mag, indicates a non-spherical shape, consistent with a triaxial ellipsoid elongation.

For the pole orientation estimate we implemented the Pospieszalska-Surdej and Surdej (1985) technique with the underlying assumption that the asteroid is a triaxial ellipsoid. In order to apply the correspondent procedure we need, for each opposition considered in the lightcurve fit (22 of the 24 observation nights), the brightness in intensity units (derived from the absolute magnitude) for each observation, the rotational period (in our case, the estimated previously with the Phase Dispersion Minimization technique), and the approximated ecliptic coordinates of the asteroid for each opposition (obtained by converting the precessed equatorial coordinates from an intermediate observation to the epoch J2000.0). The residual function, specifically the Root Mean Square Error (RMSE) was minimized through the *Pikaia* subroutine, which implements a genetic algorithm for the four-dimensional parameter space optimization ($\lambda_0,\beta_0,\gamma,\delta$). $\gamma=(a/b)^2$ and $\delta=(a/c)^2$ are the squared ratios of the ellipsoidal linear dimensions. In this geometric assumption the relation a > b > c is satisfied. a and b are the equatorial dimensions, aligned with the longest axis, while c is the polar dimension, aligned with the spin axis. The resulting values of the four parameters are: the pole ecliptic coordinates (λ_0,β_0) = (24.16º, 72.01º), γ=1.57 (a/b=1.25) and δ=10.99 (a/c=3.31), with the minimum RMSE=0.625. The pole obliquity (ε=22º) was computed with the longitude of the ascending node and the orbital inclination determined for the epoch 2460800.5 (2025-May-05.0) TDB. With our estimate of the effective diameter, the ellipsoidal dimensions could in principle be derived by combining it with the axis ratios. However, such estimates are not required for the purposes of this work and are therefore not discussed further. Additionally, using the ecliptic coordinates of the asteroid and the spin-axis solution, we estimated the approximated aspect angle for each opposition. The spin-axis solution that minimizes the RMSE and the pole estimation from Hanuš et al. (2023) are indicated in the merit value contour map (Figure 3). It shows the probability of the spin-axis orientation in different regions of the celestial sphere, according to the RMSE value for each grid point. The probability decreases gradually from dark violet, blue, green and yellow, as can be seen from the graph color bar.

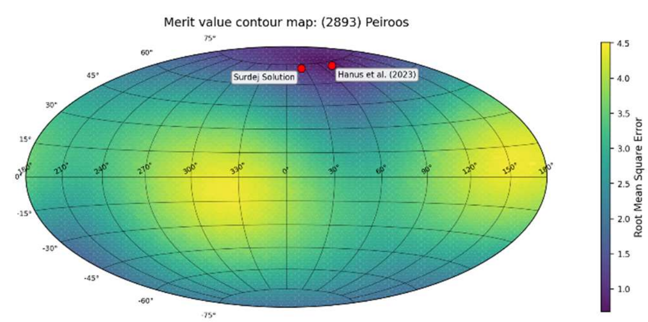

Figure 3: RMSE contour map of pole orientations. "Surdej Solution" corresponds to the spin-axis orientation obtained with the Pospieszalska-Surdej and Surdej (1985) technique. The pole reported by Hanuš et al. (2023) is shown for comparison.

To conclude, the pole orientation estimated by the Pospieszalska-Surdej and Surdej (1985) technique seems competitive, both because of the methodological robustness of the Pikaia genetic algorithm used in its estimation and because of the similarity in the ecliptic latitude with respect to the value reported by Hanuš et al. (2023).

These findings, together with the results derived from the solar phase, spectral and color index analysis (Taube et al., 2026), broaden the physical characterization of 2893 Peiroos and provide a solid basis for future comparative studies within the Trojan population.

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ROTATIONAL PERIOD DETERMINATION FOR ASTEROID 85 IO

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(Received: 2026 February 18)

CCD photometric observations of main-belt asteroid 85 Io were made between 2025 November and December in order to measure its rotation period.

Between November and December 2025, photometric observations (using CCD sensors) were made of an asteroid in the main belt. The observations took place at the Hypatia Astronomical Observatory (L62) using a 25 cm Ritchey-Chretien telescope and a Moravian C2-7000A camera and Rc photometric filter. Data processing and analysis were done with *MPO Canopus* (Warner, 2021). All images were calibrated with dark and flat field frames using *MaximDL*. Table I shows the observing circumstances and results.

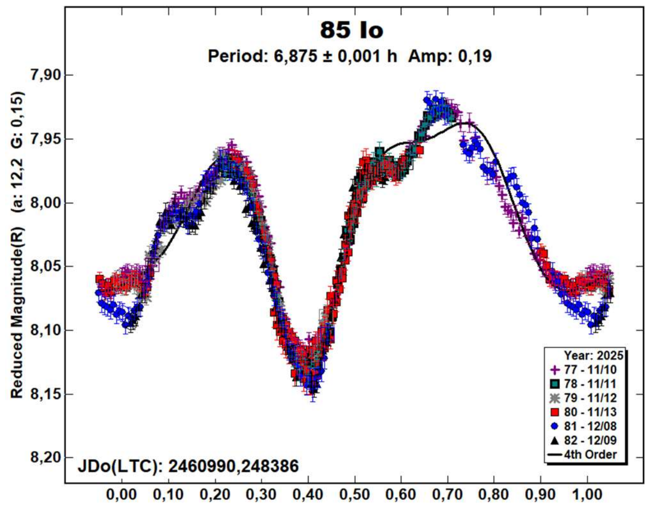
Minor planet 85 Io was first identified on 1865 September 19 by German-American astronomer Christian Heinrich Friedrich Peters, working at the Litchfield Observatory of Hamilton College in Clinton, New York. It is an asteroid located in the central region of the main asteroid belt, a vast area between the orbits of Mars and Jupiter that contains most of the primordial debris of the inner solar system, with a semi-major axis of 2.653 AU, eccentricity 0.193, inclination 11.96 degrees and orbital period of 4.32 years. Its absolute magnitude is H = 7.93 (JPL, 2026; MPC, 2026).

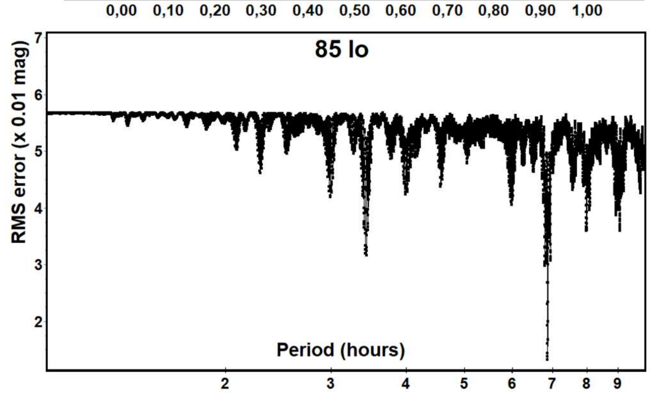
Our observations were conducted by acquiring 631 data points over six nights between 10 November and 9 December 2025. Analysis of the period shows a bimodal solution for a rotation period P = 6.875 ± 0.001 h with an amplitude A = 0.19 ± 0.022 mag. The split phase diagram allows for a critical assessment of rotational symmetry by comparing the two hemispheric portions of the asteroid. The discrepancy observed between the data from the first half of the cycle (0.0 - 0.5) and the second half (0.5 - 1.0) highlights significant geometric asymmetries. Analysis of the fourth-order fits shows that the two maxima are not identical in amplitude and slope, a phenomenon attributable to a non-uniform distribution of surface reflectance or complex morphological features.

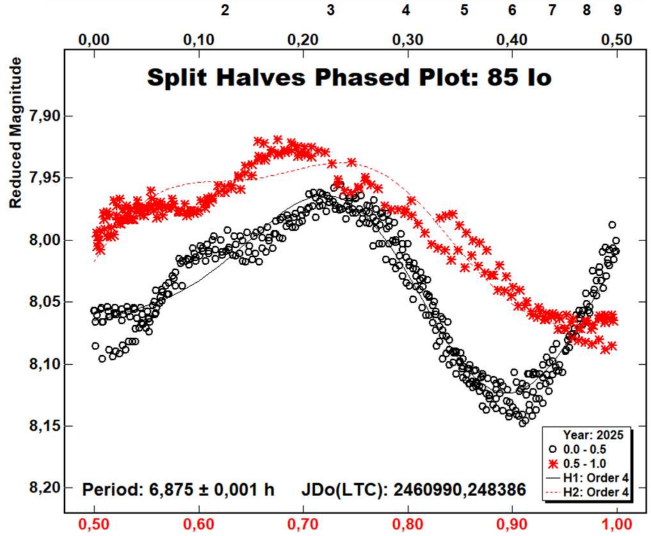
The photometric lightcurve has a well-defined bimodal morphology, indicative of an elongated rotating body. The fourth-order polynomial fit accurately describes the trend of the asymmetric minima and maxima, suggesting the presence of topographical irregularities or local variations in albedo.

Spectral analysis performed by minimizing the root mean square (RMS) error identifies an extremely robust and unambiguous periodic solution. The diagram shows a clear minimum at the synodic period of 6.875 hours, where the residual error reaches its absolute minimum value. Although secondary harmonics and aliases related to the sampling frequency are visible, the depth of the main peak ensures high statistical confidence in the result.

As a further check, we consulted the Light Curve Database of Asteroids (LCDB; Warner et al., 2009) and found three previously reported periods: Carbognani et al. (2019, 6.8750 h), Pál et al. (2020, 6.87563 h) and Martikainen et al. (2021, 6.874780 h). The period we found appears to be in good agreement with previous results.







Number	Name	2022 mm/dd	Pts	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
85	Io	11/10 - 12/9	631	13.0	24.6	-2.2	6.875	±0.001	0.19	0.022	MBA

Table I. Observing circumstances and results. Pts is the number of data points. The phase angle is given for the interim date. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).

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LIGHTCURVES AND ROTATION PERIODS OF 1027 AESCULAPIA AND 1062 LJUBA

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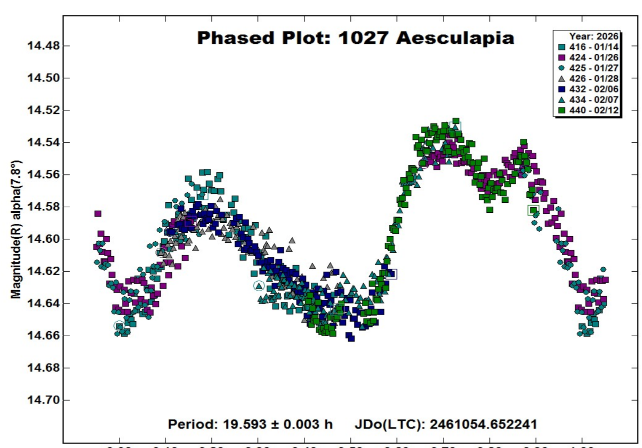
Synodic rotation periods and amplitudes are found for 1027 Aesculapia 19.593 ± 0.003 hours, 0.11 ± 0.01 magnitudes with an asymmetric bimodal lightcurve; and 1062 Ljuba 33.78 ± 0.01 hours, 0.09 ± 0.01 magnitudes, with one maximum and minimum per rotational cycle.

The new observations to produce the results reported in this paper were made at the Organ Mesa Observatory with a Meade 35-cm LX200 GPS Schmidt-Cassegrain, SBIG STL-1001E CCD, 60 second exposures, unguided, clear filter. Image measurement and lightcurve construction were with *MPO Canopus* software with calibration star magnitudes for solar colored stars from the CMC15 catalog reduced to the Cousins R band. Zero-point adjustments of a few × 0.01 magnitude were made for best fit. To reduce the number of data points on the lightcurves and make them easier to read, data points have been binned in sets of 3 with maximum time difference 6 minutes.

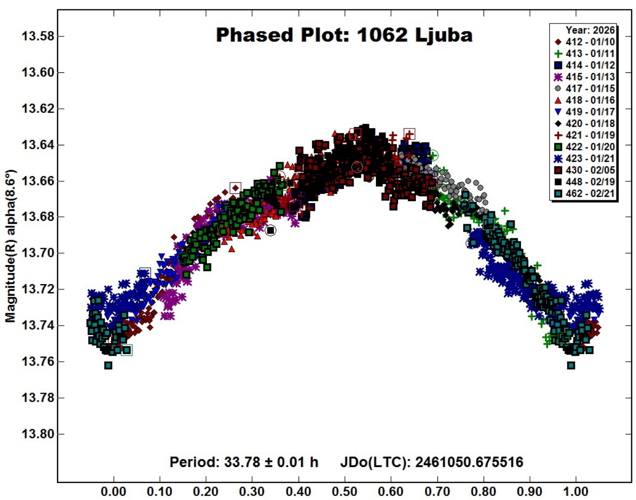
1027 Aesculapia. Many different rotation periods have been previously published: Behrend (2004web), >10 hours; Maleszewski and Clark (2004), 6.83 hours with one maximum and minimum per cycle; Ehlert and Kingery (2015), 9.791 hours with one maximum and minimum per rotational cycle; Waszczak et al. (2015), 19.506 hours; Hess et al. (2017), 13.529 hours; and Polakis (2020), 19.9 hours. New data on 7 nights 2026 Jan. 14 - Feb. 12 provide a good fit to an asymmetric bimodal lightcurve with synodic period 19.593 ± 0.003 hours, amplitude 0.11 ± 0.01 magnitudes. This period is consistent with Waszczak et al. (2015) and Polakis (2020) and improves upon the accuracy of their published periods. All other published periods are now ruled out.

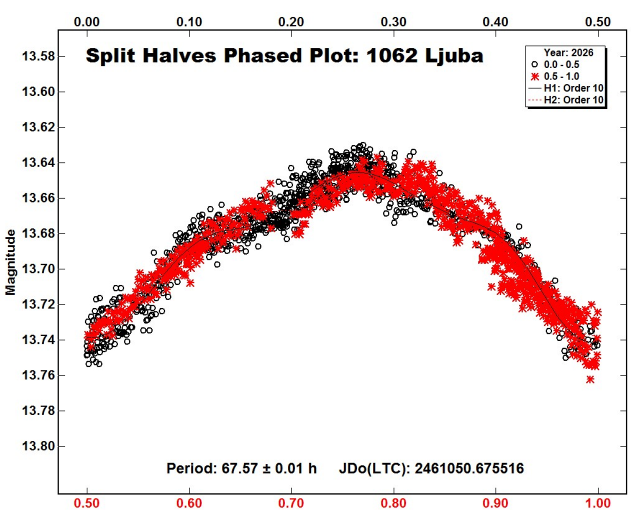


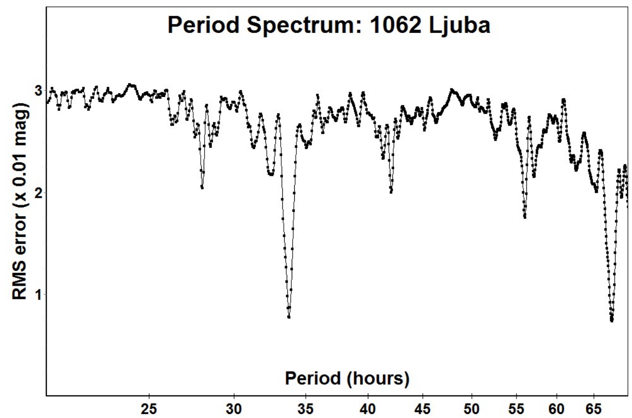
Number	Name	yyyy/mm/dd	Phase	LPAB	BPAB	Period(h)	P.E	Amp	A.E
1027	Aesculapia	2026/01/14-2026/02/12	*7.9 - 4.3	133	2	19.593	0.003	0.11	0.01
1062	Ljuba	2026/01/10-2026/02/21	*8.6 - 8.6	131	3	33.78	0.02	0.09	0.01

Table I. Observing circumstances and results. The phase angle is given for the first and last date, except that a * denotes a minimum 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).

1062 Ljuba. Previously published rotation periods are by Binzel (1987), 36 hours; Behrend (2004web), 41.5 hours; Behrend (2008web), 42 hours, all with sparse lightcurves. Cooney (2005) published a moderately dense somewhat asymmetric bimodal lightcurve with period 33.8 ± 0.2 hours, amplitude 0.17 ± 0.02 magnitudes at celestial longitude 18°. New observations on 14 nights 2026 Jan. 10 - Feb. 21 provide a good fit to a lightcurve with period 33.78 ± 0.01 hours, amplitude 0.09 ± 0.01 magnitudes, celestial longitude 131°, with one maximum and minimum per rotational cycle. The real error is likely to be larger than 0.01 hours. A period spectrum from 20 to 70 hours definitively rules out all periods except 33.78 hours and the double period. A split halves plot of the double period 67.57 hours shows that the difference between the two halves of the plot is much smaller than the spread of data points. Hence the 33.78-hour period is secure and all previously published periods except Cooney (2005) are now ruled out.







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LIGHTCURVES FOR (631) PHILIPPINA AND (771) LIBERA FROM THE UNION COLLEGE OBSERVATORY

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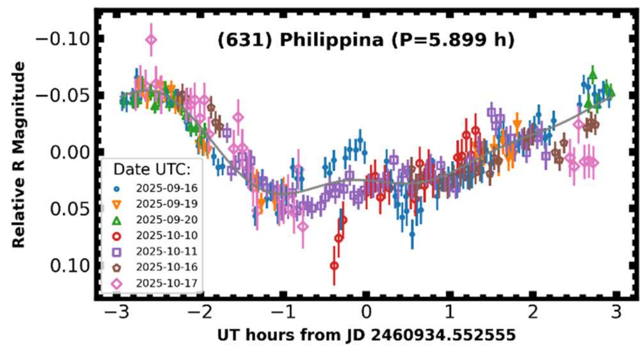
We present lightcurves for (631) Philippina and (771) Libera, on six and seven nights respectively, of 2025 September and October.

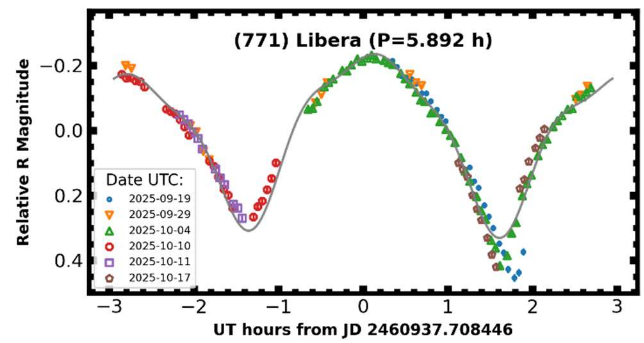
Observations for (631) Philippina and (771) Libera were planned with the Koronis Family website (Slivan, 2003), as part of a class project. We note that neither of these two objects are members of the Koronis family. These objects were chosen as being bright asteroids having well-determined rotational periods. The latest observations to our knowledge of these asteroids from González Farfán et al., (2024), gives a period of 5.889 h for Philippina and 5.892 h for Libera.

Observations were conducted using the Union College Observatory during 2025 September and October. The observatory has a 0.5-m telescope, equipped with a SBIG STXL-11002 camera, with a 2004×1336×9µm array. All observations were performed using an *R* filter with 180 second exposure time. Processing and photometry were performed using *AstroImageJ* (Collins et al., 2017) and custom-built software utilizing *Photutils* (Bradley et al., 2025). Light-time correction was performed using *SpicyPy* (Annex et al., 2017) with SPICE position kernels for both asteroids acquired from JPL Horizons System (JPL, 2026).

On three nights: September 19, October 10 and, October 17, Philippina passed in front of faint background stars, resulting in a decrease in magnitude in parts of the lightcurve. For these three nights specifically, we performed the photometry using *Photutils* (Bradley et al., 2025). Gaussian curves were fitted over the raw counts of the background stars, to find the times of overlap and the contribution that needs to be subtracted from the counts of the asteroid. The resulting flux and magnitude were calculated as described by Collins et al., (2017), to keep all results comparable.

Utilizing *SciPy*'s *curve_fit* routine (Virtanen et al., 2020), we created a model of the best night using a Fourier series, and shifted the remaining nights accordingly to create a self-consistent composite. Further, to find amplitudes, we created full Fourier models using the full composites, using the first three coefficients for Philippina and the first three even coefficients plus the first odd (added to better match the peak) for Libera. The composite lightcurves presented here are based upon the above referenced period values. We found an amplitude of 0.09 ± 0.05 mag for Philippina and 0.56 ± 0.05 mag for Libera.





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Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
631	Philippina	2025 09/16-10/17	9.4,15.5	339	19	5.899		0.56	0.05	N/A
771	Libera	2025 09/19-10/17	*10.5, 6.4	14	9	5.892		0.09	0.05	N/A

Table I. Observing circumstances and results. The phase angle is given for the first and last dates. If preceded by an asterisk, the phase angle reached an extremum during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range.

PHOTOMETRIC OBSERVATIONS OF ASTEROIDS (2345) FUCIK, (3181) AHNERT AND (34704) 2001 OS80

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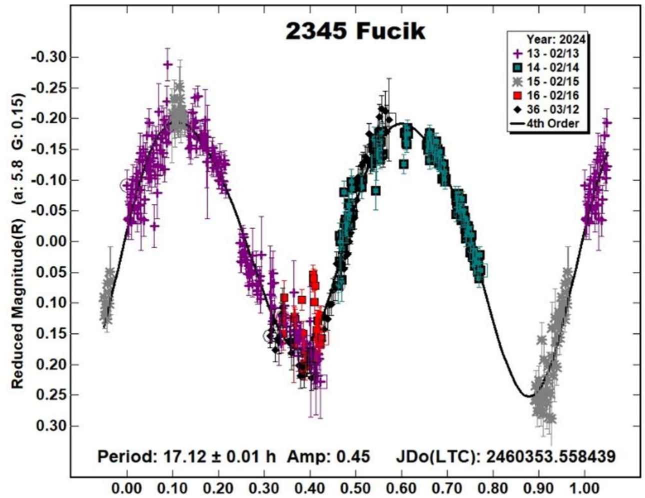
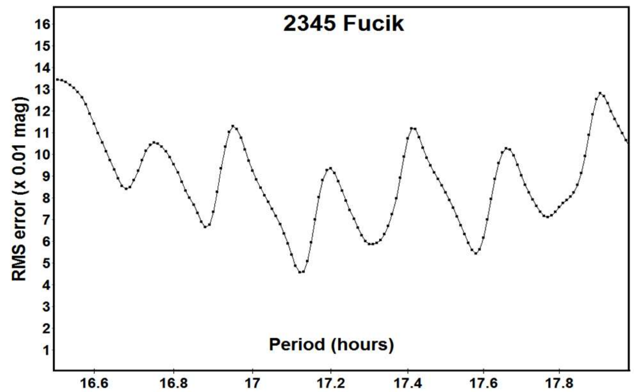
We present lightcurves for asteroids 2345 Fucik, 3181 Ahnert, and (34704) 2001 OS80 obtained during February and March 2024 using the Tonantzintla Schmidt Camera, located in Puebla, México. For 2345 Fucik, a period of 17.123 ± 0.002 h and an amplitude of 0.42 mag, consistent with previous studies, were obtained. A reliable period could not be estimated for 3181 Ahnert due to low photometric variability. For (34704) 2001 OS80, a rotation period of 3.004 ± 0.002 h and an amplitude of 0.21 mag were determined.

Asteroids 2345 Fucik, 3181 Ahnert and (34704) 2001 OS80 were chosen for observation as their rotation periods were either undefined or uncertain. The observations were conducted in February and March 2024 using the Tonantzintla Schmidt Camera, operated by the National Institute of Astrophysics, Optics and Electronics (INAOE). The Camera is equipped with an SBIG STF-8300 CCD with a 3326 × 2504 pixel array and configurable exposure times between 0.09 and 3600 s (SBIG, 2015). The resulting field of view is 28.8 × 22.0 arcmin and the image scale is 0.52 × 0.52 arcsec/pixel (Valdés et al., 2021). All observing runs were carried out using an R filter.

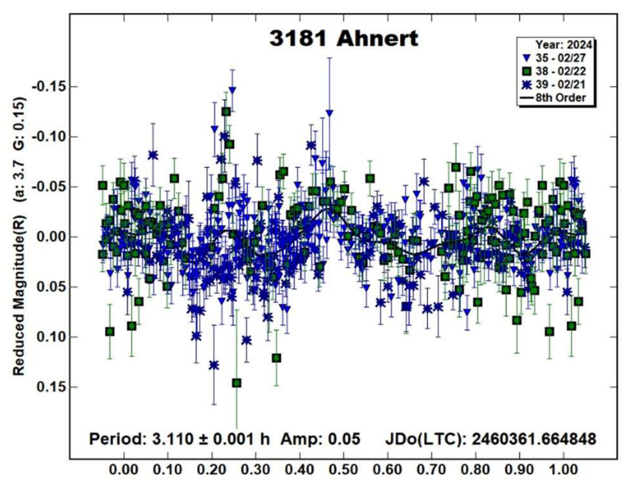
Data processing (bias, dark and flat field corrections) was done using PyRAF and the photometric analysis was made using *MPO Canopus*. The reported uncertainties correspond to a confidence level of 3σ. Lightcurves were fitted using Fourier analysis, following the method described by Harris et al. (2014).

2345 Fucik has previous determinations of its rotation period between 17.12 and 17.35 h (Brinsfield, 2008; Carbo et al., 2009). Analysis of the lightcurve obtained between February 13 and 16 and March 12, 2024, yielded a value of P = 17.12 ± 0.01 h and an amplitude of 0.45 mag. The period spectrum exhibits a pronounced global minimum below 17.12 h, with secondary minima at higher RMS values. This supports the adopted rotational period. This result is in agreement with that reported by Pál et al. (2020). Although the objective was to reduce the uncertainty in the determination of the period, the long period and instrumental limitations did not allow us to achieve a significant improvement with respect to previous results.



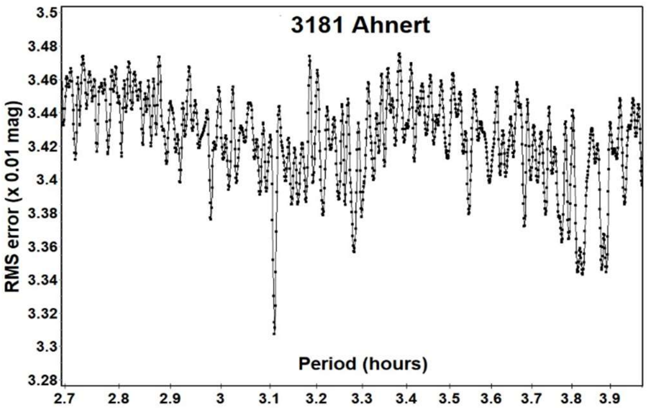


3181 Ahnert. A literature search yielded no previous reports. Observations made on February 21, 22, and 27, 2024, showed no significant variability. Analysis of the period spectrum suggests a possible fit around 3.110 h; however, the resulting lightcurve does not permit us to confirm this value, due to its very low amplitude. Consequently, a reliable period for this object is not reported.

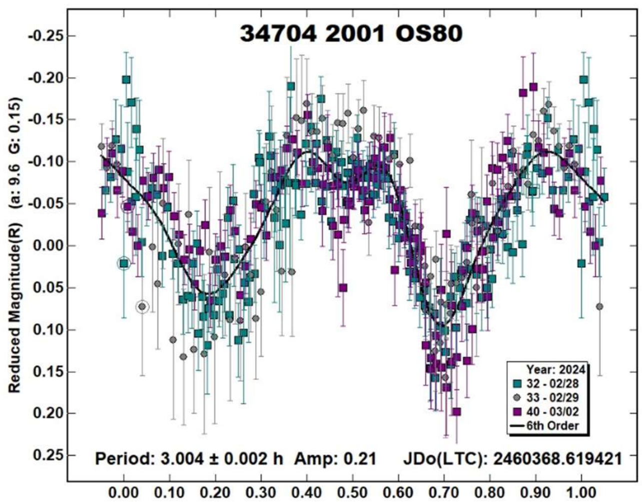


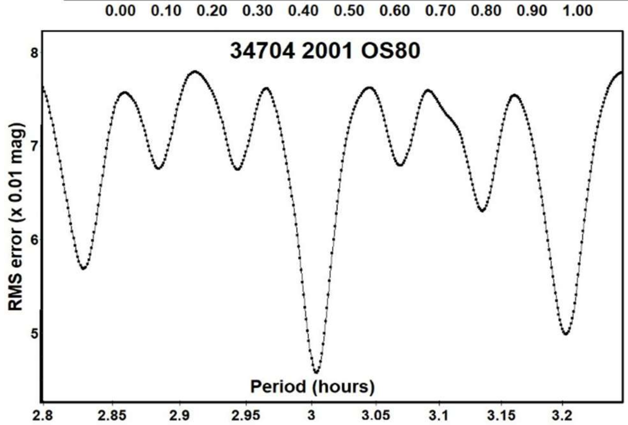
Number	Name	2024 mm/dd	Phase	L_{PAB}	B_{PAB}	Period (h)	P.E.	Amp	Grp
2345	Fucik	02/13-02/16	6.3- 7.5	128	-1	17.12	0.01	0.45	EOS
		03/12-03/12	15.3	129	-2				
34704	2001 OS80	02/28-03/02	10.1-11.3	144	-11	3.004	0.002	0.21	EUN

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range. P.E. is the Probable Error (or Associated Error) of the period and Grp is the asteroid family/group (Warner et al., 2009).



(34704) 2001 OS80. A search in the Asteroid Lightcurve Database (LCDB) and the literature yielded no previous photometric measurements for this object. Observations made on February 28 and 29, and March 3, 2024, resulted in a rotation period P = 3.004 ± 0.002 h and an amplitude of 0.21 mag. The corresponding period spectrum shows a well-defined global minimum at 3.00 h, with higher RMS values at nearby periods, supporting the adopted rotational period.





The data for the two asteroids for which we have been able to determine their periods are found in Table I.

Acknowledgements

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A COMPREHENSIVE PHOTOMETRIC STUDY OF 630 EUPHEMIA

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Based on 86 sessions 2026 Jan. 30 - March 26, we find for 630 Euphemia a synodic rotation period 387.2 ± 0.2 hours, amplitude 0.45 ± 0.05 magnitudes. The period, amplitude, and epoch of lightcurve maximum all agree with a posting on the DAMIT website. Data obtained on 2026 Feb. 18 show that B-V=0.83 ± 0.03 and V-R = 0.46 ± 0.03. At mid-light, H=11.25 ± 0.03 in the V band, G=0.25 ± 0.03.

As a summary of previous studies for 630 Euphemia, Warner (2005) published a period of 79.18 hours, amplitude 0.22 magnitudes, based on only 5 nights 2005 Apr. 1-9. A re-examination made in the year 2011 and including 7 nights of data 2005 April 1-12 suggested a period of 350 ± 50 hours, amplitude 0.4 magnitudes. Durech (2019) posted to the DAMIT website a lightcurve inversion model based entirely on sparse data from the Gaia DR2 and Lowell Observatory photometric databases. These show a sidereal rotational period of 386.98 hours, rotational pole at either longitude 2°, latitude 54°, or longitude 125°, latitude 71°.

Here we present new photometric lightcurves from 2026 Jan. 30 to March 26, many of them 7 to more than 10 hours. These provide a good fit (Fig. 1) to a slightly unsymmetric bimodal lightcurve with synodic period 387.2 ± 0.2 hours, amplitude 0.45 ± 0.05 magnitudes. This result is very close to the sidereal period published by Durech (2019) and within Warner's stated ± 50 hours error to his 350-hour period (Warner, 2011).

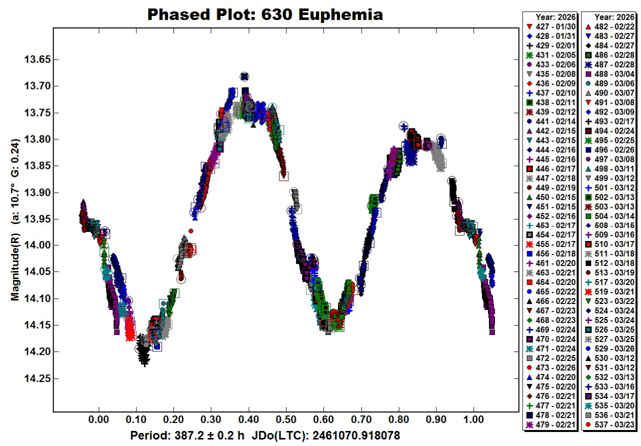

Figure 1. The lightcurve of 630 Euphemia phased to a period of 387.2 hours.

The DAMIT website has a provision that the *LI* model can be projected to any JD specified by the user. On 2026 Feb. 1, JD 2461073.0, the narrow side of the model is toward the Earth and the asteroid is observed at minimum light, as the model predicts. On 2006 Feb. 5, JD 2461077.0, the broad side of the model is toward the Earth and the asteroid is observed at brightest light, again as predicted. Furthermore, the difference between the maximum and minimum areas would predict a rotational amplitude close to the observed 0.45 magnitudes. The compatibility of rotation period, amplitude near 0.45 magnitudes predicted by the elongated shape model, and epochs of lightcurve extrema increase our confidence in the *LI* model including the two decimal places in its 386.98-hour period.

Here we also report multiband photometry, acquired by P. Bacci and M. Maestriprieri (104) on 2026 Feb. 18, allowing us to determine the color indices B-V = 0.83 ± 0.03 and V-R = 0.46 ± 0.03 (Fig. 2), consistent with a medium albedo asteroid (Shevchenko and Lupishko, 1998).

Number	Name	2026 mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
630	Euphemia	01/30-03/26	*10.4-18.2	148	14	387.2	0.2	0.45	0.05	MB-M

Table I. Observing circumstances and results. The first line gives the results for the primary of a binary system. The second line gives the orbital period of the satellite and the maximum attenuation. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).

Observatory (MPC code)	Telescope	CCD	Filter
Organ Mesa Observatory (G50)	0.35-m SCT f/10	SBIG STL-1001E	C
Observatorio Nuevos Horizontes (Z73)	0.28-m SCT f/10	ATIK 414	C
Astronomical Observatory, University of Siena (K54)	0.30-m MCT f/5.6	SBIG STL-6303e(bin 2x2)	C
GAMP (104)	0.60-m NRT f/4	Apogee Alta	B,V,R
Castelmartini Observatory (160)	0.25-m SCT f/6.3	CMOS ASI2600MM (bin 3x3)	C
Iota Scorpii(K78)	0.40-m RCT f/6.1	Player One 455M Pro (bin 4x4)	R
GiaGa Observatory (203)	0.36-m SCT f/5.8	Moravian G2-3200	R
Zen Observatory (M26)	0.30-m RCT f/7.4	Atik 383L+ (bin 2x2)	R
45th Parallel Observatory (D43)	0.25-m RCT f/5.6	IMX533 (bin 2x2)	C
ALMO Observatory (G18)	0.30-m NRT f/4.0	ZWO ASI533MM PRO	R
Monte Viseggi Observatory (126)	0.41-m RCT f/7.5	CMOS ZWO ASI 6200MM (bin 4x4)	R
HOB Astronomical Observatory (L63)	0.20-m SCT f/6	ATIK 383L+	C
Beppe Forti Astronomical Observatory (K83)	0.40-m RCT f/8	SBIG ALUMA (bin 2x2)	C

Table II. Observing Instrumentations. MCT: Maksutov-Cassegrain, NRT: Newtonian Reflector, RCT: Ritchey-Chretien, SCT: Schmidt-Cassegrain.

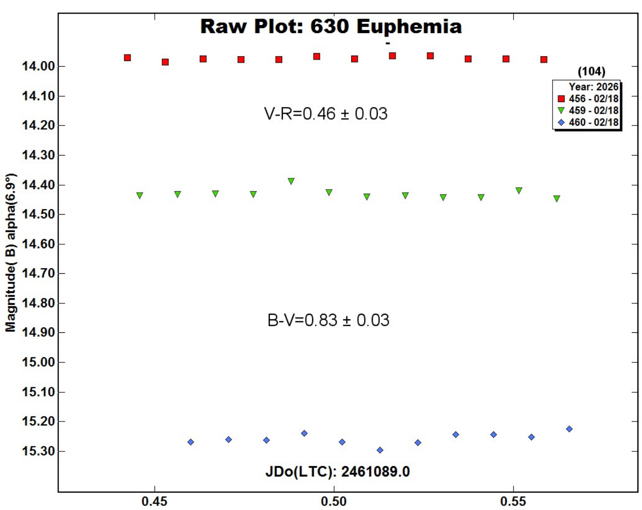

Figure 2. The magnitudes of 630 Euphemia in B, V, R filters with B-V and V-R color indices.

We also present a reflectance spectrum of 630 Euphemia (Fig. 3), retrieved from the Gaia ESA Archive (2025) and corrected for z-i parameter (Franco, 2025), is consistent with an S-type classification within the Bus-DeMeo taxonomy (DeMeo et al., 2009). This result aligns with the taxonomic attribution proposed by Franco (2025). Furthermore, the observed color indices agree with the reference values for S-type asteroids (Shevchenko and Lupishko, 1998, B-V = 0.86 ± 0.04, V-R = 0.49 ± 0.05).

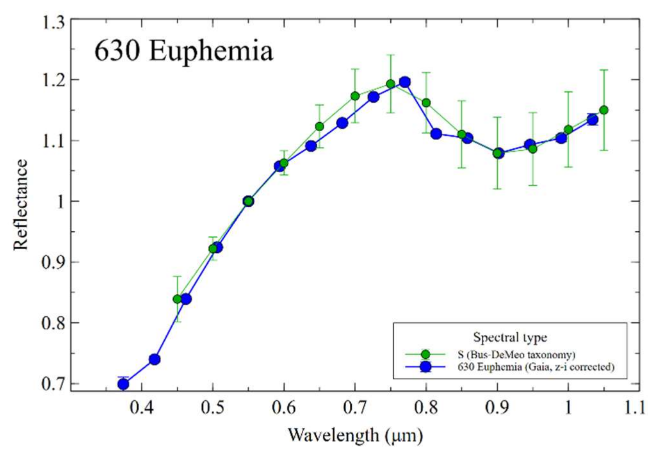

Figure 3. The reflectance spectrum for 630 Euphemia from Gaia DR3, corrected for z-i parameter (Franco, 2025), and compared with S-type taxonomy (DeMeo et al., 2009).

We further derived H-G parameters using the specific function implemented in *MPO Canopus*. For each session, the mean Julian Date (JD) and R-band magnitude were calculated; subsequently, the half peak-to-peak magnitude was evaluated using a 3rd-order Fourier model (Buchheim, 2011). Finally, magnitudes were converted to the V band by adding the V-R color index. We obtained (Fig. 4) H = 11.25 ± 0.03 and G = 0.25 ± 0.04, where the G value is consistent with an S-type asteroid (Shevchenko and Lupishko, 1998; G = 0.24 ± 0.01).

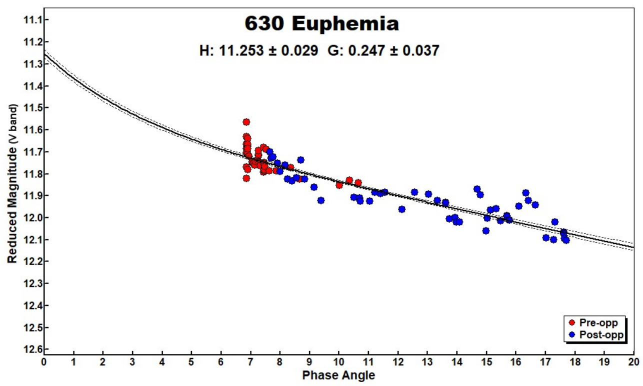

Figure 4. The H-G plot for 630 Euphemia at mid-light.

In conclusion, we find for 630 Euphemia at its early 2026 opposition a synodic rotation period of 387.2 ± 0.2 hours, amplitude 0.45 ± 0.05 magnitudes. The observed period, dates of lightcurve maxima and minima, and amplitude are all predicted by the *LI* inversion model (Durech, 2019) which finds a sidereal rotation period 386.98 hours, and provides confidence that the *LI* model is correct.

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PHOTOMETRIC OBSERVATIONS OF ASTEROIDS 1090 SUMIDA, 1825 KLARE AND 1884 SKIP

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Photometric observations of three main-belt asteroids were conducted to verify or determine their synodic rotation periods. For 1090 Sumida, we found $P = 2.720 \pm 0.001$ h with $A = 0.16 \pm 0.02$ mag. For 1825 Klare, we found $P = 4.742 \pm 0.001$ h with $A = 0.64 \pm 0.02$ mag. For 1884 Skip, we found $P = 2.894 \pm 0.001$ h with $A = 0.19 \pm 0.03$ mag.

CCD photometric observations of three main-belt asteroids were carried out in 2026 January-March at the Astronomical Observatory of the University of Siena (K54). We used a 0.30-m *f*/5.6 Maksutov-Cassegrain telescope, SBIG STL-6303E NABG CCD camera; the pixel scale was 2.30 arcsec when binned at 2×2 pixels. We used a Clear filter and 300 seconds of exposure time.

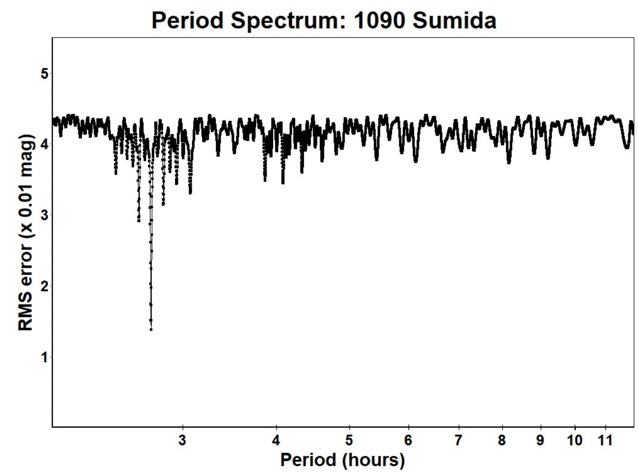
Data processing and analysis were done with *MPO Canopus* (Warner, 2018). All images were calibrated with dark and flat-field frames and the instrumental magnitudes converted to R magnitudes using solar-coloured field stars from a version of the CMC-15 catalogue distributed with *MPO Canopus*. Table I shows the observing circumstances and results.

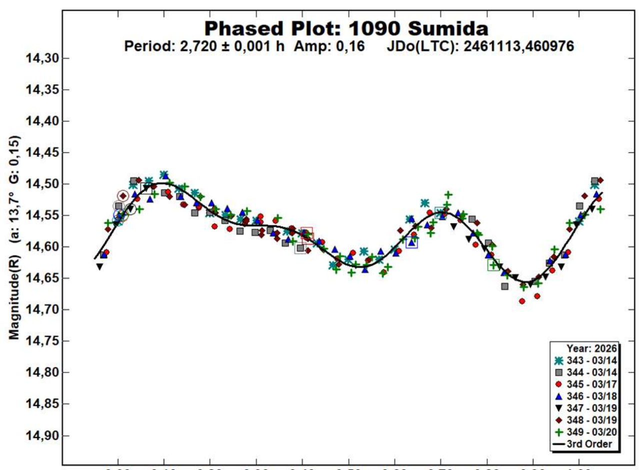
<u>1090 Sumida (1928 DG)</u> was discovered on 1928 February 20 by O. Oikawa at Tokyo. It is an inner main-belt asteroid of the Phocaea class with a semi-major axis of 2.359 AU, eccentricity 0.221, inclination 21.543°, and an orbital period of 3.62 years. Its absolute magnitude is H = 12.44 (JPL, 2026). The NEOWISE satellite infrared radiometry survey (Mainzer et al., 2016) found a diameter $D = 12.977 \pm 0.438$ km using an absolute magnitude $H = 12.49$ and a geometric albedo of $p_V = 0.106$. Based on the reflectance spectra available in GAIA DR3 (Franco, 2025; 2026), Lorenzo Franco derived the taxonomic class C for 1090 Sumida, and found a diameter $D = 19.9$ km using an absolute magnitude $H = 12.22$ and a geometric albedo of $p_V = 0.058$.

Observations were conducted over four nights and collected 188 data points. The period analysis shows a rotational period of $P = 2.720 \pm 0.001$ h with an amplitude $A = 0.16 \pm 0.02$ mag, in good agreement with the previously results published in the asteroid lightcurve database (LCDB; Warner et al., 2009; Behrend, 2004web; 2015web; 2022web; Blake and Himeno, 2018; Farfan et al., 2022; Lang, 2017; Pravec et al., 2012web; Skiff et al., 2019; Warner and Megna, 2012; Wisniewski, 1991).

Number	Name	2026/mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1090	Sumida	03/13-03/20	13.7,12.7	186	18	2.720	0.001	0.16	0.02	MB-I
1825	Klare	01/16-01/22	*1.8, 1.1	120	-1	4.742	0.001	0.64	0.02	MB-M
1884	Skip	02/17-02/22	11.5, 8.9	164	8	2.894	0.001	0.19	0.03	MB-I

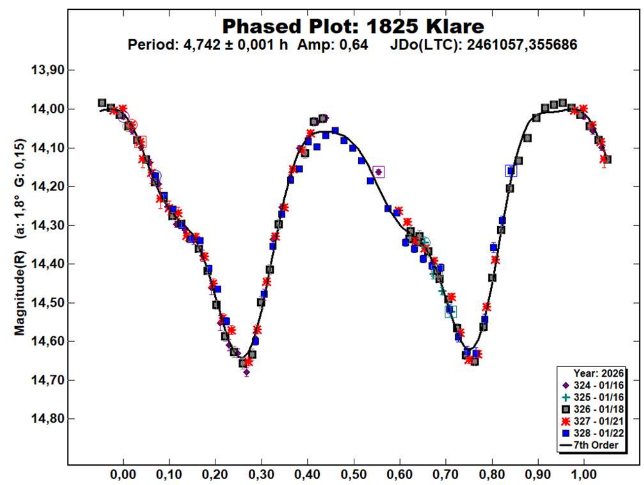
Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extremum during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).





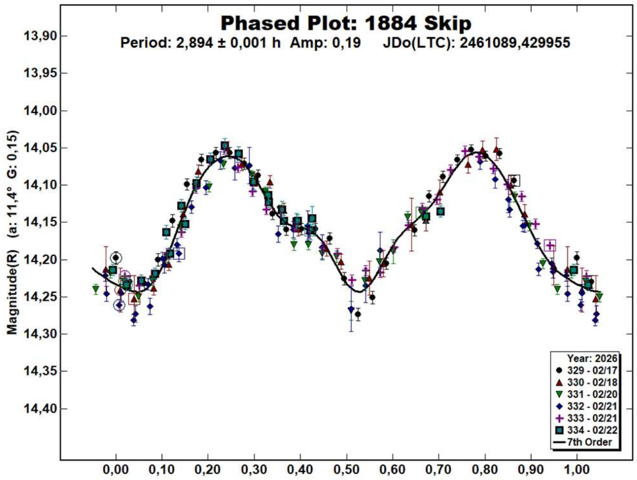
1825 Klare (1954 QH) was discovered at Heidelberg on 1954 August 31 by K. Reinmuth and named in honor of Gerhard Klare, an observing astronomer at Heidelberg-Königstuhl Observatory since 1960, whose fields of interest include minor planets. It is a middle main-belt asteroid with a semi-major axis of 2.678 AU, eccentricity 0.117, inclination 4.044°, and an orbital period of 4.38 years. Its absolute magnitude is H = 11.83 (JPL, 2026). Based on the reflectance spectra available in GAIA DR3 (Franco, 2025; 2026), Lorenzo Franco derived its taxonomic class as L, and found a diameter D = 17.4 km using an absolute magnitude H = 11.63 and a geometric albedo of p_V = 0.129.

Observations were conducted over three nights collecting 145 data points. The period analysis shows a rotational period of P = 4.742 ± 0.001 h with amplitude A = 0.64 ± 0.02 mag, in perfect agreement with those published in the LCDB (Behrend, 2007web; 2020web; Clark, 2006; Ďurech et al., 2016; Galad, 2008; Hamanowa and Hamanowa, 2011web; Hanuš et al., 2016; Krueng and Clark, 2014; Martikainen et al., 2021; Pray, 2004).



1884 Skip (1943 EB1) was discovered at Nice on 1943 March 02 by M. Laugier and named in honor of Gunther (Skip) Schwartz, manager of and observer at Harvard Observatory Agasxiz Station, previously field manager of various other Harvard and Smithsonian optical and radio observing stations and best known for his role in the recovery of the Lost City meteorite in 1970. It is an inner main-belt asteroid with a semi-major axis of 2.425 AU, eccentricity 0.262, inclination 21.853°, and an orbital period of 3.78 years. Its absolute magnitude is H = 12.24 (JPL, 2026). The NEOWISE satellite infrared radiometry survey (Mainzer et al., 2016) found a diameter D = 8.416 ± 0.394 km using an absolute magnitude H = 12.10 and a geometric albedo of p_V = 0.360. Based on the reflectance spectra available in GAIA DR3 (Franco, 2025; 2026), Lorenzo Franco derived its taxonomic class as S, and found a diameter D = 10.7 km using an absolute magnitude H = 12.03 and a geometric albedo of p_V = 0.241.

Observations were conducted over three nights collecting 168 data points. The period analysis shows a rotational period of P = 2.894 ± 0.001 h with amplitude A = 0.19 ± 0.03 mag, in good agreement with those published in the LCDB (Behrend, 2017web; Benishek and Rowe, 2018; Benishek, 2022; Ďurech et al., 2020; Skiff et al., 2019).



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PHOTOMETRIC OBSERVATIONS OF 1929 KOLLAA, 9356 ELINEKE, (27185) 1999 CH37, (47369) 1999 XA88

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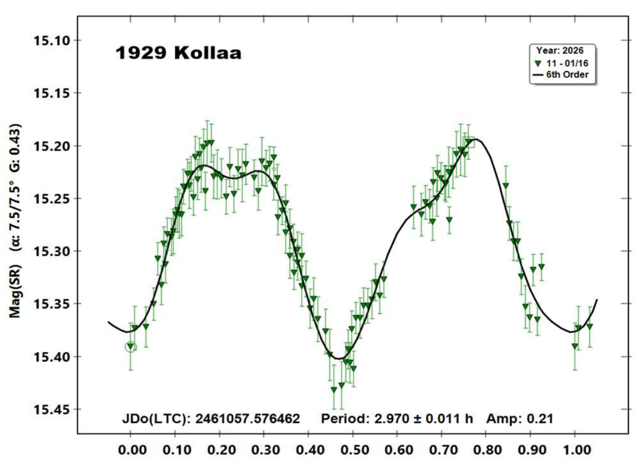
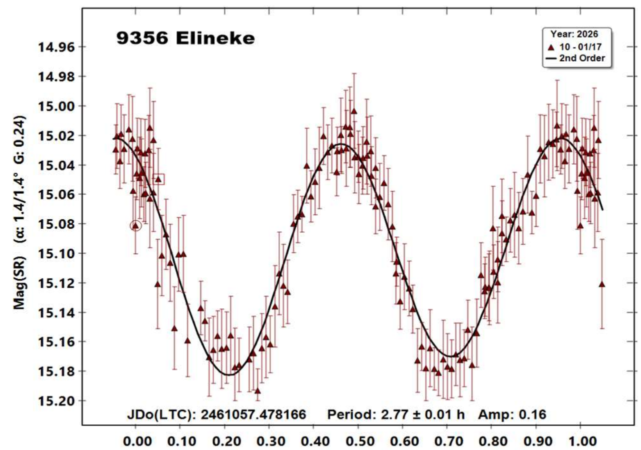
Photometric observations of two Vesta family members [1929 Kollaa and (47369) 1999 XA88], Eunomia family member 9356 Elineke, and outer main-belt asteroid (27185) 1999 CH37 were obtained to verify their synodic rotation periods. We found: 1929 Kollaa P = 2.970 ± 0.011 h with A = 0.21 ± 0.02 mag; 9356 Elineke P = 2.77 ± 0.01 h with A = 0.16 ± 0.02 mag; (27185) 1999 CH37 P = 3.178 ± 0.027 h with A = 0.20 ± 0.04 mag; (47369) 1999 XA88 P = 2.56 ± 0.03 h with A = 0.24 ± 0.05 mag.

Photometric observations were obtained with the 1-m Jacobus Kapteyn Telescope of the Southeastern Association for Research in Astronomy (SARA) consortium at the Roque de los Muchachos Observatory on the island of La Palma, Spain. The telescope is coupled with an Andor iKon-L series CCD, and a SDSS R filter was used for all images. A detailed description of the instrumentation and setup can be found in Keel et al. (2017). Images were calibrated with dark and flat frames and converted to standard magnitudes using solar colored field stars from the ATLAS All-Sky Stellar Reference Catalogue, distributed with *MPO Canopus* (Warner, 2025). All new data for these asteroids can be found in the Asteroid Lightcurve Data Exchange Format (ALCDEF) database.

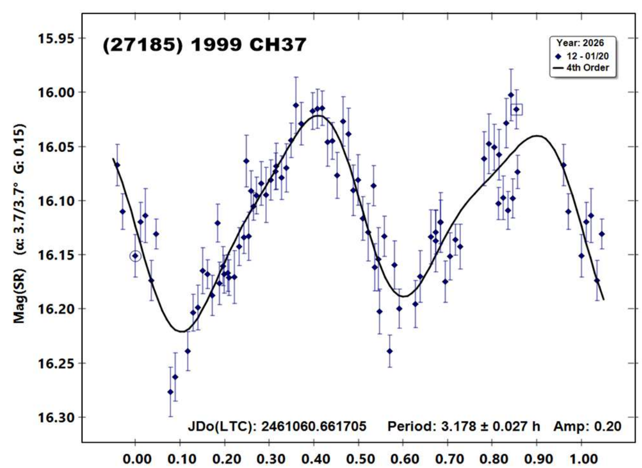
1929 Kollaa is a member of the Vesta family (Nesvorný et al., 2015). The asteroid was observed on a single night over a period of 5 hours – covering almost two full rotations – with 106 total observations. The lightcurve database (LCDB, Warner et al., 2009) lists a period of 2.9887 h. This current work derived a rotational period of 2.970 ± 0.011 h with an amplitude of 0.21 mag in agreement with the previously published results.



9356 Elineke is a member of the Eunamia family (Nesvorný et al., 2015). The asteroid was observed on a single night over a period of 5.5 hours – covering roughly two full rotations – with 131 total observations. Only two prior period determinations for this asteroid exist. Warner (2014) reported a period of 2.750 ± 0.005 h and Stephens and Warner (2022) reported a period of 2.76 ± 0.01 h. We derived a rotational period of 2.77 ± 0.01 h with an amplitude of 0.16 mag in agreement with the previously published results.



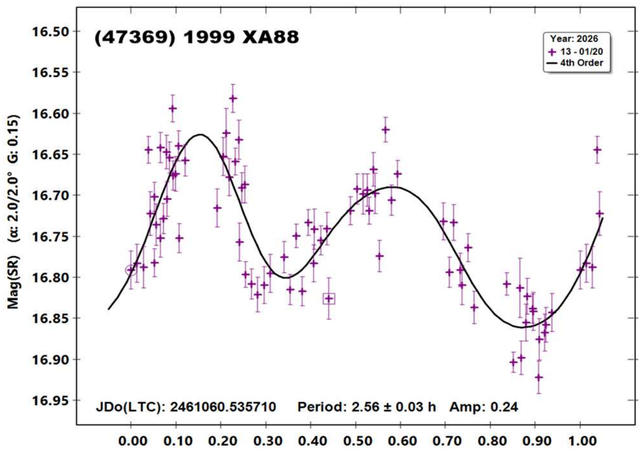
(27185) 1999 CH37 is an outer main-belt asteroid (Nesvorný et al., 2015). The asteroid was observed on a single night over a period of 6 hours – covering almost two full rotations – with 82 total observations. The observing conditions were less than ideal with high winds leading to poor seeing. The only previously reported rotational period is by Waszczak et al. (2015) based on a fit to sparse data. They reported a period of 3.155 ± 0.0003 h with an amplitude of 0.25 mag. We derived a rotational period of 3.178 ± 0.027 h with an amplitude of 0.20 mag in agreement with the previously published results.



(47369) 1999 XA88 is a member of the Vesta family (Nesvorný et al., 2015). The asteroid was observed on a single night over a period of 6.5 hours – covering more than two full rotations – with 76 total observations. The observing conditions were less than ideal with high winds leading to poor seeing. The only previously reported rotational period is by Chang et al. (2016) based on a fit to sparse data. They reported a period of 2.55 ± 0.06 h with an amplitude of 0.19 mag. We derived a rotational period of 2.56 ± 0.03 h with an amplitude of 0.24 mag in agreement with the previously published results.

Number	Name	yyyy	mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1929	Kollaa	2026	1/16	7.5	105.4	7.4	2.970	0.011	0.21	0.02	VES
9356	Elineke	2026	1/17	1.4	117.0	2.6	2.77	0.01	0.16	0.021	EUN
27185	1999 CH37	2026	1/20	3.7	116.1	-5.8	3.178	0.027	0.20	0.04	MB-O
47369	1999 XA88	2026	1/20	2.0	115.9	0.7	2.56	0.03	0.24	0.05	VES

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009): VES = Vesta, EUN = Eunomia, MB-O = outer Main Belt.



Acknowledgement

The authors would like to acknowledge partial support for this work from the University of Central Florida, Space Research Initiative Grant #110835.

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STUDY AND REVIEW OF LIGHTCURVES AND ROTATION PERIODS OF 14 ASTEROIDS

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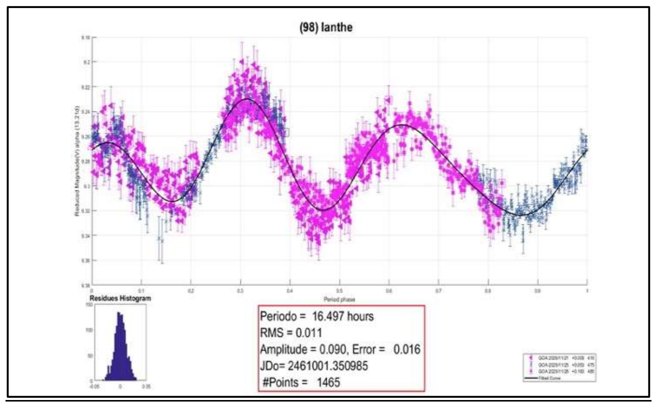
We present results of our investigation of lightcurves for the rotation periods of 14 asteroids, with new observations carried out by members of the Spanish Asteroid Observers Group over the months from 2024 November to 2026 March. The 14 asteroids studied and period results are: 98 Ianthe (16.497 h), 415 Palatia (20.728 h), 507 Laodica (4.707 h), 1005 Arago (8.789 h), 1148 Rarahu (6.540 h), 1499 Pori (3.350 h), 1541 Estonia (12.888 h), 2394 Nadeev (6.539 h), 2810 Lev Tolstoj (3.051 h), 3069 Heyrovsky (6.848 h), 3247 Di Martino (5.446 h), 8295 Toshifukushima (2.911 h), 10142 Sakka (3.347 h) and 14342 Iglika (3.988 h).

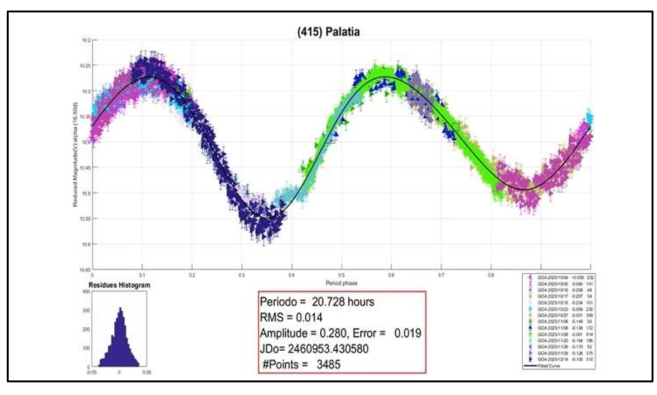
Here we report the results of the study and review of the lightcurves and rotation periods of 14 asteroids. The observations were carried out by several members of the Spanish Asteroid Observers Group (GOAS), using their own observatories and equipment, over the months from 2024 November to 2026 March. In many cases, we obtained results in good agreement with those previously published, while in some others we venture to propose results not previously reported in the usual literature, which we make available so that other observers may repeat the observations.

As on other occasions, the images obtained were calibrated in the conventional mode, without photometric filter, and with the application of darks, bias and flats. Data analysis and processing were performed using *FotoDif* (2021), *Tycho Tracker* (2023) and *Periodo*s (2020) software. In addition, all data were light-time corrected. The results are summarized below. Individual lightcurve plots along additional comments as required are also presented.

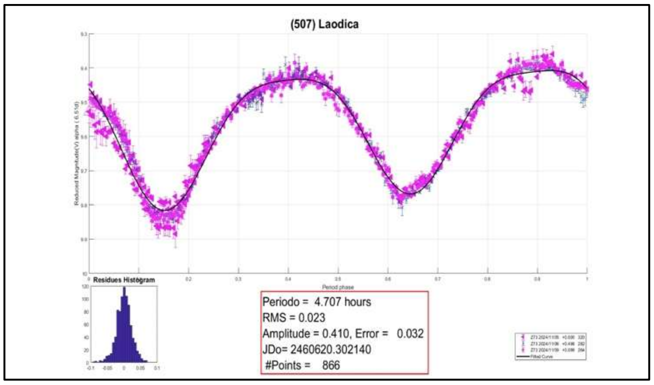
98 Ianthe. With a diameter slightly greater than 130 km, and belonging to the main belt, this asteroid has been extensively studied over the past several years. One of the most recent studies was conducted in 2022 from the Geneva Observatory (Behrend, 2022web), resulting in a rotation period of 16.479 hours. Our observations were carried out during 2025 November and the rotation period we obtained was very similar to the published value: $P = 16.497 \pm 0.011$ hours and amplitude $A = 0.09 \pm 0.02$.



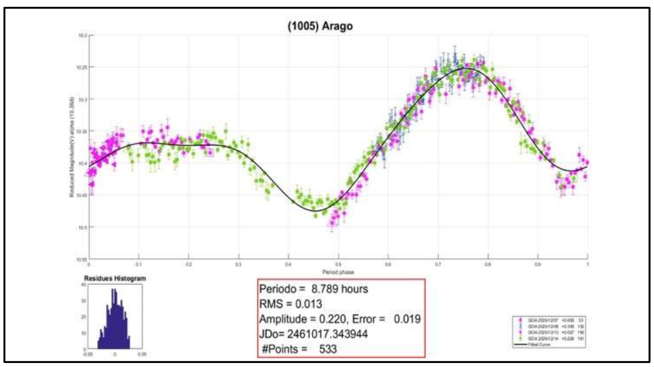
415 Palatia. We did not find many references to this asteroid in the literature. One of them dates back to 1998 (Slivan et. al., 1998). The rotation period reported there is approximately 20.73 hours. Our observational work took place from 2025 October to December, and the lightcurve obtained allowed us to derive a rotation period in very good agreement with the published value: $P = 20.728 \pm 0.014$ h and $A = 0.28 \pm 0.02$ mag.



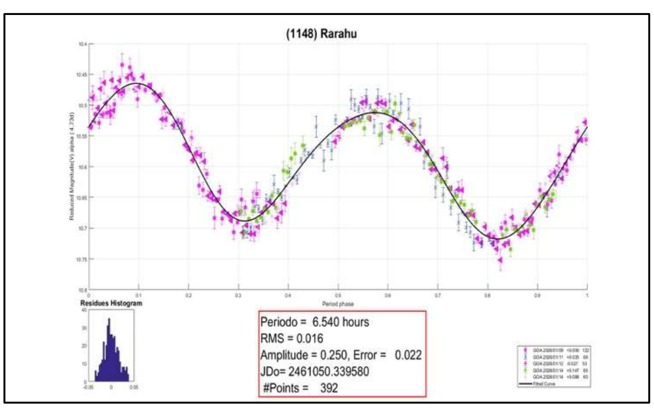
507 Laodica. One of the most recent observations of this asteroid that we found in the literature dates from 2020 (Durech et al., 2020). They report a rotation period that is very close to the one obtained by our group in 2024 November. $P = 4.707 \pm 0.023$ h and $A = 0.41 \pm 0.03$ mag.



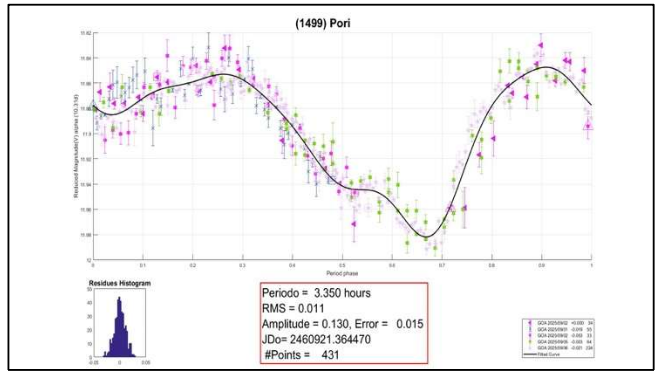
1005 Arago. One of the more recent observations of this asteroid was by Behrend (2019web). We considered it appropriate to review its lightcurve and the reported rotation period to verify whether or not those parameters remained consistent with the published values. We carried out this work during 2025 December. The data analysis we obtained did, indeed, come very close to those reported in the literature: *P* = 8.789 ± 0.013 h with *A* = 0.22 ± 0.02 mag.



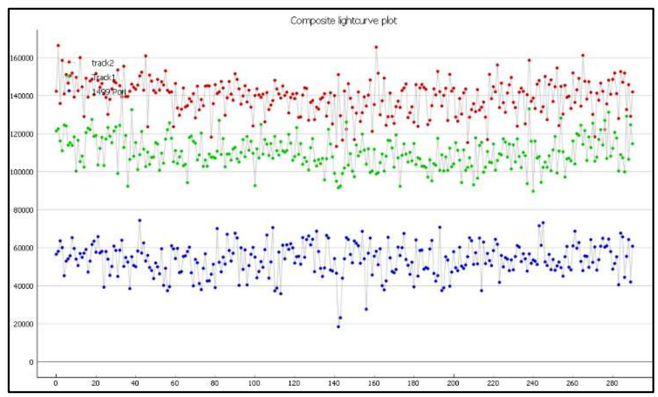
1148 Rarahu. Discovered in 1929 July and belonging to the main belt, this asteroid has been extensively studied in recent years, one of those times being by Martikainen et al. (2021). During 2026 January, our team decided to join the ongoing observational efforts with the aim of contributing to its lightcurve through our own work. The rotation period we obtained is similar to the published values. The lightcurve, comprised nearly 400 data points, has a period of *P* = 6.540 ± 0.016 h and *A* = 0.25 ± 0.02 mag.

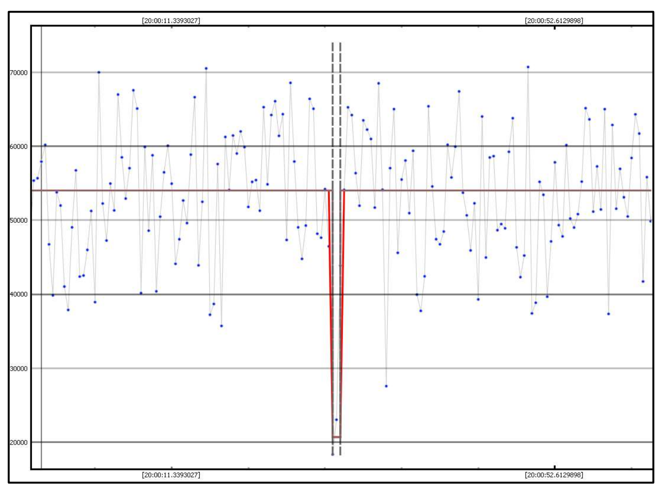


1499 Pori. During 2025 September, we decided to carry out follow-up observations of this main-belt asteroid. All the publications we consulted agree, within some variations, on the accepted rotation period. Our results are *P* = 3.350 ± 0.011 h and *A* = 0.14 ± 0.03 mag.

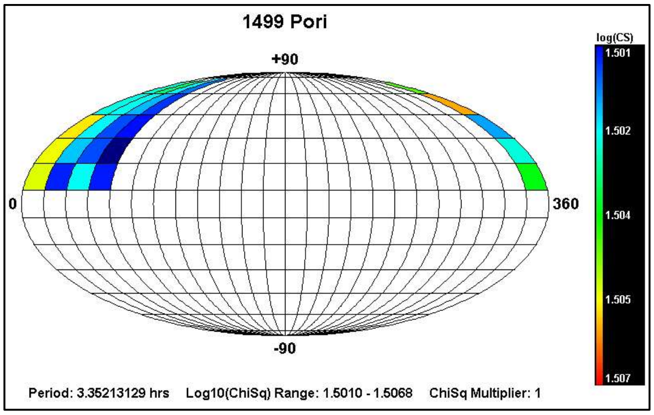


With these data, together with those available in the literature and the observation of the occultation of the star UCAC4 509-144877 by this asteroid on 2025 September 26, we were able to develop a proposed model.

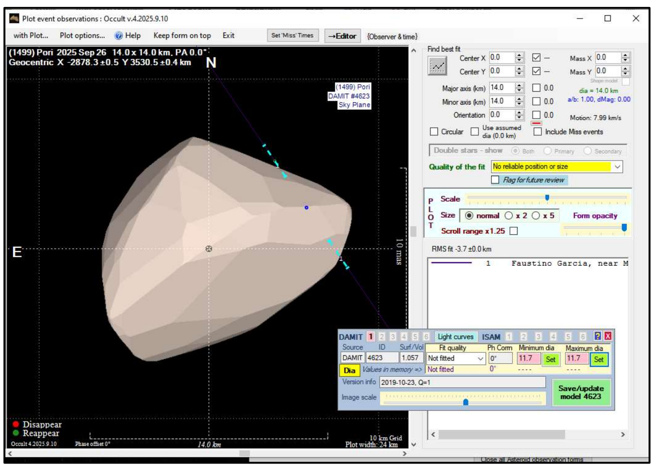




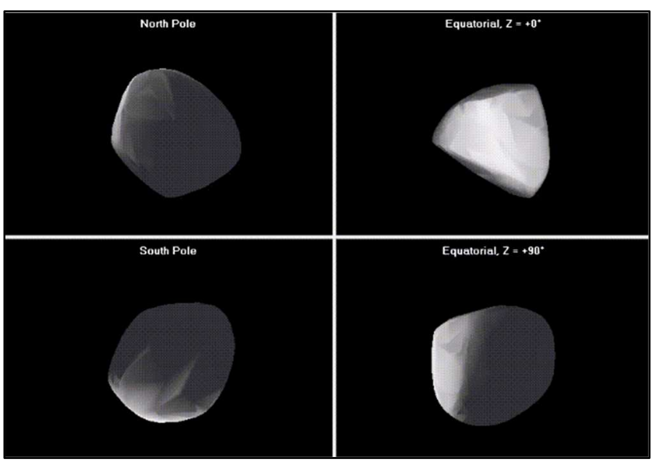
The model was computed using the *LCInvert* software package (Warner, 2016a), yielding results that are highly consistent with those published in DAMIT (Durech, 2025). We obtained a J2000 spin axis of λ = 14.965°, β = 46.929°, and $P_{sidereal}$ = 3.35213129 h.



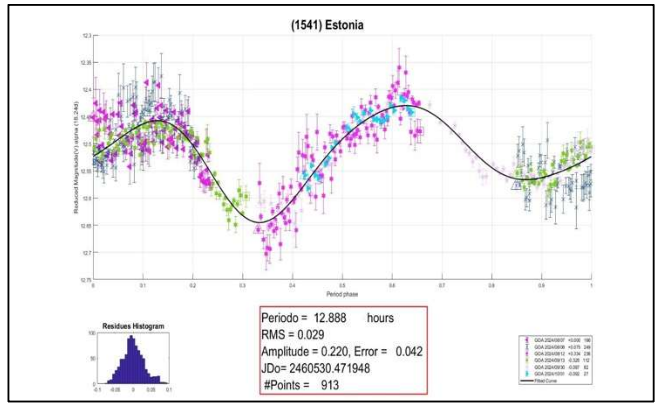
Depending on the displacement of Pori toward the west (W) or the east (E), two possible 3D model solutions are compatible with the recorded occultation. However, no additional occultations have been recorded that would allow us to determine which solution is correct.



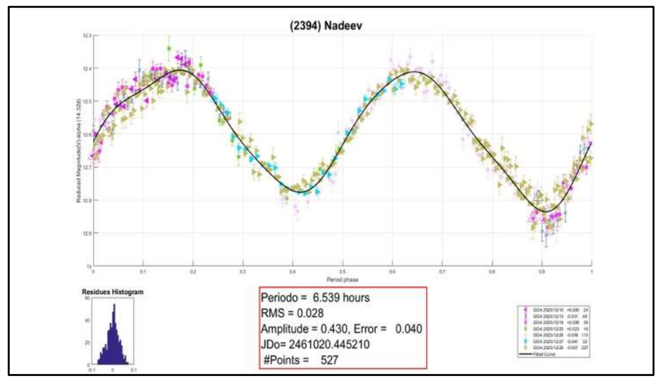
Our proposed 3D model for this asteroid is as follows:



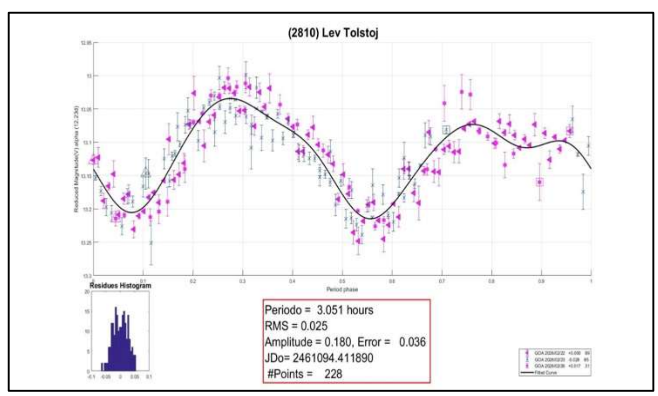
1541 Estonia. One of the more recent references we found about this asteroid is from Pilcher and Dose (2022). Our team observed it in the autumn of 2024 and found a rotation period that does not differ significantly from the one published. We obtained $P = 12.888 \pm 0.029$ h with $A = 0.22 \pm 0.04$ mag.



2394 Nadeev. During 2016 December, over the course of seven nights, our team monitored the evolution of this asteroid in order to determine its rotation period and lightcurve. Teer (2021; 6.539 h). We found $P = 6.539 \pm 0.028$ h and $A = 0.43 \pm 0.04$ mag.



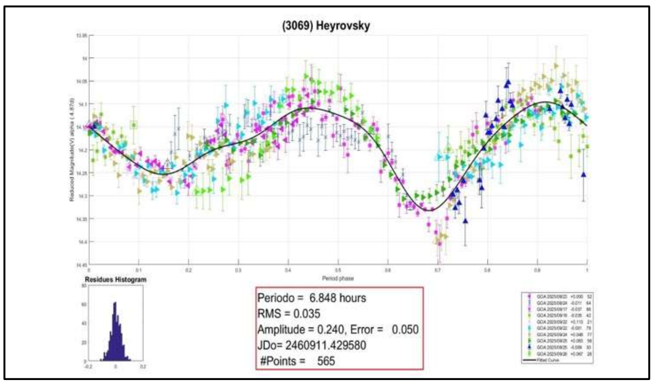
2810 Lev Tolstoj. Discovered in 1978 September and belonging to the main belt, we were unable to find any published data in the literature regarding its rotation period or lightcurve. Our team undertook its study from 2025 February into March. The results of our measurements were $P = 3.051 \pm 0.025$ h and $A = 0.18 \pm 0.03$ mag. We hope that more measurements can be carried out in the future to confirm or improve these results.



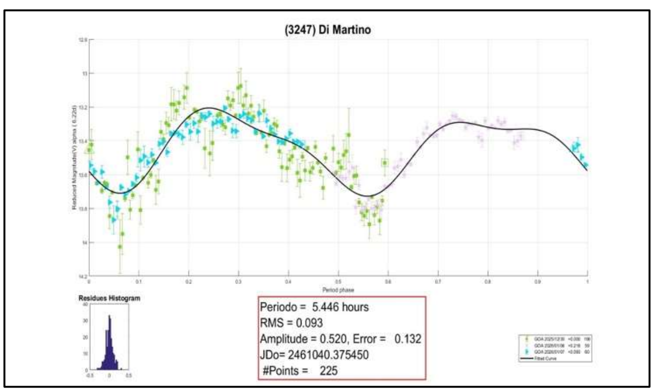
3069 Heyrovsky. Warner (2016b) found a low-precision period of 6.6 h. While higher-precision, the 6.846 h reported by Erasmus et al. (2020) is lower-rated in the LCDB. These uncertain results led our team to make observations in late summer of 2025. The resulting lightcurve allowed us to deduce a rotation period $P = 6.848 \pm 0.035$ h and $A = 0.24 \pm 0.05$ mag.

Number	Asteroid	2025 mm/dd	Phase	Period(h)	P.E.	Amp	A.E.
98	Ianthe	11/12-11/26	5.4-12.0	16.497	0.011	0.09	0.02
415	Palatia	10/04-12/14	16.5-22.3	20.728	0.014	0.28	0.02
507	Laodica	2024/11/05-11/09	16.9-16.5	4.707	0.023	0.41	0.03
1005	Arago	12/07-12/14	10.4-11.5	8.789	0.013	0.22	0.02
1148	Rarahu	01/09-01/14	4.8- 6.1	6.540	0.016	0.25	0.02
1499	Pori	09/02-09/05	10.1- 9.6	3.350	0.011	0.14	0.03
1541	Estonia	2024/08/16-2024/10/02	16.8- 2.0	12.888	0.029	0.22	0.04
2394	Nadeev	12/10-12/28	14.3- 7.3	6.539	0.028	0.43	0.04
2810	Lev Tolstoj	02/17-03/01	9.2-14.4	3.051	0.025	0.18	0.03
3069	Heyrovsky	08/23-09/26	4.9-22.9	6.848	0.035	0.24	0.05
3247	Di Martino	12/30-2026/01/07	6.0- 9.8	5.446	0.093	0.52	0.13
8295	Toshifukushima	01/16-02/21	18.5-12.5	2.911	0.044	0.32	0.06
10142	Sakka	11/30-12/25	4.1- 9.5	3.347	0.017	0.26	0.02
14342	Iglika	01/10-01/31	6.8- 2.5	3.988	0.043	0.67	0.06

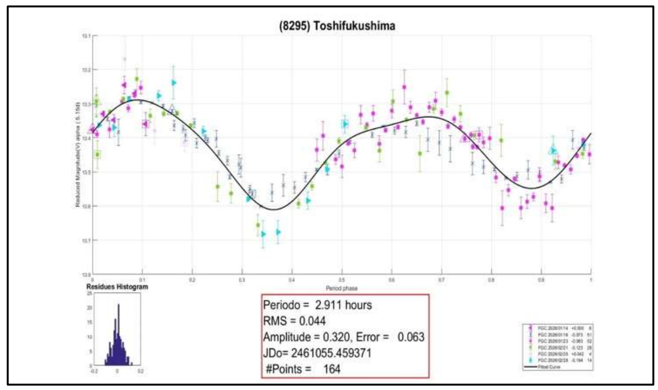
Table I. Observing circumstances and results. Phase is the solar phase angle given at the start and end of the date range. If preceded by an asterisk, the phase angle reached an extrema during the period.



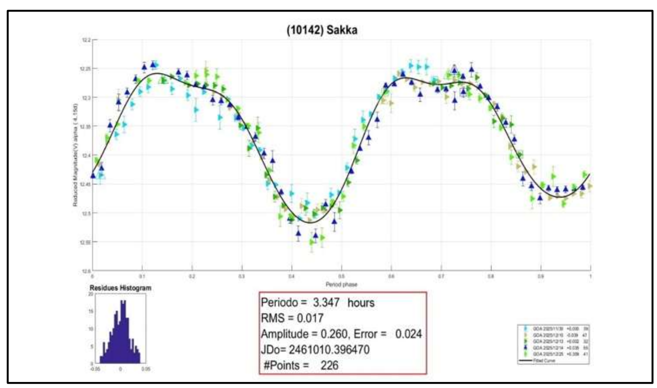
3247 Di Martino. Hanuš et al. (2016) reported a sidereal period of 5.44517 h derived from shape modeling. The result obtained by our team for the synodic rotation period largely agrees: P = 5.446 ± 0.093 h with A = 0.52 ± 0.13 nag.



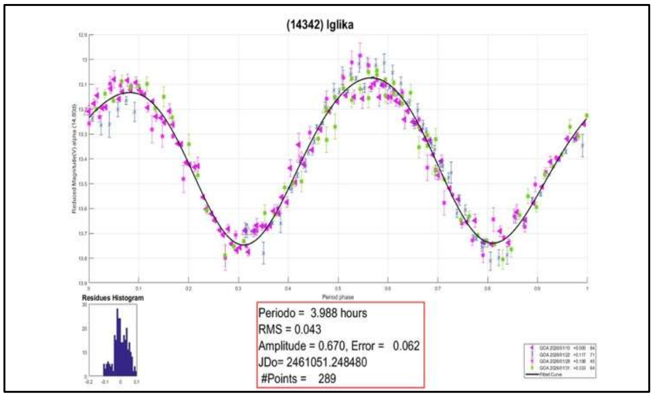
8295 Toshifukushima. The result of 2.88696 h by Pal et al. (2020) is listed as U = 2 in the LCDB (Warner et al., 2009). As such, additional observations are encouraged in order to confirm or refine the result. Throughout 2026 January and February, our team devoted several nights to observe the asteroid. The results allowed us to derive a rotation period somewhat different from Pal et al, i.e., P = 2.911 ± 0.044 h with A = 0.32 ± 0.06 mag.



10142 Sakka. Throughout most of 2025 December, our team devoted part of its observing nights to monitoring this main-belt asteroid. The results we obtained for its rotation period do not differ substantially from those previously published in the standard literature: P = 3.347 ± 0.017 h with A = 0.26 ± 0.02 mag.



14342 Iglika. We found few references to this asteroid in the literature. Durech et al. (2020) used the results of shape modeling found a sidereal period of 3.98726 h. The rotation period reported there does not differ substantially from our synodic period of P = 3.988 ± 0.043 h with A = 0.67 ± 0.06 mag.



Observer	Telescope	Camera
Botana Alba, Carlos (Y85)	Newton 8"	ZWO ASI183M Pro
De Elias Cantalapiedra, Javer (L46)	CDK 12.5"	QHY268m
Delgado Casal, Jesús (Z73)	SC 11”	Atik414ex m
Fernández Andújar, José M.(Z77)	SC 8”	Atik 460ex m
García de la Cuesta, Faustino (J38)	RCX 10”	SBIG ST8XE
González Farfán, Rafael (Z55)	SC 11”	Atik414ex m
Limón Martínez, Fernando (Z50)	SC 8”	ZWO ASI533MM Pro
Polancos Ruiz, Javier	Vixen ED103S	Atik 314L m
Reina Lorent, Esteban (232)	SC 10”	ZWO 294MM
Ruiz Fernández, Javier (J96)	RC 16”	ST8XME

Table II: Observers and equipment.

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PHOTOMETRY OF TWELVE MINOR PLANETS

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Photometric measurements were made for 12 asteroids, based on CCD observations made from 2025 November through 2026 February. Phased lightcurves were created for 10 of the asteroids. All the data have been submitted to the ALCDEF database.

CCD photometric observations of 12 main-belt asteroids were performed at Command Module Observatory (MPC V02) in Tempe, AZ. Images were taken at V02 using a 0.32-m f/6.7 Modified Dall-Kirkham telescope, QHY268M CMOS camera, and a 'clear' glass filter. Exposure time for the images was 2 minutes. The image scale after 2×2 binning was 0.74 arcsec/pixel. Table I shows the observing circumstances and results. All of the images of these asteroids were obtained between 2025 September and 2026 February.

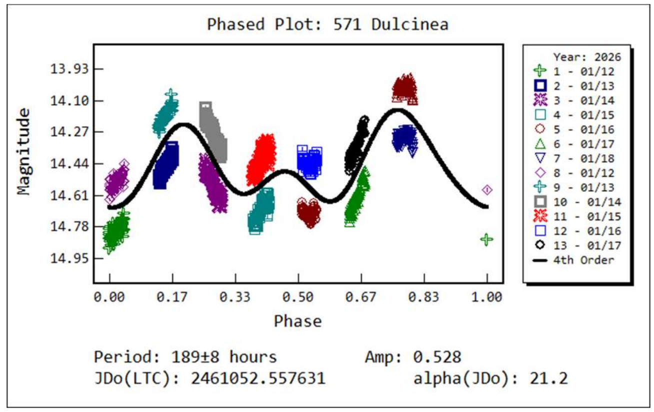
Images taken at V02 were calibrated using a dozen bias, dark, and flat frames. Flat-field images were made using an electroluminescent panel. Image calibration and alignment was performed using *MaxIm DL* (Diffraction Limited, 2026) software. The data reduction and period analysis were done using *Tycho* software (Parrott, 2025). In these fields, the asteroid and three to five comparison stars were measured. Comparison stars were selected with colors within the range of 0.5 < B-V < 0.95 to correspond with color ranges of asteroids. In order to reduce the internal scatter in the data, the brightest stars of appropriate color that had peak ADU counts below the range where chip response becomes nonlinear were selected. *Tycho* plots instrumental vs. catalog magnitudes for solar-colored stars, which is useful for selecting comp stars of suitable color and brightness.

The clear-filtered images were reduced to Sloan r´ to minimize error with respect to a color term. Comparison star magnitudes were obtained from the ATLAS catalog (Tonry et al., 2018), which is incorporated directly into *Tycho*. The ATLAS catalog derives Sloan griz magnitudes using a number of available catalogs. The consistency of the ATLAS comp star magnitudes and color-indices allowed the separate nightly runs to be linked often with no zero-point offset required or shifts of only a few hundredths of a magnitude in a series. Data reduction for V02 images used an 18-pixel (14 arcsec) diameter measuring aperture for asteroids and comp stars.

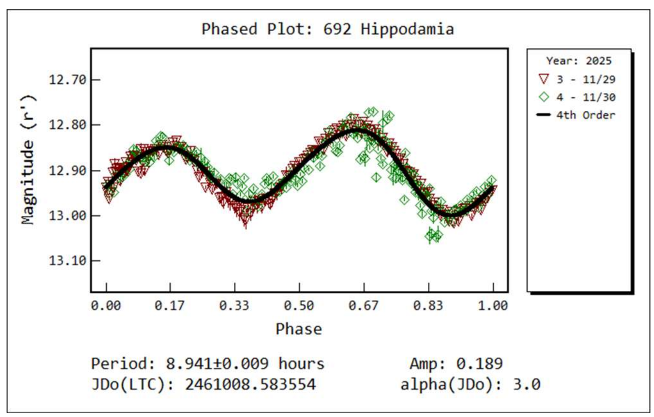
For the asteroids described here, the RMS scatter on the phased lightcurves is noted, which gives an indication of the overall data quality including errors from the calibration of the frames, measurement of the comp stars, the asteroid itself, and the period-fit. Period determination was done using the *Tycho* Fourier-type FALC fitting method (Harris et al., 1989). Magnitudes in these plots are apparent and scaled by *Tycho* to the first night.

The Asteroid Lightcurve Database (LCDB; Warner et al., 2009) was consulted to locate previously published results. All the new data for these asteroids can be found in the ALCDEF database.

<u>571 Dulcinea</u> was discovered by Paul Götz in 1905 at Heidelberg. It has an eccentric orbit, which brought it to a favorably close approach in early 2026. Stephens (2011) computed 126.3 ± 1.0 h. More recently, Pilcher et al. (2026) found a tumbling solution of 190 ± 1 h. During seven nights, 498 images were obtained to determine a similar synodic period of 189.5 ± 8 h, also showing tumbling. The lightcurve has an amplitude of 0.528 ± 0.14 mag.



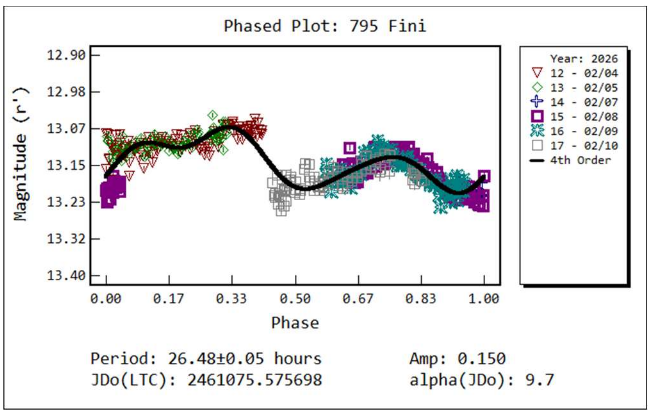
<u>692 Hippodamia</u>. Max Wolf discovered this asteroid at Heidelberg in 1901. Its strongly inclined orbit resulted in a favorable, northerly opposition in late 2025. The most recent of several closely agreeing period solutions belongs to Pal et al. (2020), who computed 8.99931 ± 0.00005 h. Two nights of observations with 400 images were sufficient to secure a phased lightcurve. The period solution is 8.941 ± 0.009 h, with an amplitude of 0.189 ± 0.020 mag.



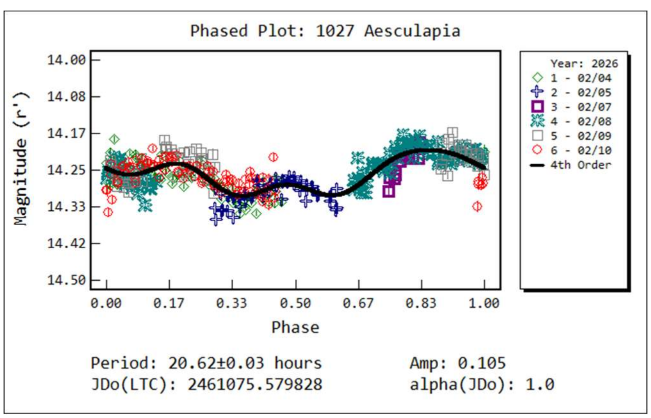
<u>795 Fini</u> was discovered in 1914 by Johann Palisa at Vienna. Many disagreeing period solutions exist for this asteroid. They include those by Warner (2011), 7.59 ± 0.02 h; Waszczak et al. (2015), 26.571 ± 0.056 h; Polakis (2022), 50.40 ± 0.20 h; and Colazo et al. (2023), 30.526 ± 0.008 h. During six nights, 505 images were taken, yielding a rotation period of 26.48 ± 0.05 h, in rough agreement with Waszczak et al. The amplitude of the lightcurve is 0.150 mag., with an RMS error of 0.025 mag.

Number	Name	yy/mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
571	Dulcinea	26/01/12-01/18	21.2,22.9	76	7	189	8	0.53	0.14	MB-I
692	Hippodamia	25/11/29-11/30	3.1, 2.8	72	5	8.941	0.009	0.19	0.02	MB-O
795	Fini	26/02/04-02/10	9.7,10.2	133	22	26.48	0.05	0.15	0.03	MB-O
1027	Aesculapia	26/02/04-02/10	1.0, 3.4	133	2	20.62	0.03	0.11	0.03	THM
1064	Aethusa	26/01/19-01/21	4.6, 4.0	129	-5	8.620	0.13	0.16	0.03	MB-I
1109	Tata	26/01/19-01/21	2.1, 1.6	125	-3	32.93	0.50	0.10	0.03	HYG
1269	Rollandia	26/01/12-01/18	7.0, 8.5	88	-2	59.85	0.29	0.08	0.03	MB-O
1390	Abastumani	26/01/12-01/16	12.6,13.4	72	18	13.16	0.01	0.36	0.03	MB-O
1646	Rosseland	26/01/19-01/21	5.0, 4.0	128	1	--	--	--	0.01	MB-I
1669	Dagmar	26/02/04-02/07	1.5, 0.5	138	1	--	--	--	0.08	THM
2859	Paganini	25/09/23-10/27	*9.2, 8.3	18	-3	47.05	0.03	0.18	0.03	MB-I
5153	Gierasch	26/01/17-01/18	6.4, 6.1	123	9	8.723	0.018	0.10	0.02	MB-M

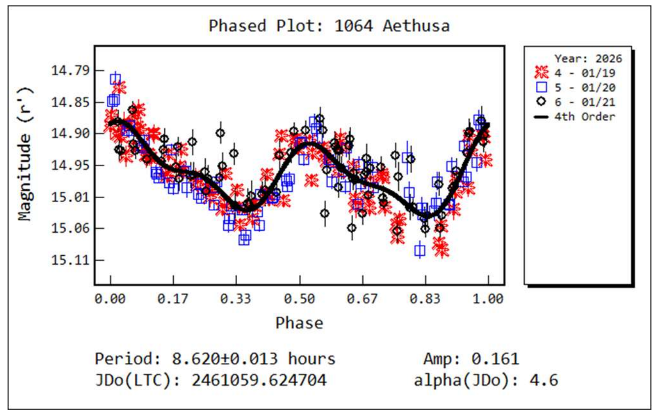
Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).



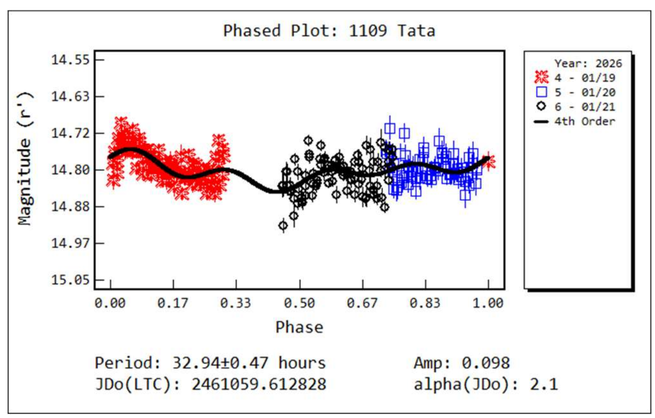
1027 Aesculapia is a Themis-family asteroid that was discovered by George Van Biesbroeck in 1921 at Williams Bay. Waszczak et al. (2015) computed a rotation period of 19.506 ± 0.150 h, and Hess et al. (2017) obtained 13.529 ± 0.042 h. Most recently, Polakis (2020a) published a period of 19.90 ± 0.06 h. A total of 416 data points obtained from six nights of observations were used, resulting in a period of 20.62 ± 0.03 h, in general agreement with published values. The amplitude of the lightcurve is 0.105 ± 0.025 mag.



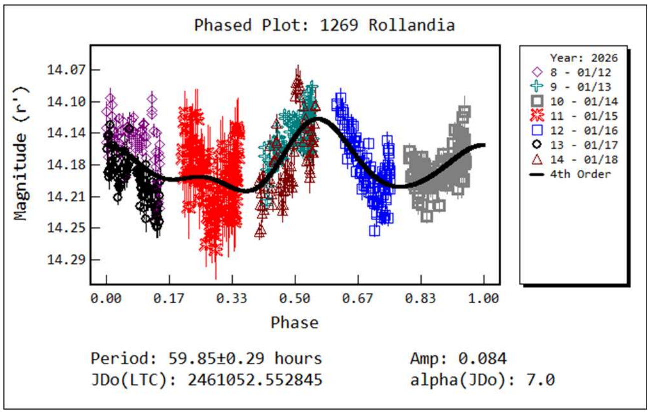
1064 Aethusa. This inner main-belt asteroid was discovered in 1926 at Heidelberg by Karl Reinmuth. The LCDB shows agreeing period solutions. Durech et al. (2020) published 8.61275 ± 0.00004 h, and Colazo et al. (2024) computed 8.612 ± 0.008 h. During three nights, 234 observations were made, producing a period solution of 8.620 ± 0.013 h, with an amplitude of 0.161 ± 0.032 mag.



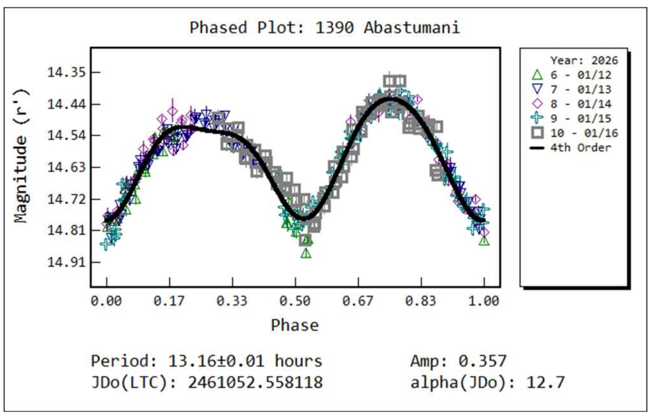
1109 Tata. Karl Reinmuth discovered this Hygenia-family asteroid from Heidelberg in 1929. Near the same opposition, Polakis (2024) computed a period of 33.14 ± 0.04 h, and Wiles (2024) calculated 33.03 ± 0.01 h. The asteroid was observed for three nights, and 264 images were gathered. The synodic rotation period is 32.93 ± 0.05 h, with an amplitude of 0.098 ± 0.032 mag.



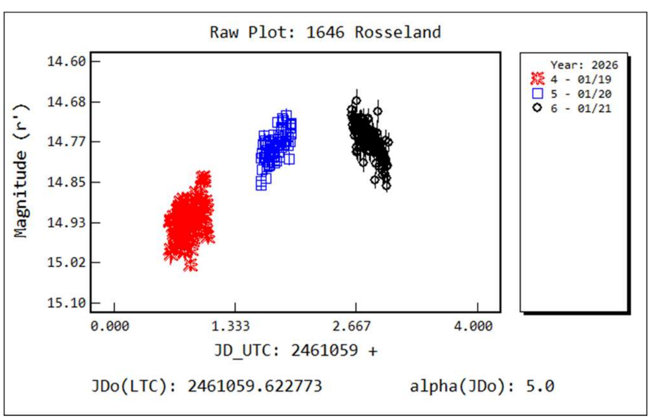
1269 Rollandia. Grigory Neujmin discovered this outer main-belt minor planet at Simeis in 1930. Determining a period solution has been problematic for a number of observers. Warner and Stephens (2019) published a rotation period of 17.12 ± 0.02 h, Polakis (2020b) computed 60.45 ± 0.07 h, and Colazo et al. (2023) showed 30.81 ± 0.01 h. A total of 598 data points from seven nights were used to acquire a period of 59.85 ± 0.29 h. The amplitude is only 0.084 mag, with an RMS scatter of 0.029 mag.



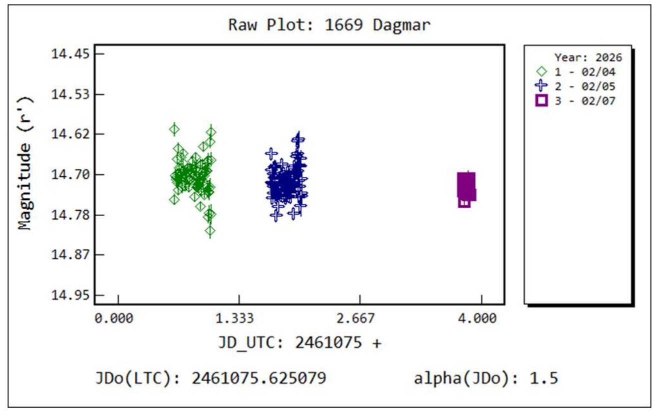
1390 Abastumani. This outer main-belt asteroid was discovered by Grigory Shajn at Simeis in 1935. Durech et al. (2019) published a synodic period of 13.16483 ± 0.00002 h. Observations were conducted at V02 for five nights, in which 311 images were obtained. Photometry resulted in a period of 13.16 ± 0.01 h, in agreement with Durech. The amplitude of the lightcurve is 0.357 mag, with an RMS error of 0.029 mag.



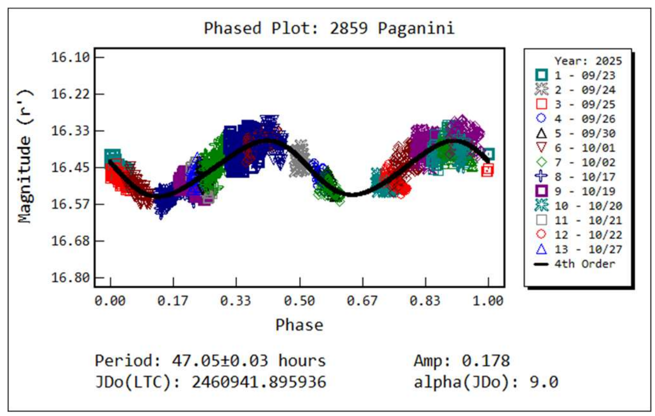
1646 Rosseland was discovered at Turku in 1939 by Yrjö Väisälä. Several period solutions in the LCDB agree, with the most recent being by Durech et al. (2020), who calculated 67.982 ± 0.003 h. The asteroid was observed on three nights, and 246 data points were acquired. A period solution was not found, so the raw lightcurve from the three nights is shown.



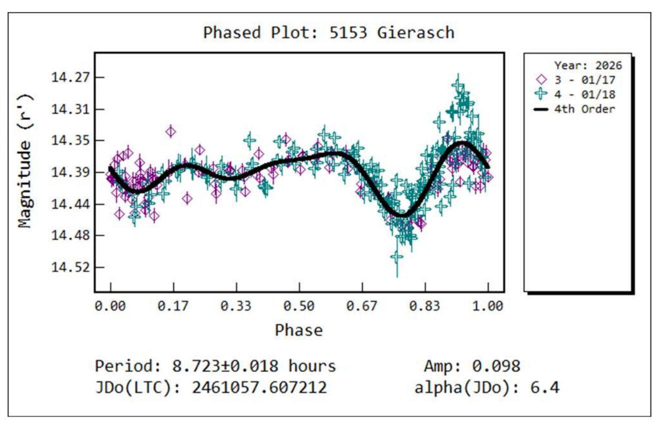
1669 Dagmar. Karl Reinmuth discovered this Themis-family asteroid at Heidelberg in 1934. No precise periods appear in the LCDB. It became apparent after three nights that a period solution would not be found from V02, so the raw lightcurve appears below.



2859 Paganini is an inner main-belt asteroid that was discovered by Lyudmila Chernykh at Nauchnyj in 1978. Behrend (2020web) determined a period of 4.5603 ± 0.0005 h. After 13 nights using 1489 images, a rotation period of 47.05 ± 0.03 h was computed. The amplitude of the lightcurve is 0.178 ± 0.032 mag.



5153 Gierasch. Yrjö Väisälä discovered this minor planet at Turku in 1940. Ruthruff (2013) published a period of 9.00 ± 0.01 h. During two nights, 284 images were taken. The resulting period is 8.723 ± 0.018 h, with an amplitude of 0.98 ± 0.022 mag.



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ASTEROID PHOTOMETRY FOR THIRTEEN MAIN BELT ASTEROIDS

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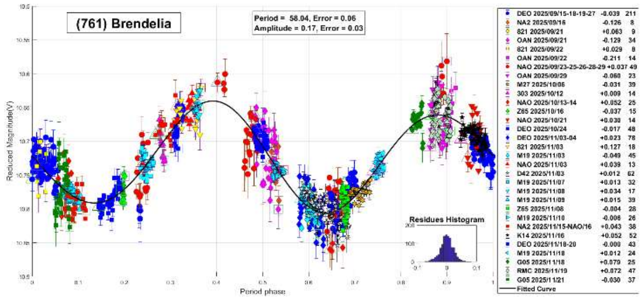
Synodic rotation periods and amplitudes are reported for: 761 Brendelia, 923 Herluga, 1118 Hanskya, 1549 Mikko, 1579 Herrick, 1586 Thiele, 1844 Susilva, 1912 Anubis, 2068 Dangreen, 2362 Mark Twain, 4382 Stravinsky, 6514 Torahiko, 8730 Iidesan.

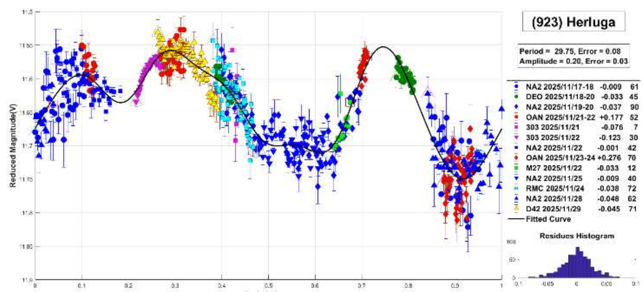
The periods and amplitudes of asteroid lightcurves presented in this paper are the product of collaborative work by the GORA (Grupo de Observadores de Rotaciones de Asteroides) group. In all the studies, we have applied relative photometry assigning V magnitudes to the calibration stars. The image acquisition was performed without filters and with exposure times of a few minutes. All images used were corrected using dark frames and, in some cases, bias and flat-field corrections were also used. Photometry measurements were performed using *FotoDif* software and for the analysis, we employed *Periodos* software (Mazzone, 2012).

Below, we present the results for each asteroid studied. The lightcurve figures contain the following information: the estimated period and period error and the estimated amplitude and amplitude error. In the reference boxes, the columns represent, respectively, the marker, observatory MPC code, or – failing that – the GORA internal code, session date, session offset, and several data points. Targets were selected based on the following criteria: 1) those asteroids with magnitudes accessible to the equipment of all participants, 2) those with favorable observation conditions from Argentina, Venezuela, Spain, Italy, or Croatia, i.e. with negative or positive declinations δ, and 3) objects with few periods reported in the literature and/or with Lightcurve Database (LCDB) (Warner et al., 2009) quality codes (U) of less than 3.

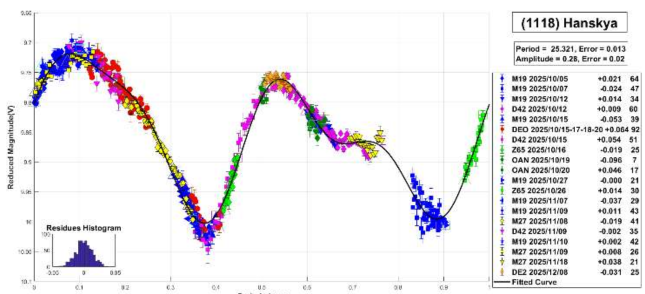
761 Brendelia: It is a binary main-belt asteroid discovered in 1913 by F. Kaiser, while its companion was identified in 2024 by GORA (Colazo et al., 2024). A previously reported rotation period for this asteroid is P = 57.96 h (Ďurech et al., 2018). During our observations in 2024, when the binarity was discovered, we measured a period of 57.98 h. In this work, we observed Brendelia again and determined a period of P = 58.04 ± 0.06 h, with an amplitude of Δm = 0.17 ± 0.03 mag.



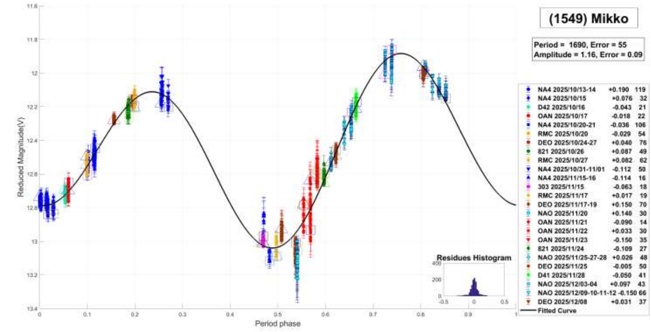
923 Herluga: This main-belt asteroid was discovered in 1919 by K. Reinmuth, with a diameter of 34.553 km. The reported rotation period for this asteroid is P = 30.61 h (Polakis, 2022). In this work, we propose a shorter period of P = 29.75 ± 0.08 h with Δm = 0.20 ± 0.03 mag.



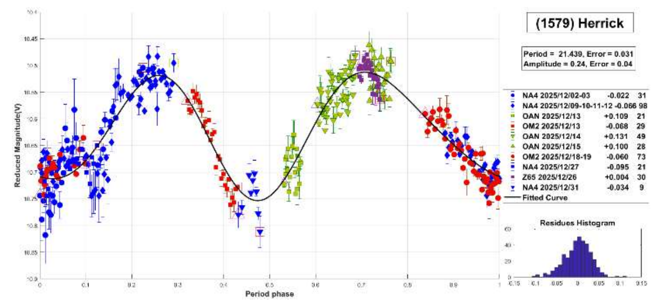
1118 Hanskya: It is an outer main-belt asteroid discovered in 1987 by S. Belyavskij and N. Ivanov, with an estimated diameter of 70.954 km. The most recent period published in the literature corresponds to P = 25.31 h (Dose, 2021). Our measured period P = 25.321 ± 0.013 h agrees with the one measured by Dose.



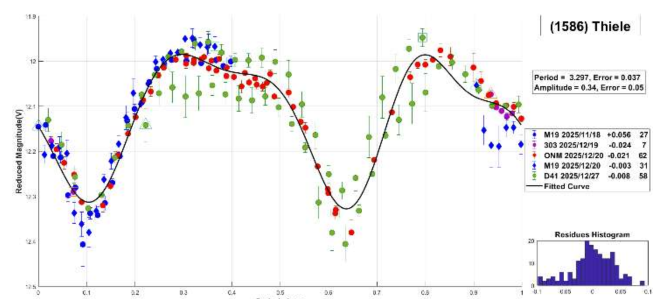
1549 Mikko: It is a main-belt asteroid with an estimated diameter of 10.376 km, discovered in 1937 by Y. Vaisala. Based on the SMASS II taxonomy (Xu et al., 1995; Bus and Binzel, 2002), it is classified as an S-type and belongs to the Flora family (Nesvorný et al., 2015). The reported rotation period for this asteroid is P = 8.74 h (Fauerbach, 2019). Our observations suggest a longer period, yielding a value of P = 1690 ± 55 h with Δm = 1.16 ± 0.09.



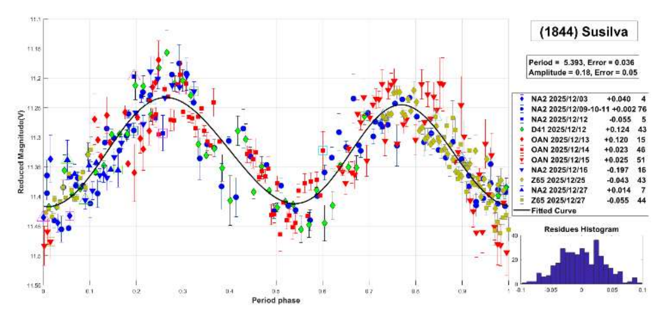
1579 Herrick: It is an outer main-belt asteroid with a diameter of 46.925 km, discovered in 1948 by S. Arend. The reported rotation period for this asteroid is 21.33 h (Polakis, 2020). We also measured a period of P = 21.439 ± 0.031 h, with Δm = 0.24 ± 0.04 mag.



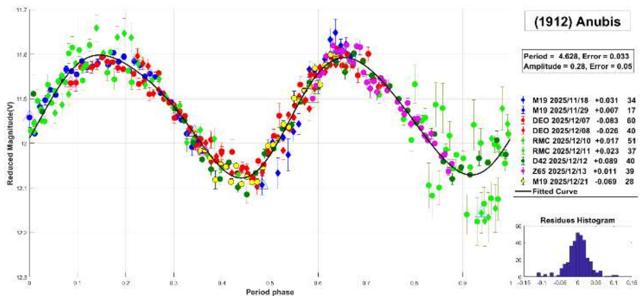
1586 Thiele: It is a main-belt asteroid discovered in 1939 by A. Wachmann and has an estimated diameter of 11.415 km. A rotation period of P = 3.086 h was previously reported for this asteroid (Childers and Church, 2007). Our results are consistent with this rotation period, giving a value of P = 3.297 ± 0.037 h.



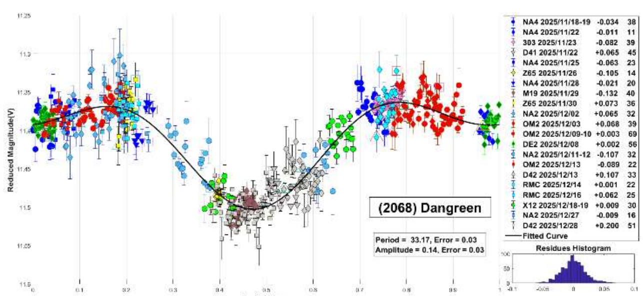
1844 Susilva: It is a main-belt asteroid discovered in 1972 by P. Wild. It is a member of the Eos family (Nesvorný et al., 2015), with a diameter of 26.8 km. A previously reported rotation period for this asteroid is P = 5.423 h (Polakis, 2021). In this work, we propose a period of P = 5.393 ± 0.036 h.



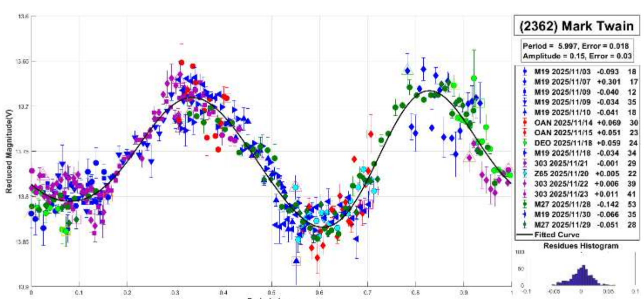
1912 Anubis: It is a main-belt asteroid discovered in 1960 by C.J. van Houten and I. van Houten-Groenveld. It is a member of the Koronis family (Nesvorný et al., 2015), with a diameter of 10.407 km. A previously reported rotation period for this asteroid is P = 4.626 h (Ďurech et al., 2019). In this work, we measured a period of P = 4.628 ± 0.033 h.



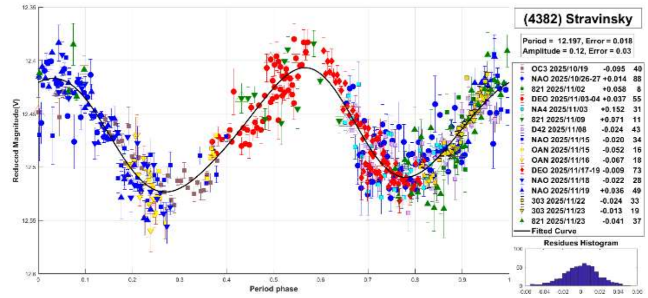
2068 Dangreen: It is a main-belt asteroid with an estimated diameter of 34.32 km. It was discovered in 1948 by M. Laugier. It is classified as a C-type asteroid according to the SDSS taxonomy (Hasselmann et al., 2012). We couldn't find a reported period for this object in the literature. We propose a period of 33.17 ± 0.03 h with Δm = 0.14 ± 0.03 mag.



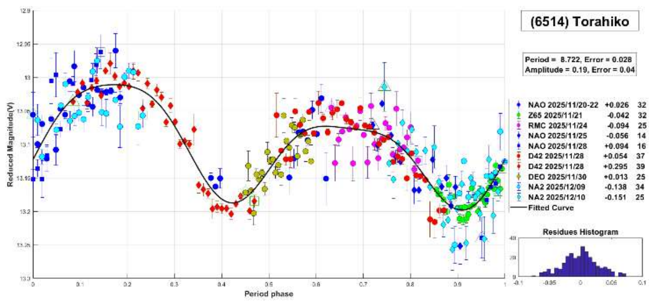
2362 Mark Twain: This is a main-belt asteroid, discovered in 1976 by N. Chernykh, with an estimated diameter of 4.331 km. For this asteroid, we could not find published periods in the literature, either. In this work, we propose a short period of P = 5.997 ± 0.018 h with Δm = 0.15 ± 0.03 mag.



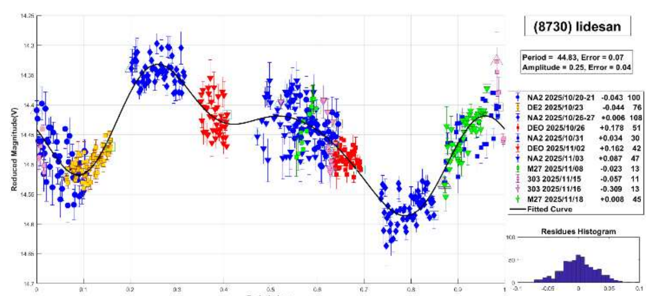
4382 Stravinsky: is a main-belt asteroid with a diameter of 8.746 km, discovered in 1989 by F. Borngen. It is classified as an Sa-type asteroid according to the SMASSII spectral type scheme (Xu et al., 1995; Bus and Binzel, 2002). For this asteroid, we couldn't find published periods in the literature either. Based on our observations and thorough analysis, we propose a period of P = 12.197 ± 0.018 h and Δm = 0.12 ± 0.03 mag.



6514 Torahiko: It is a main-belt asteroid with a diameter of 7.555 km, discovered in 1987 by T. Seki. The most recent period published in the literature corresponds to P = 8.7207 h (Pál et al., 2020). Our period P = 8.722 ± 0.028 h agrees with the one measured by Pal and collaborators.



8730 Iidesan: It is is a main-belt asteroid discovered in 1996 by T. Okviwith an estimated diameter of 3.443 km. It is a member of the Nysa-Polana family (Nesvorný et al., 2015). For this asteroid, we could not find any published rotation periods in the literature. In this work, we propose a long period of P = 44.83 ± 0.07 h with Δm = 0.25 ± 0.04 mag.



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We want to thank Julio Castellano as we used his *FotoDif* program for preliminary analyses, Fernando Mazzone for his *Periods* program, which was used in final analyses. We also used *Seqplot* (*https://www.aavso.org/seqplot*), which proved very effective for checking the magni-tudes of the calibration stars. This research has made use of the Small Bodies Data Ferret (*https://sbnapps.psi.edu/ferret/*), supported by the NASA Planetary System. This research has made use of data and/or services provided by the International Astronomical Union's Minor Planet Center.

Number	Name	yy/ mm/dd- yy/ mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
761	Brendelia	15/09/25-21/11/25	*19.5,01.7	54	1	58.04	0.06	0.17	0.03	Kor
923	Herluga	17/11/25-29/11/25	*8.4,09.4	59	-14	29.75	0.08	0.20	0.03	MB-M
1118	Hanskya	05/10/25-08/12/25	*9.5,13.5	34	16	25.321	0.013	0.28	0.02	2013
1549	Mikko	13/10/25-12/12/25	7.1,26.5	12	-6	1690	55	1.16	0.09	Flor
1579	Herrick	02/12/25-31/12/25	*10.5,04.3	96	-10	21.439	0.031	0.24	0.04	MB-O
1586	Thiele	18/11/25-28/12/25	22.6,08.5	110	-2	3.297	0.037	0.34	0.05	MB-I
1844	Susilva	03/12/25-27/12/25	*7.1,02.8	89	-3	5.393	0.036	0.18	0.05	Eos
1912	Anubis	18/11/25-21/12/25	*8.5,06.0	75	-0	4.628	0.033	0.28	0.05	Kor
2068	Dangreen	18/11/25-28/12/25	*7.1,13.0	67	-8	33.17	0.03	0.14	0.03	MB-O
2362	Mark Twain	03/11/25-30/11/25	*12.3,06.3	59	5	5.997	0.018	0.15	0.03	MB-I
4382	Stravinsky	19/10/25-23/11/25	*10.7,11.4	42	-9	12.197	0.018	0.12	0.03	MB-I
6514	Torahiko	20/11/25-10/12/25	1.2,11.8	57	-3	8.722	0.028	0.19	0.04	MB-M
8730	Iidesan	20/10/25-18/11/25	*4.1,14.1	33	1	44.83	0.07	0.25	0.04	Her

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extremum during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009). Kor: 158 Koronis, MB-M: main-belt middle, 2013 = 1118 Hanskya, Flor: 8 Flora, MB-O: main-belt outer, MB-I: main-belt inner, Eos: 221 Eos, Her: 135 Hertha.

Observatory	Telescope	Camera
303 Obs.Astr.Nacional Llano del Hato	Newtonian (D=1000mm; f=5.5)	CCD FLI PL4240
821 Est.Astrof.Bosque Alegre	Newtonian (D=1540mm; f=4.9)	CCD APOGEE Alta U9
D41 OsservatorioAstronomico di Orciatico	SCT (D=355mm; f=7.4)	CCD SBIG ST10XME
D42 OsservatorioAstronomico Piero Angela	SCT (D=300mm; f=6.2)	CMOS ToupTek 2600 KMA
G05 Obs.Astr.Giordano Bruno	SCT (D=203mm; f=6.3)	CCD Atik 420 m
K14 Obs.Astr.de Sencelles	Newtonian (D=250mm; f=4.0)	CCD SBIG ST-7XME
M19 Osservatorio Explorer	RCT (D=304 mm; f=6,5)	CMOS Player One-Poseidon
M27 Elijah Observatory	RCT (D250mm; f=8.0)	CCD QSI 683
Z65 Obs.Astr.Corgas	Newtonian (D=310mm; f=4.8)	CMOS ZWO ASI 294 MM
DEO Dark Energy Observatory	Refractor (D=115mm; f=7.0)	CMOS QHY 294M pro
DE2 Dark Energy Observatory 2	RCT (D=200mm; f=5.4)	CMOS Player One Ares-M
NAO Obs.Astr.Naos	Newtonian (D=250mm; f=4.0)	CMOS ZWO 183
NA2 Obs.Astr.Naos 2	Newtonian (D=200mm; f=5.0)	CMOS ZWO ASI 174
NA4 Obs.Astr.Naos 4	Newtonian (D=200mm; f=5.0)	CMOS ZWO ASI 174
OAN Obs.Astr.Nacional Llano del Hato	Cámara Schmidt (D=1000mm; f=3.0)	CMOS Fujifilm GFX 50R
OC3 Obs.Astr.de Carlos Ambrosioni	SCT (D=279mm; f=7)	CCD SBIG ST8XME
OM2 Obs.Astr.Vuelta por el Universo 2	Newtonian (D=200mm; f=5.0)	CMOS POA Neptune-M
ONM Obs. Remotos Nuevo México	Newtonian (D=300mm; f=3.8)	CMOS Zwo 2600MM
RMC Obs.Astr.de Raúl Melia Carlos Paz	Newtonian (D=254mm; f=4.7)	CMOS QHY 174M
X12 Obs.Astr.Los Cabezones	Newtonian (D=200mm; f=5.0)	CMOS QHY 174M

Table II. List of observatories and equipment.

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COLLABORATIVE ASTEROID PHOTOMETRY FROM UAI: 2026 JANUARY-MARCH

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(Received: 2026 April 14)

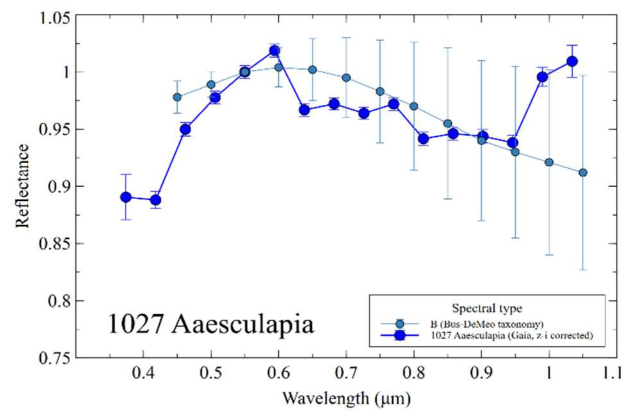
Photometric observations of six asteroids were collected to contribute to their physical characterization. Lightcurves were acquired for 1027 Aesculapia, 1584 Fuji, 1586 Thiele, 1737 Severny, 3763 Qianxuesen, and 2026 GD.

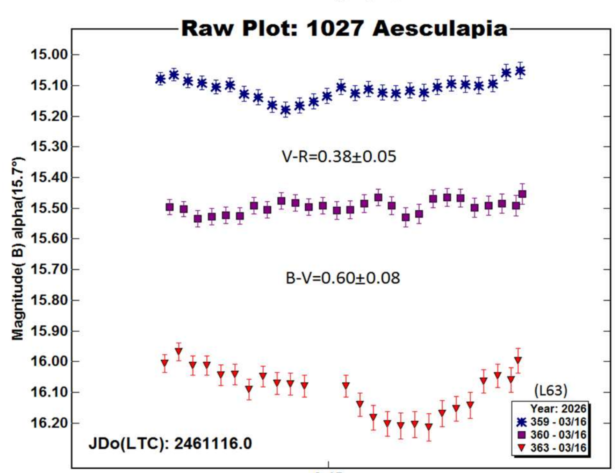
Collaborative asteroid photometry was conducted within the Italian Amateur Astronomers Union (UAI, 2026) to determine or refine some of the physical characteristics of the chosen asteroids. Table I shows the observing circumstances and results.

The CCD/CMOS observations were made in 2026 January-March using the instrumentation described in Table II. Lightcurve analysis was done with *MPO Canopus* (Warner, 2023) by UAI members M. Iozzi and R. Papini. All images were calibrated with dark and flat frames and converted to standard magnitudes using solar colored field stars from versions of the CMC15 and ATLAS catalogues distributed with *MPO Canopus*.

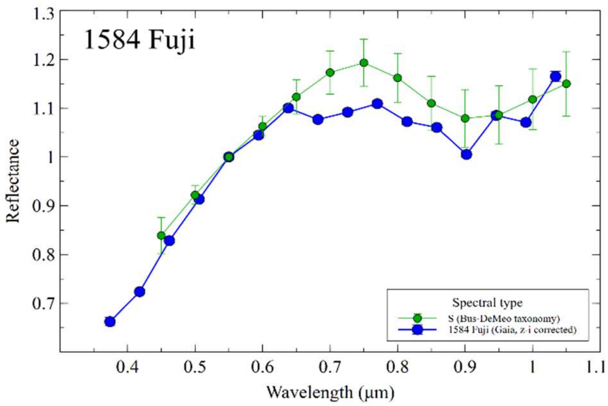
<u>1027 Aesculapia</u> is a low to medium albedo outer main-belt asteroid. The reflectance spectrum for this asteroid, retrieved from the Gaia ESA Archive (2025) and corrected for the z-i parameter (Franco, 2025), is consistent with a B-type classification within the Bus-DeMeo taxonomy (DeMeo et al., 2009) and agrees with the taxonomic attribution by Franco (2025).

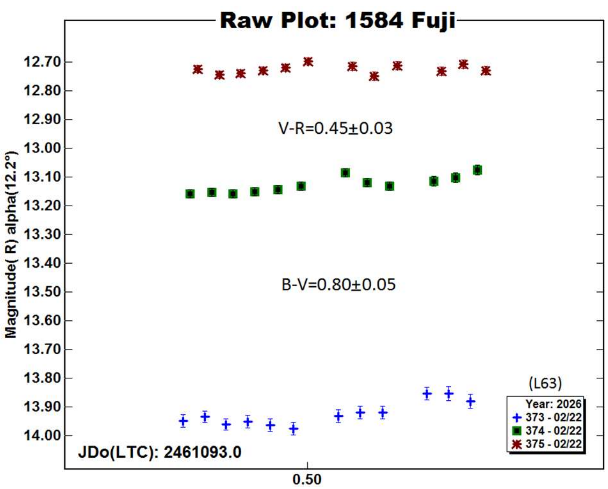
Multiband photometry was acquired by M. Iozzi (L63) on 2026 March 16, from which we found a color index B-V = 0.60 ± 0.08 and V-R = 0.38 ± 0.04. These color indices are consistent to a B-type asteroid, characterized by a slight blueward slope, compared to C-type (Shevchenko and Lupishko, 1998; B-V = 0.69 ± 0.03; V-R = 0.38 ± 0.05).





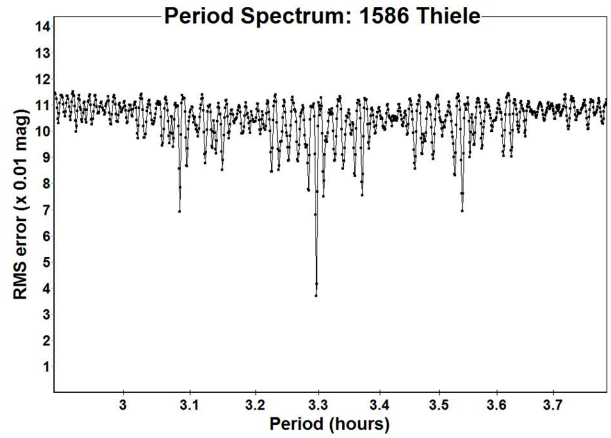
1584 Fuji is an inner main-belt asteroid classified as an S-type in the Tholen taxonomy (Tholen, 1984). The reflectance spectrum of 1584 Fuji, retrieved from the Gaia ESA Archive (2025) and corrected for the z-i parameter (Franco, 2025), is consistent with an S-type classification within the Bus-DeMeo taxonomy (DeMeo et al., 2009). This result also aligns with the previous attributions by Tholen (1984) and Franco (2025).

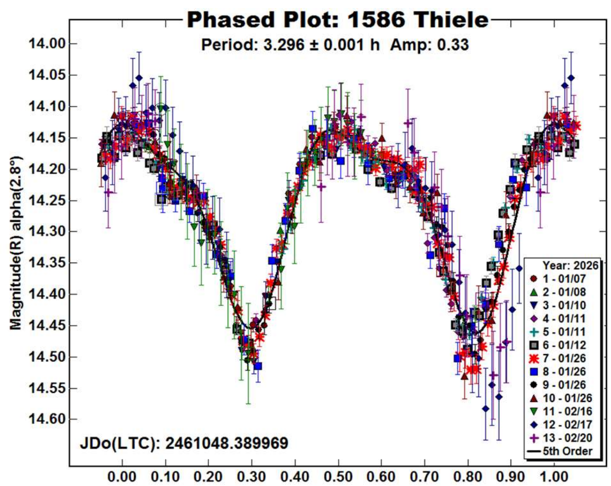




Multiband photometry was acquired by M. Iozzi (L63) on 2026 February 22, from which we found a color index B-V= 0.80 ± 0.05 and V-R = 0.45 ± 0.03. While the V-R color index is consistent with an S-type classification (Shevchenko and Lupishko, 1998; 0.49 ± 0.05), the B-V index appears slightly bluer than expected for this taxonomy (Shevchenko and Lupishko, 1998; 0.86 ± 0.04).

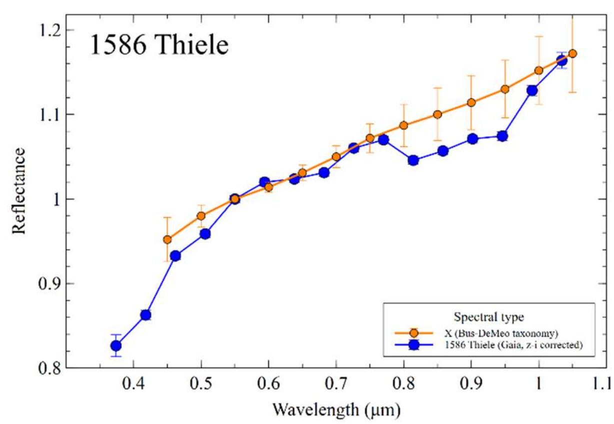
1586 Thiele is a medium albedo inner main-belt asteroid. Collaborative observations were made over thirteen nights. The period spectrum shows a deeper minimum with a bimodal solution of P = 3.296 ± 0.001 h and amplitude A = 0.33 ± 0.03 mag. This solution differs from the previous solution found by Childers and Church (2007; 3.086 ± 0.038 h).





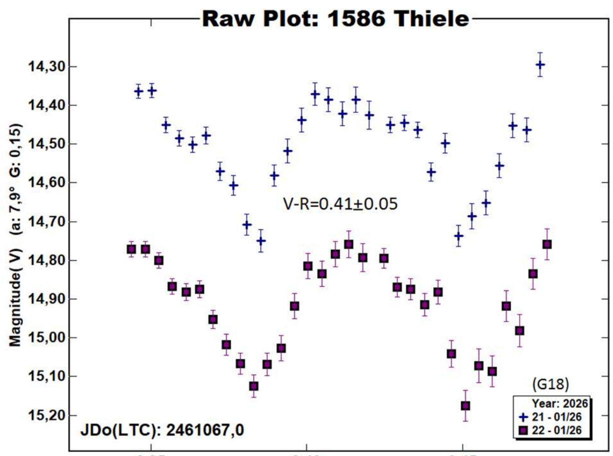
The reflectance spectrum for 1586 Thiele, retrieved from the Gaia ESA Archive (2025) and corrected for the z-i parameter (Franco, 2025), is consistent with a X-type classification within the Bus-DeMeo taxonomy (DeMeo et al., 2009) and agrees with the taxonomic attribution by Franco (2025).

Multiband photometry was acquired by A. Valvasori (G18) on 2026 January 26, from which we found a color index V-R = 0.41 ± 0.05, consistent with a M-type asteroid (Shevchenko and Lupishko, 1998; 0.42 ± 0.04).

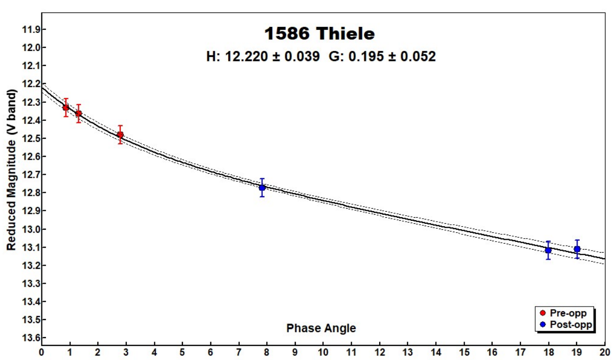


Number	Name	2026 mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1027	Aesculapia	03/16	15.7	135	1					MB-O
1584	Fuji	02/22	12.1	146	-17					MB-I
1586	Thiele	01/07-02/20	*2.7-19	113	-1	3.296	0.001	0.30	0.03	MB-I
1737	Severny	03/23	7.8	164	-4					MB-O
3763	Qiuanxuesen	03/13-03/28	*3.4-8.4	175	5	3.886	0.001	0.19	0.06	MB-I
	2026 GD	04/08	3.6	197	-2	0.0273	0.0001	0.59	0.18	NEA

Table I. Observing circumstances and results. The first line gives the results for the primary of a binary system. The second line gives the orbital period of the satellite and the maximum attenuation. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).

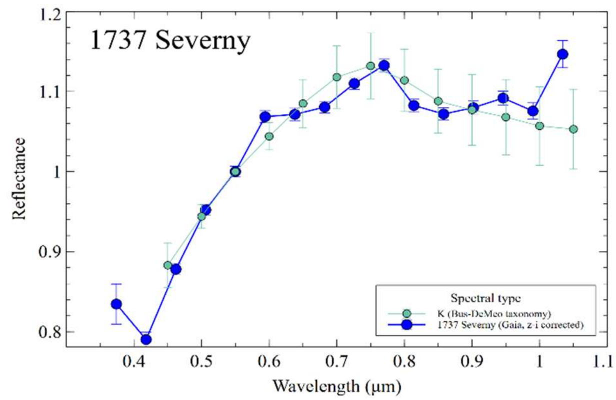


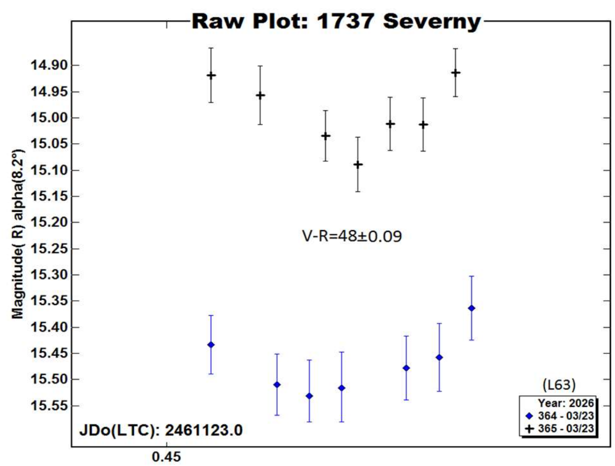
The wide phase angle covered by the observations allowed us to determine the H-G parameters. For each lightcurve, the R-band magnitude was derived using the half peak-to-peak amplitude and converted to the V-band by adding the V-R color index. We found $H = 12.22 \pm 0.04$ and $G = 0.20 \pm 0.05$; the G value is consistent with an M-type asteroid (Shevchenko and Lupishko, 1998; 0.20 ± 0.02).



1737 Severny is a medium albedo outer main-belt asteroid. The reflectance spectrum for 1737 Severny, retrieved from the Gaia ESA Archive (2025) and corrected for the z-i parameter (Franco, 2025), is consistent with a K-type classification within the Bus-DeMeo taxonomy (DeMeo et al., 2009) and agrees with the taxonomic attribution by Franco (2025).

Multiband photometry was acquired by M. Iozzi (L63) on 2026 March 23, from which we found a color index V-R = 0.48 ± 0.09, close to an S-Type asteroid (Shevchenko and Lupishko, 1998; 0.49 ± 0.05).

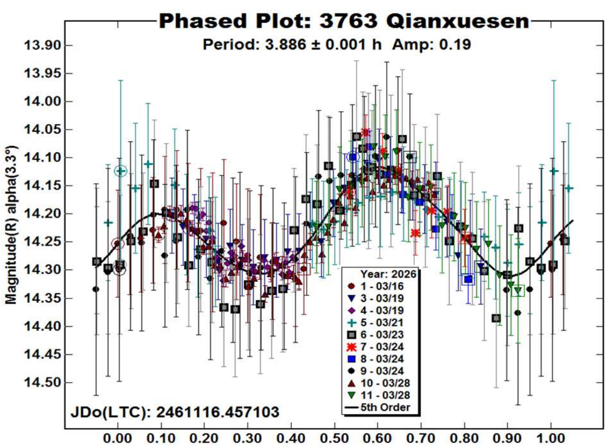




3763 Qianxuesen is a medium-high albedo inner main-belt asteroid. Collaborative observations were made over eleven nights. We found a bimodal solution with a synodic period of $P = 3.886 \pm 0.001$ h and amplitude $A = 0.19 \pm 0.06$ mag. The period is close to the previously published results in the lightcurve database (Warner et al., 2009).

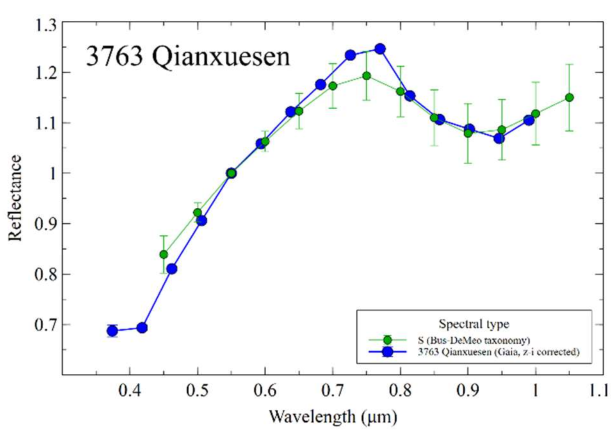
Observatory (MPC code)	Telescope	CCD/CMOS	Filters	Observed Asteroids (#Sessions)
Castelmartini (160)	0.25-m SCT f/6.3	ZWO ASI2600MM PRO	C	1584(4), 3763 (7)
HOB Astronomical Observatory (L63)	0.20-m SCT f/6.0	ATIK 383L+ (bin 2×2)	V,Rc	1027(1), 1584(1), 1737(1), 3763(1)
ALMO Observatory (G18)	0.30-m NRT f/4.0	ZWO ASI533MM PRO (bin 2×2)	V,Rc	1586(1), 1584(1), 3763(1)
Astronomical Observatory, University of Siena (K54)	0.30-m MCT f/5.6	SBIG STL-6303e (bin 2×2)	C	1586(3)
Iota Scorpii(K78)	0.40-m RCT f/6.1	Player One 455M Pro (bin 4×4)	Rc	1586(3)
GAMP (104)	0.60-m NRT f/4	Apogee Alta	Rc	2026 GD(1)
Ossevatorio astronomico L.Zannoni Monte Viseggi (126)	0.40-m RCT f6.5	ZWO ASI6200MM	Rc	3763(1)
GiaGa Observatory (203)	0.36-m SCT f/5.8	Moravian G2-3200	C	1586(1)
Zen observatory (M26)	0.30-m RCT f/7.4	Atik 383L+	Rc	3763(1)

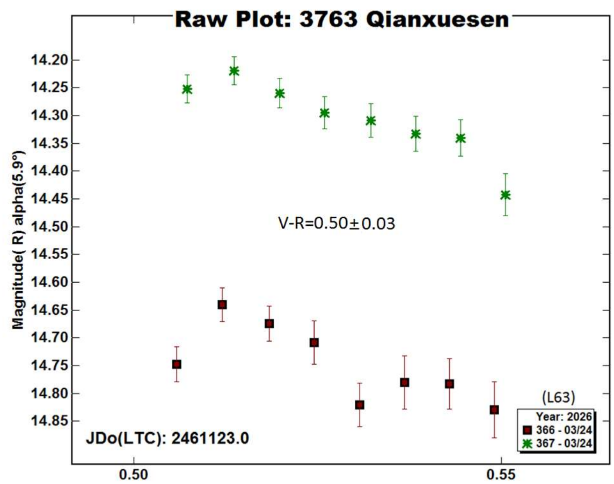
Table II. Instrumentation. NRT: Newtonian Reflector, MCT: Maksutov-Cassegrain, RCT: Ritchey-Chretien, SCT: Schmidt-Cassegrain.



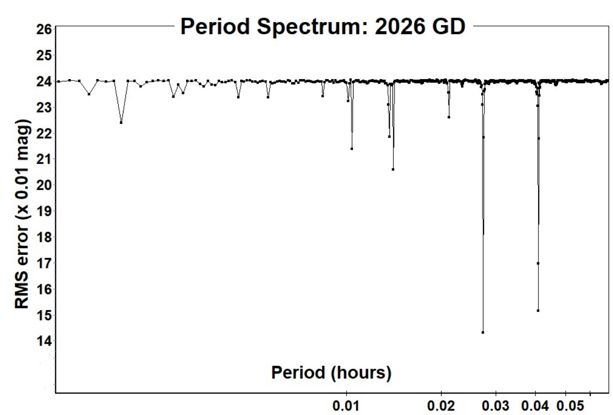
The reflectance spectrum for 3763 Qianxuesen, retrieved from the Gaia ESA Archive (2025) and corrected for the z-i parameter (Franco, 2025), is consistent with an S-type classification within the Bus-DeMeo taxonomy (DeMeo et al., 2009) and agrees with the taxonomic attribution by Franco (2025).

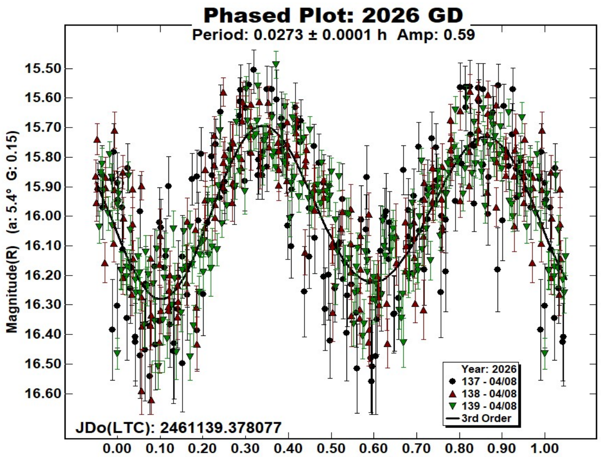
Multiband photometry was acquired by M. Iozzi (L63) on 2026 March 24, from which we found a mean color index V-R = 0.50 ± 0.03, which is consistent with an S-type asteroid (Shevchenko and Lupishko, 1998; 0.49 ± 0.05).





2026 GD is an Apollo Near-Earth asteroid discovered by Pan-STARRS 1, Haleakala, on 2026 February 2, with $H = 26.63$ and a Minimum Orbit Intersection Distance (MOID) from Earth of 0.00052 au.





Photometric observations were made by P. Bacci and M. Maestripieri (104) over a 142-minute session beginning at 21:04 UT on 8 April 2026. A synodic rotation period of $P = 0.0273 \pm 0.001$ h (1.64 minutes) was determined; the lightcurve amplitude was $A = 0.59 \pm 0.18$ mag. From this, we derived a lower limit for the triaxial ellipsoid axis ratio of $(a/b) = 10^{(0.4A)} = 1.7$.

Acknowledgements

We wish to honor the memory of our colleague and friend Giorgio Baj and express our gratitude for his significant contributions to the UAI amateur astronomers' asteroids section. His dedicated work in astrometric and photometric observations leaves a lasting legacy. He will be deeply missed.

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LIGHTCURVE ANALYSIS FOR ONE MARS-CROSSER AND SIX MAIN-BELT ASTEROIDS

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(Received: 2026 April 11)

Photometric observations for one Mars-crosser and six main-belt asteroids. We derived the following rotational synodic periods: 6414 Mizunuma, 7.307 ± 0.004 h; 9768 Stephenmaran, 4.0833 ± 0.0019 h; 10416 Kottler, 41.73 ± 0.02 h; 18818 Yasuhico, 3.4997 ± 0.0008 h; (18067) 2000 AB98, 9.573 ± 0.006 h; (19616) 1999 OS3: 3.4146± 0.0005 h; (70171) 1999 OL2, 3.4385 ± 0.0045 h.

We report on the photometric analysis for eight asteroids performed by the Asociación Valenciana de Astronomía (AVA). The data were obtained during the first quarter of 2026. We present graphic results of data analysis, mainly lightcurves, with the plot phased to a given period. We managed to obtain several complete lightcurves and calculated their rotation periods as accurately as possible.

Observatory	Telescope (meters)	CCD
C.A.A.T. J57	17” DK	QHY- 600
C.A.A.T. J57	10” NW	ZWO ASI 1600
Z93	SC 8”	SBIG ST8300
Y78	NW 300 f4	ZWO ASI 294 MM PRO
Y76	SC 9,25”	ATIK 314L+

Table I. List of instruments used for the observations.

We focused on asteroids with no reported period and those where the reported period was poorly established and needed confirmation. The targets were selected from the Collaborative Asteroid Lightcurve (CALL) website (*http://www.minorplanet.info/call.html),* the Minor Planet Center (*http://www.minorplanet.net*). The Asteroid Lightcurve Database (LCDB; Warner et al., 2009) was consulted to locate previously published results.

Work Methods and Results

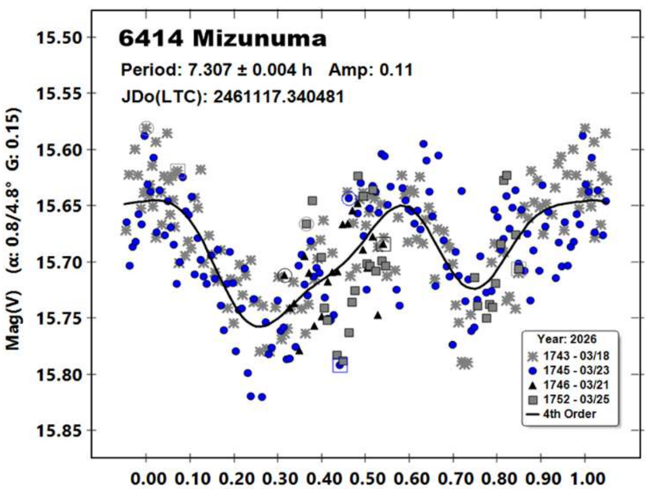
Images were measured using *MPO Canopus V12* (Bdw. Publishing) with a differential photometry technique. *MPO Canopus* using the Fourier algorithm developed by Harris (Harris et al., 1989). The comparison stars were restricted to near solar-color to minimize

Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
6414	Mizunuma	2026/3/18-25	0.8, 4.3	177.4	1.2	7.307	0.004	0.11	0.03	MB-I
9768	Stephenmaran	2026/03/17-18	17.3	173.3	26.0	4.0833	0.0019	0.62	0.03	MB-I
10416	Kottler	2025/12/30-2026/01/7	8.6,10.1	247.8	0.15	41.73	0.02	1	0.2	MC
18067	2000 AB98	2026/02/22-26	5.7, 6.1	153.6	11.0	9.573	0.006	0.13	0.05	MB-M
18818	Yasuhico	2026/03/12-16	3.8, 4.5	171.5	6.0	3.4997	0.0008	0.26	0.05	MB-I
19616	1999 OS3	2026/3/18-25	0.6, 3.6	177.3	1.0	3.4146	0.0005	0.36	0.05	MB-I
70171	1999 OL2	2026/02/20-22	7.1, 7.8	148.4	-9.9	3.4385	0.0045	0.12	0.03	MB-I

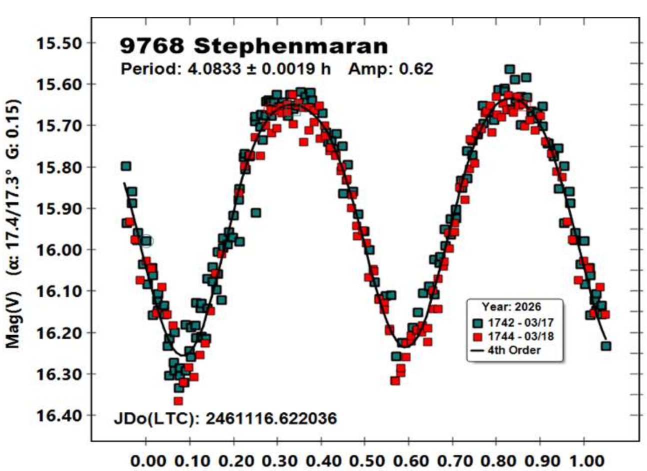
Table II. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009).

color dependencies, especially at larger air masses. The lightcurves show the synodic rotation period. The amplitude (peak-to-peak) that is shown is that for the Fourier model curve and not necessarily the true amplitude.

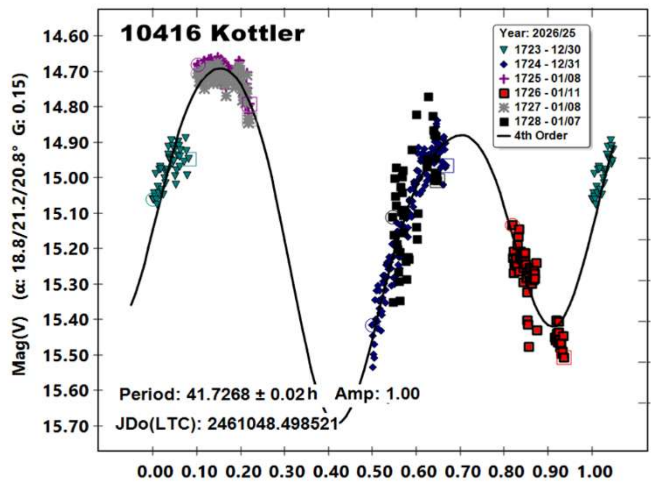
6414 Mizunuma. This inner main-belt asteroid was discovered on 1993 Oct. at Oizumi by T. Kobayashi. We made observations on 2026 March 18 to 25. From our data we derive a synodic rotation period of 7.307 ± 0.004 h and an amplitude of 0.11 mag. We have no previous information about its rotation period.



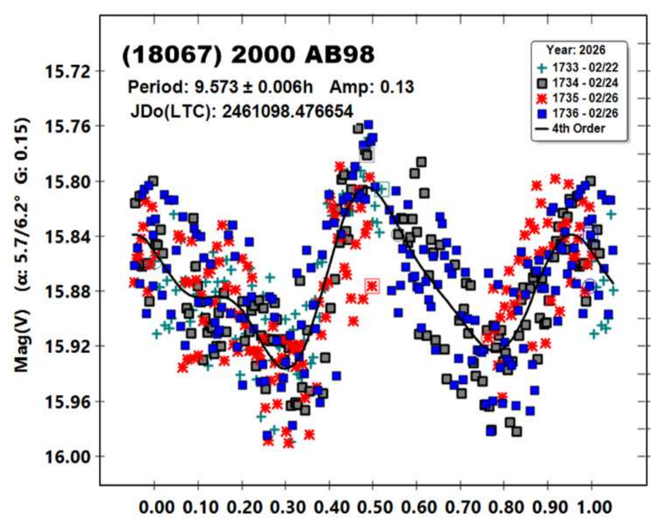
9768 Stephenmaran. This inner main-belt asteroid of the Phocaea family was discovered on 1992 Apr. at Palomar by C.S. Shoemaker and E.M. Shoemaker. We made observations on 2026 March 17 to 18. From our data we derive a synodic rotation period of 4.0833 ± 0.0019 h and an amplitude of 0.62 mag. We have no previous information about its rotation period.



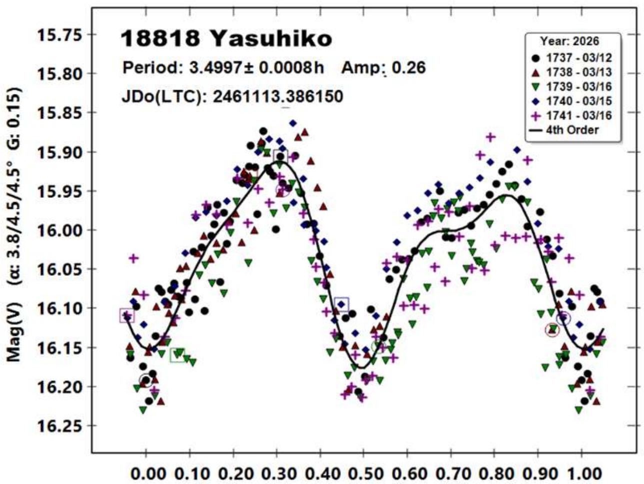
10416 Kottler. This Mars-crosser asteroid was discovered on 1998 Nov at Socorro by LINEAR. We made observations on 2025 Dic 30 to 2026 Jan 7. From our data we derive a synodic rotation period of 41.73 h ± 0.002 h and an amplitude of 1 mag. We would have liked to obtain more data on this asteroid, but bad weather over our observatory prevented it. Completing its curve remains pending for the future. We have no previous information about its rotation period.



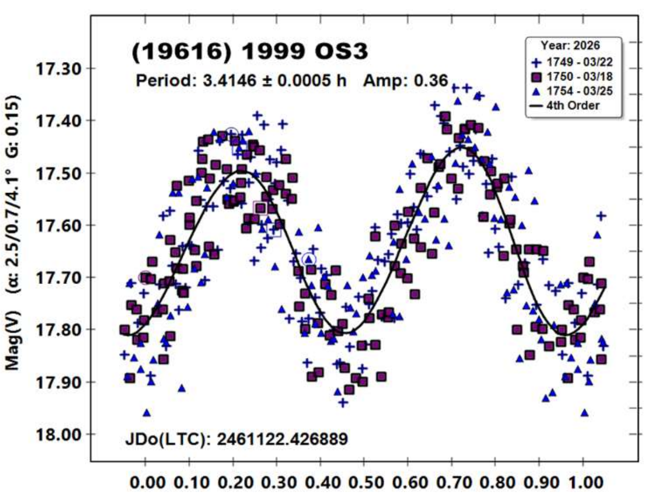
(18067) 2000 AB98. This middle main-belt asteroid of the Eunomia family was discovered on 2000 Jan at Socorro by LINEAR. We made observations on 2026 Feb 22 to 26. From our data we derive a synodic rotation period of 9.573 ± 0.006 h and an amplitude of 0.13 mag. We have no previous information about its rotation period.



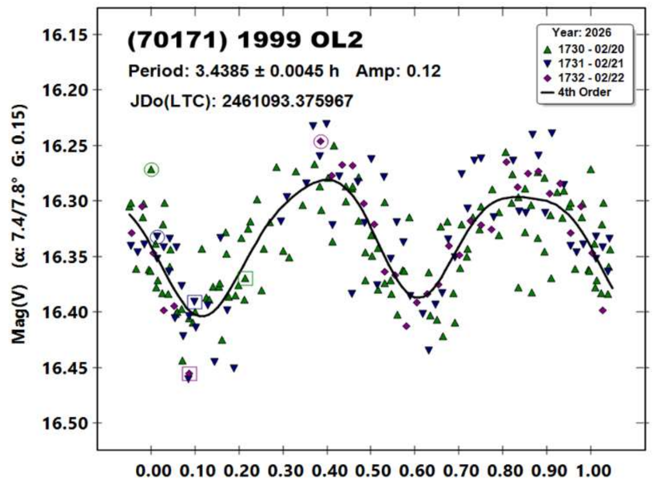
18818 Yasuhico. This inner main-belt asteroid of the Flora family was discovered on 1999 Jun at Nanyo by T. Okuni. We made observations on 2026 March 12 to 16. From our data we derive a synodic rotation period of 3.4997 ± 0.0008 h and an amplitude of 0.26 mag. We have no previous information about its rotation period.



(19616) 1999 OS3. This inner main belt-asteroid was discovered on 1999 Jul at Bickley by Perth Observatory We made observations on 2026 March 18 to 25. From our data we derive a synodic rotation period of 3.4146 ± 0.0005 h and an amplitude of 0.36 mag. Podlewska-Gaca et al. (2021) found a period of 3.393 h.



(70171) 1999 OL2. This inner main belt-asteroid was discovered on 1999 Jul at Socorro by LINEAR. We made observations on 2026 Feb 20 to 22. From our data we derive a synodic rotation period of 3.4385 ± 0.0045 h and an amplitude of 0.12 mag. We have no previous information about its rotation period.



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ASTEROID PHOTOMETRY FOR NINE MAIN-BELT AND TWO MARS-CROSSING ASTEROIDS

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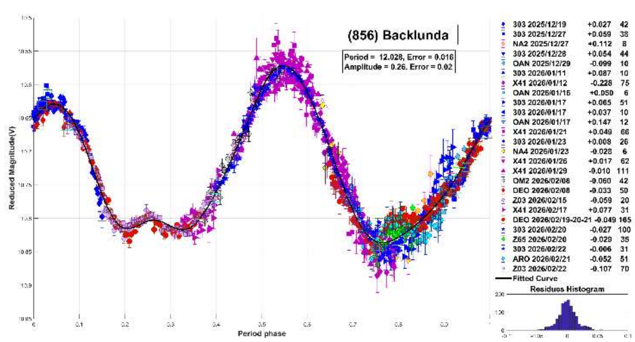
Synodic rotation periods and amplitudes are reported for: 856 Backlunda, 1390 Abastumani, 1952 Hesburgh, 2810 Lev Tolstoj, 3940 Larion, 5514 Karelraska, 7631 Vokrouhlicky, 10416 Kottler, 16958 Klaasen, 21831 1999 TX93, 70171 1999 OL2.

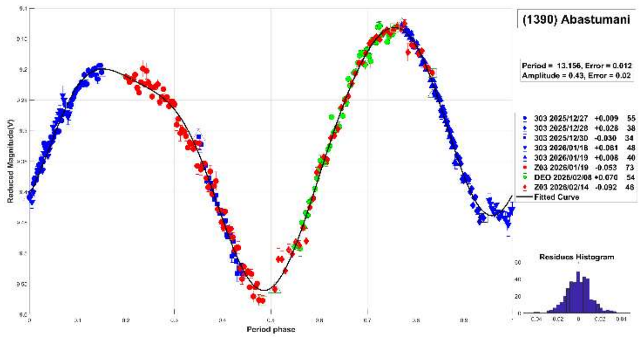
The periods and amplitudes of asteroid lightcurves presented in this paper are the product of collaborative work by the GORA (Grupo de Observadores de Rotaciones de Asteroides) group. In all the studies, we have applied relative photometry assigning V magnitudes to the calibration stars. The image acquisition was performed without filters and with exposure times of a few minutes. All images used were corrected using dark frames and, in some cases, bias and flat-field corrections were also used. Photometry measurements were performed using *FotoDif* software and for the analysis, we employed *Periodos* software (Mazzone, 2012).

Below, we present the results for each asteroid studied. The lightcurve figures contain the following information: the estimated period and period error and the estimated amplitude and amplitude error. In the reference boxes, the columns represent, respectively, the marker, observatory MPC code, or - failing that - the GORA internal code, session date, session offset, and several data points. Targets were selected based on the following criteria: 1) those asteroids with magnitudes accessible to the equipment of all participants, 2) those with favorable observation conditions from Argentina, Venezuela, Spain, Italy, or Croatia, i.e. with negative or positive declinations δ, and 3) objects with few periods reported in the literature and/or with Lightcurve Database (LCDB) (Warner et al., 2009) quality codes (U) of less than 3.

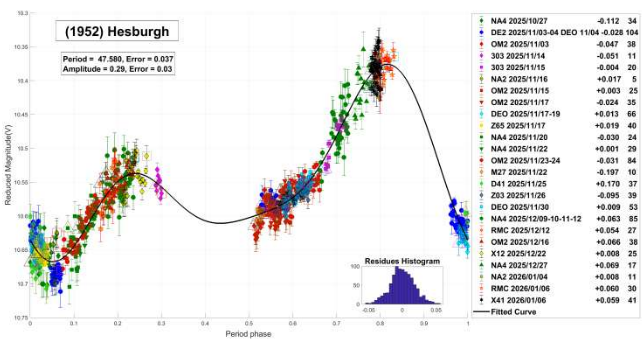
<u>(856) Backlunda</u>: Backlunda is a main-belt asteroid discovered in 1916 by S. Belyavskij. Based on the SMASSII taxonomy (Xu et al., 1995; Bus and Binzel, 2002), it is classified as a C-type, with a diameter of 45.449 km. The reported rotation period for this asteroid is P = 12.08 h (Polakis, 2019). Our measurement of the period, P = 12.028 ± 0.016 h, agrees well with the value reported by the author.



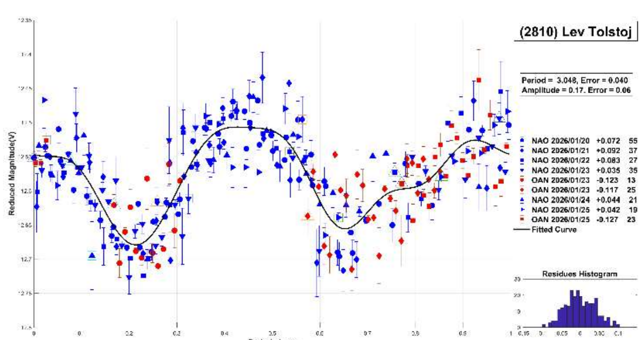
(1390) Abastumani: This outer main-belt asteroid was discovered in 1935 by P. Shajn, with a diameter of 95.849 km. The reported rotation period for this asteroid is P = 26.49 h (Polakis, 2021). In this work, we propose a considerably shorter period of P = 13.156 ± 0.012 h, based on a well-covered lightcurve.



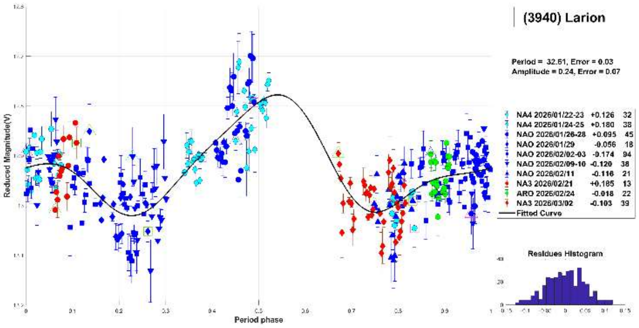
(1952) Hesburgh: It is a main-belt asteroid with a diameter of 37.501 km, discovered in 1951 at the Goethe Link Observatory. The reported rotation period for this asteroid is 47.52 h (Behrend, 2019web). We also measured a period of P = 47.580 ± 0.037 h.



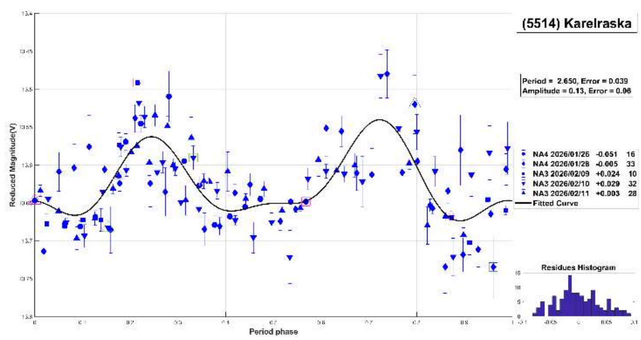
(2810) Lev Tolstoj: It is a main-belt asteroid with an estimated diameter of 7.91 km. It was discovered in 1978 by N. Chernykh. It belongs to the Eunomia family (Nesvorný et al., 2015). We couldn't find a reported period for this object in the literature. We propose a short period of 3.048 ± 0.040 h with Δm = 0.17 ± 0.06 mag.



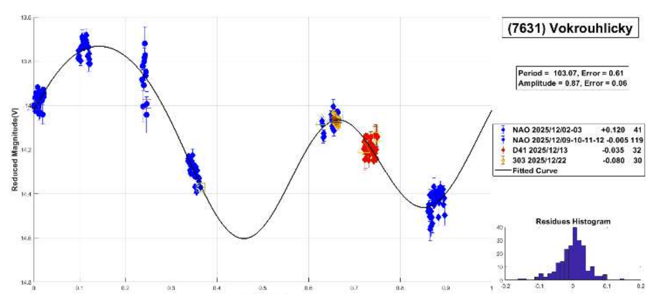
(3940) Larion: It is an inner main-belt asteroid discovered in 1973 by Zhuravleva. It is classified as a C-type asteroid according to the SDSS-based Asteroid Taxonomy (Hasselmann et al., 2012), with a diameter of 5.079 km. The reported rotation period for this asteroid is P = 84 h (Warner, 2007). In this work, we propose a shorter period of P = 32.61 ± 0.03 h.



(5514) Karelraska: It is a main-belt asteroid, discovered in 1989 by Z. Vavrova, with an estimated diameter of 5.229 km. It is classified as an S-type asteroid according to the SDSS-based Asteroid Taxonomy (Hasselmann et al., 2012), For this asteroid, we could not find published periods in the literature, either. In this work, we propose a short period of P = 2.650 ± 0.039 h with Δm = 0.13 ± 0.06 mag.



(7631) Vokrouhlicky: It is a main-belt asteroid, discovered in 1981 by E. Bowell. For this asteroid, we could not find published periods in the literature, either. In this work, we propose a long period of P = 103.07 ± 0.61 h with Δm = 0.87 ± 0.06 mag.



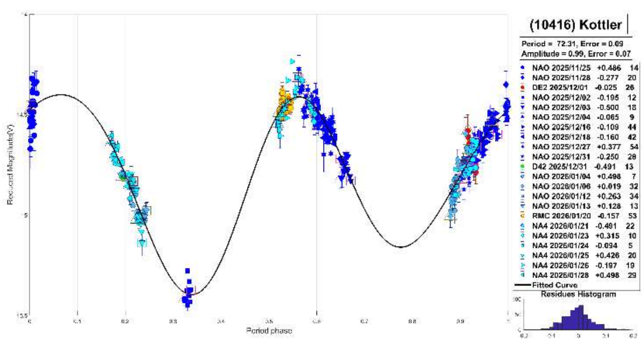
(10416) Kottler: It is a Mars-crossing asteroid with a diameter of 3.157 km, discovered in 1998 by the Lincoln Laboratory Near-Earth Asteroid Research Team. For this asteroid, we could not find any published rotation periods in the literature. In this work, we propose a period of P = 72.31 ± 0.09 h with Δm = 0.99 ± 0.07 mag.

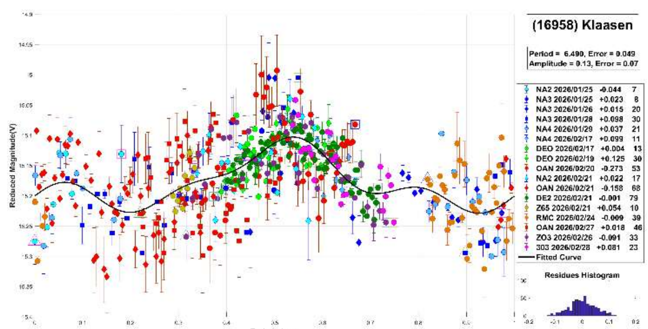
Number	Name	yy/ mm/dd- yy/ mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	Amp.E.	Grp
856	Backlunda	25/12/19-26/02/22	*23.0,05.6	146	5	12.028	0.016	0.26	0.02	MB-I
1390	Abastumani	25/12/27-26/02/14	09.3,16.5	72	18	13.156	0.012	0.43	0.02	MB-O
1952	Hesburgh	25/10/27-26/01/06	*08.3,19.0	50	-7	47.580	0.037	0.29	0.03	MB-O
2810	Lev Tolstoj	26/01/20-26/01/25	11.1,09.6	134	-15	3.048	0.040	0.17	0.06	Euno
3940	Larion	26/01/22-26/03/02	*20.8,23.6	131	-30	32.61	0.03	0.24	0.07	Hung
5514	Karelraska	26/01/26-26/02/11	*07.9,01.3	140	-2	2.650	0.039	0.13	0.06	MB-I
7631	Vokrouhlicky	25/12/02-25/12/22	14.8,03.6	90	-5	103.07	0.61	0.87	0.06	MB-I
10416	Kottler	25/11/25-26/01/29	*27.2,31.8	107	-16	72.31	0.09	0.99	0.07	M-cros
16958	Klaasen	26/01/25-26/02/28	*22.6,11.6	148	-11	6.490	0.049	0.13	0.07	M-cros
21831	1999 TX93	26/01/28-26/02/13	15.3,07.6	155	-6	4.094	0.031	0.13	0.04	MB-I
70171	1999 OL2	26/01/28-26/02/22	*14.1,07.8	148	-7	3.437	0.052	0.15	0.07	Pho

Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extremum during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009). MB-I: main-belt inner; MB-O: main-belt outer; Euno: 15 Eunomia; Hung: Hungaria; M-cros: Mars-crosser; Pho: 25 Phocaea.

Observatory	Telescope	Camera
303 Obs.Astr.Nacional Llano del Hato	Newtonian (D=1000mm; f=5.5)	CCD FLI PL4240
D41 OsservatorioAstronomico di Orciatico	SCT (D=355mm; f=7.4)	CCD SBIG ST10XME
D42 OsservatorioAstronomico Piero Angela	SCT (D=300mm; f=6.2)	CMOS ToupTek 2600 KMA
M27 Elijah Observatory	RCT (D250mm; f=8.0)	CCD QSI 683
X12 Obs.Astr.Los Cabezones	Newtonian (D=200mm; f=5.0)	CMOS QHY 174M
X41 Observatorio Protón-Protón	Newtonian (D=250mm; f=5.0)	CMOS ZWO ASI120MINI MM
Z03 Obs.Astr.Río Cofio	SCT (D=254mm; f=6.3)	CCD SBIG ST-8XME
Z65 Obs.Astr.Corgas	Newtonian (D=310mm; f=4.8)	CMOS ZWO ASI 294 MM
ARO Obs.Astr. de Albatàrrec	Refractor (D=160mm; f=5.6)	CMOS Player O-P M Pro
DEO Dark Energy Observatory	Refractor (D=115mm; f=7.0)	CMOS QHY 294M pro
DE2 Dark Energy Observatory 2	RCT (D=200mm; f=5.4)	CMOS Player One Ares-M
NAO Obs.Astr.Naos	Newtonian (D=250mm; f=4.0)	CMOS ZWO 183
NA2 Obs.Astr.Naos 2	Newtonian (D=200mm; f=5.0)	CMOS ZWO ASI 174
NA3 Obs.Astr.Naos 3	SCT (D=279; f=10)	CMOS QHY 163M
NA4 Obs.Astr.Naos 4	Newtonian (D=200mm; f=5.0)	CMOS ZWO ASI 174
OAN Obs.Astr.Nacional Llano del Hato	Cámara Schmidt (D=1000mm; f=3.0)	CMOS Fujifilm GFX 50R
OM2 Obs.Astr.Vuelta por el Universo 2	Newtonian (D=200mm; f=5.0)	CMOS POA Neptune-M
RMC Obs.Astr.de Raúl Melia Carlos Paz	Newtonian (D=254mm; f=4.7)	CMOS QHY 174M

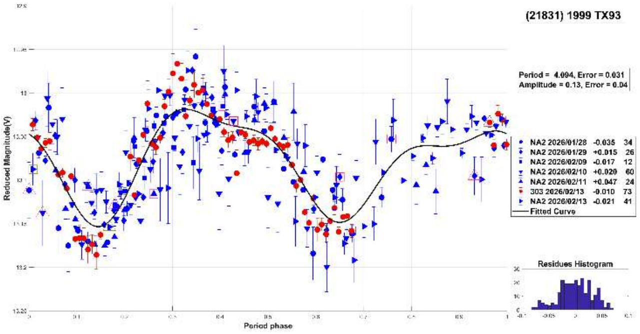
Table II. List of observatories and equipment.



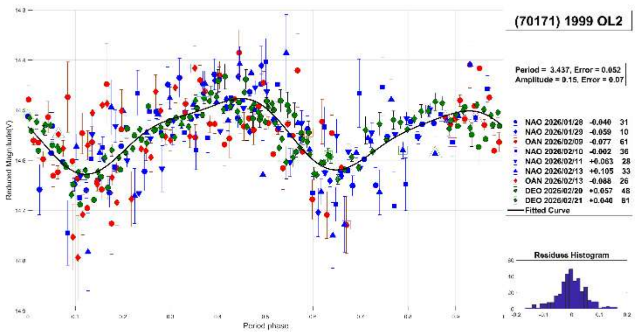


<u>(16958) Klaasen</u>: It is a Mars-crossing asteroid discovered in 1998 by the Lowell Observatory Near-Earth Object Search. For this asteroid, we could not find any published rotational periods in the literature. In this work, we propose a period of P = 6.490 ± 0.049 h with Δm = 0.13 ± 0.07 mag.

<u>(21831) 1999 TX93</u>: It is a main-belt asteroid discovered in 1999 by LINEAR, with a diameter of 13.826 km. It is classified as a C-type asteroid according to the SDSS taxonomy (Hasselmann et al., 2012). The reported rotation period for this asteroid is P = 4.084 h (Benishek, 2022). In this work, we measure a period of P = 4.094 ± 0.031 h.



(70171) 1999 OL2: It is a main-belt asteroid discovered in 1999 by LINEAR with an estimated diameter of 3.980 km. It is a member of the Phocaea family (Nesvorný et al., 2015). For this asteroid, we could not find any published rotation periods in the literature. In this work, we propose a short period of P = 3.437 ± 0.052 h with Δm = 0.15 ± 0.07 mag.



Acknowledgements

We want to thank Julio Castellano as we used his *FotoDif* program for preliminary analyses, Fernando Mazzone for his *Periods* program, which was used in final analyses. We also used *Seqplot* (*https://www.aavso.org/seqplot*), which proved very effective for checking the magni-tudes of the calibration stars. This research has made use of the Small Bodies Data Ferret (*https://sbnapps.psi.edu/ferret/*), supported by the NASA Planetary System. This research has made use of data and/or services provided by the International Astronomical Union's Minor Planet Center.

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LIGHTCURVE ANALYSIS FOR FIVE NEAR-EARTH ASTEROIDS OBSERVED BETWEEN JANUARY AND MARCH 2026

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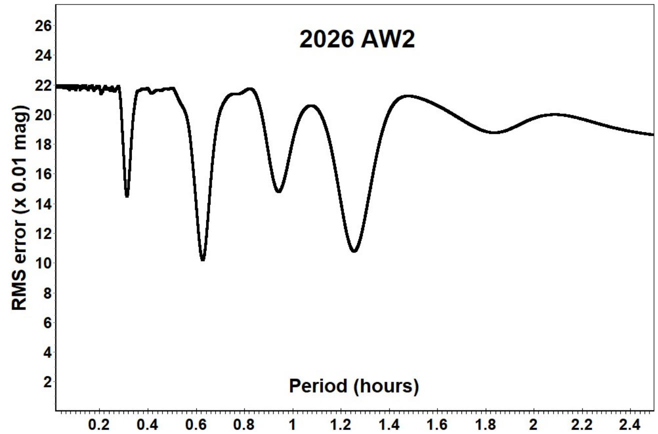
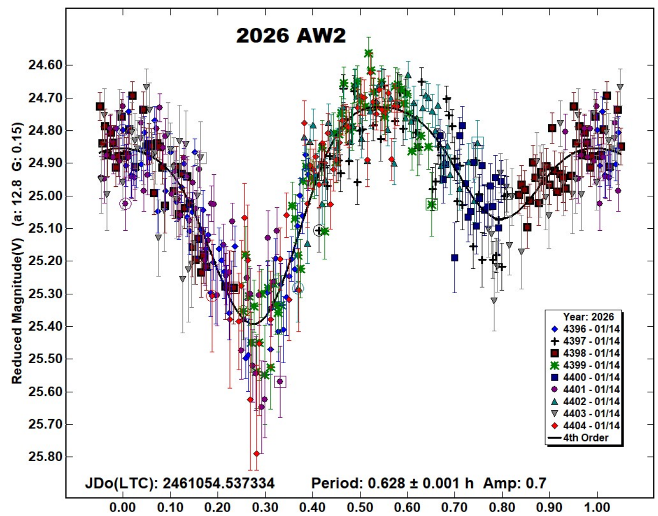
Lightcurves and amplitudes for five near-Earth asteroids observed from Great Shefford Observatory during close approaches between January and March 2026 are reported. All are small objects with rotation periods significantly shorter than the spin barrier at ~2.2 h. One is identified as having tumbling rotation and another is a suspected low-amplitude tumbler.

Photometric observations of near-Earth asteroids during close approaches to Earth between January and March 2026 were made at Great Shefford Observatory using a 0.40-m Schmidt-Cassegrain and Apogee Alta U47+ CCD camera. All observations were made unfiltered and with the telescope operating with a focal reducer at f/6. The 1K×1K, 13-micron CCD was binned 2×2 resulting in an image scale of 2.16 arcsec/pix. All the images were calibrated with dark and flat frames and *Astrometrica* (Raab, 2025) was used to measure photometry using G band data from the Gaia DR3 catalogue. *MPO Canopus* (Warner, 2023), incorporating the Fourier algorithm developed by Harris (Harris et al., 1989) was used for lightcurve analysis.

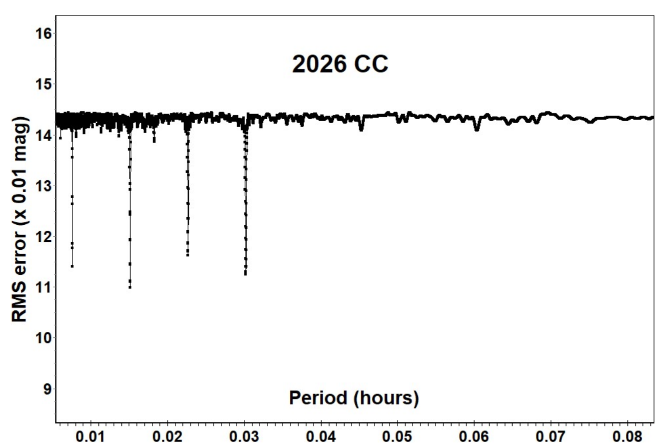
No previously reported results have been found in the Asteroid Lightcurve Database (LCDB) (Warner et al., 2009), from searches via the Astrophysics Data System (ADS, 2026) or from wider searches unless otherwise noted. All size estimates are calculated using H values from the Small-Body Database Lookup (JPL, 2026), using an assumed albedo for NEAs of 0.2 (LCDB readme.pdf file) and are therefore uncertain and offered for relative comparison only.

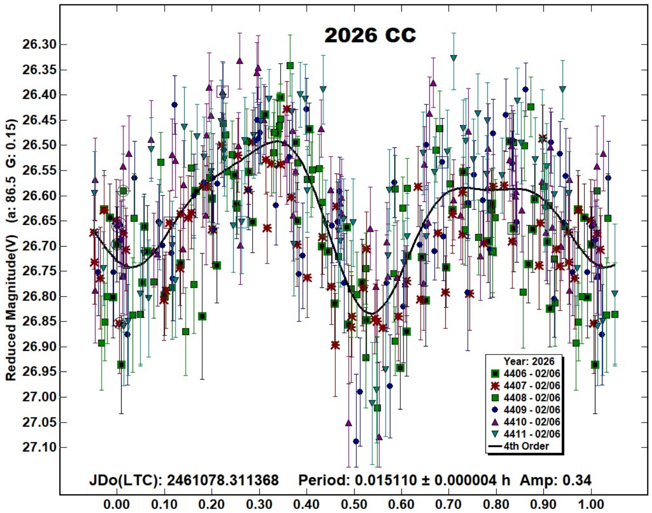
2026 AW2. This small Apollo (H = 24.3, D ~41 m) was discovered by the JPL SynTrack Robotic Telescope, Auberry on 2026 Jan 13.30 UTC, 11 hours before passing Earth at 8.5 Lunar Distances (LD) (Luongo et al., 2026). Photometry was obtained starting at 2026 Jan 14.04 UTC for 2.25 h and a linearly scaled period spectrum spanning 1 min – 2.5 h shows a well-defined periodicity. The best-fit period at 0.628 ± 0.001 h is represented by a bimodal, asymmetric phased lightcurve. 2026 AW2 completed 3.6 rotations while under observation.





2026 CC. Another small Apollo (H = 25.2, D ~27 m) discovered by the JPL SynTrack Robotic Telescope, Auberry, this time on 2026 Feb 5.17 UTC, ahead of an approach to within 1.6 LD of Earth on 2026 Feb 7.84 UTC (Wiggins et al., 2026). Photometry was collected over a span of 82 minutes starting on 2026 Feb 6.81 UTC when it was at a distance of 2.7 LD. Analysis reveals a well-defined asymmetric bimodal lightcurve of period 0.015110 ± 0.000004 h (~54 s). The 0.34 mag amplitude is relatively small considering the phase angle was 66° and shadowing effects at that time were likely to have been significant. 2026 CC completed 90 rotations while under observation.





2026 CU1. This Apollo (H = 24.6, D ~36 m) was discovered at the XuYi Station of the Purple Mountain Observatory on 2026 Feb 10.7 UTC and made an approach to 3.2 LD from Earth on 2026 Feb 26.89 UTC (Buzzi et al., 2026). It was observed for 1.7 h at a distance of 4.9 LD, beginning on 2026 Feb 24.91 UTC and ending 1.5 h prior to the minimum phase angle of this opposition (6.6°). Analysis of the photometry reveals an asymmetric lightcurve with the best-fit period being 0.037560 ± 0.000007 h (~135 s) and amplitude of 0.48, this phased lightcurve is labelled "PAR". A check for possible non-principal axis rotation (NPAR) or tumbling was made using the Dual Period Search function of *MPO Canopus* and the linearly scaled period spectrum figure is a combination of the initial analysis identifying the dominant period, labelled "PAR", together with a period spectrum generated after subtracting the effect of the dominant period, this labelled "PAR subtracted". The "PAR" line shows various harmonics of the dominant bimodal solution at 0.0376 h and the "PAR subtracted" line indicates weak minima at integer multiples of 0.0709 h hinting at the possibility of some tumbling rotation being present. The best-fit potential NPAR solution is determined to be:

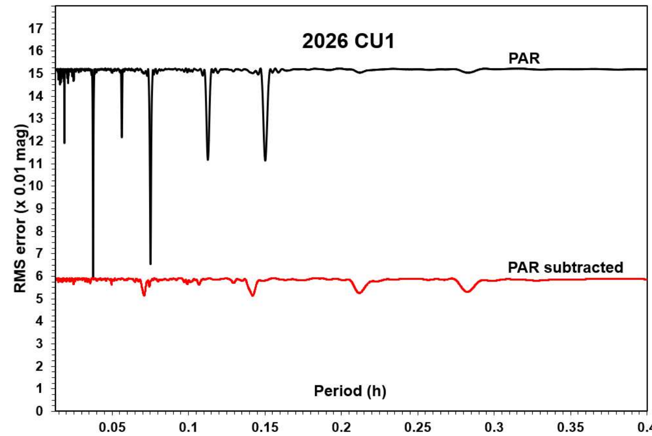
P1 = 0.037558 ± 0.000006 h, amplitude 0.49 ± 0.05

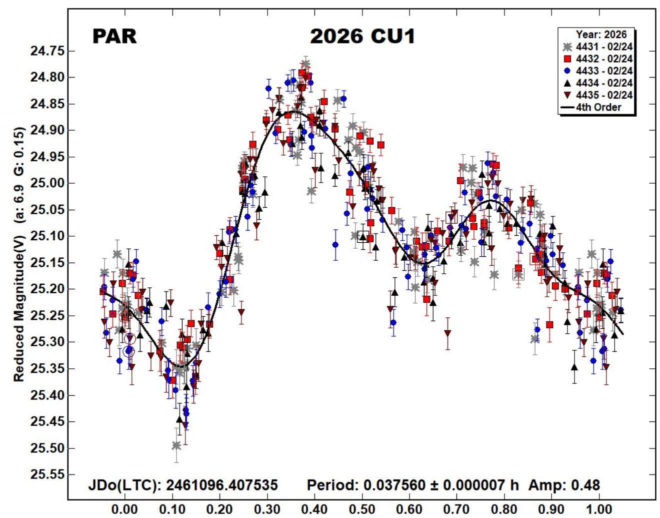
P2 = 0.0709 ± 0.0001 h, amplitude 0.10 ± 0.05

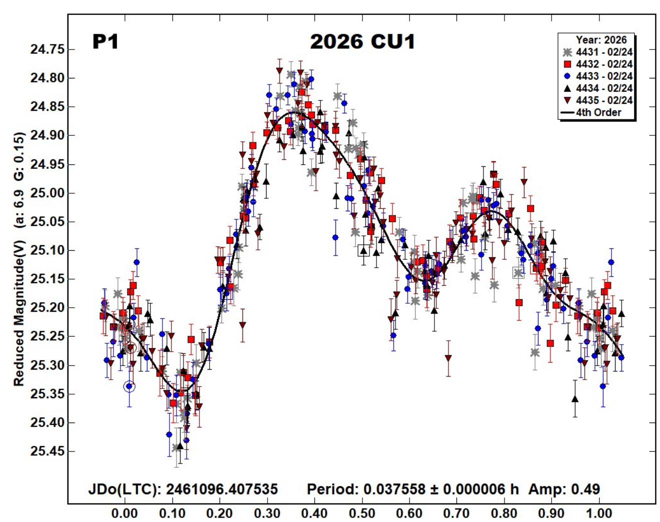
Lightcurves for these are given, labelled "P1" and "P2".

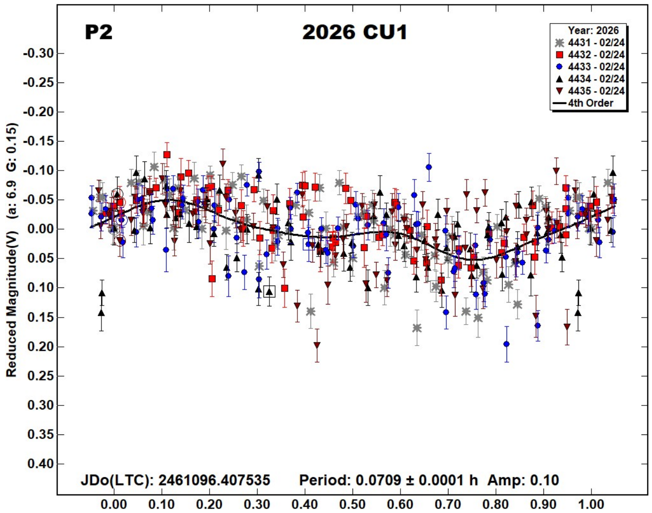
P. Pravec obtained a period of P = 0.0375543 ± 0.0000002 h and amplitude 0.35 from five observing sessions spanning 2026 Feb 18.2 - 20.2 UTC using the 1.54-m Danish Telescope at La Silla, but noting that a period twice as long was also possible (Pravec, 2026). During these five sessions, phase angle reduced from 23.9° to 23.2° and exposures utilised were 90, 70, 50, 50 and 50 s. The period is in good agreement with the PAR result above, but the amplitude is smaller than expected, considering the larger phase angle. It is noted that, assuming P = 0.0375543 h, lightcurve smoothing is likely to have affected the Pravec amplitude. The shortest exposures were 50/135.2 = 0.370 P, which may have caused the observed amplitude of the second harmonic to be reduced by approximately a factor of three (Pravec, 2000, Birtwhistle, 2021).

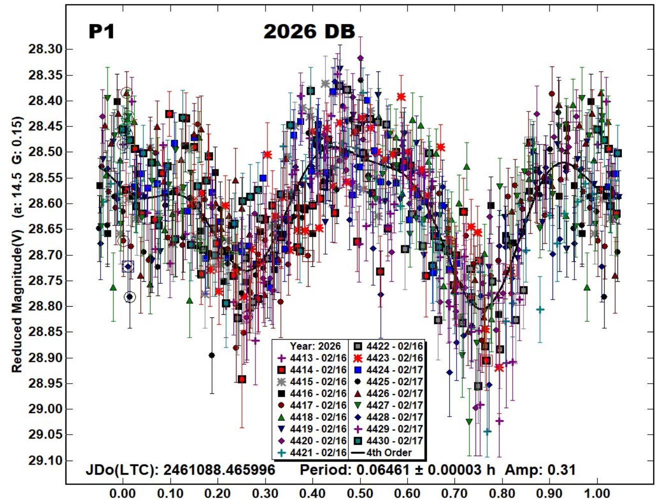
It is apparent that the secondary period P2 = 0.0709 h is only slightly shorter than 2 P1 = 0.0751 h and combined with the low-amplitude of P2 and short observing span of 1.7 h it may be the NPAR solution may just be an artifact due to the limited data, indeed there is no indication of a secondary period within the Pravec data (P. Pravec, personal communication). However, it is also possible that the changing viewing geometry between Feb 18-20 and Feb 25 may have made the low-amplitude tumbling more apparent at the later date. It is expected that the rotation may be rated on the scale of Pravec et al. (2005) with a PAR code of -1 (NPA rotation possible, some deviations from the single periodicity are seen but not at a conclusive level). 2026 CU1 completed 45 rotations of the main PAR period while under observation.



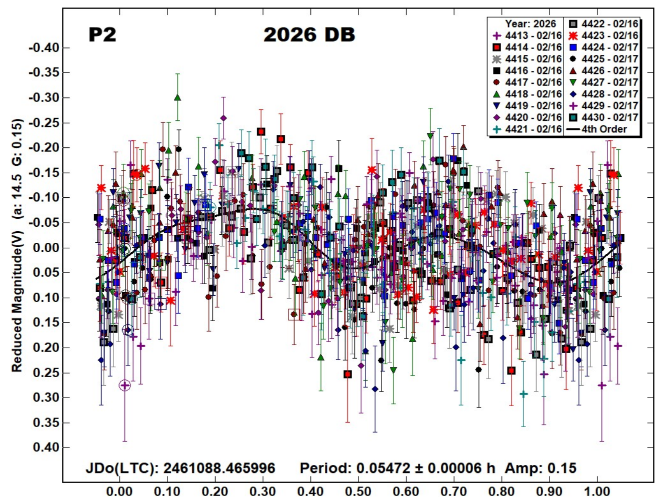


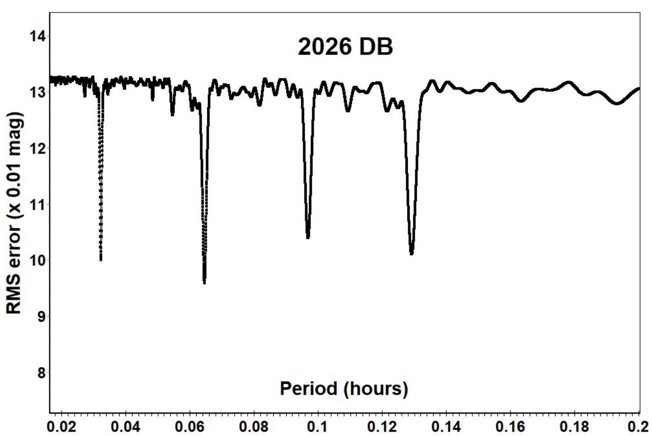






2026 DB. This Apollo (H = 28.1, D ~7 m) was discovered by the Catalina Sky Survey on 2026 Feb 16.34 UTC and made an approach to within 0.6 LD of Earth on 2026 Feb 17.25 UTC (Bacci et al., 2026). It was observed for 1.2 h starting at 2026 Feb 16.97 UTC and due to high and accelerating apparent speed, exposures were reduced from 2.5 s to 2.0 s during the session. Analysis reveals a dominant period of P = 0.06461 ± 0.00003 h (~233 s) but also a low-amplitude but well-defined secondary period, P2 = 0.05472 ± 0.00006 h (~197 s) indicating that 2026 DB has NPA rotation, i.e. is tumbling. There is a hint of another, weaker possible secondary period in the analysis using the *MPO Canopus* Dual Period Search function, this being P3 = 0.06079 h, but P3 appears to be just an alias of P1 and P2, where 2/P1 + 1/P2 ~ 3/P3. It is therefore expected that a PAR code of -3 (NPA rotation reliably detected with the two periods resolved) on the scale of Pravec et al. (2005). During the 1.2 h of observation, 2026 DB completed 18 rotations of the P1 period and 22 of the P2 period.





2026 EE2. This is an Aten class NEO (H = 24.2, D ~43 m) and was an ATLAS discovery from the Sutherland, South Africa station on 2026 Mar 10.98 UTC (Gilmore et al., 2026), making an approach to within 2.2 LD of Earth on 2026 Mar 12.67 UTC. It was observed for 86 minutes starting at 2026 Mar 13.87 UTC and again for 84 minutes starting 2026 Mar 14.91 UTC and independent lightcurve analyses of the two dates produced very similar results, with:

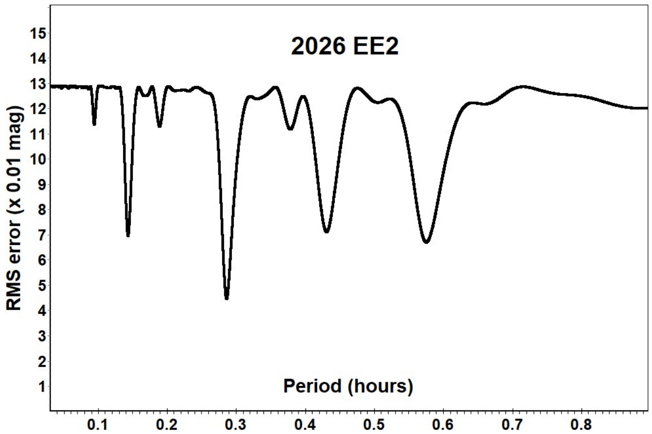
Mar 13.9: Period = 0.2862 ± 0.0003 h, amplitude 0.44

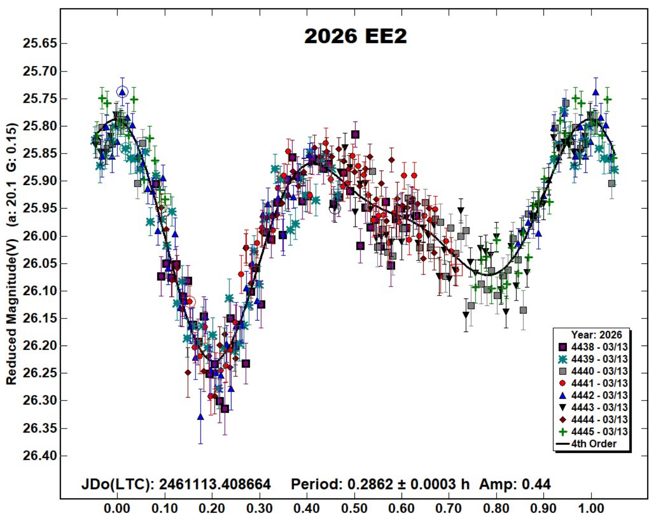
Mar 14.9: Period = 0.2863 ± 0.0003 h, amplitude 0.57

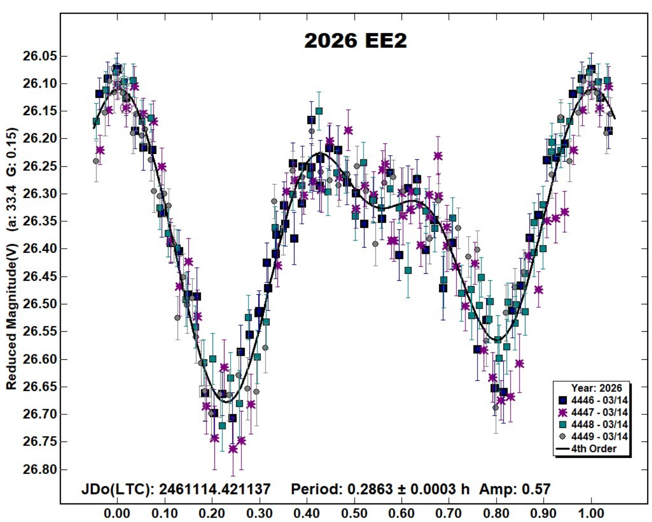
The amplitude was greater on the second date, as expected given that the phase angle increased from 20° to 33° over the two observing sessions. Phased lightcurves are given, plotted with the maximum aligned at Phase = 0 to aid comparison of the changes in lightcurve shape. Combining photometry from both nights gives a best-fit period of:

Mar 13.9 + Mar 14.9: Period = 0.28598 ± 0.00001 h, amplitude 0.48

The apparent precision of this synodic rotation period may be unwarranted, as the magnitude of the expected difference between the sidereal period and synodic period, DeltaP as estimated from the rate of change of the phase angle bisector (Harris et al., 1984) is somewhat larger, at DeltaP ≅ 0.00008 h. 2026 EE2 was observed to complete 5 rotations on Mar 13.9 and 4.9 rotations on Mar 14.9.







Number	Name	Integration times	Max intg/Pd	Min a/b	Pts	Flds
	2026 AW2	11.3-12.7	0.006	1.6	435	9
	2026 CC	8.1-8.6	0.158	1.1[1]	355	6
	2026 CU1	14.7-15.2	0.112[2]	1.6	337	5
	2026 DB	2.0-2.5	0.013[2]	1.3	696	18
	2026 EE2	9.6-18.2	0.018	1.3	618	12

Table I. Ancillary information, listing the integration times used (seconds), the fraction of the period represented by the longest integration time (Pravec et al., 2000), the calculated minimum elongation of the asteroid (Zappala et al., 1990), the number of data points used in the analysis and the number of times the telescope was repositioned to different fields. Note: 1 = Value uncertain, based on phase angle > 40°, 2 = Calculated using the shorter of the NPAR periods.

Acknowledgements

The author thanks Dr. Petr Pravec, Astronomical Institute, Czech Republic for his help reviewing the NPAR analyses of 2026 CU1 and 2025 DB. The author also gratefully acknowledges a Gene Shoemaker NEO Grant from the Planetary Society (2005) and a Ridley Grant from the British Astronomical Association (2005), both of which facilitated upgrades to observatory equipment used in this study. This work has made use of data from the European Space Agency (ESA) mission Gaia (*https://www.cosmos.esa.int/gaia*), processed by the Gaia Data Processing and Analysis Consortium (DPAC, *https://www.cosmos.esa.int/web/gaia/dpac/consortium*). Funding for the DPAC has been provided by national institutions, in particular the institutions participating in the Gaia Multilateral Agreement.

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Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E	PAR	H
	2026 AW2	2026 01/14-01/14	12.8,12.4	108	3	0.628	0.001	0.7	0.1		24.3
	2026 CC	2026 02/06-02/06	65.1,66.0	105	-3	0.015110	0.000004	0.34	0.15		25.2
	2026 CU1	2026 02/24-02/24	*6.8, 6.6	155	3	0.037558	0.000006	0.49	0.07	-1	24.6
						0.0709	0.0001	0.10	0.07		
	2026 DB	2026 02/16-02/17	15.4,19.7	152	-8	0.06461	0.00003	0.31	0.12	-3	28.1
						0.05472	0.00006	0.15	0.12		
	2026 EE2	2026 03/13-03/14	20.1,33.8	175	13	0.28598	0.00001	0.48	0.07		24.2

Table II. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Amplitude error (A.E.) is calculated as √2 × (lightcurve RMS residual). PAR is the expected Principal Axis Rotation quality detection code (Pravec et al., 2005) and H is the absolute magnitude at 1 au from Sun and Earth taken from the Small-Body Database Lookup (JPL, 2026).

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GENERAL REPORT OF POSITION OBSERVATIONS BY THE ALPO MINOR PLANETS SECTION FOR THE YEAR 2025

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Observations of positions of minor planets by members of the Minor Planets Section in calendar year 2025 are summarized.

During the year 2025 a total of 249 visual observations and 9 APN digital images of 54 different minor planets were reported by members of the Minor Planets Section.

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 interval. When a significant departure from the predicted magnitude was noted, it is stated in the next line below the number of positions. The year is 2025 in each case.

Positional observations were contributed by the following observers:

Observer, Instrument	Location	Planets	Positions
Faure, Gérard		23	65
20 cm Celestron	Vaison la Romaine (France)		
35 cm Meade LX200	Col de L'Arzelier (France)		
45 cm Dobson Skywatcher	Pas du Serpaton (France)		
Harvey, G. Roger	Concord, North	33	187
81 cm Newtonian	Carolina, USA		
Rayon, Jean-Michel (with Gérard Faure)		3	13
45 cm Dobson Skywatcher	Pas du Serpaton (France)		
20 cm Vixen R200 SS F/4			
APN positions with Sony Nex6400 imager			
	Meylan (France)		

MINOR PLANET	OBSERVER & APERTURE (cm)	OBSERVING PERIOD (2025)	NO. OBS.
1207 Ostenia	Faure, 35	Oct 18	2
1347 Patria	Faure, 45	Jul 31	2
1544 Vinterhansenia	Faure, 35	Oct 18-19	2
1702 Kalahari	Faure, 35	Jun 26	2
1734 Zhongolovich	Faure and Rayon, 45	Aug 24	2
2071 Nadezhda	Faure, 35	Jul 31	2
2109 Dhotel	Faure, 35	Oct 18	2
2408 Astapovich	Faure, 35	Aug 26	2
2660 Wasserman	Faure, 35	Jun 27-28	2
3235 Melchior	Harvey, 81	Feb 26	3
3497 Inannen	Faure, 35	Jun 27-28	2
3982 Kastel'	Faure, 35	Jun 27	4
4217 Engelhardt	Faure, 35	Sep 19	3
4257 Ubasti	Faure, 35	Sep 18	5
4573 Piestany	Harvey, 81	Jan 29	3
5275 Zdislava	Faure, 35	Aug 26	2
5676 Voltaire	Faure, 35	Jul 31	2
6521 Pina	Harvey, 81	Apr 29	3
7723 Lugger	Faure, 35	Aug 26	2
7889 1994 LX	Faure, 35	Jun 26	6
9058 1992 JB	Faure, 35	Apr 30	2
	Harvey, 81	May 8	6
			0.9f@16.0
9068 1993 OD	Faure, 35	Oct 18	3
9442 Beiligong	Harvey, 81	Jan 8	3
			0.4f@16.2
11055 Honduras	Harvey, 81	Apr 29	3
11875 Rhone	Harvey, 81	Apr 17	6
16549 1991 RE10	Harvey, 81	Jan 8	3
17664 1996 VP30	Harvey, 81	Oct 15	3
19261 1995 MB	Faure, 35	Jun 27	2
28141 ten Brummelaar	Harvey, 81	Feb 4	3
29863 1999 FC43	Harvey, 81	Mar 4	3
37275 2000 XF43	Harvey, 81	Dec 20	6
			0.5f@16.2
112985 2002 RS28	Harvey, 81	Oct 15	6
134340 Pluto	Faure and Rayon, 45	Jul 30-31	2
164206 2004 FN18	Harvey, 81	Oct 15	6
263976 2009 KD5	Harvey, 81	Jun 23	6
265196 2004 BW58	Harvey, 81	Feb 4	6
313591 2003 MB7	Harvey, 81	Aug 20	6
424482 2008 DG5	Harvey, 81	May 23-24	12
462959 2011 DU	Harvey, 81	Apr 17-18	12
465402 2008 HW1	Harvey, 81	Mar 4	6
535844 2015 BY310	Harvey, 81	Feb 26	6
612356 2002 JX8	Harvey, 81	May 5	6
613291 2005 YX128	Harvey, 81	Jul 31	6
793349 2003 AY2	Faure, 35	Jun 28-29	6
2022 FR3	Harvey, 81	Apr 2	6
2022 SW12	Harvey, 81	Sep 23	6
2025 BG	Harvey, 81	Feb 3-4	10
2025 BC10	Harvey, 81	Mar 29	6
			0.8f@16.0
2025 EF4	Harvey, 81	Mar 15	6
2025 FA22	Faure, 35	Sep 19	6
	Harvey, 81	Sep 19	6
	Rayon, 20	Sep 19	9 APN
2025 NH3	Harvey, 81	Aug 17	6
2925 QO7	Harvey, 81	Aug 31	6
			1.0f@15.8
2025 QD8	Harvey, 81	Sep 3	6
			1.4f@15.6
2025 RL2	Harvey, 81	Sep 19	6

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This list gives those asteroids in this issue for which physical observations (excluding astrometric only) were made. This includes lightcurves, color index, and H-G determinations, etc. In some cases, no specific results are reported due to a lack of or poor-quality data. The page number is for the first page of the paper mentioning the asteroid. EP is the "go to page" value in the electronic version.

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85	Io	7	175
98	Ianthe	20	188
415	Palatia	20	188
507	Laodica	20	188
571	Dulcinea	25	193
630	Euphemia	13	181
631	Philippina	10	178
692	Hippodamia	25	193
761	Brendelia	29	197
771	Libera	10	178
795	Fini	25	193
856	Backlunda	40	208
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1390	Abastumani	40	208
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1586	Thiele	33	201
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10416	Kottler	37	205
10416	Kottler	40	208
14342	Iglika	20	188
16958	Klaasen	40	208
18067	2000 AB98	37	205
18818	Yasuhico	37	205
19616	1999 OS3	37	205
21831	1999 TX93	40	208
27185	1999 CH37	18	186
34704	2001 OS80	11	179
47360	1999 XA88	18	186
70171	1999 OL2	37	205
70171	1999 OL2	40	208
	2026 AW2	44	212
	2026 CC	44	212
	2026 CU1	44	212
	2026 DB	44	212
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The deadline for the next issue (53-4) is July 15, 2026. The deadline for issue 54-1 is October 15, 2026.