ASTEROID LIGHTCURVES FOR SIX ASTEROIDS

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Synodic rotation periods and amplitudes are reported for minor planets: 57 Mnemosyne, 191 Kolga, 236 Honoria, 1428 Mombasa, 1532 Inari, and 1614 Goldschmidt.

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.

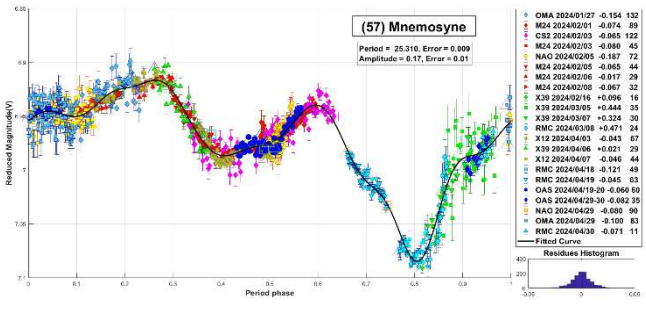
The image acquisition was performed without filters and with exposure times of a few minutes. All images used were corrected using dark frames and, in some cases, bias and flat-field corrections were also used. Photometry measurements were performed using *FotoDif* software and for the analysis, we employed *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.

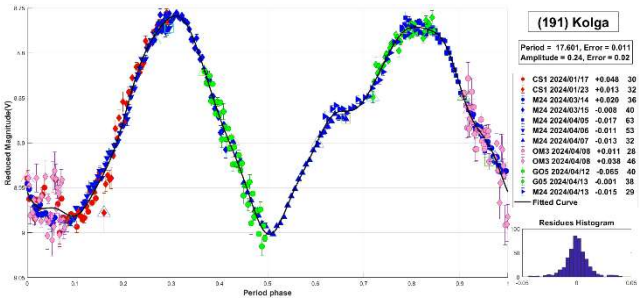
Targets were selected based on the following criteria: 1) those asteroids with magnitudes accessible to the equipment of all participants, 2) those with favorable observation conditions from Argentina or Spain or Italy, i.e. with negative or positive declinations δ, respectively, and 3) objects with few periods reported in the literature and/or with Lightcurve Database (LCDB) (Warner et al., 2009) quality codes (U) of less than 3.

In this work, we present measurements of periods corresponding to asteroids previously analyzed by our team. These lightcurves display improved results and are part of a new long-term project that we are initiating.

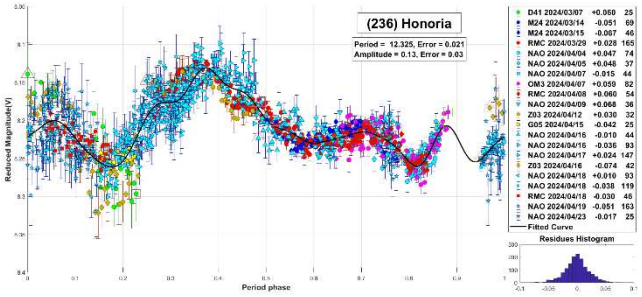
57 Mnemosyne. It is an S-type asteroid, discovered in 1859 by R. Luther. The initial measured periods reported were approximately 12 hours (Harris et al., 1992; Ditteon and Hawkins, 2007; Behrend, 2016web). Pilcher (2019) found a period P = 25.310 h. We previously measured the period of this asteroid, obtaining a result of P = 26.12 ± 0.01 h (Colazo et al., 2021). In this work, we present the following result: P = 25.310 ± 0.009 h with Δm = 0.17 ± 0.01 mag, which is closer to the value measured by Pilcher. The Julian Date for zero phase, light-time corrected is JDo(LTC) = 2460336.606489.



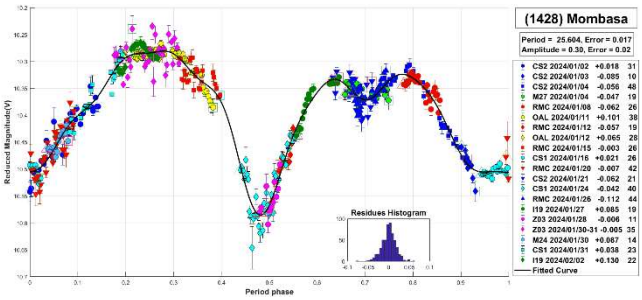
191 Kolga. It is an XC-type asteroid, discovered in 1878 by C.H.F. Peters. Behrend (2005web) found the period to be P = 17.604 h. We previously measured the period of this asteroid, obtaining a result of P = 17.59 ± 0.01 h (Colazo et al., 2021). In this paper, we present a period of 17.601 ± 0.011 h with Δm = 0.24 ± 0.02 mag. JDo(LTC) = 2460326.5411912217.



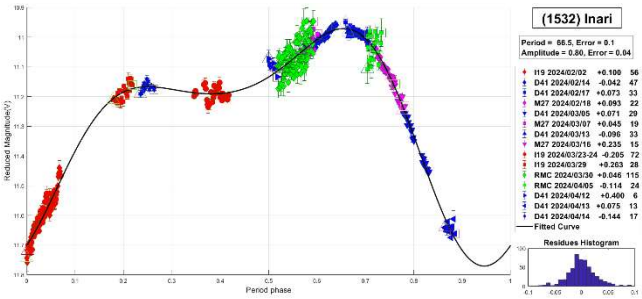
236 Honoria. It is an S-type asteroid, discovered in 1884 by J. Palisa. Lagerkvist et al. (1987) reported a period of P = 12.338 h. We previously measured the period of this asteroid, obtaining a result of P = 12.338 ± 0.008 h (Colazo et al., 2021; 2022). In this work, we present the following result: P = 12.325 ± 0.021 h with Δm = 0.13 ± 0.03 mag, obtained under different viewing illumination and geometry. JDo(LTC) = 2460377.3312493293.



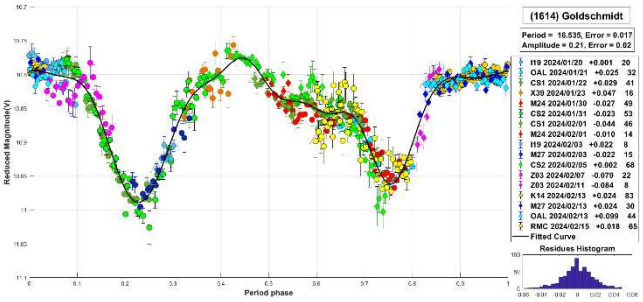
1428 Mombasa. It was discovered in 1937 by C. Jackson. The more recent period published in the literature corresponds to P = 16.67 h (Hawkins and Ditteon, 2008). In this work, we provide rather different results and propose a longer period of P= 25.604 ± 0.017 h and Δm = 0.30 ± 0.02 mag. JDo(LTC) = 2460312.449777841.



1532 Inari. It is an S-type asteroid, discovered in 1938 by Y. Vaisala. The more recent period published in the literature corresponds to P = 25 h (Behrend, 2008web). In this work, we propose a longer period of P = 66.5 ± 0.1 h with Δm = 0.08 ± 0.04 mag. JDo(LTC) = 2460342.617510007.



1614 Goldschmidt. It was discovered in 1952 by A. Schmitt. The more recent period published in the literature corresponds to P = 16.54 h (Polakis, 2019). However, the author did not present a light curve with full coverage. We measured a period of 16.535 ± 0.017 h with Δm = 0.21 ± 0.02 mag, achieving good coverage. JDo(LTC) = 2460329.5924063786.



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Number	Name	yy/ mm/dd- yy/ mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
57	Mnemosyne	24/01/27-24/04/30	*11.2,16.8	156	-11	25.310	0.009	0.17	0.01	MB-O
191	Kolga	24/01/17-24/04/13	*18.3,04.5	195	7	17.601	0.011	0.24	0.02	MB-O
236	Honoria	24/03/07-24/04/23	01.1,14.2	165	-2	12.325	0.021	0.13	0.03	MB-O
1428	Mombasa	24/01/02-24/02/02	05.0,15.0	93	-7	25.604	0.017	0.30	0.02	MB-O
1532	Inari	24/02/02-24/04/14	*06.9,17.5	149	-1	66.526	0.026	0.80	0.04	Eos
1614	Goldschmidt	24/01/20-24/02/15	*09.5,03.3	141	-7	16.535	0.017	0.21	0.02	MB-O

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-O: main-belt outer; Eos: 221 Eos.

Observatory	Telescope	Camera
D41 Osservatorio Astronomico di Orciatico	SCT (D=355mm; f=7.4)	CCD SBIG ST10XME
G05 Obs.Astr.Giordano Bruno	SCT (D=203mm; f=6.3)	CCD Atik 420 m
I19 Obs.Astr.El Gato Gris	SCT (D=355mm; f=10.6)	CCD SBIG STF-8300M
K14 Obs.Astr.de Sencelles	Newtonian (D=250mm; f=4.0)	CCD SBIG ST-7XME
M24 Oss.Astr.La Macchina del Tempo	RCT (D250mm; f=8.0)	CMOS ZWO ASI 1600MM
M27 Elijah Observatory	RCT (D250mm; f=6.0)	CCD QSI 683
X12 Obs.Astr.Los Cabezones	Newtonian (D=200mm; f=5.0)	CMOS QHY 174M
X39 Obs.Astr.Antares	Newtonian (D=250mm; f=4.72)	CCD QHY9 Mono
Z03 Obs.Astr.Río Cofio	SCT (D=254mm; f=6.3)	CCD SBIG ST-8XME
CS1 CapoSudObservatory	RCT (D=400mm; f=5.7)	CCD Atik 383L+Mono
CS2 CapoSudObservatory	Newtonian (D=254mm; f=4.7)	CCD Atik 420 Mono
NAO Obs.Astr.Naos	Newtonian (D=200mm; f=5.0)	CMOS ZWO 178
OAL Osservatorio Astronomico di Orciatico	SCT (D=355mm; f=7.4)	CCD SBIG ST10XME
OAS Obs.Astr.de Ariel Stechina 1	Newtonian (D=254mm; f=4.7)	CCD SBIG STF-402
OMA Obs.Astr.Vuelta por el Universo	Newtonian (D=150mm; f=5.0)	CMOS POA Neptune-M
OM3 Obs.Astr.Chopis	Newtonian (D=200mm; f=4.5)	CMOS ZWO ASI294MC-PRO
RMC Obs.Astr.de Raúl Melia Carlos Paz	Newtonian (D=254mm; f=4.7)	CMOS QHY 174M

Table II. List of observatories and equipment.

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