ASTEROID PHOTOMETRY: LIGHTCURVE RESULTS FOR SIX TARGETS

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Synodic rotation periods and amplitudes are reported for: 494 Virtus, 866 Fatme, 1075 Helina, 1279 Uganda, 1424 Sundmania, 1593 Fagnes, (5977) 1992 TH1, (58143) 1983 VD7.

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.

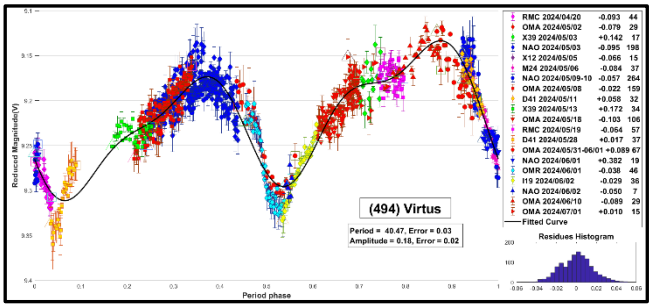
The image acquisition was performed without filters and with exposure times of a few minutes. All images used were corrected using dark frames and, in some cases, bias and flat-field corrections were also used. Photometry measurements were performed using *FotoDif* software and for the analysis, we employed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

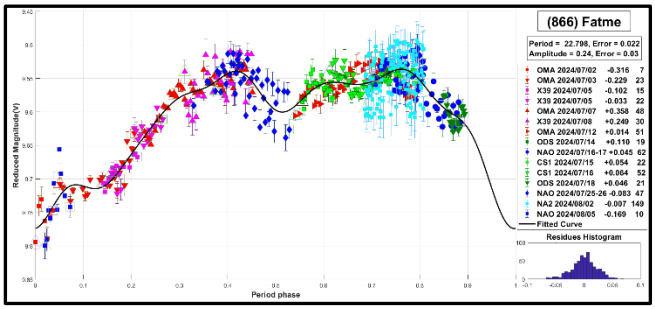
494 Virtus. It is a C-type asteroid, discovered in 1902 by M. Wolf (NASA, 2024). Several periods were measured for this asteroid with the following results: P = 4.9903 h (Behrend, 2008web), P = 5.570 h ± 0.003 h (Hamanowa and Hamanowa, 2009), and more recently P = 40.431 ± 0.004 h (Dose, 2022). We have determined a 40.47 ± 0.03 h period, which is consistent with the one proposed by Dose.



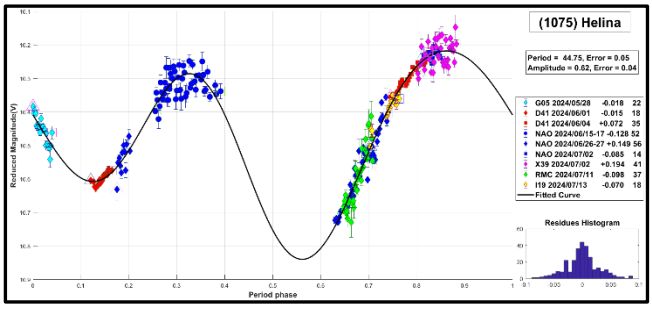
866 Fatme. It was discovered in 1917 by M. Wolf (NASA, 2024). Several periods were measured for this asteroid with the following results: P = 20.03 h ± 0.01 h (Stephens, 2002), P = 9.36 h ± 0.05 h (Behrend, 2012web), and P = 11.600 ± 0.001 h (Dose, 2021). The results we obtained, P = 22.798 ± 0.022 h with Δm = 0.24 ± 0.03 mag, are consistent with the longer period proposed by Stephens.

Number	Name	yy/ mm/dd- yy/ mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
494	Virtus	24/04/20-24/07/01	*2.1,19.9	215	-1	40.47	0.03	0.18	0.02	MB-O
866	Fatme	24/07/02-24/08/05	*4.7,08.3	292	-4	22.798	0.022	0.24	0.03	MB-O
1075	Helina	24/05/28-24/07/14	5.0,16.9	238	8	44.75	0.05	0.62	0.04	EOS
1279	Uganda	24/05/18-24/07/03	16.7,30.5	216	-7	11.172	0.043	0.21	0.06	MB-I
1424	Sundmania	24/05/09-24/07/05	*3.5,16.2	237	4	93.3	0.2	0.44	0.02	MB-O
1593	Fagnes	24/05/25-24/07/13	10.3,29.1	247	12	25.310	0.015	0.45	0.02	MARS
5977	1992 TH1	24/06/30-24/07/11	12.2,08.0	302	9	42.5	0.2	0.63	0.03	MAR
58143	1983 VD7	24/07/07-24/08/06	*16.0,04.6	303	-18	79.1	0.2	0.57	0.03	MB-I

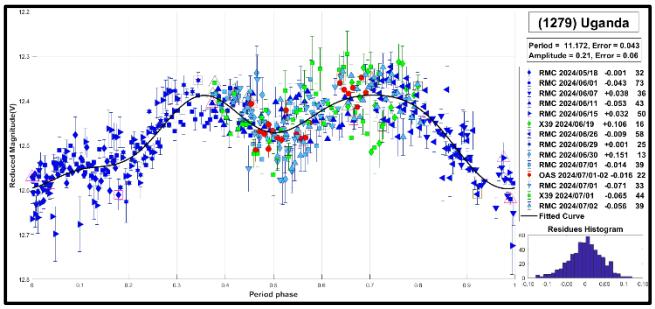
Table I. Observing circumstances and results. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extremum during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range (see Harris et al., 1984). Grp is the asteroid family/group (Warner et al., 2009). MB-I: main-belt inner; MAR: 170 Maria; MB-O: main-belt outer; MARS: Mars-crosser; EOS: 221 Eos.



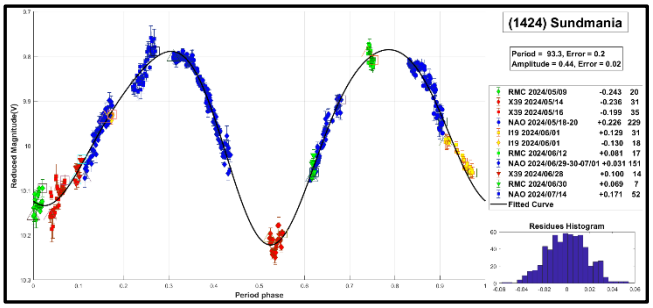
1075 Helina. It was discovered in 1926 by G. Neujmin (NASA, 2024). The more recent period published in the literature corresponds to P = 44.9 h (Martikainen et al., 2021). Our period P = 44.75 ± 0.05 h agrees with the one measured by Martikainen et al.



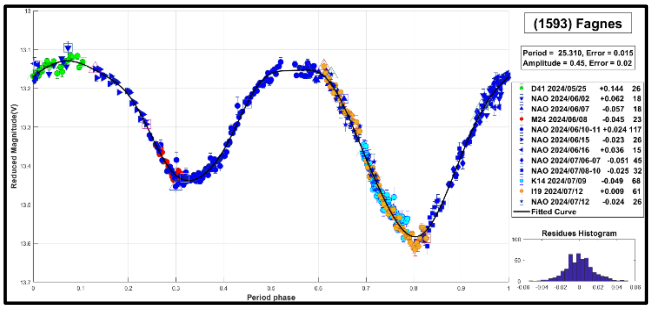
1279 Uganda. It was discovered in 1933 by C. Jackson (NASA, 2024). In the literature, we found only one period reported for this asteroid: P = 11.6 h (Binzel, 1987). Our study supports the aforementioned period and yielded the following data: P = 11.172 ± 0.043 h with Δm = 0.21 ± 0.06 mag. The previously reported period, derived from fragmentary lightcurves, may be subject to significant uncertainty, according to JPL.



1424 Sundmania. It was discovered in 1937 by Y. Vaisala (NASA, 2024). The more recent period published in the literature corresponds to P = 93.73 h (Martikainen et al., 2021). The results we obtained are P = 93.3 ± 0.2 h and Δm = 0.44 ± 0.02 mag. Our period agrees well with the one measured by Martikainen et al.



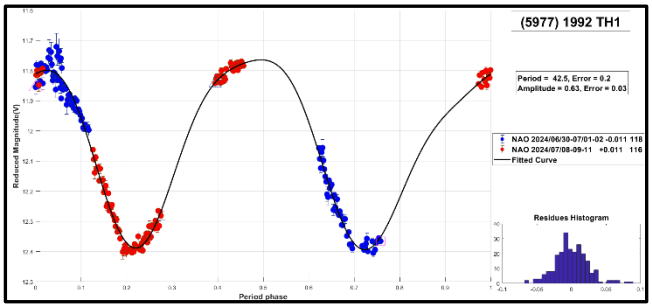
1593 Fagnes. It was discovered in 1951 by S. Arend (NASA, 2024). We found in the literature two rather different periods calculated for this object: P = 16.45 ± 0.03 h (Harris et al., 1992), and P = 25.25 h (Behrend, 2021web). The results we obtained are P = 25.310 ± 0.015 h. Our period well agrees with the one measured by Behrend.



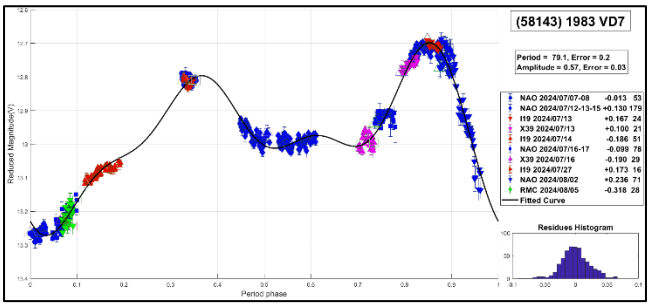
(5977) 1992 TH1. It was discovered in 1992 by H.E. Holt (NASA, 2024). Interestingly, we couldn't find a reported period for this object in the literature. According to our observations and after a thorough analysis, we propose a period of P = 42.5 ± 0.2 h and Δm = 0.63 ± 0.03 mag.

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
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
NAO Obs.Astr.Naos	Newtonian (D=250mm; f=4.0)	CMOS QHY 163M
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
OMR Obs.Astr.Municipal Reconquista	Newtonian (D=254mm; f=4.0)	Player One Ceres-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.



(58143) 1983 VD7. It was discovered in 1983 by Cavriana (NASA, 2024). For this asteroid, we could not find published periods in the literature either. In this work, we propose a period of $P = 79.1 \pm 0.2$ h with $\Delta m = 0.57 \pm 0.03$ mag.



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