PHOTOMETRY AND LIGHT CURVE ANALYSIS OF SIX ASTEROIDS BY GORA'S OBSERVATORIES

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La Pampa, ARGENTINA

Observatorio Orbis Tertius (MPC X14) - Córdoba
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Observatorio Galileo Galilei (MPC X31) - Oro Verde
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Observatorio Astronómico Aficionado Omega
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Observatorio Cielos de Banfield (GORA OCB) - Banfield
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Observatorio de Damián Scotta 1
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Synodic rotation periods and amplitudes are reported for 470 Kilia, 478 Tergeste, 548 Kressida, 666 Desdemona, 814 Tauris, and (68063) 2000 YJ66.

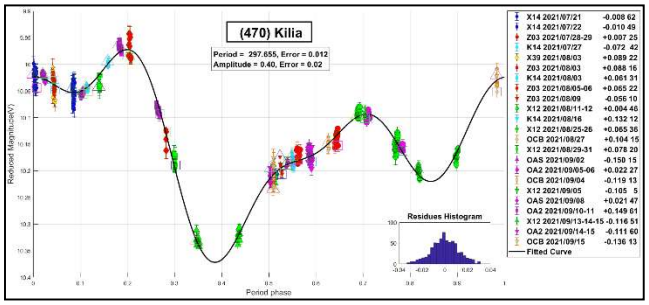
The periods and amplitudes of asteroid lightcurves presented here are the product of collaborative work by GORA (Grupo de Observadores de Rotaciones de Asteroides). In all the studies we have applied relative photometry assigning V magnitudes to the calibration stars.

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-fields. Photometry measurements were performed using *FotoDif* software and for the analysis, we employed *Periodos* software (Mazzone, 2012).

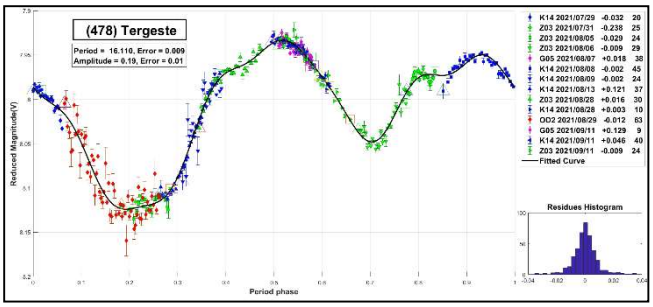
The lightcurve figures contain the following information: the estimated period and period error and the estimated amplitude and amplitude error. In the reference boxes, the columns represent, respectively, the marker, observatory MPC code or the GORA internal code, session date, session offset, and several data points.

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

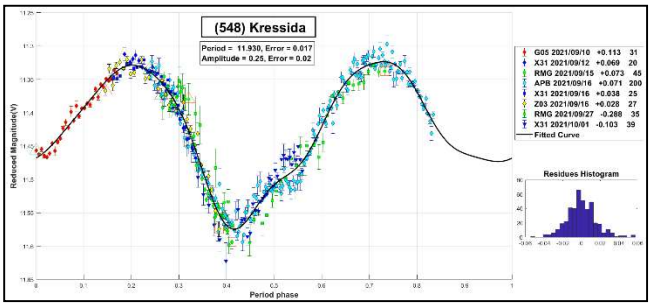
470 Kilia is an S-type asteroid discovered in 1901 by Carnera. Behrend (2010web) reported a period of 26.4 h. In contrast, Stephens (2009) measured a period of 290 h, and, recently, Pilcher and Polakis (2020) published a period of 296.0 ± 5 h. Our analysis yields a period of 297.655 ± 0.012 h and amplitude Δm = 0.40 ± 0.01 mag. Note that our period is in good agreement with a slow rotator, as previously proposed by Stephens and Pilcher and Polakis.



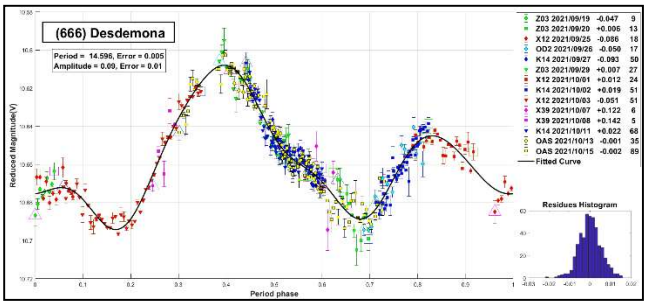
478 Tergeste is an S-type asteroid discovered in 1901 by Carnera. The period most recently reported in the literature is P = 16.105 ± 0.002 h (Marciniak et al., 2018). Previous observations, including several performed by the same author, yielded a similar period. The results we obtained are P = 16.110 ± 0.009 h and Δm = 0.19 ± 0.01 mag, in good agreement with previous results.



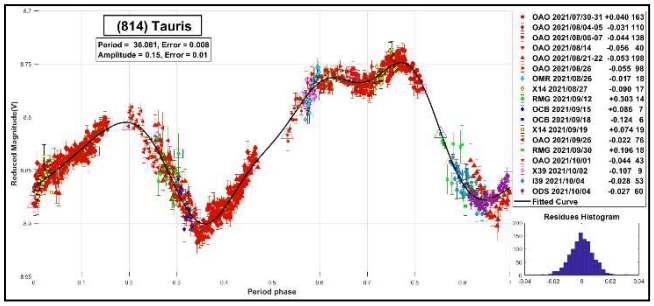
548 Kressida. This S-type asteroid was discovered in 1904 by Gotz. We measured a period of 11.930 ± 0.017 h with Δm = 0.25 ± 0.02 mag. These results agree well with those reported by Behrend (2002web) of P = 11.9404 ± 0.0006 h and Δm = 0.44 ± 0.02 mag. The difference between the amplitudes might be caused by the change in aspect angle between observations.



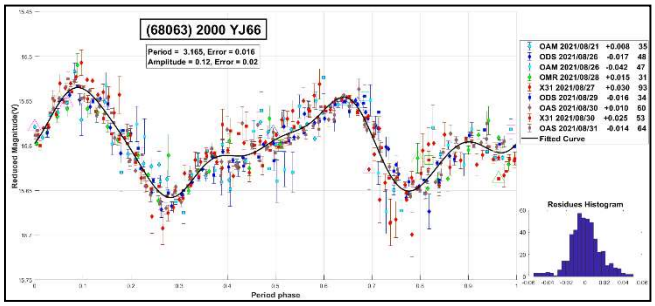
666 Desdemona was discovered in 1908 by Kopff. Behrend (2004web, 2005web, 2006web) reported three identical periods for this asteroid: 9.6 h. Nevertheless, Marciniak et al. (2015) published a period of 14.607 ± 0.004 h. We determined a period of 14.596 ± 0.005 h with Δm = 0.09 ± 0.01 mag, which is consistent with the one proposed by Marciniak et al.



814 Tauris is a C-type asteroid that was discovered in 1916 by Neujmin. We measured a period of 36.081 ± 0.008 h with Δm = 0.15 ± 0.01 mag. Similar values were previously reported by Alkema (2013), who found P = 35.8 ± 0.1 h and Δm = 0.18 ± 0.03 mag.



(68063) 2000 YJ66. This asteroid was discovered in 2000 from Kitt Peak Observatory, Arizona, USA, by the Spacewatch Program. It was linked to observations performed in 1964. After lightcurve analysis in 2014, Warner et al. (2015) proposed a companion for this asteroid. They reported a period of 2.1102 ± 0.0005 h and Δm = 0.14 ± 0.02 mag. Interestingly, our analysis yields rather different values. We found a period of P = 3.165 ± 0.016 h with Δm = 0.12 ± 0.02 mag. In view of such significant difference in the period, we believe that this case deserves further observations and analysis.



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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
470	Kilia	21/07/21-21/09/15	*9.5,16.5	315	6	297.655	0.012	0.40	0.02	MB-O
478	Tergeste	21/07/29-21/09/11	*10.7,8.0	332	16	16.110	0.009	0.19	0.01	MB-O
548	Kressida	21/09/10-21/10/01	*4.4,9.6	353	-5	11.930	0.017	0.25	0.02	MB-I
666	Desdemona	21/09/19-21/10/15	*10.3,6.1	12	6	14.596	0.005	0.09	0.01	MB-O
814	Tauris	21/07/30-21/10/04	*11.5,21.9	320	-24	36.081	0.008	0.15	0.01	MB-O
68063	2000 YJ66	21/08/21-21/08/31	6.2,10.5	330	6	3.165	0.016	0.12	0.02	NEA

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/O: main-belt inner/outer. NEA: near-Earth Asteroid.

Observatory	Telescope	Camera
G05 Obs.Astr.Giordano Bruno	SCT (D=203mm; f=6.0)	CCD Atik 420 m
I39 Obs.Astr.Cruz del Sur	Newtoniano (D=254mm; f=4.7)	CMOS QHY174
K14 Obs.Astr.de Sencelles	Newtoniano (D=250mm; f=4.0)	CCD SBIG ST-7XME
X12 Obs.Astr.Los Cabezones	Newtoniano (D=200mm; f=5.0)	CMOS QHY174MGPS
X14 Obs.Astr.Orbis Tertius	Newtoniano (D=200mm; f=5.0)	CMOS P1 Neptune M
X31 Obs.Astr.Galileo Galilei	RCT ap (D=405mm; f=8.0)	CCD SBIG STF8300M
X39 Obs.Astr.Antares	Newtoniano (D=250mm; f=4.7)	CCD QHY9 Mono
Z03 Obs.Astr.Río Cofio	SCT (D=254mm; f=6.3)	CCD SBIG ST8-XME
APB Obs.Astr.AstroPilar	Refractor (D=150mm; f=7.0)	CCD ZWO-ASI183
OAM Obs.Astr.de Aldo Mottino	Newtoniano (D=250mm; f=4.7)	CCD SBIG STF8300M
OAO Obs.Astr.Aficionado Omega	Newtoniano (D=150mm; f=5.0)	CMOS ZWO ASI178mm
OAS Obs.Astr.de Ariel Stechina 1	Newtoniano (D=254mm; f=4.7)	CCD SBIG STF402
OA2 Obs.Astr.de Ariel Stechina 2	Newtoniano (D=305mm; f=5.0)	CMOS QHY 174M
OCB Obs.Astr.Cielos de Banfield	Newtoniano (D=150mm; f=5.0)	CMOS QHY5L-II M
ODS Obs.Astr.de Damián Scotta 1	Newtoniano (D=300mm; f=4.0)	CMOS QHY 174M
OD2 Obs.Astr.de Damián Scotta 2	Newtoniano (D=250mm; f=4.0)	CCD Atik 314L+
OMR Obs.Astr.Municipal Reconquista	Newtoniano (D=254mm; f=4.0)	CMOS QHY5 Mono
RMG Obs.Astr.de Raúl Melia	Newtoniano (D=254mm; f=4.7)	CCD Meade DSI Pro II

Table II. List of observatories and equipment.

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