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## LIGHTCURVE ANALYSIS FOR SIX MAIN-BELT ASTEROIDS

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Photometric observations of six main-belt asteroids were obtained from 2022 August 3 to December 31. We derived the following rotational periods: 940 Rockefellia 6.834 ± 0.006 h, 1399 Teneriffa 2.829 ± 0.001 h, 1543 Bourgeois 41.163 ± 0.016 h, 5076 Lebedev-Kumach 3.341 ± 0.003 h, 6025 Naotosato 27.016 ± 0.009 h, and (20602) 1999 RC198 7.304 ± 0.005 h.

We report on the photometric analysis result for six main-belt asteroids. This work was done from Observatorio Polop MPC Z93 (Alicante) and from the Astronomical Center Alto Turia (CAAT), with the MPC code J57, located in Aras de los Olmos, Valencia, both operated by members of the Valencian Astronomy Association (AVA) (*http://www.astroava.org*). This database shows graphic results of the data (lightcurves), with the plot phased to a given period.

| Observatory | Telescope | CCD |
|---|---|---|
| Polop Z93 | SC 8" | SBIG ST8300 |
| C.A.A.T. J57 | 43 cm DK | SBIG STXL-11002 |

Table I. List of instruments used for the observations.

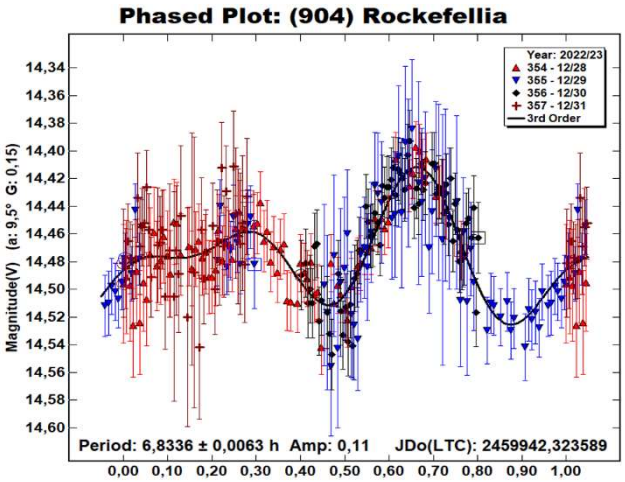
We managed to obtain a number of accurate and complete lightcurves. Observations were concentrated on asteroids with no reported period and those where the reported period was poorly established and needed confirmation. All the targets were selected from the Collaborative Asteroid Lightcurve (CALL) website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

Images were calibrated in *MaximDL* and measured using *MPO Canopus* (Bdw Publishing) with a differential photometry technique. The comparison stars were restricted to near solar-color to avoid introducing color dependencies, especially at larger air masses. The lightcurves give 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.

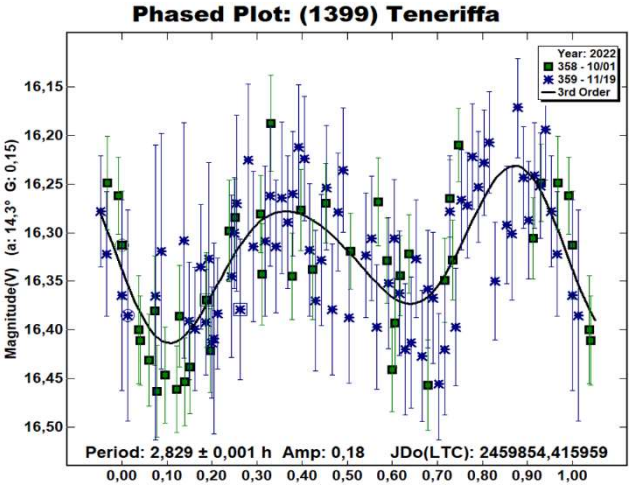
| Number | Name | mm/dd | Pts | Phase | $L_{PAB}$ | $B_{PAB}$ | Period(h) | P.E. | Amp | A.E. | Grp |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 904 | Rockefellia | 2022 12/28-12/31 | 274 | 9.70,10.47 | 81.7 | -17.7 | 6.834 | 0.006 | 0.11 | 0.02 | MB-O |
| 1399 | Teneriffa | 2022 10/01-11/19 | 204 | 13.7,17.84 | 29.5 | -7.3 | 2.829 | 0.001 | 0.18 | 0.02 | MB-I |
| 1543 | Bourgeois | 2022 08/04-08/19 | 1,242 | 8.67,9.34 | 319 | 9.5 | 41.163 | 0.016 | 0.16 | 0.02 | MB-M |
| 5076 | Lebedev-Kumach | 2022 11/18-11/25 | 340 | 8.3,8.66 | 59.6 | -11.4 | 3.341 | 0.003 | 0.05 | 0.01 | MB-I |
| 6025 | Naotosato | 2022 08/15-09/04 | 928 | 3.32,5.68 | 329.3 | 8.5 | 27.016 | 0.009 | 0.43 | 0.05 | MB-O |
| 20602 | 1999 RC198 | 2022 12/25-12/27 | 287 | 8.3,8.04 | 104.2 | 14.6 | 7.304 | 0.005 | 0.64 | 0.05 | MB-O |

Table II. Observing circumstances and results. Pts is the number of data points. The Phase angle values are for the first and last 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). MB-I/O: Main-belt inner/outer.

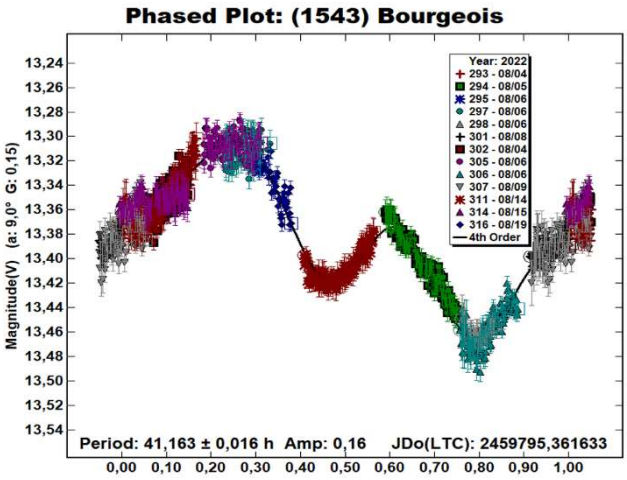
(904) Rockefellia. This main-belt asteroid (outer) was discovered on 1918 October 29 by German astronomer Max Wolf at the Heidelberg-Königstuhl State Observatory. It measures approximately 59 kilometers (37 miles) in diameter. It was named after American philanthropist and oil industrialist John D. Rockefeller (1839-1937). We made observations on 2022 Dec 28 to 31. We derived a rotation period of 6.836 ± 0.006 h and an amplitude of 0.11 mag. This is consistent with previous results: Dose (2022), Polakis (2018), and Polakis (2020).



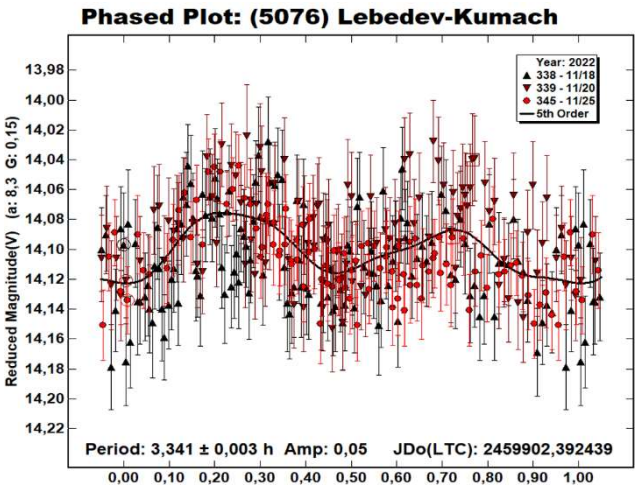

(1399) Teneriffa. This main-belt asteroid was discovered on 1936 August 23 by K. Reinmuth at Heidelberg. Its name derives from Tenerife, the largest and most populous island of the Canary Islands. We made observations on 2022 Oct 1-2 and Nov 19. From our data we derive a rotation period of 2.2829 ± 0.001 h and an amplitude of 0.18 mag. This is consistent with Waszczak et al. (2015), who got a 2.692 h period.



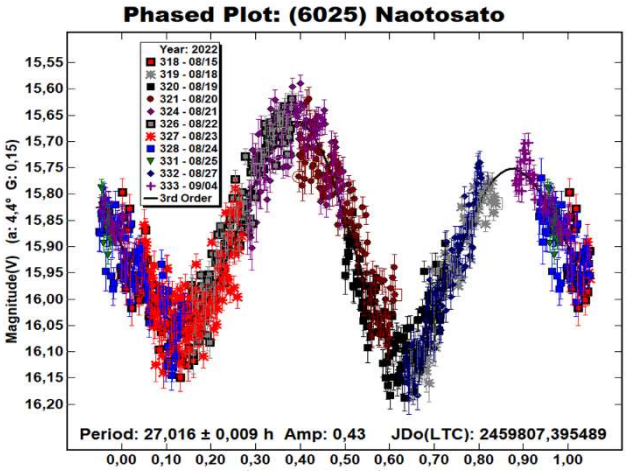

(1543) Bourgeois. This main-belt asteroid (middle) was discovered on 1941 September 2 by E. Delporte at the Uccle observatory. We made observations on 2022 Aug 4 to 19. From our data we derive a rotation period of 41.163 ± 0.016 h and an amplitude of 0.18 mag. Behrend (2005web) found a period of 2.48 h with incomplete data (U=1).



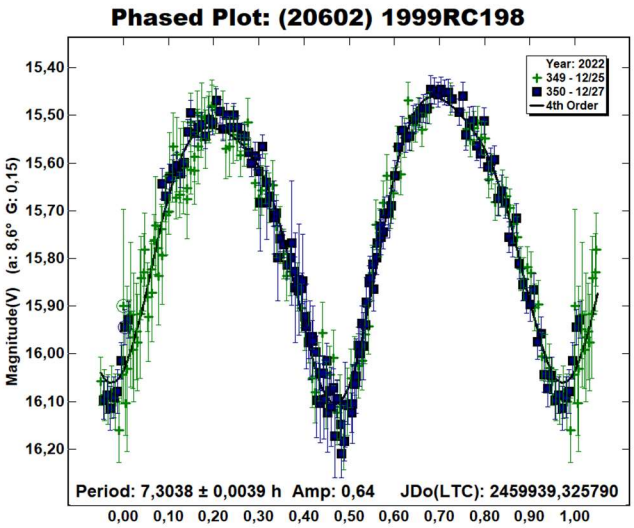

(5076) Lebedev-Kumach. This main-belt asteroid (inner) was discovered on 1973 September 23 by L. I. Chernykh at the Crimean Astrophysical Observatory. We made observations on 2022 Nov 18-25. From our data we derive a rotation period of 3.341 ± 0.003 h and an amplitude of 0.05 mag. Warner (2014) found a period of 3.219 h and Fauerbach and Fauerbach (2019) found 3.215 h.



(6025) Naotosato. This main-belt asteroid (outer) was discovered on 1992 December 30 by T. Urata at Oohira Observatory, Japan. We made observations on 2022 Aug 15 to Sep 4. From our data we derive a rotation period of 27.016 ± 0.009 h and an amplitude of 0.43 mag. Behrend (2006web) found a period of 10 h with incomplete data (U=1), which is not consistent with our observations.




(20602) 1999 RC198. This main-belt asteroid (outer) of the MEL category was discovered on 1999 September 8 at the LINEAR observatory, Socorro, USA. We made observations on 2022 Dec 25-27. From our data we derive a rotation period of 7.3038 ± 0.0038 h and an amplitude of 0.64 mag. Durech et al. (2019) and Pál et al. (2020) found a period of 7.361 h and 7.305 h respectively, both of which agree with our observations.

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