THE LIGHTCURVE AND ROTATION PERIOD OF 128 NEMESIS 2022 AUGUST THROUGH OCTOBER

Frederick Pilcher
Organ Mesa Observatory (G50)
4438 Organ Mesa Loop
Las Cruces, NM 88011 USA
fpilcher35@gmail.com

Julian Oey
Blue Mountains Observatory (Q68)
94 Rawson Pde. Leura, NSW, AUSTRALIA

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A synodic rotation period of 38.922 hours and amplitude 0.09 magnitudes with a somewhat irregular lightcurve is found for 128 Nemesis at its 2022 August-October apparition.

The first published lightcurve of 128 Nemesis was by Scaltriti et al. (1979), who found a period of 39 hours, amplitude 0.10 magnitudes, celestial longitude 78º, with a somewhat unsymmetric bimodal lightcurve.

This author (Pilcher, 2015) was unable to fit his observations from 2015 Jan. 5 - Apr 14, celestial longitude near 131º, to a period near 39 hours and published for that longitude a period of 77.81 hours, amplitude 0.08 magnitudes that had a good fit to a slightly unsymmetic bimodal lightcurve.

Colazo et al. (2022) found a period 38.907 hours, amplitude 0.14 magnitudes, celestial longitude near 245º, with a good fit to an unsymmetric bimodal lightcurve.

Vernazza et al. (2021) obtained disk resolved images of 128 Nemesis in the year 2018 with the SPHERE (Spectro-Polarimetric High contrast Exoplanet Research) instrument on the 8-meter VLT at the European Southern Observatory. They found a sidereal rotation period of 38.9325 ± 0.0001 hours and a rotational pole located at celestial longitude 313º, celestial latitude -19º.

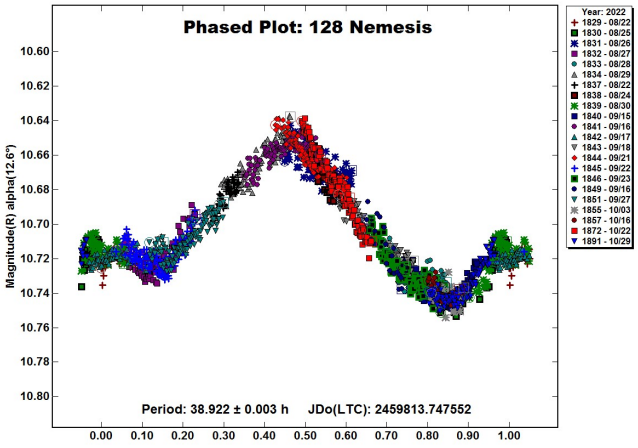
Being now the only author who claimed a period twice as great as near 38.9 hours, this author (Pilcher, 2022) re-examined his data from the year 2015. By adjusting the zero points of many sessions a few x 0.01 magnitudes, he found a fit to period 38.91 hours, amplitude 0.05 magnitudes with one asymmetric maximum and minimum per rotational cycle that was almost as good as to the original 77.81 hours. The two halves of a split halves plot to 77.81 hours were nearly identical. While the data near celestial longitude 131º are ambiguous between 38.91 hours and 77.81 hours, the overlap of the split halves plot led the author to prefer the 38.91-hour period.

In the next issue of the *Minor Planet Bulletin,* Ferrais et al. (2022) published a rotation period of 38.904 hours, amplitude 0.17 magnitudes with a slightly unsymmetric bimodal lightcurve near celestial longitude 235º.

In 2022 September 128 Nemesis came to opposition at brightest magnitude 10.6, declination -12º near perihelion. First author Pilcher invited second author Oey, who kindly accepted his invitation, to collaborate from the southern hemisphere. The observing strategy was to sample the full double period near 77.8 hours. A good overlap, including small irregularities, of both halves of the split halves lightcurve would constitute a robust resolution of the ambiguity in favor of near 38.9 hours.

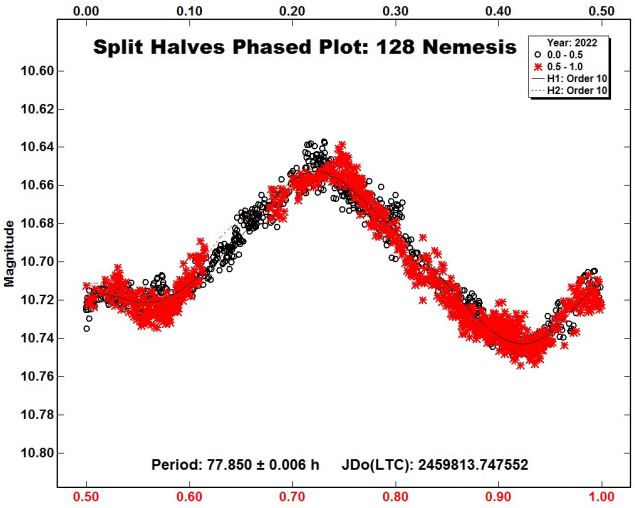
First author Pilcher used a 0.35m f/10 Meade LX200 GPS SCT, SBIG STL-1001E CCD, clear filter, exposure times limited to 20-30 seconds by the brightness of the target. Second author Oey used a 0.35m f/5.9 SCT, SBIG ST-8XME CCD, clear filter, 60 second exposure times. Both observers were hampered by an abundance of cloudy nights, but between them sampled the entire 38.9-hour lightcurve and all but one six-hour segment of the 77.8-hour lightcurve.

A total of 22 sessions were obtained in the interval 2022 Aug. 22 to Oct. 29 with the target near celestial longitude 354º. The data make an excellent fit to a somewhat irregular monomodal lightcurve with period 38.922 ± 0.003 hours, amplitude 0.09 ± 0.01 magnitudes. When phased to 77.850 hours, the split halves diagram shows that both halves of the lightcurve fit closely except for a missing 6-hour segment in the uniformly rising part of the lightcurve. Even without the other fully compatible results described in the next paragraph, the evidence in favor of the shorter period is strong.



Number	Name	yyyy/mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E	Amp	A.E.
128	Nemesis	2022/08/22-10/29	*12.6 - 17.8	354	-8	38.922	0.003	0.09	0.01

Table I. Observing circumstances and results. The phase angle is given for the first and last date, where the * indicates that a minimum value was reached between these dates. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude and latitude at mid-date range (see Harris et al., 1984).



Five dense lightcurves well distributed around the sky, and disk resolved images from adaptive optics, are all compatible with a period very close to the 38.922 hours found in this study. The period ambiguity has been resolved and a period near 38.922 hours can be considered secure; bringing a match to the conclusions reached through independent techniques.

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ROTATIONAL PERIOD DETERMINATION AND TAXONOMIC CLASSIFICATION FOR ASTEROID (1399) TENERIFFA

Massimiliano Mannucci, Nico Montigiani
Associazione Astrofili Fiorentini
Osservatorio Astronomico Margherita Hack (A57)
Florence, ITALY
info@astrofilifiorentini.it

Paolo Aldinucci
Associazione Astrofili Fiorentini
Osservatorio Astronomico Orciatico
Orciatico (PI), ITALY

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CCD photometric observations of one main-belt asteroid was obtained in order to measure its rotation period and define their taxonomic class. These measures were performed on October 2022 using the instrumentation available at the two observatories.

CCD photometric observations of (1399) Teneriffa were carried out in 2022 October at the Osservatorio Astronomico Margherita Hack (A57) and Osservatorio Astronomico Orciatico. The Osservatorio Astronomico Margherita Hack is equipped with a 0.35-m f/8.25 Schmidt-Cassegrain telescope, a SBIG ST10 XME ccd camera and Johnson-Cousins BVRc photometric filters. The pixel scale was 1 arcsec when binned at 2×2 pixels. The Osservatorio Astronomico Orciatico is equipped with a 0.35-m f/7.4 Schmidt-Cassegrain telescope and a SBIG ST1603 XME ccd camera with Johnson-Cousins BVRcIc photometric filters, having the pixel scale of 1.41 arcsec in bin 2×2. Data processing and analysis were done with *MPO Canopus* (Warner, 2021). All the images were calibrated with dark and flat field frames using *Astroart 6.0*. and Ricerca (Warner, 2006). Table I shows the observing circumstances and results.

1399 Teneriffa was discovered on 1936 Aug 23 at Heidelberg by the german astronomer Karl Wilhelm Reinmuth. The asteroid takes its name from the island of Tenerife, the largest of the Canary Islands. It was chosen from the list of lightcurve photometry opportunities on the *Minor Planet Bulletin* (Warner et al., 2022). It is a main-belt asteroid with a semi-major axis of 2.21576 AU, eccentricity 0.1663, inclination 6.507°, and an orbital period of 3.298 years. Its absolute magnitude is H = 13.62 (JPL, 2022; MPC, 2022). Our observations were conducted in two different steps. The first step consisted in collecting 209 data points during 4 nights across 18/10/2022 and 29/10/2022. The period analysis shows a bimodal solution for the rotational period with P = 2.69247 ± 0.00009h and an amplitude A = 0.15 mag, AE = 0.01 mag (Figure 1). The split-halves plot (Figure 2) let us solve the potential ambiguity between monomodal and bimodal solution by showing that the two halves of the 2.69247 h solution are not well superimposable even if very similar. This makes the bimodal solution much more probable. Moreover, we consulted the asteroid lightcurve database (LCDB; Warner et al., 2009) and we found one previous calculated period: P = 2.692 (Waszczak, 2015). The period we found seems to be in very good agreement with the previous mentioned period.