LIGHTCURVE ANALYSIS AND ROTATION PERIOD DETERMINATION OF ASTEROID 1821 ACONCAGUA

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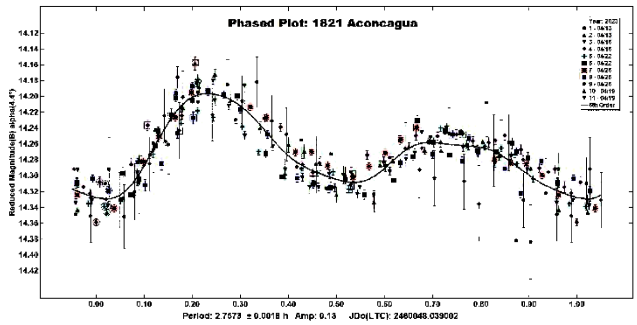
Lightcurve analysis was conducted on data from observations of main-belt asteroid 1821 Aconcagua between 2023 April 13 and 2023 April 26. Images were taken using two telescopes in Siding Spring, Australia and Naxxar, Malta. *MPO Canopus* was used for the data analysis, resulting in a rotation period determination of 2.7573 ± 0.0018 h, with amplitude 0.13 ± 0.02 mag.

1821 Aconcagua is a main-belt asteroid first discovered on 1950 June 24 by Miguel Itzigsohn. It has an eccentricity of 0.20, semi-major axis of 2.38 AU, orbital period of 3.67 years, inclination of 2.10°, and absolute magnitude of 13.30 (NASA JPL). The rotation period is currently unknown in the Asteroid Lightcurve Database (Warner et al., 2009). We present a lightcurve analysis to determine a rotation period for 1821 Aconcagua.

Images were collected during 13 nights between 2023 April 13 and April 26. The University of Maryland observers used the iTelescope T17 in Siding Spring, Australia (MPC Code: Q62) on April 13, April 16, April 19, April 22, and April 25. The Planewave 17" CDK telescope has a focal length of 2912mm and an aperture of 431mm. The FLI ProLine E2V CCD camera used has a pixel size of 9 µm square, array of 1024 × 1024 pixels, and a resolution of 0.92 arcsec/pix. The luminance filter was used for all observations.

Galdies observed from the Znith Observatory in Malta on April 26 using a 200mm SCT telescope with a Moravian G2-1600 CCD camera at 1 × 1 binning and a C filter.

A lightcurve analysis was performed on 234 images using *MPO Canopus* (version 10.7.12.9; Warner 2019). Images from each night were used to generate raw lightcurves, and lightcurves were generated before and after meridian flips when relevant. A typical two-peak and two-trough phased lightcurve was then generated using the raw lightcurves. The rotation period was determined to be 2.7573 ± 0.0018 h, with amplitude 0.13 ± 0.02 mag.



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Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1821	Aconcagua	2023 04/13-04/26	4.6	209.9	-2.9	2.7573	0.0018	0.13	0.02	MBA

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 extrema 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).

ROTATION PERIOD DETERMINATION AND LIGHTCURVE ANALYSIS OF ASTEROID 1852 CARPENTER

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We report on photometric observations of the main-belt asteroid 1852 Carpenter that were acquired from 2023 April 13 to April 26. The observations yielded a synodic rotation period of 29.8685 ± 0.0185h and an amplitude of 0.41 ± 0.06 mag.

During 2023, photometric observations of main-belt asteroid 1852 Carpenter were carried out from two observatories located in Utah, United States and Malta, Europe. Observations were carried out on 5 nights beginning on 2023 April 13 until 2023 April 26.

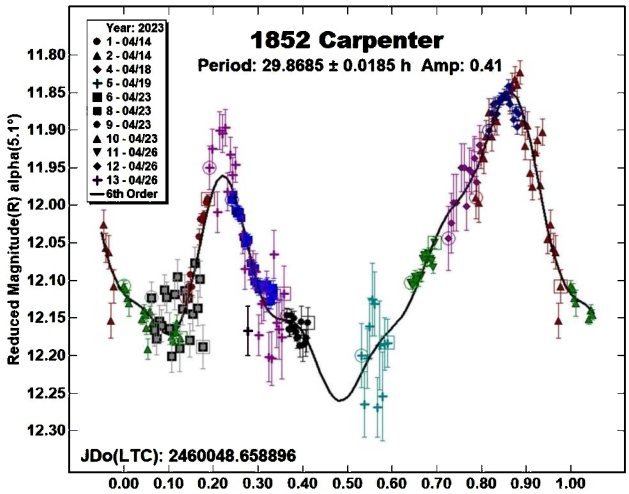
Observations from the Utah Desert Remote Observatory, MPC code U94, were conducted with telescope 21. T21 is a Deep Field Planewave 17" CDK telescope that uses a FLI-PL6303E CCD. It has a focal length of 1940mm, a pixel size of 9 µm square, an array of 3072 × 2048 pix, and resolution of 0.96 arcsec/pix. The luminance filter was used for all observations.

Observations were also obtained from Manikata Observatory, MPC code A40, in Malta using an OTA Meade 8in with a Mount Skywatcher EQ6-R Pro. The telescope utilized a SBIG ST10XMe CCD.

Photometric reduction, lightcurve construction, and period analyses were done using *MPO Canopus* software 10.7.12.9 (Warner, 2019). Differential aperture photometry was used and photometric measurements were based on the use of comparison stars of near-solar color that were selected by the Comparison Star Selector (CSS) utility available through *MPO Canopus*. Asteroid magnitudes for all nights except 2023 April 22 were based on the MPOSC3 catalog supplied with *MPO Canopus*. For the observation on the 22nd, we used the APASS catalog due to the dearth of comparison stars in the MPOSC3 catalog.

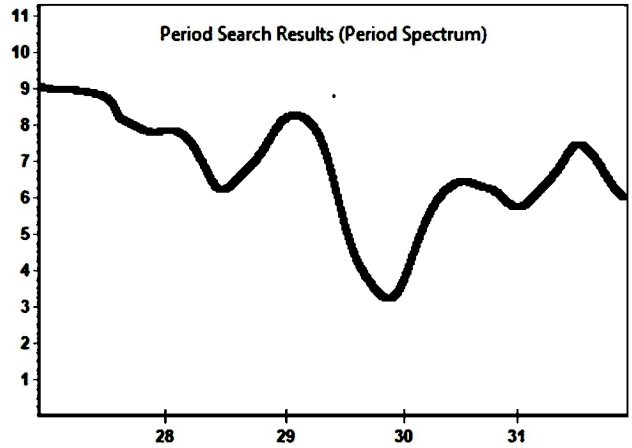
1852 Carpenter is a main-belt asteroid discovered on 1955 April 1 at the Goethe Link Observatory located in Indiana. This outer main-belt asteroid has a semi-major axis of 3.02 AU, an eccentricity of 0.06, a diameter of 21.38 km, and an absolute magnitude of 11.35 (JPL, 2020). Following a search of the Asteroid Lightcurve Database, we did not find any data previously recorded regarding a rotation period for this asteroid (LCDB, Warner et al., 2009).

Raw light curves were created for each night in *MPO Canopus* for data collected in Utah as well as Malta. In total, 208 images were used for analysis. After combining the individual raw lightcurves, we did Fourier analysis, adjusting the zero points of the magnitude system to find a lightcurve. The phased plot shows a fit with 6 orders, which has a full amplitude of 0.41 ± 0.06 mag and a potential lightcurve showing a period of 29.8685 ± 0.0185 h.



We experienced difficulty collecting data on a few nights due to excessive clouds and other weather conditions. This likely contributed to scatter in our phased plot and variance in uncertainties. Despite the scatter, the majority of data points in the lightcurve follow the reported shape well.

The period spectrum for this 21.38-km main-belt asteroid shows one primary solution. The Fourier analysis finds a pronounced RMS minimum between 29 h to 30 h. Further observations are needed to refine our lightcurve and overall period.



Number	Name	2023/mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
1852	Carpenter	04/13-04/25	5.0,6.7	202.1	13.3	29.8685	0.0185	0.41	0.06	MB

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 extrema 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).