ROTATION PERIOD DETERMINATION OF 3214 MAKARENKO

Gregory Dellamura, Elliot Frueh, Alexander Green, Melissa Hayes-Gehrke, Amy Kim, Sage Leone, Evelyn Ose, Carol Pang, Jason Ramsland, Maggie Reed, Matthew Simmons, Sandra Sumesh, Ehani Lai Taylor Mercado
University of Maryland Dept. of Astronomy
1113 PSC Bldg 415
College Park, MD, 20740 USA
mhayesge@umd.edu

Stephen M. Brincat
Flarestar Observatory
San Gwann SGN 3160, MALTA

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We report observations of the main-belt asteroid 3214 Makarenko in April 2023. Our results show P = 10.114 ± 0.015 h with an amplitude of 0.10 ± 0.04 mag.

3214 Makarenko was discovered on 1978 October 2 by Lyudmila Zhuravlyova at the Crimean Astrophysical Observatory in Crimea, Ukraine. This asteroid has an absolute magnitude of 11.57, a geometric albedo of 0.136, a diameter of 18.442 km, and an orbital period of 5.2315 years. With a semi-major axis of 3.0136 AU, it is located in the main belt between the orbits of Mars and Jupiter (NASA Small-Body Data Base).

According to the Asteroid Lightcurve Database, there are no previously found rotation periods for 3214 Makarenko (Warner et al., 2009).

The observations conducted of 3214 Makarenko were performed partly using the Beryl Junction observatory in Utah. The observations were completed using iTelescope T21 which is a Planewave 17" CDK that used a FLI-PL6303E CCD camera and used a pixel scale of 0.96 arcsec per pixel with an array of 3072 × 2048 (iTelescope Support Document). When observing, a luminance filter was used in order to be sure that all of the visible wavelengths are able to pass through. The exposure time of the images was set to 300 seconds and the binning was set to 1.

Additional observations of 3214 Makarenko were conducted at the Flarestar Observatory in San Gwann, Malta using a Meade SCT 0.25-m SCT telescope. The telescope had a Moravian G2-1600 CCD camera and used a pixel scale of 0.99 arcsec per pixel.

Analysis of the lightcurve was performed using *MPO Canopus* (Warner, 2012), using differential photometry techniques to determine the best polynomial approximation of the data. This period analysis gives a solution of P = 10.114 ± 0.015 h with an amplitude of 0.10 ± 0.04 mag.

This period gave a bimodal phased lightcurve, however, the two maxima are not spaced equally in the period, and one minimum is extended for about half of the period length. Because of this unusual lightcurve shape, more observations would be required to confirm period results.

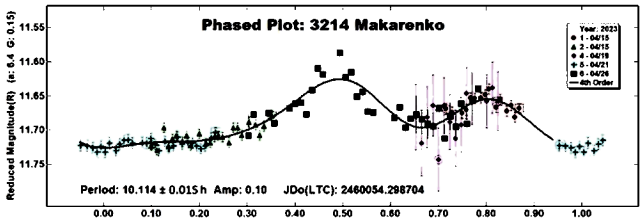

Figure 1. Phased lightcurve of 3214 Makarenko.

Acknowledgments

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Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
3214	Makarenko	2023 4/15-4/26	6.3,8.8	198.5	14.2	10.114	0.015	0.10	0.04	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).

LIGHTCURVE ANALYSIS AND ROTATION PERIOD DETERMINATION OF ASTEROID 1821 ACONCAGUA

Melissa Hayes-Gehrke, Alex Richman, Neil Sorkin,
George Wilson, Jerry Yang, Keith Hill, Jeff Jiang, Yash Joon,
Colin Nguyen, Aaron Price, Nobukazu Sawai, James Trauger
University of Maryland Dept. of Astronomy
113 PSC Bldg 415
College Park, MD, 20742 USA
mhayesge@umd.edu

Charles Galdies
Institute of Earth Systems
Znith Observatory
Naxxar, Malta

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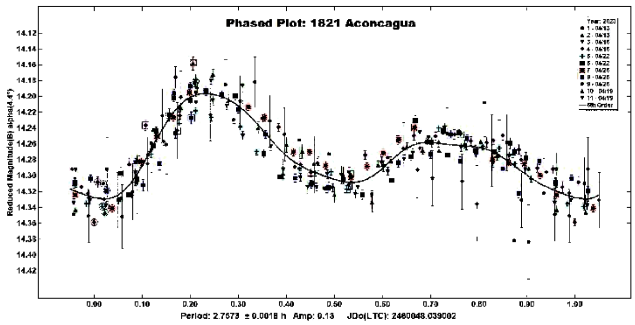
Lightcurve analysis was conducted on data from observations of main-belt asteroid 1821 Aconcagua between 2023 April 13 and 2023 April 26. Images were taken using two telescopes in Siding Spring, Australia and Naxxar, Malta. *MPO Canopus* was used for the data analysis, resulting in a rotation period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