

ASTEROID 471109 VLADOBAYHL (2010 CO12): OBSERVATIONS OF THE LIGHTCURVE

Vladimír Bahýl
Observatory “Júlia”
962 01 Zvolenská, Slatina
Slovakia
basoft@zv.psg.sk

Jaromír Volný,
(private astronomical observatory)
Stupava, Slovakia

(Received: 2022 June 16)

We present CCD photometry results for the asteroid 471109 Vladobahyl (2010 CO12). From 507 images we have constructed the lightcurve of this asteroid and estimate its rotational period to be 4.9217 ± 0.1746 h.

The asteroid 471109 Vladobahyl was discovered by Stefan Kürti in 2010. Since discovery, there have been very few observations of it. We attempted to observe it at its opposition in 2022 since it was accessible to our telescopes at the time.

We used the Newton AG 14 telescope equipped with the Atik 460EXm camera with the pixel dimensions $4.54 \mu\text{m} \times 4.54 \mu\text{m}$ at the J. Volny observatory in Stupava, Slovak Republic, during two nights. On 2022 January 6 we observed from the evening (19^h 04^{min} 06^{sec} UT) till the early morning of 2022 January 7 (03^h 42^{min} 12^{sec} UT). The next night on 2022 January 7 we have observed from the evening (18^h 03^{min} 38^{sec} UT) till the early morning of 2022 January 8 (02^h 26^{min} 24^{sec} UT). The exposure time was 120 s with no filters used. The sets of ‘fits’ files were stacked in *Astrometrica* (Raab, 2012) and the resultant fits images were measured using the *AstroImageJ* (Collins et al., 2017) software.

For the analysis of our measurements, we used the *Astrometrica* and *AstroImageJ* packages mentioned above. With *Astrometrica*, we first correctly detected the asteroid and then we measured it with *AstroImageJ*. We would like to emphasize that the measurements were done only if the object was clearly visible in the image. We used *AstroImageJ* for magnitude measurements since we found that *AstroImageJ* was more precise in our case. The comparison stars were selected individually from the Tycho-2 catalogue and were used for measurements on both nights.

Despite careful measurements, the dispersion of the observed magnitudes was quite high. Therefore, we decided to smooth the data using the *Mathematica* (Wolfram Research, 2021) package with a 7-point running average. The smoothed data were treated in the *Peranso* (Paunzen and Vanmunster, 2016) package to find the lightcurve of the asteroid using the CLEANest (Foster) and Lomb-Scargle methods. Both methods gave us the same results within the limits of errors. We applied the *Peranso* package three times, i.e., for the data from both nights separately, and for the combined data from both nights with very similar results. The results were used to determine the rotation period of the asteroid to be 4.927 ± 0.1746 h (Table I).

While we acknowledge the fact that the dispersion of the observed data is high, we had two full nights of continuous observations with consistent results of the observed rotation period of the asteroid.

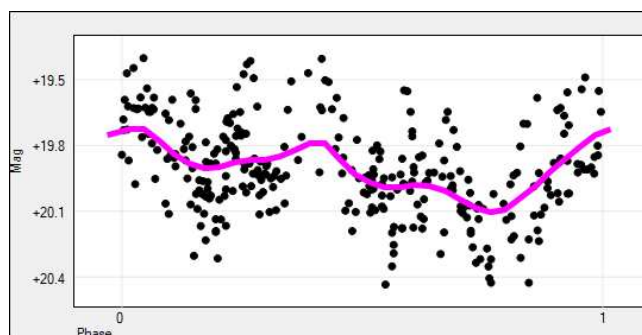


Figure 1. The lightcurve of the asteroid 471109 Vladobahyl.

Acknowledgements

This research made use of the NASA Exoplanet Archive, which is maintained by the California Institute of Technology, under contract with the National Aeronautics and Space Administration and the Exoplanet Exploration Program.

References

- Collins, K.A.; Kielkopf, J.F.; Stasson, K.G.; Hessman, F.V. (2017). “*ASTROIMAGEJ*: Image processing and photometric extraction for ultra-precise astronomical light curves.” *Astron. J.* **152**:77, 13pp. <http://www.astro.louisville.edu/software/astroimagej/>
- Paunzen, E.; Vanmunster, T. (2016). *Peranso* - Light Curve and Period Analysis Software.
- Raab, H. (2012). *Astrometrica*: Astrometric data reduction of CCD images, Astrophysics Source Code Library, record ascl: 1203.012.
- Wolfram Research, Inc. (2021). *Mathematica*, Version 13.0.0, Champaign, IL.

Number	Name	yyyy mm/dd	Phase	LPAB	BPAB	Period(h)	P.E.	Amp	A.E.	r
471109	Vladobahyl	2022 01/06-01/08	7.8, 8.5	94	5.9	4.9217	0.1746	0.38	0.21	2.15

Table I. Observing circumstances and results.