CCD LIGHTCURVE AND PERIOD ANALYSIS OF 712 BOLIVIANA

Kevin B. Alton
UnderOak Observatory
70 Summit Ave
Cedar Knolls, NJ 07927
mail@underoakobservatory.com

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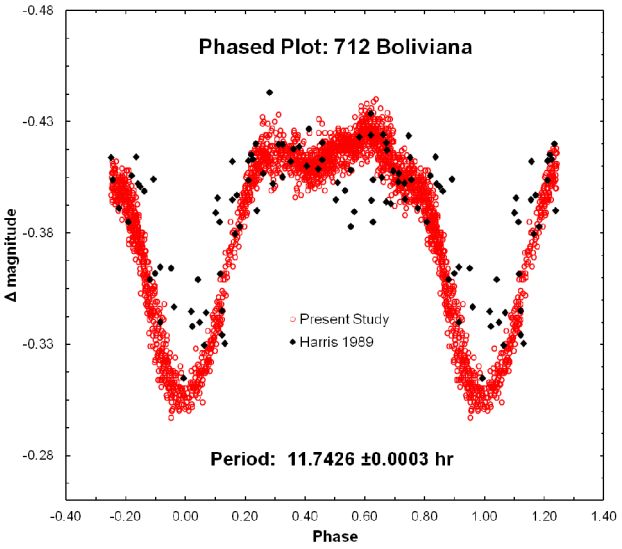
Analysis of combined CCD-derived lightcurves captured at UnderOak Observatory and photoelectric data from the literature has resulted in a revised synodic period solution for 712 Boliviana of P = 11.7426 h.

Discovered in 1911 by Max Wolf, 712 Boliviana is a moderately-sized (D = 128 km) C-type asteroid with an albedo of p_V = 0.051. Only two published papers regarding the rotation period of the asteroid were found: a report by Zappala *et al.* (1983) in which a partial lightcurve was obtained, and a later study by Harris and Young (1989) which combined new photoelectric data with those from Zappala *et al.* (1983) in order to improve the estimate for the rotation period.

The instrument used for the data obtained at UnderOak Observatory (UO) was a 0.2-m *f*/10 catadioptric OTA equipped with an SBIG ST-8XME thermoelectrically-cooled CCD. This combination produced a field-of-view (FOV) of about 21×14 arcmin. Unfiltered 60-sec exposures were continually captured during each session. Image calibration/registration procedures typically used at UO for CCD photometry have been published elsewhere (Alton, 2013). Data reduction with *MPO Canopus* (Warner, 2013) used at least two non-varying comparison stars in the same FOV to generate lightcurves by differential aperture photometry. Data were light-time corrected but not reduced to standard magnitudes. Fourier analysis (Harris *et al.,* 1989) yielded a period solution from the dataset acquired at UO; the combined data set was independently analyzed using a statistical method featured in *Peranso* (Vannmunster, 2006). Phased data are available upon written request.

For the new study, a total of 1927 images were taken over 11 nights in 2013 Oct-Nov. Fourier analysis within *MPO Canopus* was seeded with the rotation period (11.732 h) obtained from the JPL Solar System Dynamics website and produced the best folded fit at 11.743 ± 0.001 h. This value was independently confirmed using *Peranso* by applying periodic orthogonals (Schwarzenberg-Czerny, 1996) to fit observations and analysis of variance (ANOVA) to evaluate fit quality. The peak-to-peak amplitude (A = 0.12) was similar to that observed in the other two published lightcurves for this object. Alan Harris (private communications) graciously provided the photoelectric observations (n = 79) from Table Mountain Observatory (Harris and Young, 1989) which were originally used to estimate the first synodic period (11.732 ± 0.003 h) derived from a full lightcurve. The authors stated that they were confident in this value but could not rule out a period which was twice as long. Combined analysis (ANOVA) of these data (n = 2006; total time span: 12090.33 d) produced a slightly longer and presumably less equivocal value (11.7426 ± 0.0003 h) for the rotation period of 712 Boliviana.

Observatory	Year	Dates Observed
Table Mountain	1980	Oct 12-14, 26, 30, Nov 01, 02, 04, 05
UnderOak	2013	Oct 25, 26, 28, 29, Nov 02-04, 08, 09, 14, 19



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