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ASTEROID LIGHTCURVES FROM ALTIMIRA OBSERVATORY

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The following asteroid lightcurve synodic periods are reported: 502 Sigune (*P* = 10.929 ± 0.02 h); 781 Kartvelia (*P* = 19.04 ± 0.02 h); 828 Lindemannia (*P* = 20.52 ± 0.02 h); and 3322 Lidiya (*P* = 710 ± 10 h).

CCD differential photometry was performed on four asteroids at Altimira Observatory in southern California using a 28-cm *f*/6.3 Schmidt-Cassegrain telescope (SCT) and ST-8XE non-anti blooming gate (NABG) imager. Comparison stars were selected using the "solar-color" criterion in *MPO Canopus*, and their V-band magnitudes were extracted from the APASS DR7 catalog. No color transforms were applied to any of these targets; this is reasonable given that the comp stars were selected to have colors similar to a typical asteroid. All of the observations used for this report have been uploaded to the Minor Planet Center's ALCDEF web site (*http://www.minorplanetcenter.net/light_curve*).

502 Sigune. This object has a well-determined lightcurve period (*P* = 10.922 h) in the Lightcurve Database (LCDB; Warner *et al.*, 2009), and according to Warner *et al*. (2014) it is a candidate for shape/spin modeling if a few more lightcurves can be gathered. Three nights of differential photometry using a clear filter during the 2014 April apparition yielded the phased lightcurve shown in Figure 1. This figure is wrapped to the best-fit period, *P* = 10.929 ± 0.02 h, which is consistent with previous reports.

781 Kartvelia. A lightcurve period of *P* = 19.06 h has been reported by Behrend (2003) for this asteroid and Melton *et al*. (2012) reported *P* = 19.02 ± 0.02 h. This asteroid was observed on 7 nights during the 2014 April apparition using unfiltered differential photometry. The resulting lightcurve, phased to the best-fit period *P* = 19.04 h, is shown in Figure 2. Considering the formal accuracy of the period solutions (± 0.02 h), this is consistent with the previously-reported periods.

828 Lindemannia. No lightcurve period has been previously reported for this asteroid. Ditteon *et al.* (2012) observed a 0.08-mag variation but did not determine a period. Masiero *et al*. (2012) reported the diameter and albedo from WISE observations, but no lightcurve parameters. This asteroid was observed through 10 nights during its 2013 Oct–Nov apparition. The phased lightcurve is shown in Figure 3, wrapped to the best-fit period of *P* = 20.52 ± 0.02 h. The amplitude appears to be ≈ 0.15 mag (peak-to-peak) although this may be an underestimate since the maximum near phase ≈ 0.8 was not observed.

3322 Lidiya. There is no report in the lightcurve data base (Warner *et al.*, 2009), and no observations in ALCDEF for this asteroid. It was selected for study because it had a favorable apparition in late 2012, i.e., relatively bright and at a convenient northern declination. Observations were made in a mixture of V- and R-band as well as clear filter on nineteen nights. Each individual lightcurve was basically a flat line (within measurement noise), which suggested a long rotation period. The asteroid's V-magnitude was estimated from the R-band and unfiltered differential photometry using the APASS V-magnitudes of the comp stars, without applying any color transform; this is reasonable given that the comp stars were selected to have colors similar to a typical asteroid.

Figure 4 presents the time-history of the asteroid's reduced magnitude, based on the default slope parameter of $G = 0.15$. Several storms that passed through southern California caused sizeable gaps in coverage. The solar phase angle during this series of observations ranged from $\alpha \approx -5$ deg to +26 deg.

A search was made spanning a range of 16 to 1400 hours. The only plausible result was a bimodal lightcurve with period near 710 h (Figure 5). The 4th-order Fourier fit curve is provided only as a guide to the eye: no significance is claimed for it, particularly because the observations do not provide any information about the height of the brightness maximum that is presumed to be near rotational phase 0.25. Several iterations of the *MPO Canopus* lightcurve fitting procedure were run using subsets of the measured data (i.e., leaving out a randomly-selected night's data), changing the averaging of data points, and assuming 3rd or 4th order Fourier models. Different realizations of the fitting routine always converged to a best-fit period in the range 710 ± 10 h.

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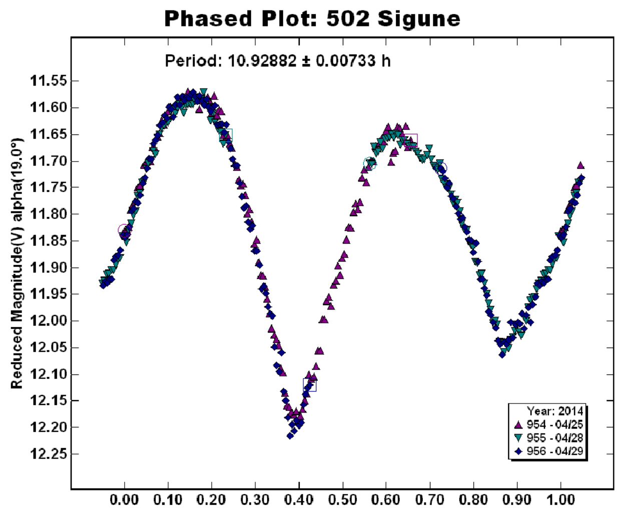

Figure 1: 502 Signue phased lightcurve, wrapped to best-fit period P= 10.929 h.

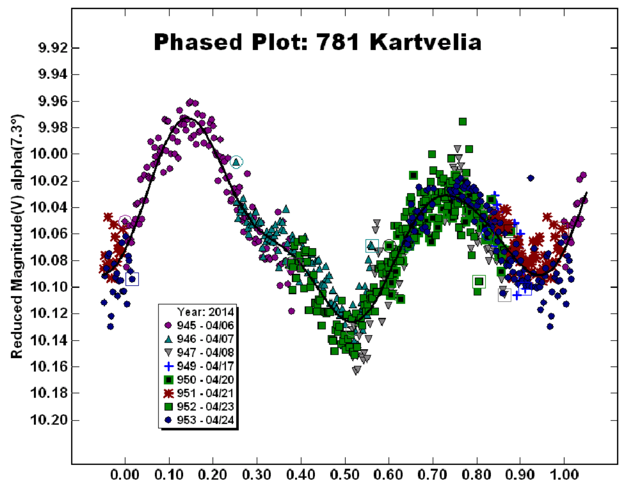

Figure 2: 781 Kartvelia phased lightcurve, wrapped to best-fit period P= 19.04 h.

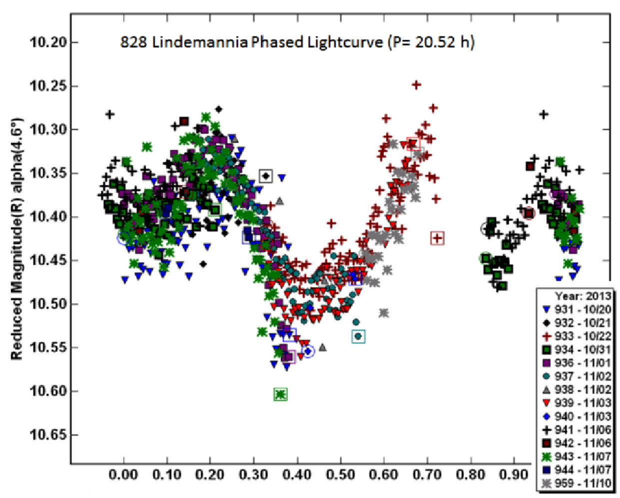

Figure 3: 828 Lindemannia phased lightcurve (P= 20.52 h)

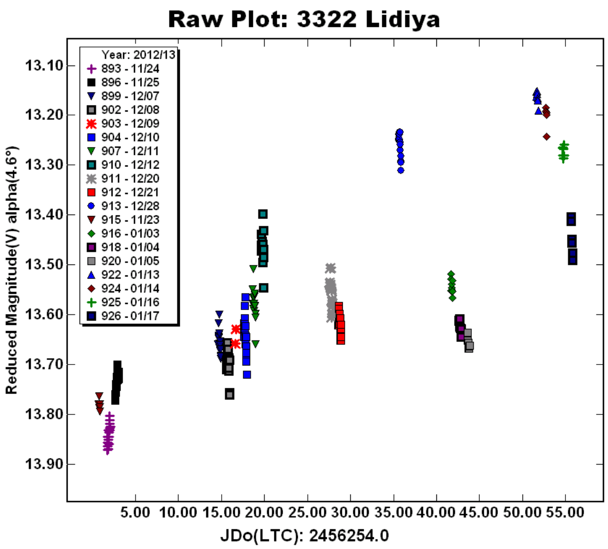

Figure 4: Reduced V-magnitude of 3322 Lidiya from Nov 2012 through Jan 2013.

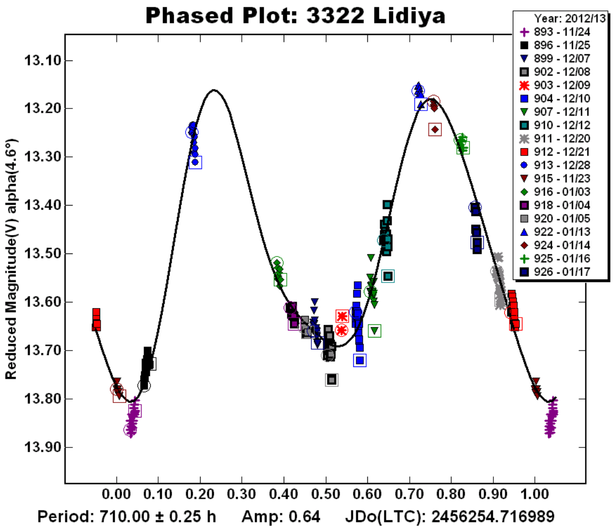

Figure 5: Lightcurve of 3322 Lidiya, phased to P= 710 h.

ROTATIONAL PERIOD FOR 1658 INNES, (10597) 1996 TR10, AND 30017 SHAUNDATTA

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Photometric observations of three main-belt asteroid were made over seven nights during 2014 April-June: 1658 Innes, (10597) 1996 TR10, and 30017 Shaundatta.

CCD photometric observations for three main-belt asteroids were collected from Balzaretto Observatory (A81) in Rome (Italy) on seven nights from 2014 April 9 to June 5. Images were obtained using a 0.20-m Schmidt-Cassegrain (SCT) reduced to *f*/5.5 equipped with an SBIG ST7-XME CCD camera. Observations at Carpione Observatory (K49) near Florence (Italy), were made using a 0.25-m *f*/10 SCT and SBIG ST9-XE CCD camera. Differential photometry and period analysis were done using *MPO Canopus* (Warner, 2013). All unfiltered images were calibrated with dark and flat-field frames. The asteroid magnitude was reduced to R-band using near-solar color index comparison stars that were selected using the Comp Star Selector feature in *MPO Canopus*.

1658 Innes. This main-belt asteroid was selected from the "Potential Lightcurve Targets" web site (Warner, 2014) and observed on three nights over a time span of 19 days. The derived synodic period was P = 3.191 ± 0.001 h with an amplitude of A = 0.22 ± 0.03 mag.

(10597) 1996 TR10. This main-belt asteroid was selected from the "Potential Lightcurve Targets" web site (Warner, 2014) and observed on three nights over a time span of 12 days. The derived synodic period was P = 6.60 ± 0.01 h with an amplitude of A = 0.32 ± 0.03 mag.

30017 Shaundatta. This main-belt asteroid was accidentally found in the field-of-view during a photometric session dedicated to another asteroid and was observed for only one night. However, enough data were obtained to cover the rotational period for more than two times. There are no entries in the Asteroid Lightcurve Database (LCDB; Warner *et al.*, 2009) for 30017 Shaundatta. The derived synodic period was P = 2.6 ± 0.1 h with an amplitude of A = 0.23 ± 0.03 mag.

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