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LIGHTCURVES FOR KORONIS FAMILY OBJECTS (2498) TSESEVICH AND (2742) GIBSON

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We present lightcurves for (2498) Tsesevich and (2742) Gibson during 2022. Observations of Tsesevich made at the Union College Observatory are consistent with the previous period (Wilkin and Schechter, 2022). Observations of Gibson on two nights at Chi-4 yielded a partial lightcurve which we combined with ATLAS sparse survey data to obtain a doubly-periodic composite with period 20.60±0.01 h.

We continue our project (Wilkin et al., 2022; Wilkin et al., 2023; Crowley and Wilkin, 2023) to obtain rotation periods and lightcurves for Koronis family asteroids to facilitate subsequent shape and spin solutions. Asteroid spins are subject to YORP torques (Rubincam, 2000) due to interaction with sunlight and subsequent thermal emission. Observations of members of a common family avoid difficulties of interpreting heterogenous samples (see, e.g., Slivan et al., 2008; 2023).

Observation planning was performed using the *Koronisfamily.com* webtool (Slivan, 2003). Telescope and camera properties are given in Table I. Bias, dark, and flat field corrections and subsequent photometry were performed in *AstroImageJ* (Collins et al., 2017). Corrections for light-travel time, unit distance, and solar phase angle were applied using ephemerides from the NASA Horizons app assuming a slope parameter G=0.23 typical for Koronis family members (Slivan, personal communication).

(2498) Tsesevich. Period determinations and lightcurves have been published by Fauerbach and Brown (2019) and Wilkin and Schechter (2022). We performed imaging observations at the Union College Observatory on two nights in September, 2022 with 240s exposure time, R filter and 2×2 binning. Significant light pollution was present due to nearby athletic facilities, and images from a third night had to be rejected. Magnitude values for Sep 24 were shifted relative to those of Sep 16 to obtain a self-consistent composite. Our resulting lightcurve is consistent with the period obtained from the previous apparition (Wilkin and Schechter, 2022), assuming that the lightcurve is doubly-periodic. The amplitude 0.26 mag was the same as in the 2021 apparition. We also examined ATLAS sparse survey data (Tonry et al., 2018) for 2022 at telescope T08 in the o filter (orange, 560-820 nm) folded at the same 2.8734-h period, which results in a similar lightcurve (not shown).

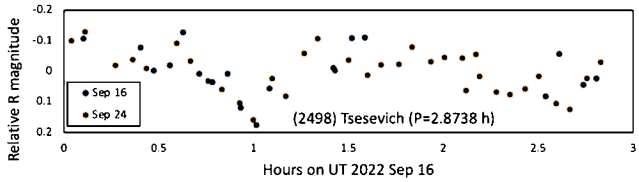

Figure 1. Lightcurve for (2498) Tsesevich.

(2742) Gibson. No previously published lightcurves for Gibson were found in the literature and no rotation period was listed on the NASA Horizons system. We obtained imaging observations of Gibson on two nights at the telescope Chi-4 operated by *Telescope.Live*. Exposures in color-separation Red filter were 300s and unbinned. Each individual night showed significant variation, but neither exhibited an unambiguous local extremum. A common comparison star was used for both nights to create a partial lightcurve (see Fig. 2), but these two nights were insufficient to establish a unique period. Additionally, a gradient of background across the images on Sep 06 suggests that the relative calibration of the two nights is slightly ambiguous.

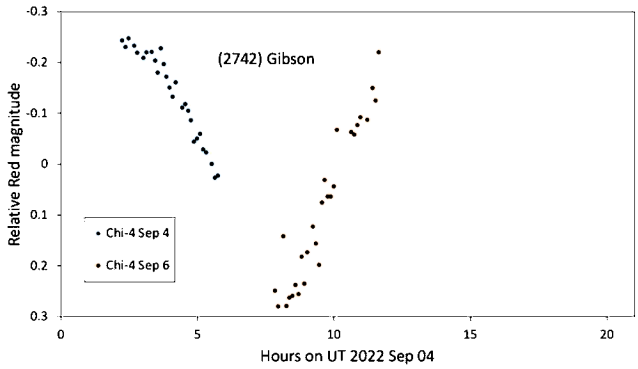

Figure 2. Partial lightcurve for (2742) Gibson from Chi-4 folded at P=20.60 h.

Name	Site	Telescope	Camera	Array	Filter	FOV(')	Scale ("/pix)
UCO	Schenectady, NY	0.50-m RC f/8.1	SBIG STXL-11002	2004×1336x9μm	R	30×20	0.93
Chi-4	Rio Hurtado, Chile	0.50-m RC f/6.8	FLI PL16803	4096×4096x9μm	Red	65×65	0.96

Table I. Telescopes and Cameras. RC=Ritchey-Chrétien; CDK = Planewave with f/4.5 focal reducer. UCO = Union College Observatory

Number	Name	yyyy mm/dd	Phase	L_{PAB}	B_{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
2498	Tsesevich	2022 09/16-09/24	4.0,0.5	2	1	2.8738	0.0002	0.26	0.04	MB-KOR
2742	Gibson	2022 09/04-09/06	3.2,4.0	334	-2	20.60	0.01	0.60	0.05	MB-KOR

Table II. Observing circumstances and results. The phase angle is given for the first and last date. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at mid-date range. Grp is the asteroid family/group.

We supplemented our observations with sparse survey data from the ATLAS project in o filter on three telescopes, constrained in time between the two stationary points in 2022. We then shifted our Chi-4 magnitudes to produce a smooth composite with those of the ATLAS telescopes, including a small additional shift between the two nights on Chi-4. A search for consistent period in the range 9-100 h led to a best-fit, doubly-periodic lightcurve with period 20.60 ± 0.01 h (see Fig. 3). An alternate, singly-periodic solution with half of that period or a quadruply-periodic solution at double this period can be excluded, despite the nearly equal maxima, due to the large amplitude ~0.60 mag in Red (Harris et al., 2014).

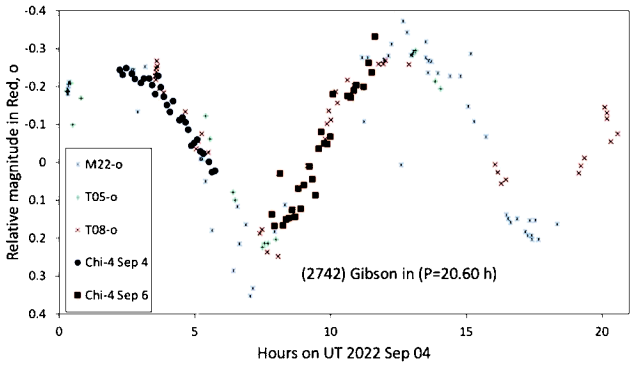

Figure 3. Composite lightcurve for (2472) Gibson.

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