COLLABORATIVE ASTEROID PHOTOMETRY FOR 3653 KLIMISHIN, 4748 TOKIWAGOZEN AND 9951 TYRANNOSAURUS

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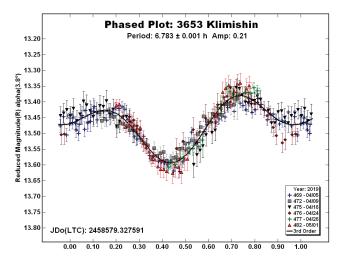
Stephen M. Brincat Flarestar Observatory (171) San Gwann SGN 3160, MALTA

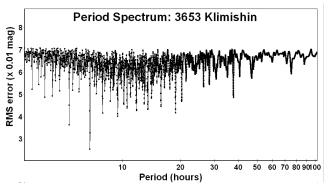
(Received: 2019 July 15)

Photometric observations of three main-belt asteroids were made in order to acquire lightcurves. The synodic period and light curve amplitude were found for: 3653 Klimishin 6.783 ± 0.001 h, 0.21 mag; 4748 Tokiwagozen 39.78 ± 0.01 h, 0.42 mag.; 9951 Tyrannosaurus 3.767 ± 0.004 h, 0.21 mag. Asteroid 4748's lightcurve shows a few interesting features which suggest the opportunity of further observations in order to verify a possible "tumbling" nature.

Collaborative asteroid photometry was made in the second quarter of 2019. The targets were selected in order to acquire lightcurves for determining their rotational period. The CCD observations were performed in April-June 2019 using the instrumentation described in the Table I. Lightcurve analysis was done with MPO Canopus (BDW Publishing, 2018). All the images were calibrated with dark and flat frames and converted to R magnitudes using solar colored field stars from CMC15 catalogue, distributed with MPO Canopus. Table II shows the observing circumstances and results.

3653 Klimishin is a main belt asteroid discovered on April 25 1979, by N. Chernykh, at Nauchnyj. Collaborative observations were made over six nights. We found a synodic period of $P = 6.783 \pm 0.001$ h with an amplitude $A = 0.21 \pm 0.02$ mag.



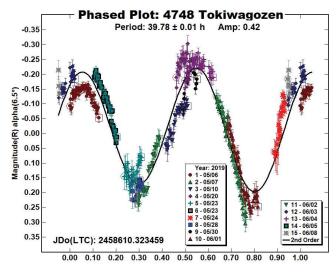


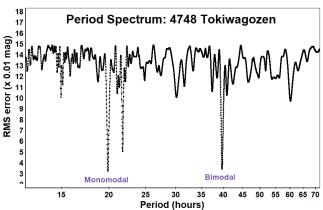
<u>4478 Tokiwagozen</u> is a main-belt asteroid discovered on November 20 1989, by Suzuki and Urata at Toyota. Collaborative observations were made over fifteen nights. The folded lightcurve was very tough to fold using the MPO's tools. We found a synodic rotation period of $P = 39.78 \pm 0.01$ h with an amplitude $A = 0.42 \pm 0.06$ mag. The lightcurve shows some phase and amplitude variations that could indicate a tumbling nature of the asteroid. A dual period search shows a possible secondary period close to 46 h.

Observatory (MPC code)	Telescope	CCD	Filter	Observed Asteroids		
DSFTA Observatory (K54)	0.30-m MCT f/5.6	SBIG STL-6303e	Rc,C	3653, 4748, 9951		
WBRO (K49)	0.23-m SCT f/10	SBIG ST8-XME	Rc,C	3653, 4748, 9951		
Znith	0.20-m SCT f/10	Moravian G2-1600	С	4748		
Flarestar (171)	0.25-m SCT f/10	Moravian G2-1600	С	4748		

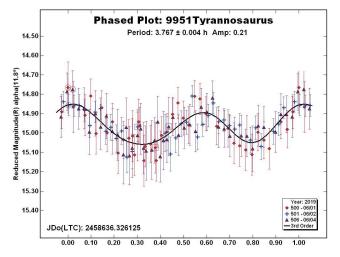
Number	Name	2019 mm/dd	Phase	L_{PAB}	B _{PAB}	Period(h)	P.E.	Amp	A.E.	Grp
3653	Klimishin	04/05-05/01	*4.3,11.0	202	3	6.783	0.001	0.21	0.025	FLOR
4748	Tokiwagozen	05/06-06/08	6.6,11.9	232	11	39.78	0.01	0.42	0.06	MB-O
9951	Tyrannosaurus	06/01-06/04	11.3,12.6	233	10	3.767	0.004	0.21	0.06	V

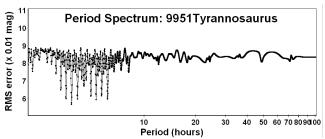
Table II. Observing circumstances and results. The first line gives the results for the primary of a binary system. The second line gives the orbital period of the satellite and the maximum attenuation. The phase angle is given for the first and last date. If preceded by an asterisk, the phase angle reached an extrema during the period. L_{PAB} and B_{PAB} are the approximate phase angle bisector longitude/latitude at middate range (see Harris *et al.*, 1984). Grp is the asteroid family/group (Warner *et al.*, 2009).





9951 Tyrannosaurus was discovered on November 15 1990 by E. W. Elst at the European Southern Observatory. Collaborative observations were performed over three nights. We found a synodic rotation period of $P = 3.767 \pm 0.004$ h with an amplitude $A = 0.21 \pm 0.06$ mag.





Acknowledgements

This research was made possible in part based on data from the AAVSO Photometric All-Sky Survey (APASS), funded by the Robert Martin Ayers Sciences Fund.

References

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Warner, B.D. (2018). MPO Software, MPO Canopus v10.7.7.0. Bdw Publishing. http://minorplanetobserver.com

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