

COMMISSIONS G1 AND G4 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Volume 62 Number 6197 DOI: 10.22444/IBVS.6197

Konkoly Observatory
Budapest

6 February 2017

HU ISSN 0374 – 0676

ADDITIONAL OBSERVATIONS OF THE 1943 ECLIPSE OF TYC 2505-672-1

OSBORN, W.; MILLS, O.F.

Yerkes Observatory, 373 W. Geneva St., Williams Bay WI 53191, U.S.A., e-mail: Wayne.Osborn@cmich.edu

Rodriguez et al. (2016) and Lipunov et al. (2016) recently reported independent discovery of an unusual eclipsing binary, TYC 2505-672-1. The star shows deep eclipses that last about 3.5 years and occur every 69 years, making it the eclipsing binary with the longest period known. The period was determined from observations of an eclipse in 2012 – 2014 and a second eclipse about 1943 seen on archival photographic plates at Harvard. and released as part of the DASCH project (Los et al. 2011). Those plates, however, only partially sampled the 1943 eclipse and such data as its eclipse depth, duration and mid-eclipse epoch were just approximate.

We have searched the Yerkes Observatory plate archive for additional observations of TYC 2505-672-1, particularly in the years around the 1943 eclipse. We located 27 plates showing the field and reaching sufficiently deep to be useful. The epochs range from 1915 to 1956. Included are two red plates taken in 1943; all other plates were unfiltered photographic (blue) ones with most being pairs taken on the same night.

A comparison sequence of surrounding stars was established using magnitudes from the Tycho, Nomad and ASCC catalogs. The adopted B , V and R magnitudes, some of which have uncertainties of up to 0.3 mag., are given in Table 1.

Eye estimates of the magnitude of TYC 2505-672-1 were made for each of the plates. The star was not visible on the two 1943 red plates and we determined the faintest magnitudes seen. The results are given in Table 2, listing the two red plates last. To aid comparison with the light curves published by Rodriguez et al. (2016) and Lipunov et al. (2016), the approximate colors of TYC 2505-672-1 of $B - V = 1.7$ and $V - R = 0.9$ have been used to estimate the equivalent V magnitudes from the corresponding blue and red measures. These are listed in the final column of Table 2.

Table 1: Comparison star sequence.

Star	GSC1 No.	B	V	R
A	2504-00723	9.4	8.4	7.8
B	2505-00438	11.5	10.8	10.4
X	2505-00435	12.1	11.6	11.3
C	2505-00703	13.3	12.3	11.7
D	2505-00347	13.8	13.1	13.0
E	2505-00630	15.0	14.0	14.1
F	2505-00332	15.3	14.1	13.8

Table 2: Yerkes archival photographic observations of TYC 2505-672-1.

Plate	Date	Type	Mag.	V
10B-961	1915-05-05	Blue	12.6	10.9
6B-961	1915-05-05	Blue	12.5	10.8
P-T231	1918-04-01	Blue	12.3	10.6
P-A239	1918-04-09	Blue	12.6	10.9
P-T239	1918-04-09	Blue	12.6	10.9
P-50A	1932-02-05	Blue	12.7	11.0
P-114A	1932-02-28	Blue	12.5	10.8
P-115B	1932-02-28	Blue	12.5	10.8
P-128A	1932-03-05	Blue	12.6	10.9
P-129B	1932-03-05	Blue	12.6	10.9
P-216A	1932-03-11	Blue	12.5	10.8
P-217B	1932-03-11	Blue	12.4	10.7
P-394A	1932-05-01	Blue	12.6	10.9
P-395B	1932-05-01	Blue	12.6	10.9
P-430A	1932-05-23	Blue	12.6	10.9
P-431B	1932-05-23	Blue	12.3	10.6
10R-1367	1937-08-10	Blue	12.7	11.0
CA-640	1951-02-10	Blue	12.5	10.8
CA-644	1951-02-10	Blue	12.5	10.8
Co-C026	1951-05-08	Blue	12.5	10.8
Co-C028	1951-05-08	Blue	12.5	10.8
CA-1988	1952-01-31	Blue	12.4	10.7
CA-2011	1952-02-18	Blue	12.4	10.7
Co 10-75	1956-03-11	Blue	12.4	10.7
Co 10-76	1956-03-11	Blue	12.6	10.9
D-1669	1943-02-08	Red	>12.0	>12.9
D-1690	1943-03-08	Red	>13.8	>14.7

All of the blue plates were outside of eclipse, and their derived magnitudes scatter about 12.5 with a standard deviation of 0.10 mag. The two red plates taken during eclipse have limiting R magnitudes of about 12.0 and 13.8, equivalent to approximately 12.9 and 14.7 respectively in V and 14.6 and 16.4 in B . These results confirm both the deep nature of the 1943 eclipse and that mid-eclipse was near the epoch found by Rodriguez et al. (2016). This is illustrated in the light curve from 1910 to 1970, shown in Figure 1. Plotted are our derived B magnitudes (large circles), our approximate limiting B values (lines) and the blue magnitudes from Harvard plates from the DASCH project (Grindlay et al. 2009, Los et al. 2011) database (dots).

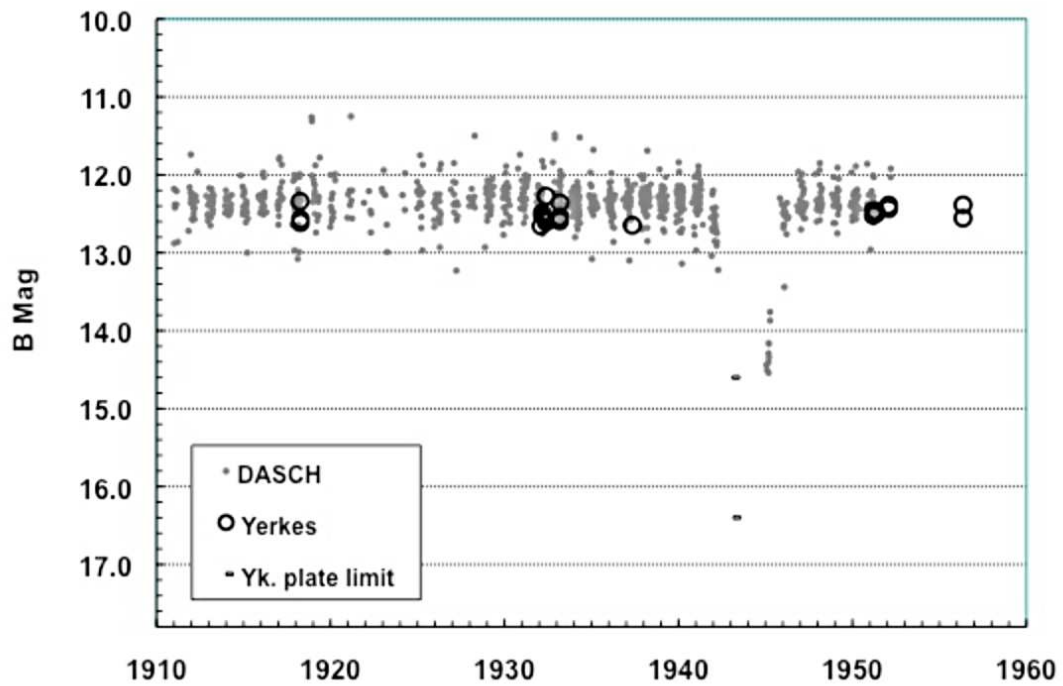


Figure 1. The light curve of TYC 2505-672-1 from 1910 to 1960.

References:

- Grindlay, J. et al. 2009, *ASPC*, **410**, 101
Lipunov, V. E. et al. 2016, *A&A*, 588, A90 DOI
Los, E. et al. 2011, *ASPC*, **442**, 269
Rodriguez, J. E. et al. 2016, *AJ*, **151**, 123 DOI