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NEW CMOS PHOTOMETRY AND ARCHIVAL PHOTOGRAPHIC OBSERVATIONS OF THE W UMA STAR V752 CEN: EXTENDING THE O–C RECORD OF PERIOD CHANGES

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Abstract: We present new CMOS Bayer g–band photometry of the southern W UMa star V752 Cen, presenting two new times of primary minimum, and use archival photographic photometry from the Bamberg Sky Survey (mid 1960s) and the Harvard plate collection (∼1890 to 1990) to extend the O−C diagram back in time to ∼1900. Earlier authors have reported a constant period from the earliest published photometry in 1970 to about the year 2000, when a sudden change occurred to an increasing period. The archival photographic record presented here indicates the period was effectively constant back to 1900. Our 2020 data are also consistent with reported period increase. The V752 Cen system is known from earlier work to be a W UMa binary orbiting a lower mass spectroscopic binary. Our preliminary calculations, based on the reported centre–of–mass velocity change of the W UMa binary, suggest the wide orbit may have a period near 245 d, and could give rise to a light–travel time–effect of order 0.02 d. This does not however appear to be consistent with the SuperWASP photometric O−C results. Hence we suggest that considerable uncertainty exists concerning the properties of the wide orbit.

1 Introduction

V752 Cen (HD 101799) is a bright (V∼9), southern, relatively well–studied W UMa star. The variability appears to have been first noted by Strohmeier et al (1964) in the Bamberg Observatory Southern Sky Survey, appearing as BV 502. Bond (1970) discovered it to be a spectroscopic binary and subsequently obtained photometric data, although not with complete phase cover, and found it to be an eclipsing system with a period near 0.37 d. Sistero & Sistero (1971) obtained more extensive photometry, discovering the eclipses to be total, and refining the period. Subsequently Sistero & Sistero (1973) then presented a more complete account and derived the system parameters from the light–curve solution, concluding the components were in contact. The same authors later provided a revised analysis including radial velocity data in Sistero & Sistero (1974), indicating the system was not quite in contact. However, Leung (1976) rederived the system parameters using the Wilson–Devinny method, and concluded the system was in contact. Nearly two decades later Barone et al (1993) re–analysed the existing observational data, simultaneously incorporating all available photometric and radial velocity information for the binary and, as noted by those authors, produced 'a completely different solution from that found either by Sistero & Sistero (1974) or Leung (1976)'.

The unpublished thesis of Schumacher (2008) included radial velocity measurements and extensive photometry of V752 Cen. As well as spectral lines from the close W UMa binary, the spectral signature of a third star was present. The radial velocity of this third object was itself variable with a period of 5 d, and semi–amplitude 43 km s^{-1}. Schumacher (2008) concluded the system was quadruple, with the W UMa system in a wide orbit about a lower–mass detached binary.

Two times of minimum light were reported by Paschke (2009) and Paschke (2010). Mallama & Pavlov (2015) reported a sudden period increase by $\sim 10^{-5}$ d near 2004, with an accompanying dimming in brightness. Their analysis of archival data indicated the period had been effectively constant since the 1970s. The general features of the reported period change were confirmed by Zhou et al (2019), whose extensive analysis of new and archival data implied the period, constant since the first measurements in 1970, began increasing about the year 2000 at a rate of $+5.05\times10^{-7}$ day.year^{-1}. Zhou et al (2019) interpreted this as due to mass loss from the less massive to the more massive star. The analysis of Zhou et al (2019) of light curves from 1971 and 2018 produced almost identical solutions, and they concluded that the two component stars and geometric structure of W UMa binary of V752 Cen were stable over the past forty-eight years. Zhou et al (2019) noted that the period variation of V752 Cen over the 48 years in which the period has been monitored was unusual, and may potentially relate to effects from interaction with a nearby third star or pair of stars in a second binary.

In early 2020 V752 Cen was chosen as a preliminary target for a new camera at the private Brightwater Observatory to investigate the camera's potential for photometric studies. Observations commenced in late March 2020. Several nights were spent in configuring the system, but by early April stable data were obtained. We will present a light curve in Bayer–g from early April to late May 2020.

After several primary minima were observed in 2020 the literature was consulted in detail and the papers of Mallama & Pavlov (2015) and Zhou et al (2019) were noted. It was also noted that the published photometry did not extend before 1970, and that the period appeared constant from then until around the year 2000. We previously have used the archival photographic plate collection of the Dr. Karl Remeis–Observatory in Bamberg, Germany[1] to retrieve light curves of the active star CF Oct for the interval 1964 to 1976 (Innis et al, 2004). We decided to explore the relevant archival material for V752 Cen to determine if more information concerning period changes before 1970 was available.

In the following we will briefly describe our 2020 observations obtained with reasonably standard 'DSLR photometry', the new light curve and times of minima, and the analysis of the archival material.

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2 Instrumentation and Observations

The Brightwater Observatory is located in southern Tasmania at 147°27’ E, 43°01’ S. A description of the observatory with an earlier camera is given in Innis et al (2007). The telescope is a 70–mm diameter, 485 mm focal length Tele–Vue ‘Pronto’ refractor.

In early 2020 a ZWO ASI183MC colour CMOS camera was installed at the observatory. The camera has 5496×3672 pixels, with each pixel being 2.4 μm square in an RGGB Bayer pattern. The camera was operated with a ‘gain’ of zero to give a full–well depth of $\sim$15,000 e. At the telescope 3×3 pixel binning was used. This meant each binned pixel was approximately 3 arc sec square, with a total field near 1.6°×1.0°. The focus was set to give a stellar Half–Flux–Radius (HFR) near 3 binned pixels (i.e. 9 arc sec) as this was found, empirically, to give the most stable photometry.

The observatory enclosure was opened in late twilight usually at least 30 minutes before a series of dark frames were taken to form a master dark–frame for the night. The camera was not cooled nor temperature–controlled, but the camera temperature was recorded in the FITS images and generally did not vary greatly over a night. A master flat–field of the twilight sky was obtained in April–May observing interval and used for all frames.

The camera and telescope were controlled by the Ekos program through KStars. All exposures of the star field were 30 seconds in duration. After dark subtraction and flat–field division the individual R, G1, G2 and B frames were extracted using locally–written python routines calling astropy library functions. The G1 and G2 frames from each image were added into a single ‘g’ frame for photometric processing. Aperture photometry was performed with Astroimagej, using a star aperture radius of 8 pixels, and sky inner and outer radii of 16 and 30 pixels. The final data were combined into 4–point averages, meaning each data point shown below effectively represents a 120–second integration.

As well as the target V752 Cen, three comparison stars were also measured, denoted for convenience here as C2, C3, and C4. The details of these stars are given in Table 1

Table 1: Characteristics of the target and comparison stars. Magnitudes are taken from the SIMBAD webpages (CDS). Co–ordinate epoch is J2000.0.

Star	ID	RA [h:m:s]	DEC [°: ′:″]	B [mag]	V [mag]	$B-V$ [mag]
Target	V752 Cen	11:42:48.1	-35:48:57.5	9.88	9.30	0.58
C2	HD 101834	11:43:04.1	-36:01:19.6	9.47	9.02	0.45
C3	HD 101760	11:42:32.1	-35:59:38.2	9.05	8.16	0.89
C4	HD 101863	11:43:17.4	-35:44:17.1	9.99	8.88	1.11

Data were obtained over several nights in April to May 2020. Intervals of cloud and some frames with poor focus were excluded to produce the data–totals given in Table 2.

The mean Δg magnitudes and standard deviations for the differences between the comparison stars as determined from our 492 data points are given in Table 3, along with the catalogued V and $B-V$ differences for reference. The ‘Bayer G’ varies from camera to camera, and is not strictly equivalent to the Cousins–Johnson V (e.g. Cardiel et al (2021), Bessell (1990)). An approach to defining RGB standard bands was presented by (Cardiel et al, 2021). Typically, the Bayer G will have a similar peak wavelength of transmission to

Table 2: Observation log.

Night	Number of 4–point combined data
05/06 April 2020	57
08/09 April 2020	150
09/10 April 2020	94
04/05 May 2020	52
09/10 May 2020	40
22/23 May 2020	10
26/27 May 2020	89
Total	492

the Cousins V near 530 nm, the Bayer–G extends more to the blue. It is seen however that for our data the measured Δg and ΔV agree within several hundredths of a magnitude, albeit possibly with a colour dependence. Of greater relevance for this work is that the internal precision in the Brightwater data is consistently better than 0.02 mag, as can be assessed from the standard deviation of the Δg values for the comparison stars.

Table 3: Measured Δg magnitudes and standard deviations between the comparison stars, along with the catalogued V and $B - V$ differences.

Stars	$\Delta g \pm \sigma$	ΔV	$\Delta B - V$
C3-C2	-0.821±0.017	-0.860	0.44
C4-C2	-0.093±0.019	-0.140	0.66
C3-C4	-0.727±0.016	-0.720	-0.22

Two primary minima were well observed, on 8/9 April 2020 and 9/10 April 2020. The details are summarised in Table 4. Figure 1 shows the primary minimum from 8/9 April 2020.

Table 4: Primary minima from April 2020, Brightwater Observatory. The uncertainties are estimated.

Night	HJD of minimum
08/09 April 2020	2458948.050 ± 0.003
09/10 April 2020	2458949.162 ± 0.003

A phase–plot of the Brightwater data of Δg magnitudes for V752 Cen−C2 is given in the top panel of Figure 2, where the epoch of HJD 2456108.3448 and period of 0.37023198 d are from Zhou et al (2019)[2]. The light curve shows the slightly deeper primary eclipse which is well documented for this star. The lower panel shows the Δg magnitudes for C3−C2 (i.e. HD 101760−HD 101834) on the same scale to allow a visual estimation to be made of the photometric precision for the V752 Cen data.

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[2] We will use this epoch and period in the following analysis.

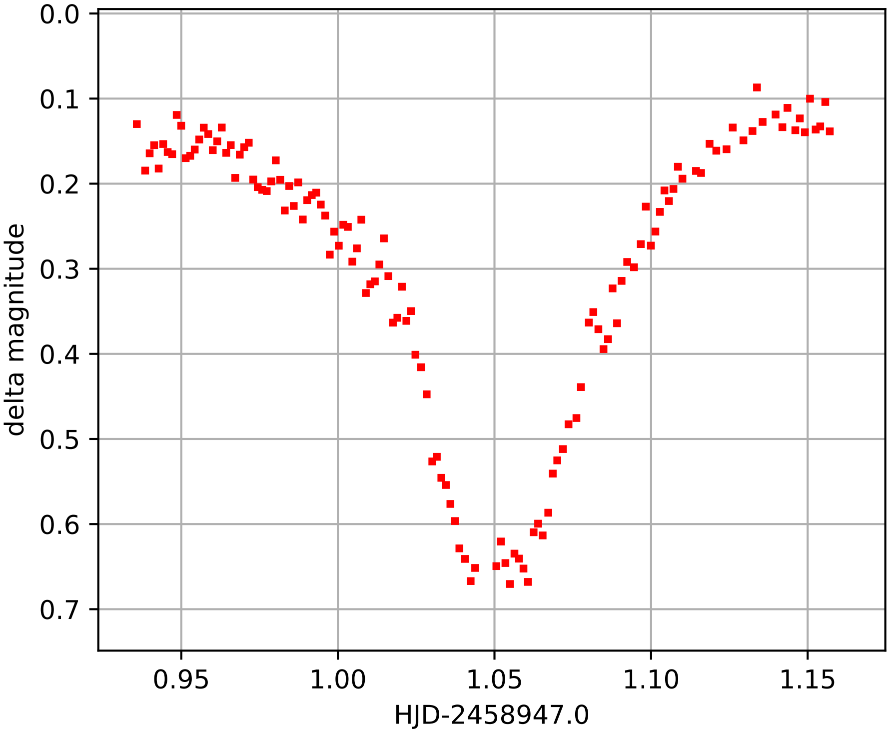


Figure 1: Δg magnitude differences V752 Cen−HD 101834 (C2) versus HJD, showing a primary minimum on 8th–9th April 2020.

3 Archival photographic light–curves

3.1 Overview

As noted, we have in an earlier study used the plate collection of the Dr. Karl Remeis–Observatory in Bamberg to retrieve light curves of the active star CF Oct for the interval 1964 to 1976 (Innis et al, 2004). In that study we found the typical uncertainty in the derived magnitude of CF Oct from aperture photometry on the digitised plates was near 0.05 mag. As V752 Cen is of comparable apparent brightness to CF Oct we considered it would be worthwhile to carry out a similar study.

3.2 Bamberg data

In the earlier CF Oct study we visited the Bamberg Observatory and made both digital photographic copies and later digital scans of the original Bamberg Southern Sky Survey photographic plates. Subsequently the ‘Archives of Photographic PLates for Astronomical USE’ (APPLAUSE) project has digitised and analysed the Bamberg plates, and has made these data available on–line via the APPLAUSE web–site.

We downloaded the photographic magnitude data for V752 Cen from the APPLAUSE data–base. The most comprehensive data for V752 Cen appeared to cover the years from 1964 to 1966. An initial string–length search (Dworetsky, 1983) on the 1964 data

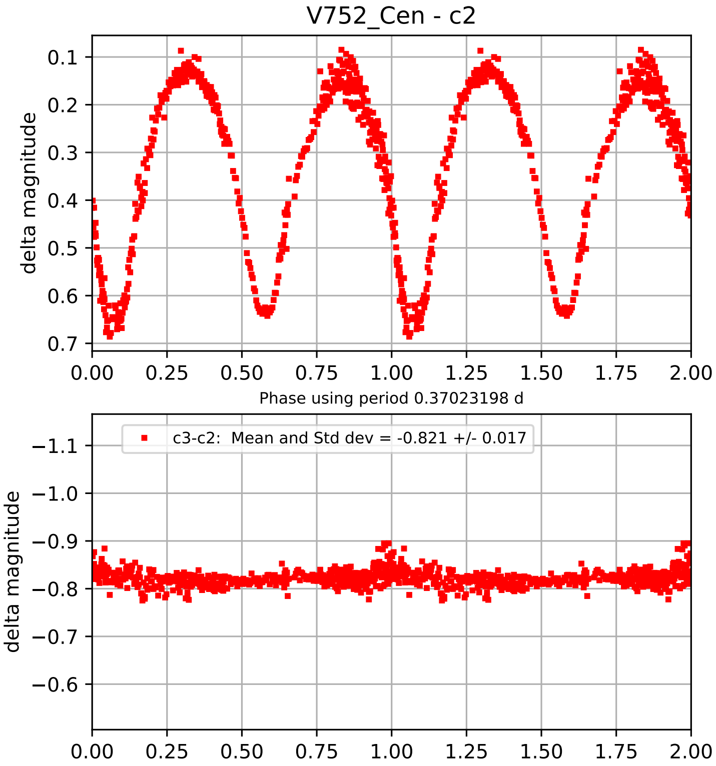


Figure 2: Top panel: Phase plot of the Δg magnitude differences V752 Cen−C2 (HD 101834). The epoch of HJD 2456108.3448 and the period of 0.37023198 d are from Zhou et al (2019). Lower panel: Δg magnitude differences C3−C2 (HD 101760−HD 101834) plotted on the same scale and with the same epoch and period as the data in the top panel.

detected the ∼0.37 d periodicity, with the resulting light curve clearly showing the eclipses (Figure 3).

We combined the 1964 to 1966 Bamberg data into one data–set. Figure 4 shows these data plotted with the epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019). Again, the form of the light–curve is readily seen.

3.3 Harvard data

Much of the extensive Harvard Observatory plate collection for low galactic latitudes has also been digitised, analysed, and made available on–line via the Digital Access to a Sky Century @ Harvard (DASCH) program (DASCH). The data record for V752 Cen extends from ∼1890 to ∼1990, though coverage varies over this interval. The complete data set is shown in a time–series plot in Figure 5. As can be seen, the best coverage is from about 1900 to 1950.

In order to obtain reasonable phase cover in a given light–curve, we split the data set into 5–year intervals from 1900. That is, we created data subsets for 1900 to 1904, 1905 to 1910, etc. For each 5–year subset we created a phase plot using the epoch and period

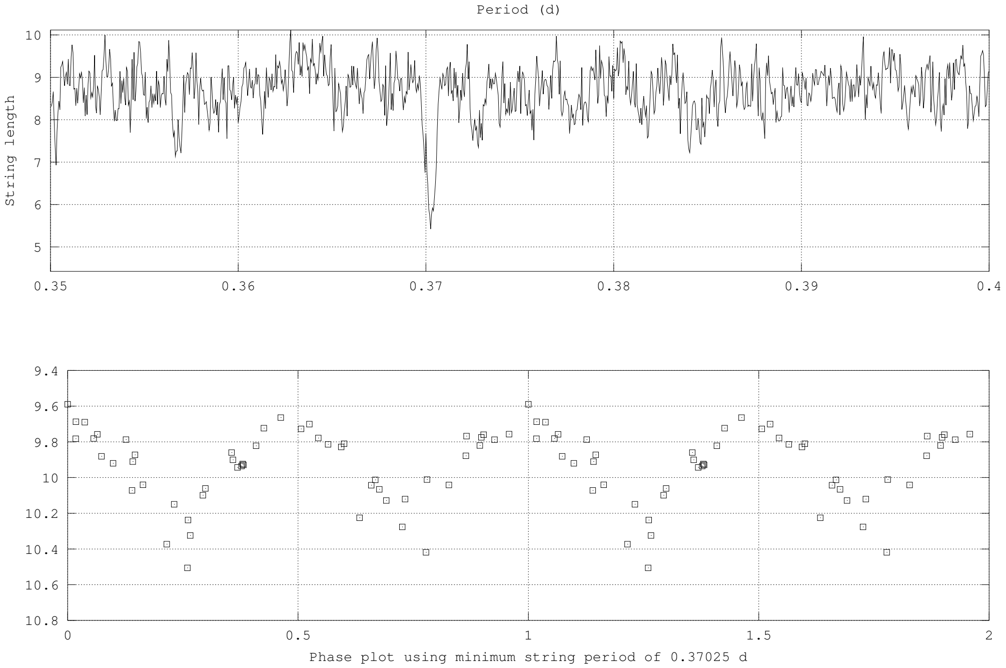


Figure 3: Upper panel: String–length periodogram of the 1964 Bamberg photographic magnitude data for V752 Cen for trial periods from 0.35 d to 0.4 d. Lower panel: Phase–plot of these data for the recovered period of 0.37025 d, with an arbitrary epoch.

of Zhou et al (2019) noted earlier. In many cases these 5–year subsets produced clearly visible eclipse light curves. We also calculated phase–binned light–curves, using a bin–width of 0.05 in phase, to help in determining the phase of primary eclipse. Examples of these data for the subsets 1905–1909; 1910–1914; 1915–1919; 1940–1944; and 1945–1949 are given in Figures 6 to 8 respectively.

A three–dimensional representation of the phase–binned light curves is given in Figure 9, where the vertical axis is the median time (in year) of each light curve, and the horizontal axis being phase. The star's photographic magnitude is represented by the colour–scale at the right of the Figure. There is a clear retrograde phase–progression of the occurrence of primary and secondary eclipses in the data from 1900 to 1950. There is an indication that the phase–progression may have continued to the more recent years, but the data gap in the 1960s and the fewer data from 1970 onward make this less certain.

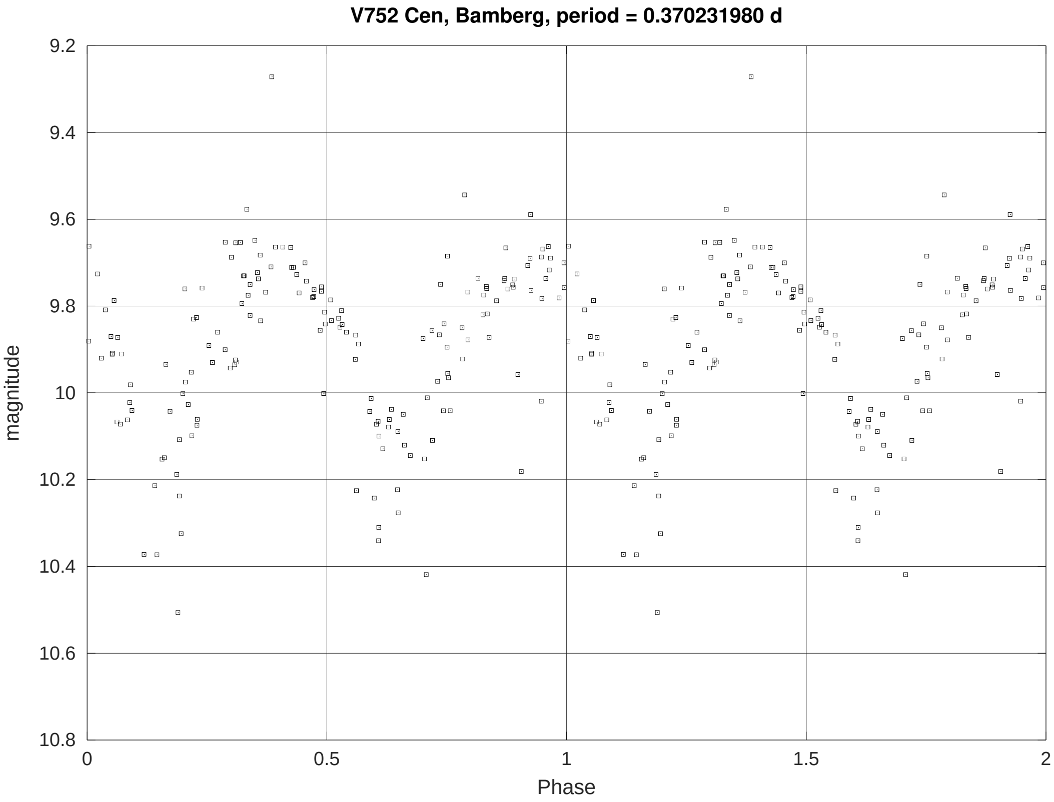


Figure 4: Phase–plot of the photographic magnitudes for V752 Cen from the APPLAUSE web–database for the years 1964 to 1966, from the Bamberg Sky Survey plates. We have used an epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019).

4 Discussion

4.1 The O−C diagram for V752 Cen including the historical photographic observations

The photographic material does not allow direct estimates of the times of minimum light, but from the 5–year–subsetted, phase–binned light–curves we can derive the phase of minimum light at the median epoch of the light curve. We convert this phase to an equivalent day interval by multiplying by the period 0.37023198 d. The estimated phase of minimum light is taken from the minimum in the phase–binned light curve. We adopt an uncertainty of one bin (i.e. 0.05 in phase) for the phases of minimum. We will use Harvard data from the subsets from 1900–1904 to 1945–1949, which covers the most complete interval, along with the 1964–1966 Bamberg light curve. For the first six Harvard light curves we added one whole cycle, as near 1930 primary minimum crossed zero phase as defined by the adopted period and epoch.

The resulting O−C diagram is shown in Figure 10. We have used the epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019), so this can be

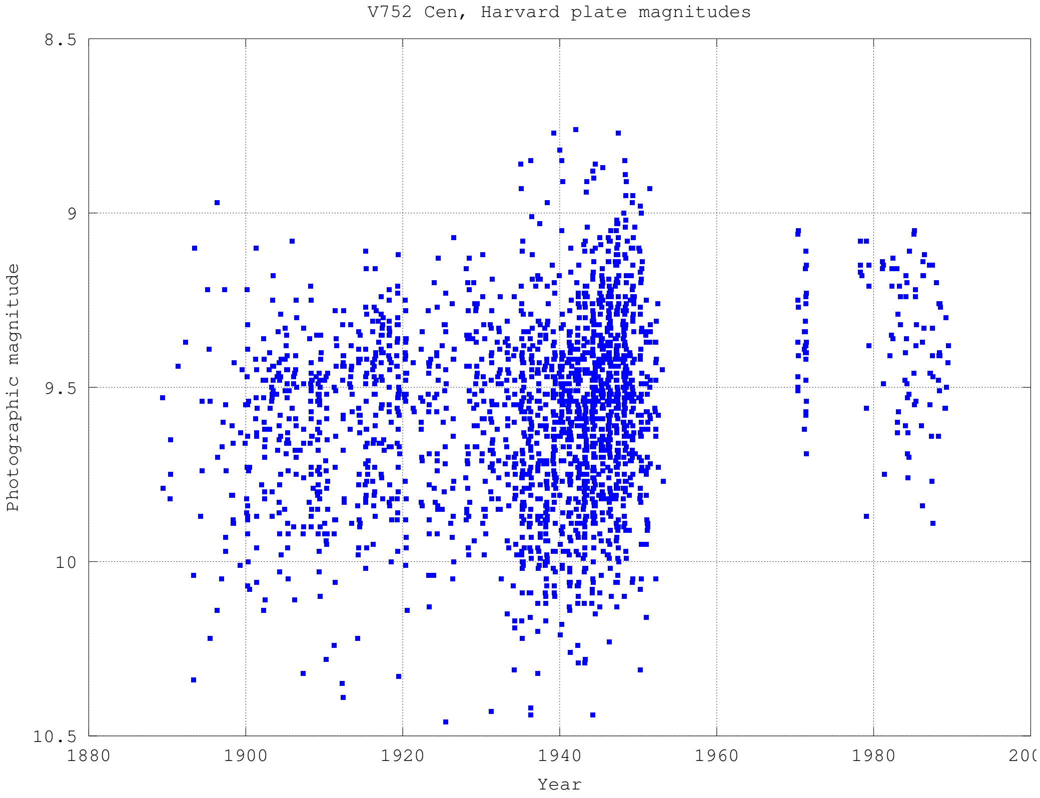
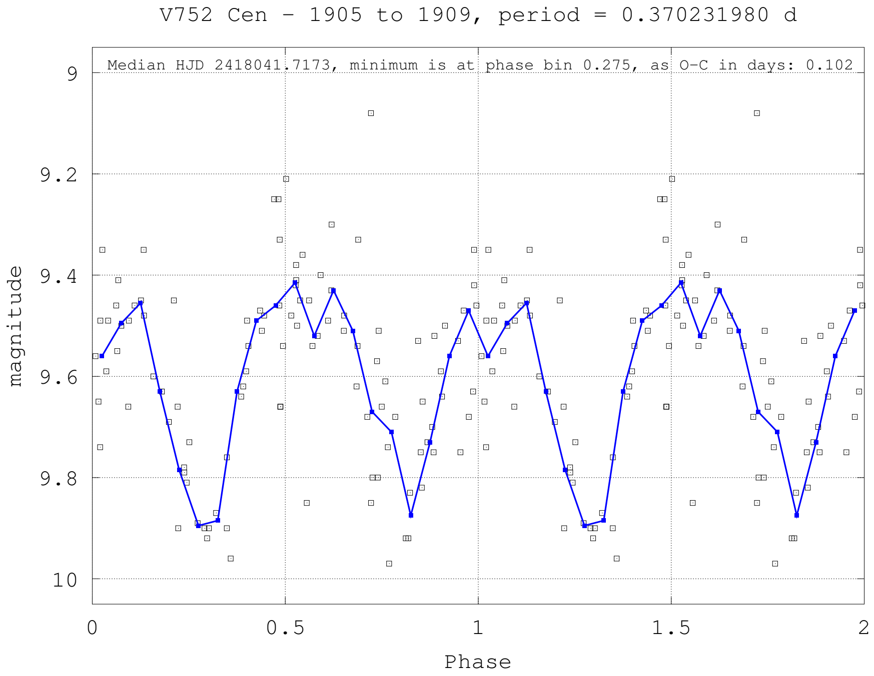


Figure 5: Time–series of the photographic magnitudes of V752 Cen from the Harvard plate collection.

directly compared to their Figure 3. We also include our two data points from 2020, and TESS data from 2021. The newly–derived photographic O−C data for 1900 to 1966 appear consistent with general trend in the previously published photometry from 1970 to about 2000. That is, the period of the W UMa binary V752 Cen was reasonably constant in the hundred years from 1900 to 2000. There is an indication of a deviation from a strictly linear trend near 1935 (around HJD 2429000). The linear trend could of course be removed by adopting a more appropriate value of the mean period (e.g., Mallama & Pavlov (2015)).

Mallama & Pavlov (2015) reported a dimming of V752 Cen at the time of period increase in the early 2000s. The Harvard photographic magnitudes have undergone a rigourous calibration process (Laycock et al, 2010; Tang, 2013), and hence potentially may provide some additional information regarding the issue of long–term changes.

We have used the phase–binned light–curves, examples of which were shown earlier, to estimate the maximum, median, and minimum magnitudes for V752 Cen for each of the 5–year subsets. We also retrieved data for two of the comparison stars used in the 2020 Brightwater Observatory photometry, being C2 (HD 101834) and C4 (HD 101863), and treated these data in the same way as a check for potential instrumental effects in the photographic record. The three time–series are shown in Figure 11, respectively



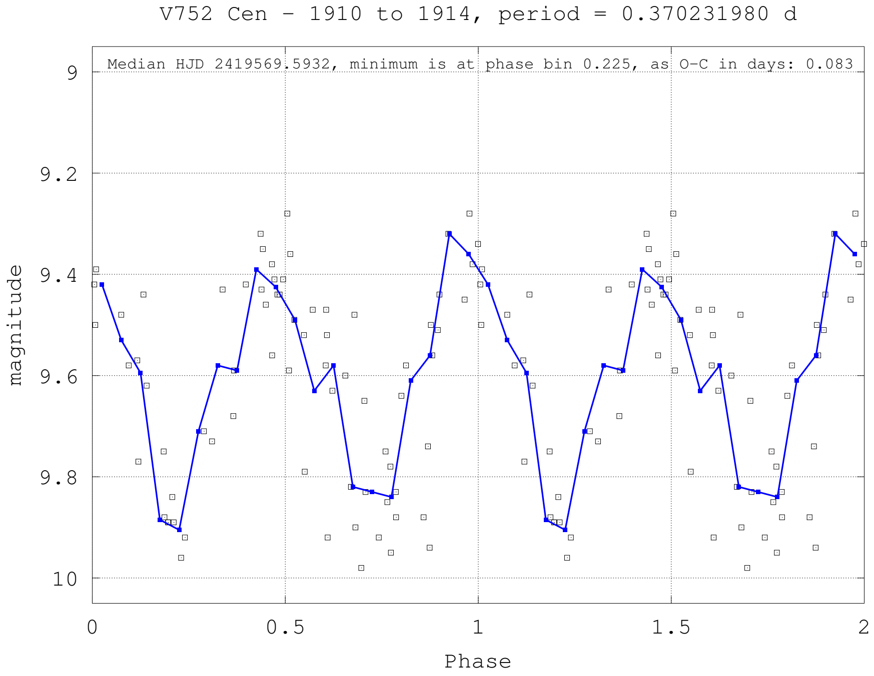


Figure 6: Phase–plot for the photographic magnitudes of V752 Cen for 1905 to 1909 (upper panel) and 1910 to 1914 (lower panel) from the Harvard plate collection. Individual data points are shown. Also shown is the resulting light–curve obtained by binning the data into 0.05 phase intervals. We have used an epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019), for this and the following plots.

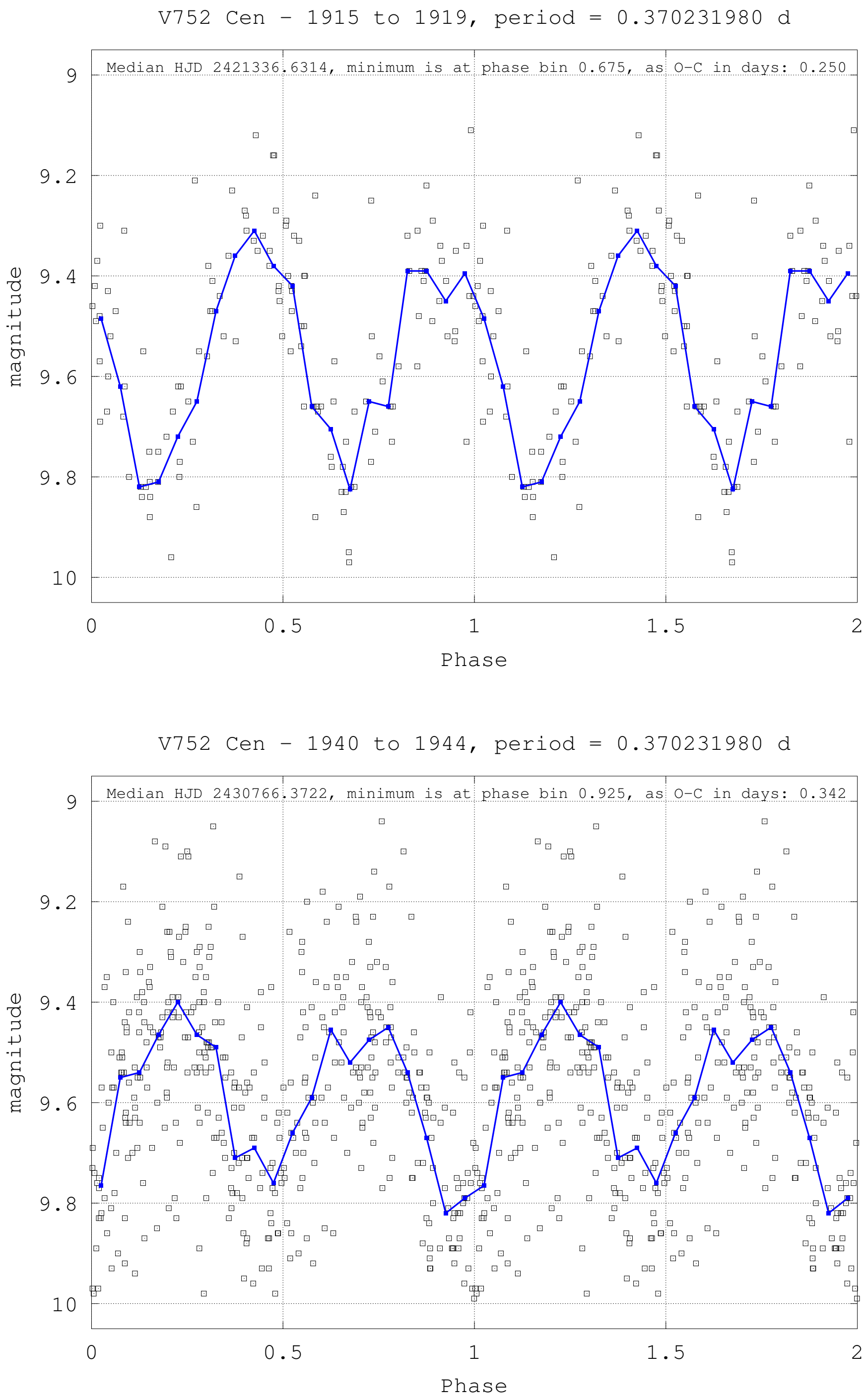


Figure 7: Phase–plot for the photographic magnitudes of V752 Cen for 1915 to 1919 (upper panel) and 1940 to 1944 (lower panel) from the Harvard plate collection. Individual data points are shown. Also shown is the resulting light–curve obtained by binning the data into 0.05 phase intervals.

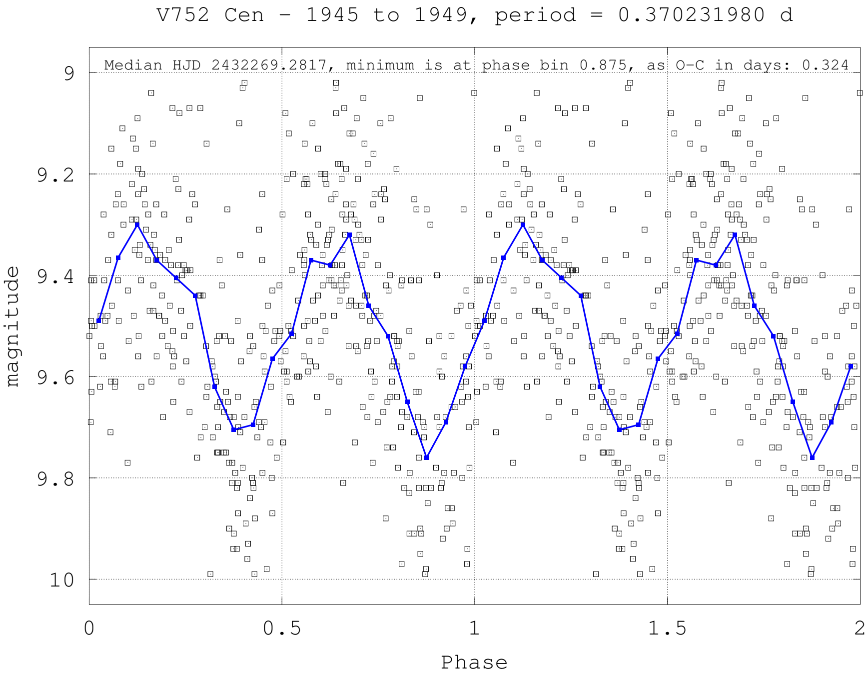


Figure 8: Phase–plot for the photographic magnitudes of V752 Cen for 1945 to 1949 from the Harvard plate collection. Individual data points are shown. Also shown is the resulting light–curve obtained by binning the data into 0.05 phase intervals.

for V752 Cen (upper panel), C2 (middle panel), and C4 (lower panel). The median magnitudes are shown as the square symbols. The maximum and minimum magnitudes are shown by the extent of the vertical bar. (That is, these are not conventional error bars.)

The constancy of the time–series for the two comparison stars demonstrates a high–level of quality–control and skill in the Harvard plate magnitude calibration method. There is evidence for a slow secular brightening for V752 Cen that is not seen in the data record for C2 or C4. (This is also seen in the individual data–points for V752 Cen as shown in Figure 5.) We note that in the 1930s the median brightness of V752 Cen appears to have decreased slightly (Figure 11), and at about the same time the O-C graph seems to have departed from linearity. Neither change is considered conclusive in the data record. However the data from the Harvard plates indicate that V752 Cen slowly increased in brightness over time.

4.2 The early–K dwarf, 5-day spectroscopic binary and implications for light–time effects in O-C

As discussed earlier, Schumacher (2008) discovered the W UMa system of V752 Cen is in a wide orbit around a lower–mass, 5–day, spectroscopic binary, and hence forms a quadruple system. The primary star of the lower–mass binary was inferred by Schumacher

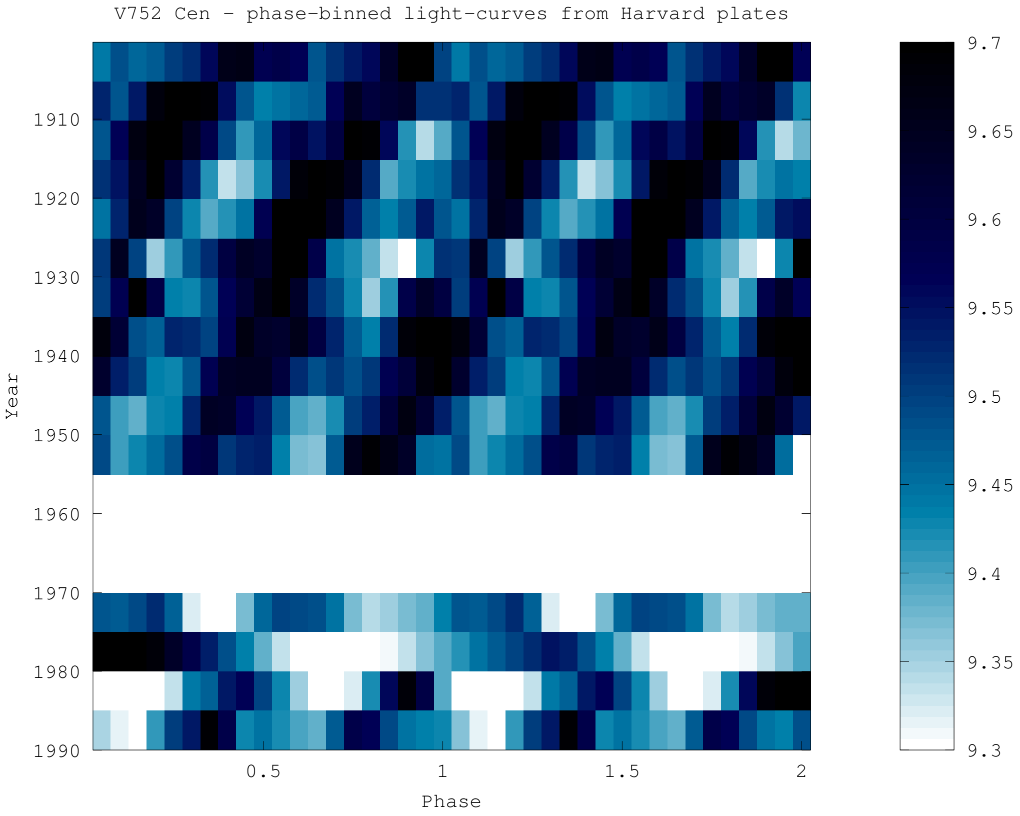


Figure 9: Three–dimensional representation of the 5–yearly phase–binned light curves of V752 Cen, derived from the Harvard plate archive. The vertical axis is the median time (in year) of each light curve, and the horizontal axis is phase. The star's photographic magnitude is represented by the colour–scale at the right of the Figure. We use the epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019).

(2008) to be an early K dwarf. The companion to the K dwarf could not be identified spectroscopically.

However, Schumacher (2008) deduced the orbital velocity of the K–dwarf to be 43 km s^{-1}. Assuming the mass, denoted m_3, of the K–dwarf is near 0.8 M$_\odot$, and that the orbital inclination, i, is similar to the W UMa inclination, i.e. 80°, we can estimate the mass of the unseen companion, m_4, via the well–known equation (from Kepler and Newton):

$$\frac{m_4^3 \sin^3 i}{(m_3 + m_4)^2} = \frac{P \times K^3}{2\pi G}, \tag{1}$$

where m$_3$ is 0.8 M$_\odot$, P is 5.1 d, K is orbital velocity of 43 km s^{-1}, and G is the gravitational constant. Solving iteratively yields m_4 to be near 0.4 M$_\odot$, and hence it is likely to be an early M–dwarf, and of lower–luminosity relative to the K–dwarf star.

Schumacher (2008) noted the centre–of–mass velocity of the W UMa binary had changed by 44 km s^{-1} between the 1972 observations of Sistero & Sistero (1973) and her

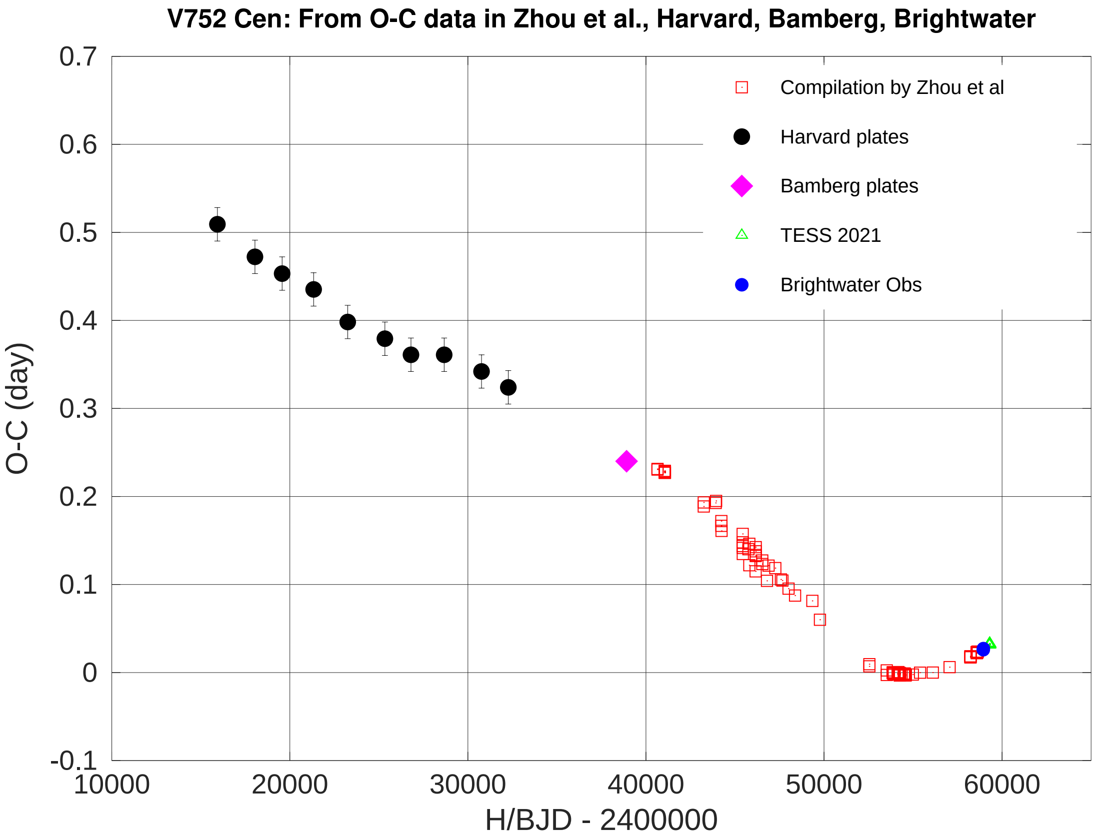


Figure 10: O−C diagram for V752 Cen using the data compilation of Zhou et al (2019) (red squares), the two new times of minima from our observations in 2020 (blue symbols, both points overlap), TESS data from 2021 (green triangles) and the results from the archival photographic light curves from Bamberg data (magenta diamond) and the Harvard archive (black circles). We use the epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019).

2007 data. If this is due to a real change in the centre–of–mass velocity of the W UMa binary, and is not from systematic or other errors, it indicates the *minimum* orbital velocity of the W UMa binary about the K–M–dwarf binary is approximately 22 km s^{-1}.

The V752 Cen system therefore most likely comprises a 0.37–d eclipsing W UMa system and the 5–d K dwarf–M dwarf spectroscopic binary. Schumacher (2008) suggested the two binaries are likely to be in a wider, effectively non–interacting orbit. It is feasible that a light–time effect due to this wide orbit may be visible, at some level, in the O−C diagram for the W UMa binary. Such complications are well illustrated in the 'double–eclipsing' binary BU CMi, which has B/A stars that eclipse in 2.9 d and 3.3 d in a wider 120 d orbit (Jayaraman et al, 2021). Both of the eclipsing binaries in BU CMi show rapid apsidal motion with 20 to 30 year periods. In the following we provide some preliminary analysis and estimates of the properties of the wide binary of V752 Cen. We stress this work is hypothetical, but may provide guidance for further investigations. We do not suggest that the entire O−C behaviour of V752 Cen can be interpreted as a light–time effect, but

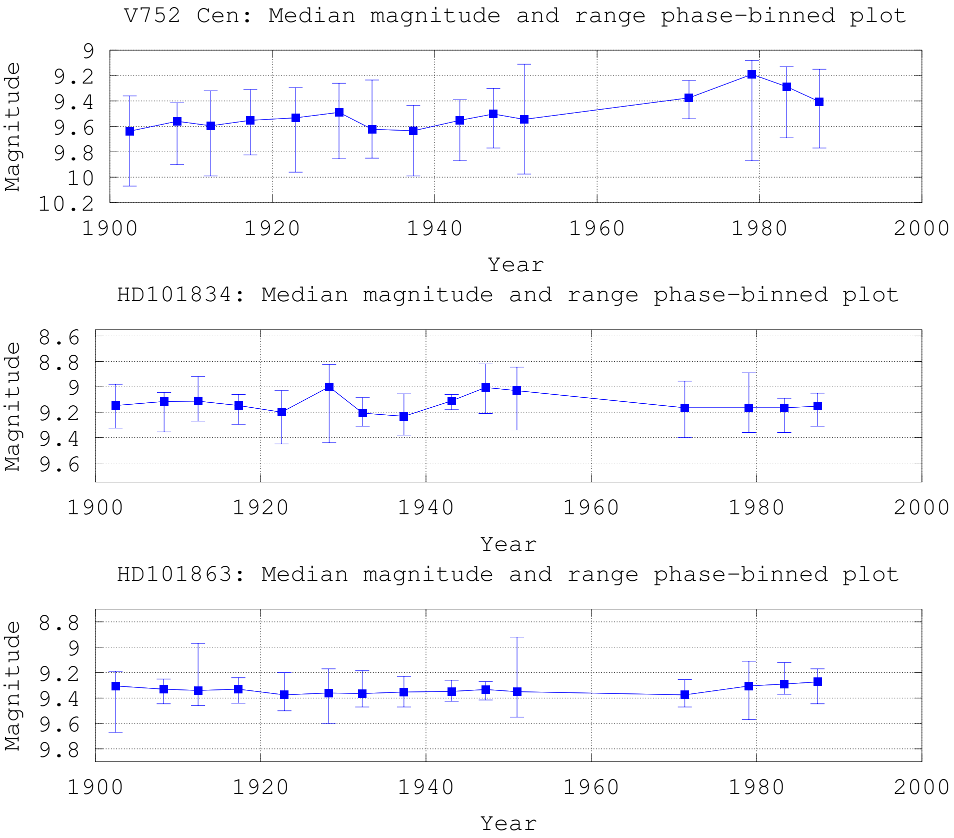


Figure 11: Time–series of maximum, minimum and median magnitude from the 5–yearly phase–binned light curves for V752 Cen (upper panel), for HD 101834 (comparison star C2, middle panel), and for HD 101863 (comparison star C4, lower panel) from the Harvard photograpic data.

note that any such effect should be quantified to assist in a more complete interpretation of this system.

Zhou et al (2019) infer the masses of the W UMa stars are near 0.4 $M_\odot$ and 1.3 $M_\odot$. We can treat the entire system as being composed of one star of mass 1.4 $M_\odot$ (i.e. the sum of the W UMa components) and another star of mass 1.2 $M_\odot$ (the sum of the K and M dwarf binary components) with a minimum orbital velocity of 22 km s^{-1}. Again we assume the system inclination is near 80°. We can then use equation 1 to obtain a maximum period near 245 d for the wide binary. Assuming a circular orbit, the period and orbital velocity leads to a light–travel time across the diameter of the orbit to be near 0.02 d.

The putative 245 d orbital period is relatively short. However, we note that the radial velocity data of Sistero & Sistero (1973) were obtained over 5 nights, while the velocity data of Schumacher were obtained on two runs of ∼6 days, approximately one month apart. In both cases the duration of the velocity observations are too small to expect to detect a change in the centre–of–mass velocity for a 245 d orbit.

We have searched the existing times of photometric O−C for evidence of a ∼245 d periodicity of amplitude 0.02 d. In most cases the data are too sparse to form a critical

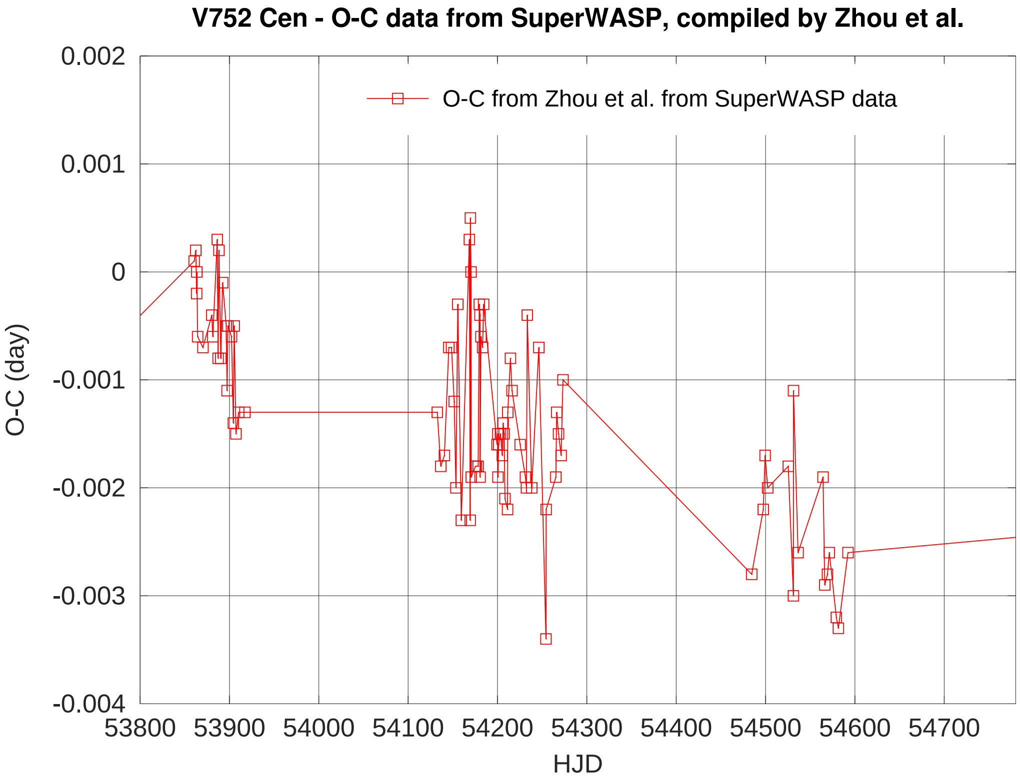


Figure 12: O-C data for V752 Cen from the SuperWASP dataset given in Zhou et al (2019). We use the epoch of HJD 2456108.3448 and period of 0.37023198 d, from Zhou et al (2019).

test of this hypothesis. (For example the available TESS datasets are of ∼50–day duration, separated by two years.) However the SuperWASP data include intervals of over 100 d in duration. Figure 12 shows the O−C measurements from SuperWASP as listed in Zhou et al (2019): The middle data set spans nearly 150 d. While a highly eccentric orbit cannot be excluded, there is no indication in Figure 12 of a variation of 0.02 d that could arise from the hypothetical 245 d orbit.

The calculated 245 d wide–binary orbit derived above was based in large part on the reported change in the centre–of–mass velocity between the measurements of Sistero & Sistero (1974) (+29 km s^{-1}) and Schumacher (2008) (∼-13 km s^{-1}). We note that Sistero & Sistero (1974) derived their centre–of–mass velocity of the W UMa system from photographic spectra, using five stellar spectral lines relative to laboratory arc–lines, for each component. These individual centre–of–mass velocities ranged from +8 to +49 km s^{-1}, yielding the adopted average of +29 km s^{-1}. Given this, it is possible that there is a level of uncertainty of actual centre–of–mass change of the W UMa system, and hence a corresponding uncertainty concerning the properties of the wide orbit. As was noted earlier, Zhou et al (2019) suggested the period variation of V752 Cen may potentially relate to interaction with the wider spectroscopic binary. Determining the system parameters of the wide orbit would assist in assessing the effect of such an interaction. A comprehensive radial–velocity study may be the least ambiguous approach.

5 Conclusions

We have used archival photographic–plate magnitudes, from the Bamberg and Harvard collections, to extend the previously published O−C diagram for the W UMa star V752 Cen back in time approximately 70 years. The period appears to have been largely constant over this time. The photographic record also suggests a small secular brightening of the system occurred in the interval 1900 to 1990. Two times of minima obtained by us in 2020 via CMOS photometry are consistent with the period change near 2000, reported by Mallama & Pavlov (2015) and analysed in detail by Zhou et al (2019). The change in the centre–of–mass velocity of the W UMa binary about the K–dwarf/M–dwarf spectroscopic binary leads to the expectation of a possible light–travel time–effect of order 0.02 d. However, this does not appear consistent with the photometric data record, and indicates there is a level of uncertainty regarding the properties of the wide binary.

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