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International observational campaign of the 2014 eclipse of EE Cep ⋆

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ABSTRACT

Context. EE Cep is one of few eclipsing binary systems with a dark, dusty disk around an invisible object similar to ε Aur. The system is characterized by grey and asymmetric eclipses every 5.6 yr, with a significant variation in their photometric depth, ranging from $\sim 0^m.5$ to $\sim 2^m.0$.
Aims. The main aim of the observational campaign of the EE Cep eclipse in 2014 was to test the model of disk precession (Gałan et al. 2012). We expected that this eclipse would be one of the deepest with a depth of $\sim 2^m.0$.
Methods. We collected multicolor observations from almost 30 instruments located in Europe and North America. This photometric data covers 243 nights during and around the eclipse. We also analyse the low- and high-resolution spectra from several instruments.
Results. The eclipse was shallow with a depth of $0^m.71$ in V-band. The multicolor photometry illustrates small color changes during the eclipse with a total amplitude of order $\sim +0^m.15$ in $B-I$ color index. The linear ephemeris for this system is updated by including new times of minima, measured from the three most recent eclipses at epochs $E = 9, 10$ and 11. New spectroscopic observations were acquired, covering orbital phases around the eclipse, which were not observed in the past and increased the data sample, filling some gaps and giving a better insight into the evolution of the H_α and Na I spectral line profiles during the primary eclipse.
Conclusions. The eclipse of EE Cep in 2014 was shallower than expected $0^m.71$ instead of $\sim 2^m.0$. This means that our model of disk precession needs revision.

Key words. Stars: binaries, eclipsing – Stars: circumstellar matter – Stars: emission-line, Be

1. Introduction

The 11-th magnitude system EE Cep (BD+552693) is a member of a rare class of binary systems, in which the eclipses are caused by a dark, dusty disk surrounding the orbiting companion. The precursor of this group is the extremely long-period (27.1 yr) eclipsing binary system ε Aur (see Guinan & Dewarf 2002). For a long time, these two systems were the only ones in this class of systems. Nowadays, more than a dozen such systems with similar properties are known, since many researchers have been reported (see eg. Lipunov et al. (2016), Garrido et al. (2016), Rattenbury et al. (2015), Kenworhty & Mamajek (2015), Scott et al. (2014) and references in Gałan et al. (2014)). Among these systems, there is a large diversity in orbital period duration – from days to decades. Most of these systems have weak observational records, frequently with one or a few eclipses observed so far. The interpretation of their nature is therefore often uncertain and requires verification through further observations and analysis. An example is the case of M2-29, which we ascribed into this group (Gałan et al. 2014), based on Hajduk et al. (2008) analysis of a single eclipse observed by OGLE and MACHO surveys. However Miszalski et al. (2011) prove that the scenario of eclipses by dusty disk is unlikely and propose another explanation of the observed eclipse as due to condensed dust and its evaporation around the R CrB star.

The EE Cep system stands out in this group with a relatively long orbital period (5.6 yr) after ε Aur and TYC 2505-672-1 (69.1 yr, Lipunov et al. (2016)). It has a well documented long history of eclipses showing very unusual behaviour, for over 13 orbital epochs. The research on this object dates back to the middle of the last century. It was discovered as a variable in 1952 (epoch $E = 0$) by Romano (1956). confirmed soon after by Weber (1956), who reported the singular observation of the change in its brightness during the previous eclipse in 1947 ($E = -1$). The eclipsing nature of the light curve was established with photometric observations of the subsequent events in 1958, 1964 and 1969 (Meinunger 1973). Henceforth all consecutive, primary eclipses were observed, but no traces of the secondary eclipse have ever been recorded.

⋆ Tables A.1 – A.29 are available at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (XXX.XX.XXX.X) or via http://cdsweb.u-strasbg.fr/cgi-bin/qcat?J/A+A/XXX/XXX

The first analytical model of the system was proposed by Meinunger (1975). He assumed that the B-type primary star is eclipsed by an M-type red giant. Pulsations of the giant should cause changes in depth of the eclipses whereas its inflated atmosphere could account for atmospheric wings. This model was questioned when the first multi-color observations using the R and I pass-bands of Johnson's photometric system were obtained in Piwnice Observatory in 1997 (Mikołajewski & Graczyk 1999). Very small color changes, observed during the eclipse, against the interpretation that the eclipsing component is a red giant. Mikołajewski & Graczyk (1999) proposed another model in which the eclipses could be caused by an invisible, cold object – a dark disk around a low-luminosity central star or a close binary. From an analysis of the color indices, they constrained the basic parameters of the primary component: a hot star of spectral type B5, effective temperature 14300 K, radius $10\,R_{\odot}$, and distance of 2.75 kpc. Gaia DR2 (Gaia Collaboration 2016, 2018) brought an independent parallax $\pi = (0.503 \pm 0.032) \times 10^{-3}$ arcsec, indicating that EE Cep system is closer, at 1.99 ± 0.13 kpc.

The most striking feature of the EE Cep minima is the significant variation in their depth, from $\sim 0\overset{m}{.}5$ to $\sim 2\overset{m}{.}0$ (Fig.1). The top panel in Fig. 1 shows the representative light curves of four minima: typical examples of deep minima observed in 1975 ($E = 4$) and 1997 ($E = 8$), the shallowest (so far) eclipse observed in detail during 2008/9 ($E = 10$), and the exceptional eclipse with flat bottom during its central part in 1969 ($E = 3$). The bottom panel of the same figure shows the variation in time of the eclipses The changes in the depth are accompanied by variations of the total duration of the eclipses (Graczyk et al. 2003). All eclipses are characterized by a similar asymmetry – the descending branches are longer than ascending ones. It is possible to distinguish in light curves repeatable phases during the eclipses: more or less sloped-bottomed transit during the central part of the eclipse is preceded and followed by the real ingress and egress, and atmospheric wings caused by semitransparent external parts of the eclipsing body. To explain this unusual behavior, Mikołajewski & Graczyk (1999) suggested that the eclipses are caused by the disk which is opaque in its interior and semitransparent in outer regions and which has a varying inclination to the line of sight during different eclipses due to precession. In this scenario, the unique flat-bottomed eclipse, observed in 1969 ($E = 3$), can be explained by a nearly edge-on and non-tilted projection of the disk.

To test this model we needed good temporal coverage and high quality photometric and spectroscopic observations. Obtaining dense enough sampling of the eclipses would be possible only through the collective effort of a large number of observers in various locations around the world. For the events in 2003 and 2008/9, we organized extensive, international observing campaigns (Mikołajewski et al. (2003); Gałan et al. (2008)), which attracted the attention of several dozens of observers. Analysis of the high-resolution spectra of these campaigns (Gałan et al. 2012) confirmed that the primary component is a B5III star rotating at very high velocity (~350 km/s) which causes inhomogeneous temperature and flux distribution on its surface due to the von Zeipel (1924) effect. Recent photometric results complemented by the historical light curves (Graczyk et al. 2003) were used to calculate a model of the system that would be able to reproduce the changing shapes of the eclipses caused by the disk precession and taking into account a mechanism which would explain the unusually different eclipses at epochs $E = 3$ and 8 (see Fig.1 – bottom). The the best solution obtained for the disk precession was $P_{prec} \sim 11 - 12 P_{orb}$ (Gałan et al. 2012). According to this model, the eclipse in 2014 (E =11) should attain a large, close to $2\overset{m}{.}0$. This model was based on observations obtained in a time interval almost exactly equal to the derived precession period. Additional photometric and spectroscopic observations were needed for its verification.

In this paper, we present photometric and spectroscopic data obtained with the new campaign that constitutes a basis for future papers with quantitative analysis. Section 2 describes technical details of the campaign in 2014, including a compilation of instruments involved in the observations and a description of techniques used to combine data from various photometric systems. Section 3 presents the results of the campaign, i.e. the light curves and spectra. A brief discussion of the conclusions from obtained results is made in Section 4.

2. Observations

Our call for observations (Gałan et al. 2014) gained a wide response from observers, using 30 telescopes located in Europe and two in North America. Several science facilities and organizations were involved in this campaign, as well as a large number of amateur astronomers, who were participating in an independent campaign, coordinated by AAVSO (Waagen 2014). Technical details of telescopes are listed in Table 1. All telescopes were reflectors with the range from 0.2 to 2.0 m in diameter. More than 11000 individual photometric measurements were obtained with 27 instruments – most using $UBV(RI)_{\rm C}$ pass-bands of Johnson-Cousins photometric system and in several cases RI filters more close to Johnson's realization of these bands. The photometric data cover 243 days from March 22 to November 20, 2014.

One photometric measurement in near-infrared $JHK_{\rm S}$ bands was obtained on June 3, 2010 (HJD = 2455350.67) with the *CAIN* infrared camera operating on 1.5 m Carlos Sánchez telescope at Teide Observatory. The frames were reduced on flatfields, bad pixel corrected, background subtracted, and finally combined with the use of *CAINDR*[1] data reduction tasks working in the *IRAF*[2] environment, and the photometry was performed using the *apphot* package. The resulted magnitudes are shown in Table A.28.

2.1. Transformation to the standard system

We propose to use the four brightest stars from the Meinuger's sequence (Meinunger 1975) as comparison and check stars – all these objects are close in the sky, within ~3′ to the position of EE Cep (Gałan et al. 2014). They were marked as "a", "b", "c" and "d" for BD+55° 2690, GSC−39732150, BD+55° 2691, and GSC−39731261, respectively (Fig. 2).

Most of the data were expressed by the observers directly as apparent magnitudes. In these cases we calculated differential magnitude with respect to the "a" star: $(v - a)$. In other cases, differential magnitudes were already given with respect to "a" star. All data were corrected for the differences resulting from using different instruments. We choose two standard systems. The photometric data from Suhora Observatory (Table A.3) were adopted as a zero-point for URI bands in the Johnson system. They covered, with a good density of observational

[1] CAINDR – Infrared Camera Reduction Software developed by R. Berrena and J. Acosta - IAC v0.5 – July 2007.

[2] IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under a cooperative agreement with the National Science Foundation.

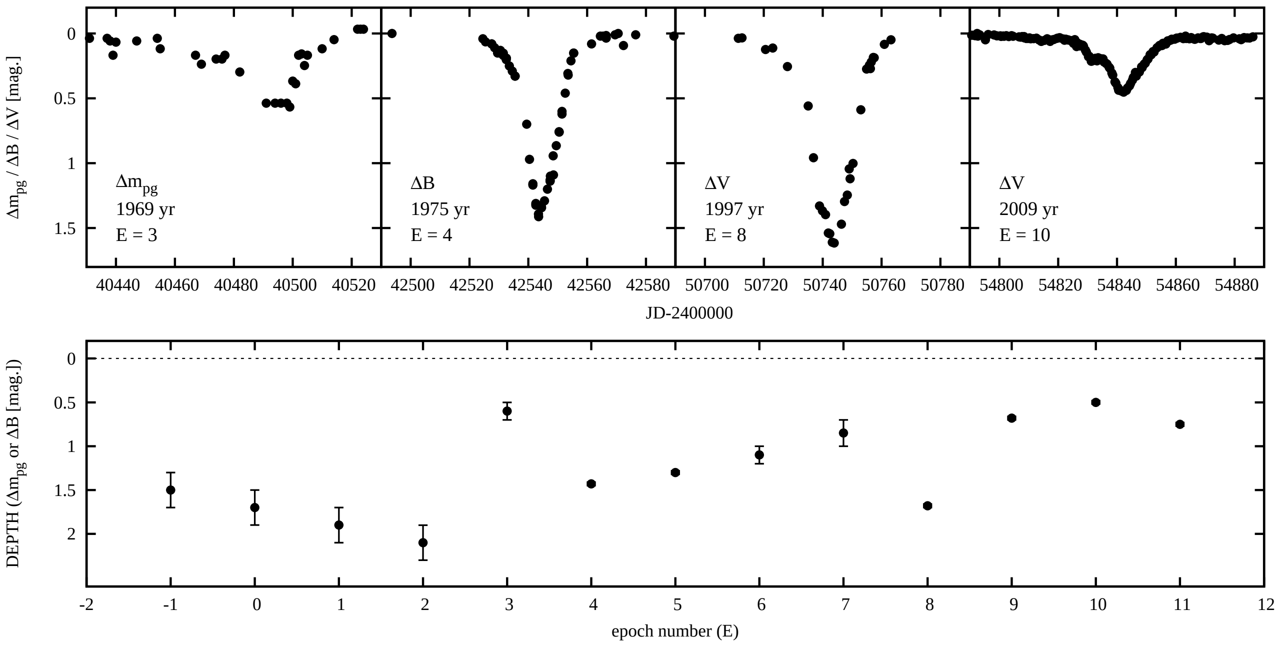

Fig. 1. *Top*: Four representative light curves of the eclipses in EE Cep selected among the best quality so far light curves with good time coverage – two deep ($E = 4$ and 8) and two shallowest ($E = 3$ and 10). *Bottom*: Time dependence relation for the depth of eclipses.

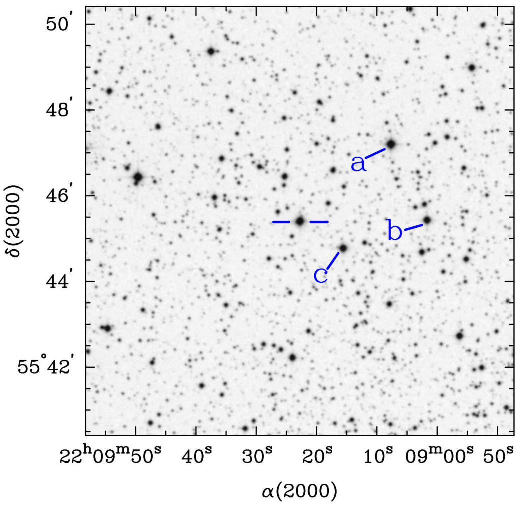

Fig. 2. $10' \times 10'$ DSS-2-red finding chart for EE Cep.

points in time, the whole time duration of the eclipse as well as a long baseline before and after. For $BV(RI)_C$ bands in Johnson-Cousins system, we chose photometric data from the University of Athens Observatory (UOAO) (Table A.1). The data consists of 10–50 individual observations every night during the entire duration of the eclipse (descending and ascending wings, as well as outside the eclipse). There are differences between Johnson RI bands and Johnson-Cousins $(RI)_C$ bands, so we use different magnitudes of "a" star (Table 2). For the Johnson system, we used magnitudes of "a" star given by Mikołajewski et al. (2003), and for Johnson-Cousins system we use magnitudes measured by the University of Athens Observatory (UOAO) (Table 2). We decided to reject differential measurements which had been done in respect to "b" and "c" stars. According to Samus et al. (2009) they are suspected to be variable stars. We mentioned in Gałan et al. (2014) that those stars were monitored in a time period of about 5 years and also during and close to EE Cep eclipse in 2008-2009. Variability of "b" star wasn't confirmed. However, we didn't want any unexpected variability from this star in the course of the eclipse in 2014.

As it was in the case of previous two campaigns we transform measurements to one standard system in every band. The procedure was similar to (Gałan et al. 2012) but this time the eclipse was deeper, and we had to take the effect of the colors into consideration. The difference between the two systems is not constant as a function of depth. We assumed that the relation between the shift among standard system and the instrumental one $(v_r - v)$ and depth of eclipse can be approximated by a linear function. This relation takes the form of $f(x) = Ax + B$, where x is the depth of eclipse measured from the point where $(v - a) = 0$, and $f = (v_r - v)$ is the shift between standard system v_r and shifted system v. It was calculated by taking measurements that had been done at the same time in different systems. We assumed that observations which were done at time duration shorter than 0.25 day fulfilled this condition. Parameters A and B were estimated by fitting the linear function to the data. We obtained instrumental data shifted to zero-point by subtracting calculated shift $v - f(v)$. We started from the standard system data set, which had the largest number of averaged measurements. As a next step, we added less numerous data sets, ending up to the data sets with two measurements. At the end, all photometric data from Tables A.1 to A.27 were averaged to one point per night. Table A.29 contains this average values with standard deviation and number of measurements used to average.

2.2. Spectroscopic data

High-resolution spectra were collected with two spectrographs (Coudé and ESpeRo) operating on the 2-m Ritchey-Chretién telescope at the Rozhen Observatory, Bulgaria. Two spectra ($R \sim 30000$) in range $\sim 4000 - 9000$ Å were obtained with ESpeRo echelle spectrograph (Bonev et al. 2017). Ten spectra ($R \sim 16000$) covering narrow ranges (~ 200 Å) were obtained

Table 1. All instruments and their involvement in photometric observations of the EE Cep eclipses in 2014.

Observatory	Country	Telescope type	Diameter [m]	Bands	N_i	N_n	Table
Astrolab Iris	Belgium	Newton	0.68	V	25	25	A.16
Athens	Greece	Cassegrain	0.4	$BV(RI)_C$	10344	65	A.1
Białków	Poland	Cassegrain	0.6	$BV(RI)_C$	150	38	A.5
Cerro del Viento	Spain	Schmidt-Cassegrain	0.2	V	9	9	A.23
France	France	Home made	0.203	BVR	5	2	A.24
Furze Hill	United Kingdom	Schmidt-Cassegrain	0.35	$BV(RI)_C$	123	41	A.7
Glyfada	Greece	Schmidt-Cassegrain	0.28	V	44	44	A.12
Guadarrama	Spain	Schmidt-Cassegrain	0.25	$BVRc$	27	41	A.15
Gualba	Spain	Schmidt-Cassegrain	0.356	$V(RI)_C$	3	1	A.26
Horten	Norway	Ritchey-Chretien	0.46	BVR_b	11	4	A.21
Jan Kochanowski	Poland	Schmidt-Cassegrain	0.35	$UBVR$	20	5	A.19
Las Pegueras	Spain	Schmidt-Cassegrain	0.35	V	51	51	A.10
Leicester	United Kingdom	Corrected Dall-Kirkham	0.508	BVR_C	3	1	A.25
Madrid-Ventila	Spain	Refractor	0.06	V	1	1	A.27
Magnago	Italy	Schmidt-Cassegrain	0.25	$BVIc$	15	5	A.20
Nerpio	Spain	Corrected Dall-Kirkham	0.431	BVR_C	34	32	A.14
New Mexico Skies	USA	Corrected Dall-Kirkham	0.508	BV	9	5	A.22
Rozhen	Bulgaria	Schmidt	0.7	$UBV(RI)_C$	50	10	A.11
Rozhen	Bulgaria	Cassegrain	0.6	$BV(RI)_C$	23	7	A.17
Slovak Academy	Slovakia	Cassegrain	0.6	$UBV(RI)_C$	139	30	A.6
Sonoita	USA	Folded Newtonian	0.5	$BV(RI)_C$	349	90	A.2
Suhora	Poland	Cassegrain	0.6	$UBVRI$	307	57	A.3
Szczecin	Poland	Newton	0.203	BVI	66	34	A.8,A.12
Tenerife-BRT	Spain	Schmidt-Cassegrain	0.356	$BVRI_C$	23	10	A.18
West Challow	United Kingdom	Schmidt-Cassegrain	0.356	VI_C	56	28	A.9
Wyspa Pucka	Poland	Schmidt-Cassegrain	0.203	BVR_C	172	72	A.4
IGeoE, Lisboa	Portugal	Schmidt-Cassegrain	0.36	$3840-7360$Å$^{R\sim483}$	4	4	
Madrid-Ventila	Spain	Ritchey-Chretien	0.2	$3890-7600$Å$^{R\sim600}$	1	1	
Rozhen	Bulgaria	Ritchey-Chretien*	2.0	$H_\alpha*, H_\beta*, Na^{R\sim16000}$	10	6	
Rozhen	Bulgaria	Ritchey-Chretien**	2.0	$4000-9000$Å$^{R\sim30000}$	2	2	
San Pedro Mártir	Mexico	Ritchey-Chretien	2.1	$5000-8600$Å$^{R\sim2000}$	3	2	
West Challow	United Kingdom	Schmidt-Cassegrain	0.28	$3800-7585$Å$^{R\sim1000}$	1	1	

Notes. N_n is the number of observed nights. N_i is the number of individual brightness determinations summed over all the photometric bands. The last column presents the number of the table with the original data. (*) are spectra made with Coude spectrograph, and (**) are spectra made with ESperRo spectrograph.

Table 2. Magnitudes of star BD+55° 2690 in $UBVRI(RI)_C$ bands

U^*	B^{**}	V^{**}	R_C^{**}	I_C^{**}	R^*	I^*
10.86	10.704	10.397	10.218	10.015	10.09	9.87

* given by Mikołajewski et al. (2003)

** given by the University of Athens Observatory (UOAO)

with Coudé spectrograph during 6 nights in the period from April 4 to August 6, 2014. Balmer H_α, H_β and H_γ and sodium Na I doublet line profiles from these spectra are shown in figure 3. Nine low-resolution spectra were collected with 4 instruments in range $\sim 4000-8600$ Å. All spectra were heliocentric corrected and normalized to the continuum. The list of spectra and instruments together with some additional information are given in Table 1 and all obtained spectra are available as FITS files at the CDS[3].

[3] Centre de Données astronomiques de Strasbourg

3. Results

3.1. Photometric Results

The best coverage with observations was obtained in the V band used by every observer. Coverage in R_C and I_C is also very dense. After averaging observations in time intervals as described in Section 2.1, we obtained useful data on 170 individual nights. The final $UBVRI(RI)_C$ light curves are presented in Fig.4.

The minimum of the eclipse took place on $JD = 2456894.0\pm 0.05$. The timing residual (observations minus calculations – i.e. the $(O-C)$ value) with respect to ephemeris from equation 1 is small ($O-C = 0^d.75$). The amplitude of the eclipse reached from about $0^m.81$ to $0^m.61$ in U and I_C bands, respectively. The amplitudes in all bands and the averaged differential magnitudes $(\overline{v-a})$ outside the eclipse (to phase ~ -0.054 and from phase ~ 0.024) are shown in Table 3.

The profiles of the eclipse in all bands are similar to those from 2003 and 2008/09 ($E=9$ and $E=10$). In particular, there was a "bump" at about $\sim$ 9 days before the photometric minimum during two previous eclipses. During this eclipse event ($E=11$) it is not so evident in the light curve, like in the all other previous deep eclipses, but it is visible in color indices ($B-I_C$,

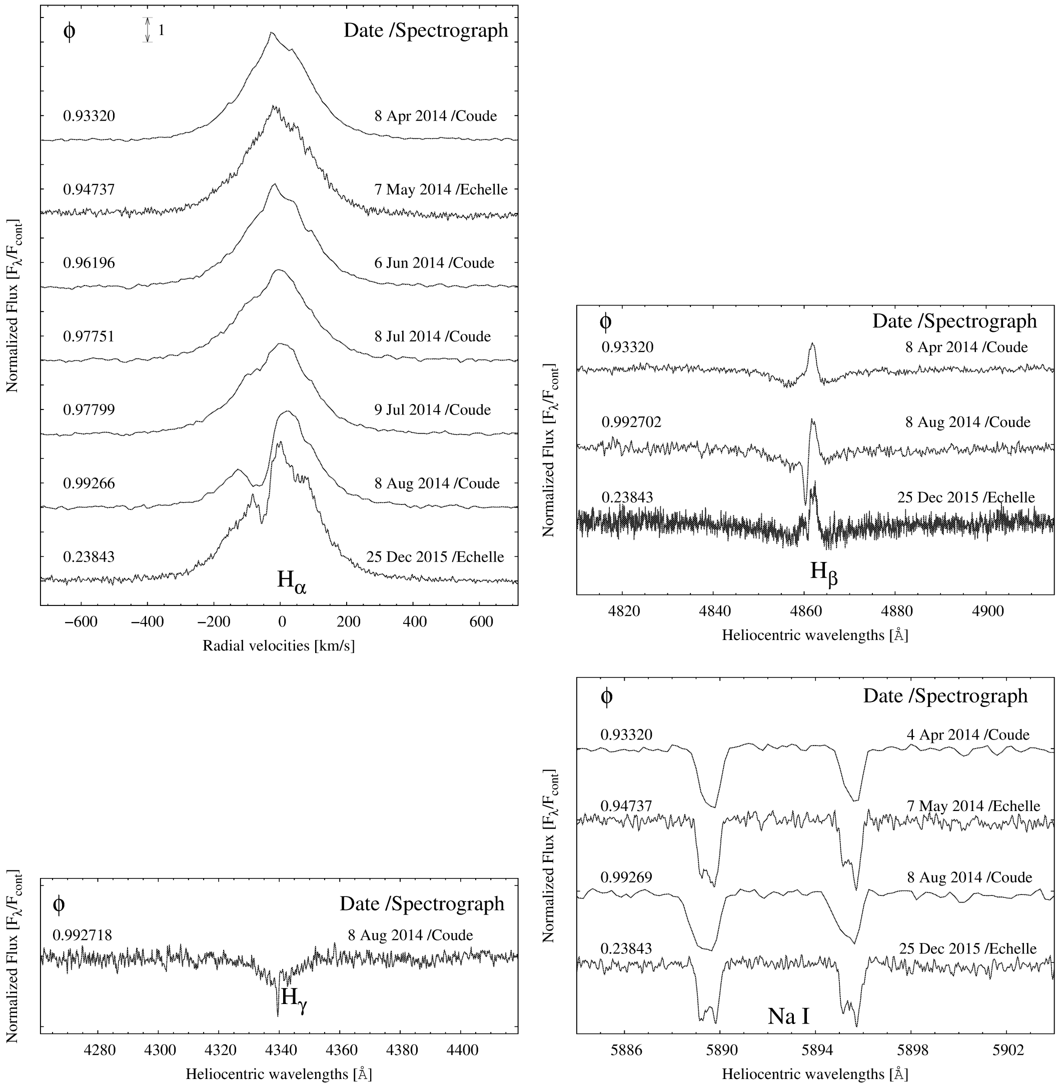

Fig. 3. Balmer H_α, H_β and, H_γ, and Na I doublet line profiles in the high-resolution spectra obtained during and around the eclipse EE Cep in 2014 ($E = 11$)

Table 3. Average magnitudes of the EE Cep outside the eclipse (to phase ~ −0.054 and from phase ~ 0.024), brightnesses in the minimum of the eclipse and the eclipse depths (differences between the outside and the minimum values) for seven particular pass-bands.

Band	U	B	V	R_C	I_C	R	I
Outside	0.12	0.48	0.43	0.33	0.15	0.31	0.41
Minimum	0.97	1.22	1.12	0.97	0.76	0.97	1.12
Depth	0.83	0.75	0.71	0.65	0.62	0.66	0.71

$V - I_C$, and $B - R_C$) that we calculated (Fig.4 – bottom). Neglecting the second order effects – short and small amplitude variations – as observed during both previous campaigns and interpreted as a manifestation of the possible complex, multi-ring structure of the disk (Gałan et al. 2010), the observed color indices generally show a two-component profile with a maximum of the "bump" on roughly ~9–10 days before the photometric minimum. The beginning of the fast ingress can be observed in all observed photometric bands. A small (~ $0\overset{m}{.}05$) dip is also present, which is visible in V and B light curves at orbital phase ~ −0.015 (Figs. 7 and 4). It coincides roughly in phase and amplitude (these are subject to change slightly due to changes in the orientation of the disk) with shallow minima, noticed during the eclipses of previous campaigns in B and V light curves, but corresponding events observed previously roughly at a similar time after the mid-eclipse is not clearly detectable. The number of measurements collected in the very near-infrared domain I and I_C bands) during this campaign turned out unfortunately too small to confirm the repeatable brightening by several hundredths of magnitudes with a maximum at orbital phase ~0.2, which we reported after previous campaigns (Gałan et al. 2012). However, the independent campaign by AAVSO collected a relatively large number of measurements in I-band. There are significant differences between photometric systems, and the scatter is large, but after correcting for them in the I band light curve for epoch E=11 there also seems to be an apparent maximum at phase ~0.2 (see fig. 5).

Our JHK_S photometry obtained at phase (ϕ = 0.247) – during the time of fall after reaching the maximum brightness – compared to 2MASS photometry obtained at ϕ = 0.338 (Table A.28) shows a slightly increased brightness coherent with the I band, confirming the reality of this phenomenon, and indicating that we can expect a somewhat increased amplitude of

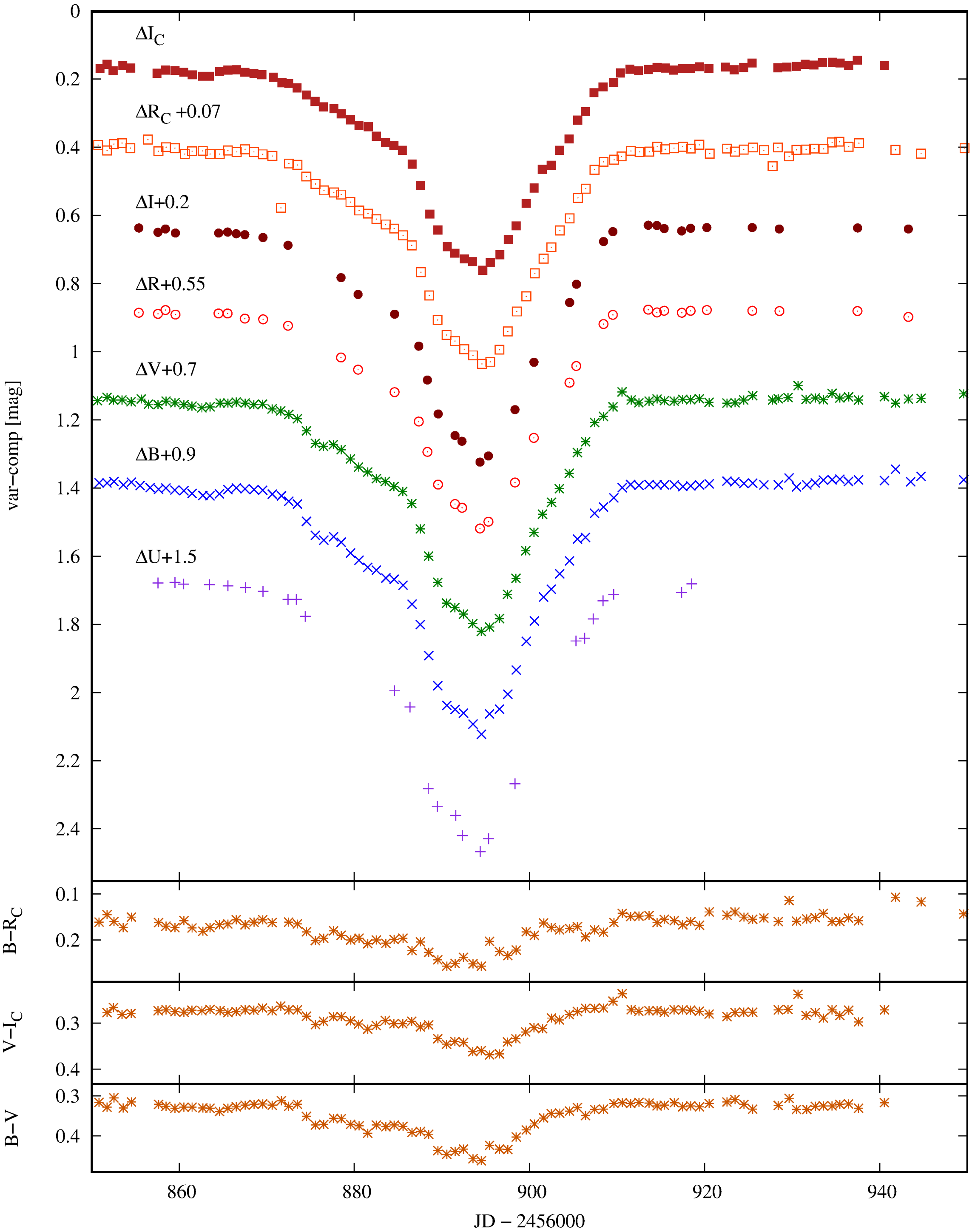

Fig. 4. Average points from Table A.29 obtained from photometric measurements of the 2014 eclipse. $UBVRI(RI)_C$ light curves (*Top*) and three colour indices (*Bottom*) are presented.

this effect in the near infrared region – with a maximum falling somewhere in the region of *H* band.

3.2. Calculating the new ephemeris

The eclipses of EE Cep are asymmetric, so we couldn't use the standard methods to calculate the time of minimum in the light curve. We decided to use the algorithm described by Kwee & van Woerden (1956). The same method was used by Mikołajewski & Graczyk (1999) to calculate the minimum of epoch $E = 4$ eclipse, and helped to calculate the minima of epochs 2, 5 and 8, and also to calculate the minima of the last three eclipses (epochs 9, 10 and 11). Using every known time of minimum for EE Cep (Table 4) we calculated the $O - C$ residuals for the times of minima using the linear ephemeris $JD(Min) = 2434344.1 + 2049^d.94 \times E$ by Mikołajewski & Graczyk (1999).

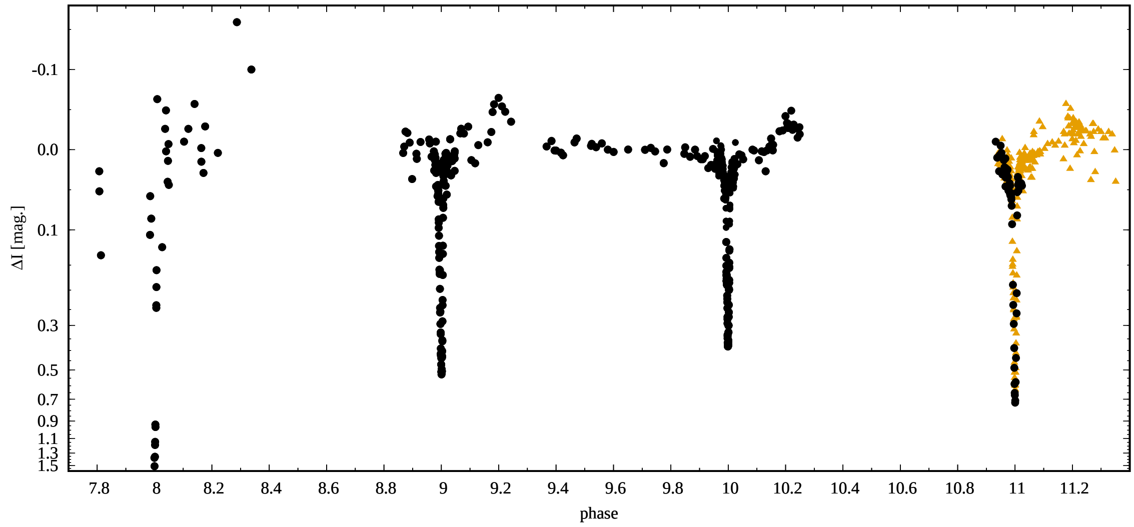

Fig. 5. Differential *I* magnitudes of EE Cep during and around of eclipses at epochs E = 8, 9, 10, and 11. The zero value represents average brightness outside eclipses (phase 0.4-0.8). Yellow triangles show the AAVSO *I*-band light curve after correcting for the differences between photometric systems of particular observers. Magnitudes of epoch E = 11 (black points) are the same as in figure 4 for *I*-band.

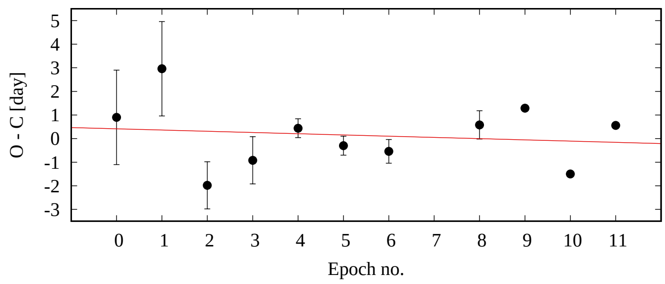

Fig. 6. O–C diagram with a linear fit (solid line) to residuals.

Table 4. Observed moments of minima and the O–C (observations minus calculations) residuals calculated according to the linear ephemeris $JD(Min) = 2434344.1 + 2049^d.94 \times E$ (Mikołajewski & Graczyk 1999)

Epoch	Light	JD	O-C	Reference
0	mpg	2434345.0 ± 2.0	0.90	[1]
1	mpg	2436397.0 ± 2.0	2.96	[1]
2	mpg	2438442.0 ± 1.0	-1.98	[2]
3	mpg	2440493.0 ± 1.0	-0.92	[3]
4	V	2442544.3 ± 0.4	0.44	[2]
5	V	2444593.5 ± 0.4	-0.30	[2]
6	V	2446643.2 ± 0.5	-0.54	[4]
7	V	2448691.87 ± 0.89	-1.78	[5]
8	V	2450744.2 ± 0.6	0.58	[2]
9	V	2452794.85 ± 0.14	1.29	this work
10	V	2454842.0 ± 0.1	-1.50	this work
11	V	2456894.0 ± 0.2	0.56	this work

References: [1] Meinunger (1973); [2] Mikołajewski & Graczyk (1999); [3] Baldinelli et al. (1975); [4] Di Luca (1988); [5] Halbach (1992)

They are listed in Table 4 and are marked in Figure 6. The best linear fit to the residuals gives the new ephemeris:

$$JD(Min) = 2434345.16(\pm 2.08) + 2049^d.78(\pm 0^d.22) \times E \qquad (1)$$

3.3. Spectroscopic Results

We have not observed any significant changes in the H_α line up to July 8, and 9, 2014, when signs of absorption components began to appear on the blue wings of the emission component (Figs 3 and 7). It coincides with the time when the small dip starts to develop in the light curves, which signifies the beginning of the photometric eclipse. The new precise photometric data with dense time coverage reveals more subtle changes and more accurate determination of the eclipse times and their total duration. The shallow eclipses last up to 2.5 – 3.5 months and there is now less difference with results obtained from spectroscopic observations. The total duration times estimated from the old photometric data (Graczyk et al. 2003) seem to be underestimated. The Balmer H_α, H_β and H_γ profiles in the spectra obtained deep in the eclipse (Aug 8, 2014) show deep absorption component on their blue wings. Interestingly, H_α and H_β lines in the spectra obtained on Dec 25, 2015, also show absorption component – this is the orbital phase ~0.24 during the brightening event (soon after its maximum) in the *I*-band. The blue-shifted absorption components are visible also in Na I doublet observed during this phase. Sodium develops absorption before and after the external photometric contacts of the eclipses (eg. spectrum on May 7, 2014). Similar behaviour of the sodium and potassium lines was observed in ε Aur system (see eg. Leadbeater et al. (2012); Tomov et al. (2012)). Several low-resolution (R ~ 500 – 1000) spectra listed in Table 1 generally confirm the evolution of the EE Cep spectrum shown by Boyd (2014).

4. Precessing Be star model

Analysis of the photometric data of the last campaigns together with the changes in the spectral line profiles proves that the eclipses have longer total duration, even up to ~3.5 months, than postulated on the basis of observations of previous eclipses. The last eclipse reached a depth of only ~$0^m.75$ mag in *B*, much shallower than expected ~ $2^m.0$ according to Gałan et al. (2012) model. One possible reason can be that the assumptions made to the disk precession model were too simple. In particular: (*i*) circularity of the orbit, and (*ii*) very simplified, disk density profile (~ r^{-2}). Moreover, (*iii*) the disk diameter was adopted quite arbi-

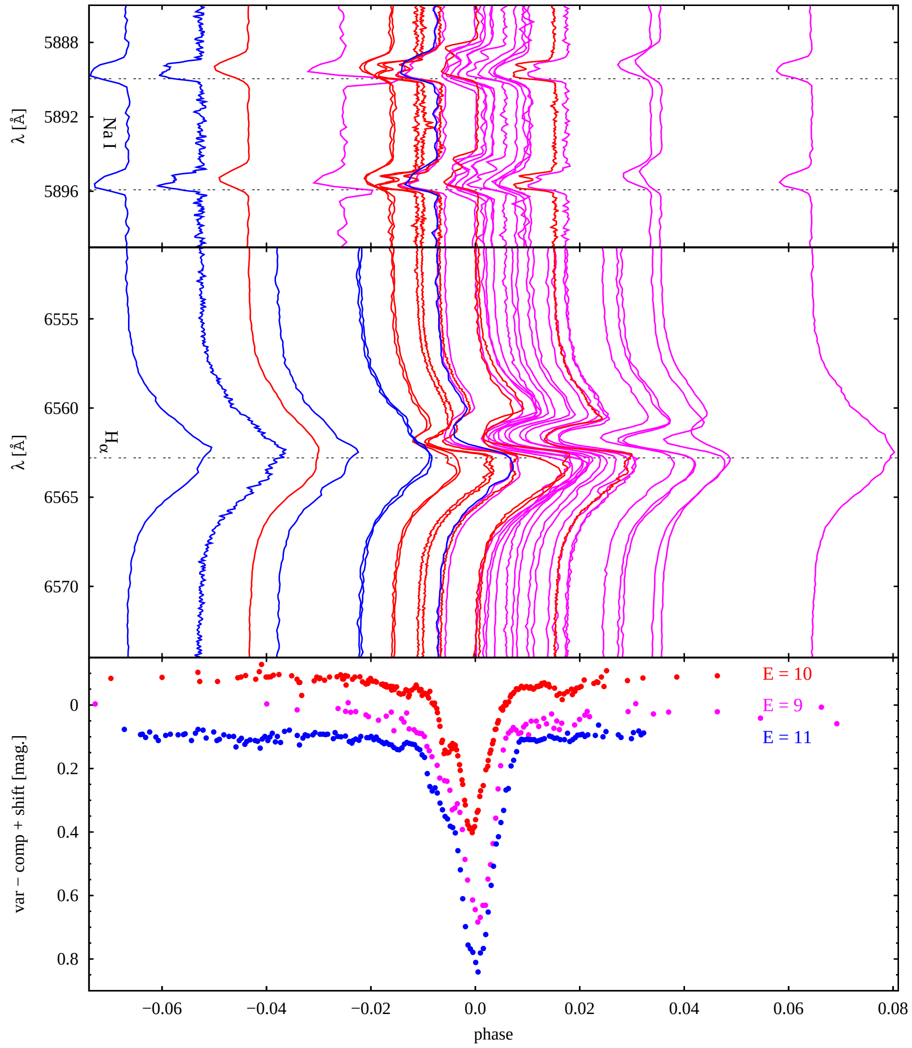

Fig. 7. Evolution of the Na I line profiles (*Top*), H_α line profiles (*Middle*) and *B* light curves (*Bottom*) during and around of eclipses at epochs *E* = 9, 10 and 11. Data are folded according to ephemeris by equation 1.

trarily as not larger than $D \sim 150\,R_\odot$. This could be justified by making simple assumptions about the system geometry shown on figure 8. The disk size can be calculated as a function of component separation a, companion radius R_S, and viewing angle θ. The viewing angle corresponds to half the duration of the eclipse which is about 3 months, thus $\theta \simeq 0.056$. We assumed that disk mass is much lower than the Be star mass (which is $\sim 8M_\odot$ according to Gałan et al. (2012) as well as $R_S \simeq 9R_\odot$). Taking this into consideration the component separation determined by Keplerian law is $a = 1360R_\odot$, which gives the disk diamater about $370R_\odot$. However this estimation doesn't take into consideration impact parameter D, inclination and eccentricity of the system.

In future work, we are going to take into consideration another model that could explain changes in eclipse depths. At the moment the hypothesis of eclipses caused by a disk still offers the best way to explain the grey character of all eclipses and that the secondary component is still eluding detection. It is also a good explanation for small changes in the light curve in the early stage of the eclipses.

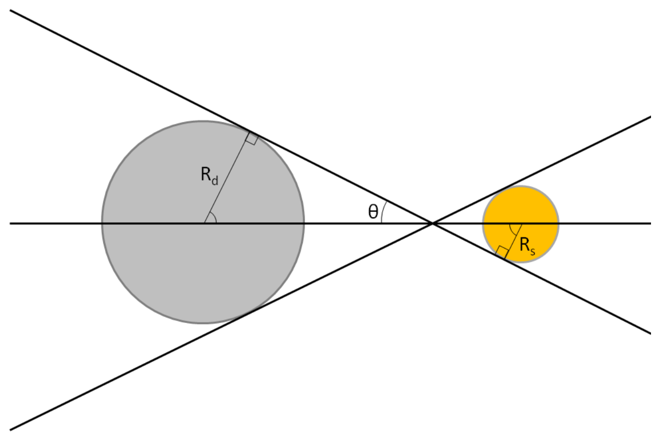

Fig. 8. Simple assumptions about geometry of the EE Cep system.

We want to propose a model in which the Be star is precessing instead of the disk. In this case, the changes in the eclipse depth would be caused by eclipsing the hot spots on the poles of the star as shown in the scheme on figure 9. We can distinguish four special orientations in the geometry of the system, where the angle of the disk and impact parameter D is the same. Only the inclination of the star φ is changing due to precession which would cause different amplitude A of the eclipses.

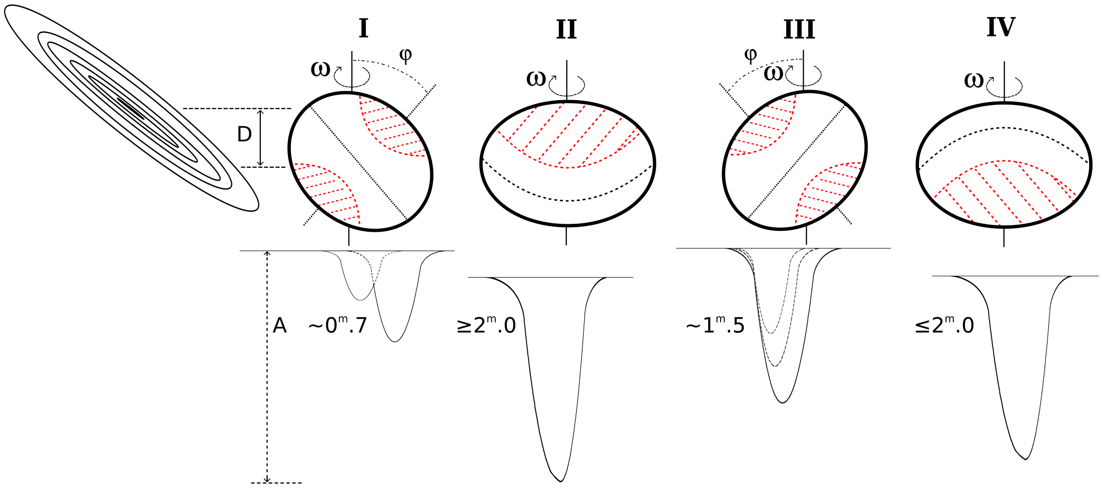

Fig. 9. Precessing Be star model explaining changes in the depths of the eclipses

I. Two clearly separate, relatively shallow minima with depth $\sim 0^m.7$ (epochs 9, 10, 11). First is the occultation of the bottom pole, then top one.
II. Only one, the visible hot pole is being highly eclipsed (epochs 0, 1, 2). The hot spot is close to the disk center. Deep ($A \gtrsim 2^m.0$) eclipses are observed.
III. Overlapping minima from two poles that are being eclipsed almost simultaneously (epochs 4, 5, 6). The hot spot caused by the bottom pole experiences a weaker eclipse ($A \sim 1^m.5$) through the outer, more transparent parts of the disk. Intermediate depth eclipses are observed.
IV. The hot spot, further from the disk center is eclipsed (epoch 8). Similar to case II but the eclipse is less deep $A \lesssim 2^m.0$.

Changes in the inclination of Be star (precession) may cause small changes in its brightness and colors due to the visibility of hot polar regions. Line broadening may also change during the precession cycle. Our future studies will concentrate on veryfing this model.

5. Concluding remarks

In this work, we present the processed photometric and spectroscopic data that have been obtained during the recent eclipse season of EE Cep in 2014 ($E = 11$). We can formulate several conclusions as to possibly the most important observational features of the eclipses which should be taken into account:

There are small effects detectable in the light and color curves which could be related to a possible complex multi-ring structure of the disk. Gałan et al. (2010) speculated that possible planets could be responsible for the formation of the gaps in the disk. However, this adds an extra complication to the model and such small second-order effects should be neglected in the modeling of the precession.

There are indications that the orbit is significantly eccentric. Variations out of the eclipses noted in I-band light curves at orbital phase ~ 0.2 (Gałan et al. 2012, and this paper) we believe could be related to proximity effects, when components are approaching each other close to periastron passage. In that case, the acceleration in the orbital motion may be an additional reason for the observed eclipse asymmetry and this complication may have to be taken into account in the model.

The most serious problem for developing the unified model of all eclipses are two events at epochs $E = 3$ and $E = 8$ which are characterised with extremely different depths from neighbouring eclipses. In the case of the disk precession model this effect could be reproduced by realization of the scenario in which two effects compete when the disk is seen nearly edge-on: (i) the rapid change in the optical depth of the disk, and (ii) the change in size of the disk projection which makes changes in the extent of obscuration (see Gałan et al. 2012, section 4.4). The larger disk diameter should enhance the efficiency of this mechanism because it will imply a smaller inclination of the precession axis. In the alternative option of the star precession some other mechanism explaining such quick changes will have to be proposed – eg. it can be considered to what extent the slope of the star's precession axis could be responsible for this.

Applying new modelling techniques might bring a breakthrough. For example, any possibility to know parameters of the orbit from measurements of the radial velocity variations (very difficult for such a rapidly rotating, hot star) and/or if possible the movement of the cold component from infrared interferometry, may be crucial for constraining the parameters and understanding of this system. Our still scant infrared data ($IJHK$–bands) seem to indicate the possibility to detect the cold component through systematic infrared monitoring during the whole orbital cycle.

6. Call for observations

We announce another observation campaign of EE Cep which will be held in 2020. The ingress will start at about 7th March (JD 2458916.4), whereas the end of egress will be observed around 21st April (JD 2458960.5) with mid-eclipse around 3rd April (JD 2458943.19).

Due to the duration of the previous eclipses, it is recommended to start the observations at least two months before the mid-eclipse and continue for four months.

Attention should be paid around 20th May 2021 (JD 2459354.7) due to the fact that in previous epochs flux increase in I band was observed around these days. This phenomenon will start around 25th October, 2020 (JD 2459148.1) and end around 9 December, 2021 (JD 2459558.2).

It is recommended to observe in the Johnson-Cousin system with an accuracy of $0\overset{m}{.}01$ or higher. In case of J,H,K infrared bands, all possible observations will be useful.

As a comparison star, we suggest star "*a*", BD+55°2690, but we also encourage to observe stars "*b*", "*c*", and "*d*" for GSC-3973 2150, BD+55°2691, and GSC-3973 1261, respectively.

Stars "*b*" and "*c*" are designated as New Suspected Variables in the General Catalog of Variable Stars (Samus et al. 2009). Observations should verify this possibility.

We are interested in spectroscopic observations with a resolution of R ∼ 10 000 or higher. Observing lines H_α, H_β and H_γ, and Na I doublet for the analysis of spectral profiles is encouraged. In the case of spectrographs with low resolutions only observations calibrated in flux will become useful.

Support necessary for maintaining the observations may be found at: http://sites.google.com/site/eecep2020campaign/. Observers interested in taking part in the campaign are requested to contact Dariusz Kubicki at kubickid@gmail.com.

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Appendix A: Online photometric and spectroscopic data

Table A.1. Photometry obtained at Athens Observatory (Greece) with standard $BV(RI)_C$ (Bessell) filters during and near the 2014 eclipse (E = 11). The 0.4 m reflector telescope with an SBIG ST10 XME CCD camera was used. Differential magnitudes are given with respect to $BD + 55\,2690$. Each point is the mean value obtained from 3 h frames, together with the corresponding standard deviations and number of points that were used to average. The columns labeled 'HJD+' denote the fraction of the day.

HJD	$HJD+$	ΔB	σ_B	N_B	$HJD+$	ΔV	σ_V	N_V	$HJD+$	ΔR_C	σ_{R_C}	N_{R_C}	$HJD+$	ΔI_C	σI_C	N_{I_C}
2456839	.37866	0.485	0.006	10	.37978	0.432	0.008	10	.38043	0.323	0.007	10	.38109	0.161	0.008	10
2456859	.59785	0.502	0.007	13	.59836	0.448	0.008	13	.59876	0.344	0.006	13	.59723	0.176	0.009	15
2456860	.59779	0.502	0.004	8	.59831	0.456	0.007	8	.59870	0.339	0.006	8	.59912	0.169	0.008	8
2456864	.57769	0.503	0.006	20	.57878	0.451	0.008	20	.57942	0.342	0.007	20	.58007	0.177	0.011	20
2456865	.57204	0.496	0.006	21	.57477	0.446	0.006	22	.57542	0.342	0.004	22	.57608	0.173	0.005	22
2456866	.56753	0.500	0.008	25	.56865	0.449	0.006	25	.56930	0.345	0.008	25	.56995	0.175	0.005	25
2456867	.56976	0.496	0.005	25	.57088	0.446	0.006	25	.57153	0.344	0.006	25	.57218	0.175	0.005	25
2456868	.56914	0.502	0.003	26	.57025	0.453	0.004	26	.57091	0.350	0.004	26	.57156	0.182	0.004	26
2456869	.57126	0.502	0.007	27	.57238	0.450	0.005	27	.57303	0.352	0.007	27	.57369	0.180	0.006	27
2456870	.56595	0.524	0.009	54	.56741	0.471	0.008	55	.56780	0.358	0.007	55	.56822	0.190	0.010	55
2456871	.54726	0.527	0.008	48	.54282	0.475	0.007	44	.55188	0.364	0.008	51	.54231	0.203	0.007	44
2456872	.54684	0.544	0.008	67	.54923	0.492	0.008	67	.54775	0.380	0.006	67	.54817	0.218	0.009	67
2456872	.61361	0.535	0.004	4	.61506	0.484	0.002	3	.61451	0.369	0.005	4	.61494	0.209	0.009	4
2456873	.53673	0.558	0.008	61	.53724	0.501	0.007	61	.53848	0.386	0.005	60	.53806	0.222	0.006	61
2456873	.60609	0.557	0.008	12	.60754	0.510	0.011	13	.60793	0.386	0.006	13	.60836	0.223	0.009	13
2456874	.53046	0.594	0.007	55	.53096	0.530	0.007	55	.53136	0.411	0.007	55	.53178	0.249	0.006	55
2456874	.60036	0.599	0.009	17	.60274	0.544	0.013	19	.60313	0.421	0.006	19	.60355	0.253	0.007	19
2456875	.56154	0.635	0.009	57	.56486	0.562	0.009	60	.56526	0.438	0.007	60	.56568	0.267	0.008	60
2456876	.52253	0.652	0.009	31	.52304	0.582	0.008	31	.52250	0.452	0.010	32	.51917	0.279	0.008	28
2456877	.50467	0.639	0.009	67	.50518	0.573	0.009	67	.50558	0.450	0.008	67	.51162	0.284	0.008	67
2456877	.59268	0.648	0.008	27	.59319	0.580	0.009	27	.59358	0.457	0.006	27	.59587	0.290	0.007	23
2456878	.55004	0.672	0.011	67	.55055	0.604	0.010	67	.55094	0.480	0.010	67	.55136	0.306	0.010	67
2456878	.61658	0.669	0.008	4	.61710	0.593	0.003	4	.61749	0.479	0.004	4	.61791	0.304	0.007	4
2456879	.52536	0.694	0.010	67	.52587	0.619	0.009	67	.52627	0.491	0.007	67	.52669	0.319	0.009	67
2456879	.60400	0.695	0.006	17	.60451	0.621	0.009	17	.60491	0.491	0.008	17	.60533	0.320	0.006	17
2456880	.55238	0.718	0.011	67	.55289	0.645	0.010	67	.55328	0.511	0.009	67	.55370	0.338	0.009	67
2456880	.61789	0.734	0.005	3	—	—	—	–	.61879	0.516	0.004	3	.61922	0.352	0.006	3
2456881	.55256	0.733	0.009	67	.55307	0.652	0.009	67	.55346	0.520	0.009	67	.55388	0.346	0.009	67
2456881	.61811	0.715	0.014	3	.61862	0.647	0.003	3	.61902	0.515	0.006	3	.61944	0.333	0.005	3
2456882	.55028	0.750	0.008	67	.55078	0.671	0.009	67	.55118	0.538	0.014	67	.55160	0.364	0.009	67
2456882	.61767	0.757	0.006	5	.61818	0.692	0.005	5	.61857	0.554	0.008	5	.61899	0.376	0.005	5
2456883	.51435	0.761	0.008	67	.51486	0.683	0.007	67	.51525	0.550	0.007	67	.51567	0.378	0.007	67
2456883	.59958	0.761	0.009	24	.60009	0.688	0.009	24	.60049	0.554	0.007	24	.60091	0.383	0.007	24
2456884	.54167	0.766	0.008	67	.54217	0.692	0.009	67	.54257	0.563	0.010	67	.54299	0.393	0.008	67
2456884	.61284	0.781	0.007	9	.61334	0.697	0.007	9	.61374	0.571	0.009	9	.61416	0.398	0.008	9
2456885	.53685	0.781	0.007	67	.53736	0.709	0.008	67	.53775	0.581	0.005	67	.53818	0.410	0.007	67
2456885	.61082	0.791	0.010	12	.61133	0.723	0.010	12	.61172	0.586	0.006	12	.61215	0.420	0.006	12
2456886	.54298	0.823	0.011	67	.54348	0.751	0.012	67	.54388	0.621	0.011	67	.54430	0.446	0.010	67
2456886	.61317	0.824	0.007	8	.61368	0.750	0.005	8	.61314	0.621	0.010	7	.61450	0.450	0.006	8
2456887	.51926	0.905	0.015	63	.51989	0.825	0.019	59	.52305	0.692	0.012	61	.51833	0.509	0.013	63
2456887	.60359	0.913	0.011	25	.60316	0.835	0.011	26	.60543	0.701	0.009	24	.60398	0.515	0.012	26
2456888	.56987	0.992	0.008	56	.57131	0.910	0.011	55	.57170	0.770	0.009	55	.57119	0.573	0.012	56

Table A.1. continued.

HJD	$HJD+$	ΔB	σ_B	N_B	$HJD+$	ΔV	σ_V	N_V	$HJD+$	ΔR_C	σ_{R_C}	N_{R_C}	$HJD+$	ΔI_C	σ_{I_C}	N_{I_C}
2456889	.57425	1.074	0.010	55	.57570	0.985	0.010	54	.57609	0.839	0.008	54	.57558	0.642	0.008	55
2456890	.58437	1.137	0.010	44	.58488	1.051	0.014	44	.58434	0.903	0.011	45	.58476	0.701	0.012	45
2456891	.57053	1.145	0.010	57	.57222	1.060	0.013	57	.57168	0.906	0.010	58	.57210	0.707	0.009	58
2456892	.50958	1.154	0.009	67	.51009	1.067	0.009	67	.51048	0.915	0.009	67	.51091	0.716	0.011	67
2456892	.59542	1.156	0.010	23	.60009	1.072	0.011	29	.60048	0.924	0.011	29	.60090	0.718	0.011	29
2456893	.44185	1.184	0.008	25	.44330	1.094	0.007	24	.44181	0.937	0.007	26	.44224	0.734	0.006	26
2456894	.61565	1.221	0.008	17	.61616	1.139	0.015	17	.61655	0.973	0.010	17	.61698	0.767	0.016	17
2456895	.61416	1.185	0.018	15	.61467	1.098	0.015	15	.61506	0.948	0.013	15	.61548	0.730	0.008	15
2456896	.62070	1.150	0.006	8	.62003	1.063	0.007	9	.62068	0.923	0.015	9	.62134	0.703	0.009	9
2456897	.61852	1.092	0.011	9	.61786	1.014	0.014	10	.61851	0.873	0.005	10	.61917	0.666	0.003	10
2456899	.62046	0.946	0.010	9	.62336	0.873	0.005	8	.62401	0.757	0.005	8	.62289	0.565	0.008	9
2456900	.61549	0.876	0.010	10	.61839	0.818	0.005	9	.61727	0.700	0.007	10	.61792	0.514	0.008	10
2456901	.61426	0.827	0.014	22	.61477	0.767	0.012	22	.61423	0.650	0.017	23	.61635	0.455	0.012	21
2456902	.61572	0.791	0.007	13	.61623	0.743	0.011	13	.61662	0.620	0.010	13	.61705	0.450	0.009	13
2456903	.47540	0.752	0.008	10	.47592	0.691	0.006	10	.47729	0.574	0.007	9	.47675	0.409	0.014	10
2456904	.60132	0.714	0.012	34	.60276	0.670	0.009	35	.60315	0.541	0.011	35	.60358	0.370	0.008	35
2456905	.59386	0.645	0.015	38	.59942	0.596	0.011	34	.59735	0.471	0.010	36	.59322	0.314	0.015	40
2456911	.58930	0.488	0.011	42	.59078	0.440	0.011	41	.59068	0.329	0.009	38	.59162	0.171	0.010	41
2456912	.56499	0.496	0.012	49	.56965	0.447	0.010	43	.56495	0.339	0.011	48	.56638	0.181	0.010	49
2456913	.58507	0.495	0.006	42	.58559	0.450	0.008	42	.58599	0.338	0.009	42	.58642	0.172	0.010	42
2456914	.59102	0.488	0.011	47	.59059	0.449	0.010	46	.59099	0.329	0.009	46	.59142	0.166	0.012	46
2456915	.58892	0.495	0.017	49	.58944	0.446	0.013	49	.58985	0.333	0.008	49	.59027	0.170	0.010	49
2456916	.51145	0.517	0.011	41	.51598	0.455	0.021	41	.51334	0.322	0.028	45	.51256	0.180	0.015	49
2456916	.60070	0.490	0.015	32	.60126	0.449	0.016	32	.60166	0.336	0.009	32	.60220	0.163	0.010	33
2456917	.58631	0.491	0.011	52	.58667	0.445	0.012	52	.58616	0.330	0.008	51	.58749	0.167	0.018	52
2456919	.57727	0.478	0.014	56	.57665	0.434	0.014	56	.57894	0.317	0.014	58	.57567	0.157	0.009	53
2456920	.59426	0.494	0.012	51	.59450	0.443	0.018	49	.59422	0.343	0.011	50	.59752	0.169	0.012	47
2456922	.51130	0.486	0.010	13	.51182	0.447	0.008	13	.51222	0.336	0.008	13	.51266	0.158	0.004	13
2456923	.50741	0.488	0.008	16	.50794	0.460	0.012	16	.50893	0.342	0.012	15	.50877	0.187	0.016	16
2456924	.51262	0.492	0.009	7	.51313	0.437	0.007	7	.51354	0.335	0.006	7	.51592	0.163	0.004	5
2456925	.51498	0.488	0.009	11	.51549	0.439	0.007	11	.51588	0.330	0.009	11	.51630	0.162	0.007	11
2456929	.48865	0.478	0.014	10	.48917	0.446	0.005	10	.49050	0.325	0.013	9	.49092	0.165	0.010	9
2456930	.49584	0.497	0.009	10	.49637	0.448	0.007	10	.49679	0.338	0.008	10	.49722	0.163	0.005	10
2456931	.49226	0.480	0.007	11	.49279	0.433	0.005	11	.49320	0.326	0.007	11	.49363	0.157	0.007	11
2456932	.48496	0.483	0.005	8	.48552	0.437	0.007	8	.48593	0.330	0.006	8	.48637	0.159	0.006	8
2456933	.48361	0.474	0.010	13	.48411	0.427	0.007	13	.48451	0.318	0.007	13	.48493	0.151	0.005	13
2456934	.61446	0.480	0.011	10	.61496	0.423	0.011	10	.60879	0.308	0.010	3	.61578	0.151	0.004	10
2456935	.45518	0.474	0.007	8	.45568	0.436	0.011	8	.45608	0.324	0.010	8	.45650	0.153	0.005	8
2456937	.44125	0.486	0.015	16	.44093	0.438	0.004	17	.44132	0.319	0.010	17	.44080	0.145	0.008	16

Observers: K. Gazeas.

Table A.2. $BV(RI)_C$ photometry obtained at Sonoita (USA) Observatory during and near the 2014 eclipse (E = 11). The 0.5 Folded Newtonian telescope with an SBIG STL-1001E CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 39732150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	B	ΔB	$JD+$	V	ΔV	$JD+$	R_C	ΔR_C	$JD+$	I_C	ΔI_C	$JD+$	$B - Rc$	$JD+$	$B - V$	$JD+$	$V - Rc$
2456761	.98694	11.162	0.458	.98750	10.800	0.403	—	—	—	—	—	—	—	—	—	—	—	—
2456763	.98641	11.171	0.467	.98699	10.803	0.406	—	—	—	—	—	—	—	—	—	—	—	—
2456767	.98415	11.170	0.466	.98472	10.806	0.409	—	—	—	—	—	—	—	—	—	—	—	—
2456768	.97720	11.181	0.477	.97778	10.799	0.402	.97926	10.529	0.311	—	—	—	.97823	0.652	.98722	0.362	.97852	0.270
2456771	.98258	11.169	0.465	.98315	10.808	0.411	.98356	10.542	0.324	.98399	10.196	0.181	.98307	0.627	.98670	0.368	.98336	0.266
2456776	.99179	11.184	0.480	.99235	10.791	0.394	.99277	10.526	0.308	.99318	10.182	0.167	.99228	0.658	.98443	0.364	.99256	0.265
2456777	.96637	11.192	0.488	.96589	10.804	0.407	.96631	10.531	0.313	.96673	10.189	0.174	.96634	0.661	.97749	0.382	.96610	0.273
2456778	.96483	11.163	0.459	.96540	10.810	0.413	.96580	10.540	0.322	.96623	10.186	0.171	.96532	0.623	.98287	0.361	.96560	0.270
2456781	.97619	11.181	0.477	.97676	10.813	0.416	.97715	10.541	0.323	.97758	10.190	0.175	.97667	0.640	.99207	0.393	.97696	0.272
2456787	.95515	11.183	0.479	.95572	10.808	0.411	.95612	10.538	0.320	.95655	10.197	0.182	.95564	0.645	.96613	0.388	.95592	0.270
2456790	.95291	11.170	0.466	.95348	10.800	0.403	.95388	10.535	0.317	.95431	10.199	0.184	.95339	0.635	.96512	0.353	.95368	0.265
2456791	.95315	11.181	0.477	.95373	10.812	0.415	.95414	10.552	0.334	.95456	10.204	0.189	.95365	0.629	.97647	0.368	.95394	0.260
2456792	.95644	11.177	0.473	.95700	10.808	0.411	.95739	10.537	0.319	.95780	10.192	0.177	.95691	0.640	.95543	0.375	.95719	0.271
2456796	.94917	11.192	0.488	.94973	10.804	0.407	.95014	10.538	0.320	.95056	10.220	0.205	.94966	0.654	.95320	0.370	.94993	0.266
2456800	.95256	11.196	0.492	.95313	10.811	0.414	.95353	10.548	0.330	.95396	10.206	0.191	.95305	0.648	.95344	0.369	.95333	0.263
2456802	.95480	11.193	0.489	.95539	10.814	0.417	.95579	10.555	0.337	.95622	10.193	0.178	.95530	0.638	.95672	0.369	.95559	0.259
2456803	.96213	11.192	0.488	.96270	10.816	0.419	.96311	10.550	0.332	.96352	10.202	0.187	.96262	0.642	.94945	0.388	.96290	0.266
2456804	.95792	11.179	0.475	.95849	10.814	0.417	.95889	10.538	0.320	.95931	10.206	0.191	.95841	0.641	.95284	0.385	.95869	0.276
2456806	.94673	11.181	0.477	.94732	10.819	0.422	.94773	10.546	0.328	.94814	10.192	0.177	.94723	0.635	.95509	0.379	.94753	0.273
2456807	.94530	11.183	0.479	.94587	10.810	0.413	.94630	10.554	0.336	.94671	10.209	0.194	.94580	0.629	.96241	0.376	.94608	0.256
2456808	.94756	11.206	0.502	.94814	10.804	0.407	.94855	10.540	0.322	.94896	10.200	0.185	.94806	0.666	.95821	0.365	.94834	0.264
2456809	.94761	11.189	0.485	.94819	10.811	0.414	.94859	10.547	0.329	.94902	10.207	0.192	.94810	0.642	.94703	0.362	.94839	0.264
2456810	.94310	11.175	0.471	.94368	10.808	0.411	.94411	10.541	0.323	.94452	10.201	0.186	.94361	0.634	.94558	0.373	.94390	0.267
2456811	.94180	11.181	0.477	.94245	10.825	0.428	.94285	10.542	0.324	.94326	10.207	0.192	.94233	0.639	.94785	0.402	.94265	0.283
2456812	.94182	11.177	0.473	.94238	10.804	0.407	.94281	10.540	0.322	.94321	10.197	0.182	.94232	0.637	.94790	0.378	.94259	0.264
2456813	.94697	11.164	0.460	.94753	10.810	0.413	.94794	10.537	0.319	.94837	10.194	0.179	.94746	0.627	.94339	0.367	.94773	0.273
2456814	.94371	11.185	0.481	.94429	10.804	0.407	.94468	10.534	0.316	.94510	10.208	0.193	.94419	0.651	.94213	0.356	.94449	0.270
2456815	.94311	11.175	0.471	.94367	10.802	0.405	.94407	10.534	0.316	.94450	10.188	0.173	.94359	0.641	.94210	0.373	.94387	0.268
2456816	.94244	11.187	0.483	.94301	10.807	0.410	.94341	10.543	0.325	.94384	10.195	0.180	.94292	0.644	.94725	0.354	.94321	0.264
2456825	.94561	11.174	0.470	.94619	10.812	0.415	.94659	10.539	0.321	.94702	10.202	0.187	.94610	0.635	.94400	0.381	.94639	0.273
2456826	.93956	11.173	0.469	.94013	10.816	0.419	.94053	10.549	0.331	—	—	—	.94005	0.624	.94339	0.373	.94033	0.267
2456827	.94232	11.174	0.470	.94289	10.807	0.410	.94329	10.543	0.325	.94373	10.201	0.186	.94280	0.631	.94272	0.380	.94309	0.264
2456837	.93643	11.189	0.485	.93700	10.814	0.417	.93740	10.547	0.329	.93783	10.200	0.185	.93691	0.642	.94590	0.362	.93720	0.267
2456840	.94818	11.180	0.476	.94874	10.814	0.417	.94915	10.553	0.335	.94958	10.215	0.200	.94866	0.627	.93984	0.357	.94894	0.261
2456843	.94462	11.184	0.480	.94520	10.815	0.418	.94560	10.543	0.325	.94602	10.202	0.187	.94511	0.641	.94260	0.367	.94540	0.272
2456844	.94648	11.189	0.485	.94704	10.835	0.438	.94743	10.555	0.337	.94788	10.223	0.208	.94696	0.634	.93671	0.375	.94724	0.280
2456847	.95151	11.189	0.485	.95207	10.811	0.414	.95248	10.544	0.326	.95289	10.204	0.189	.95200	0.645	.94846	0.366	.95228	0.267
2456848	.95091	11.238	0.594	.95147	10.814	0.417	.95190	10.545	0.327	.95232	10.218	0.203	.95140	0.693	.94491	0.369	.95169	0.269
2456850	.95405	11.192	0.488	.95461	10.819	0.422	.95502	10.554	0.336	.95546	10.216	0.201	.95454	0.638	.94676	0.354	.95482	0.265
2456851	.95546	11.184	0.480	.95602	10.828	0.431	.95644	10.556	0.338	.95684	10.211	0.196	.95595	0.628	.95179	0.378	.95623	0.272
2456857	.94872	11.203	0.499	.94935	10.843	0.446	.94980	10.576	0.358	—	—	—	.94926	0.627	.95119	0.424	.94957	0.267
2456860	.94433	11.369	0.665	.94498	10.925	0.528	.94545	10.623	0.405	—	—	—	.94489	0.746	.95433	0.373	.94521	0.302

Table A.2. continued.

JD	$JD+$	B	ΔB	$JD+$	V	ΔV	$JD+$	R_C	ΔR_C	$JD+$	I_C	ΔI_C	$JD+$	B-Rc	$JD+$	B-V	$JD+$	V-Rc
2456862	.92842	11.230	0.526	.92905	10.851	0.454	.92952	10.576	0.358	.93000	10.238	0.223	.92897	0.654	.95574	0.356	.92929	0.275
2456864	.92233	11.229	0.525	.92294	10.834	0.437	.92341	10.577	0.359	.92386	10.215	0.200	.92287	0.652	.94904	0.360	.92317	0.257
2456870	.90092	11.210	0.506	.90152	10.859	0.462	.90199	10.590	0.372	.90244	10.246	0.231	.90146	0.620	.94466	0.444	.90175	0.269
2456871	.90911	11.216	0.512	.90973	10.870	0.473	.91018	11.358	1.140	.91064	10.271	0.256	.90965	-0.142	.92874	0.379	.90996	-0.488
2456877	.88560	11.334	0.630	.88621	10.944	0.547	.88669	10.694	0.476	.88717	10.334	0.319	.88615	0.640	.92264	0.395	.88645	0.250
2456886	.87169	11.541	0.837	.87231	11.142	0.745	.87277	10.862	0.644	.87324	10.512	0.497	.87223	0.679	.90122	0.351	.87254	0.280
2456887	.86435	11.625	0.921	.86497	11.231	0.834	.86543	10.947	0.729	.86587	10.581	0.566	.86489	0.678	.90942	0.346	.86520	0.284
2456888	.85281	11.721	1.017	.85342	11.313	0.916	.85388	11.019	0.801	.85436	10.680	0.665	.85335	0.702	.88591	0.390	.85365	0.294
2456889	.86282	11.784	1.080	.86344	11.386	0.989	.86390	11.079	0.861	.86437	10.700	0.685	.86336	0.705	.87200	0.399	.86367	0.307
2456890	.84799	11.829	1.125	.84861	11.420	1.023	.84908	11.123	0.905	.84956	10.741	0.726	.84854	0.706	.86466	0.394	.84885	0.297
2456892	.84121	11.871	1.167	.84183	11.465	1.068	.84229	11.153	0.935	.84275	10.782	0.767	.84175	0.718	.85311	0.408	.84206	0.312
2456893	.84052	11.894	1.190	.84114	11.468	1.071	.84159	11.176	0.958	.84321	10.802	0.787	.84106	0.718	.86313	0.398	.84137	0.292
2456894	.83884	11.927	1.223	.83946	11.503	1.106	.83874	11.197	0.979	.84040	10.799	0.784	.83879	0.730	.84830	0.409	.83910	0.306
2456896	.83857	11.822	1.118	.83801	11.452	1.055	.83848	11.142	0.924	.83894	10.762	0.747	.83853	0.680	.84152	0.406	.83824	0.310
2456898	.82984	11.697	0.993	.83045	11.321	0.924	.83090	11.037	0.819	.83136	10.655	0.640	.83037	0.660	.84083	0.426	.83067	0.284
2456904	.83453	11.398	0.694	.83384	11.006	0.609	.83615	10.750	0.532	—	—	—	.83534	0.648	.83915	0.424	.83499	0.256
2456905	.81164	11.299	0.595	.81260	10.953	0.556	.81326	10.665	0.447	—	—	—	.81245	0.634	.83829	0.370	.81293	0.288
2456909	.81004	11.188	0.484	.81066	10.845	0.448	.81112	10.575	0.357	—	—	—	.81058	0.613	.83014	0.376	.81089	0.270
2456910	.80740	11.184	0.480	.80803	10.835	0.438	.80849	10.586	0.368	—	—	—	.80795	0.598	.83419	0.392	.80826	0.249
2456911	.79219	11.177	0.473	.79282	10.822	0.425	.79328	10.563	0.345	—	—	—	.79274	0.614	.81212	0.346	.79305	0.259
2456912	.77271	11.172	0.460	.77710	10.831	0.434	.77406	10.558	0.340	—	—	—	.77339	0.614	.81035	0.343	.77558	0.273
2456913	.81273	11.179	0.475	.81351	10.835	0.438	.81407	10.553	0.335	—	—	—	.81340	0.626	.80771	0.349	.81379	0.282
2456916	.82073	11.181	0.477	.82168	10.825	0.428	.82234	10.554	0.336	—	—	—	.82153	0.627	.79250	0.355	.82201	0.271
2456917	.78864	11.178	0.474	.78959	10.805	0.408	.79025	10.518	0.300	—	—	—	.78944	0.660	.77490	0.341	.78992	0.287
2456920	.91730	11.160	0.456	.91994	10.844	0.447	.91898	10.589	0.371	—	—	—	.91814	0.571	.81312	0.344	.91946	0.255
2456922	.83336	11.158	0.454	.83431	10.837	0.440	.83497	10.530	0.312	—	—	—	.83417	0.628	.82120	0.356	.83464	0.307
2456923	.75678	11.176	0.472	.75741	10.849	0.452	.75788	10.572	0.354	—	—	—	.75733	0.604	.78912	0.373	.75764	0.277
2456924	.76147	11.174	0.470	.76226	10.808	0.411	.76221	10.561	0.343	—	—	—	.76184	0.613	.91862	0.316	.76223	0.247
2456925	.78932	11.178	0.474	.79027	10.814	0.417	.79093	10.528	0.310	—	—	—	.79013	0.650	.83384	0.321	.79060	0.286
2456926	.77848	11.178	0.474	.77943	10.875	0.478	.78009	10.544	0.326	—	—	—	.77928	0.634	.75709	0.327	.77976	0.331
2456927	—	—	—	.77343	10.820	0.423	.77409	10.593	0.375	—	—	—	—	—	—	—	—	—
2456929	.80334	11.150	0.446	.80266	10.800	0.403	.80495	10.596	0.378	—	—	—	.80414	0.554	.76187	0.366	.77376	0.227
2456931	.74694	11.173	0.469	.74755	10.817	0.420	.74801	10.555	0.337	—	—	—	.74748	0.618	.78980	0.364	.80381	0.204
2456932	.89176	11.166	0.462	.88947	10.810	0.413	—	—	—	—	—	—	—	—	—	—	—	—
2456933	.73552	11.168	0.464	.73614	10.812	0.415	.73661	10.542	0.324	—	—	—	.73607	0.626	.77895	0.303	.74778	0.262
2456937	.83074	11.145	0.441	.83332	10.831	0.434	.83398	10.520	0.302	—	—	—	.83236	0.625	.80300	0.350	.73638	0.270
2456941	.80398	11.131	0.427	.80166	10.829	0.432	.80234	10.543	0.325	—	—	—	.80316	0.588	.74724	0.356	.83365	0.311
2456943	.81619	11.171	0.467	.81390	10.874	0.477	—	—	—	—	—	—	—	—	—	—	—	—
2456944	.73470	11.152	0.448	.73401	10.815	0.418	.73467	10.555	0.337	—	—	—	.73469	0.597	.89061	0.356	.80200	0.286
2456949	.68979	11.168	0.464	.69042	10.800	0.403	.69088	10.538	0.320	—	—	—	.69033	0.630	.73583	0.356	.73434	0.260
2456950	.86631	11.182	0.478	.86726	10.817	0.420	.86792	10.549	0.331	—	—	—	.86712	0.633	.83203	0.314	.69065	0.262
2456954	.72398	11.175	0.471	.72493	10.812	0.415	.72559	10.535	0.317	—	—	—	.72479	0.640	.80282	0.302	.86759	0.268
2456955	.74045	11.159	0.455	.75319	10.817	0.420	.72126	10.543	0.325	—	—	—	.73086	0.616	.81505	0.297	.72526	0.277
2456957	.76168	11.153	0.449	.76248	10.797	0.400	.76304	10.530	0.312	—	—	—	.76236	0.623	.73435	0.337	.73722	0.274

Table A.2. continued.

JD	*JD*+	*B*	ΔB	*JD*+	*V*	ΔV	*JD*+	R_C	ΔR_C	*JD*+	I_C	ΔI_C	*JD*+	B-Rc	*JD*+	B-V	*JD*+	V-Rc
2456958	.66372	11.166	0.462	.66434	10.809	0.412	.66480	10.546	0.328	—	—	—	.66426	0.620	.69011	0.368	—	—
2456959	.69503	11.157	0.453	.69582	10.788	0.391	.69638	10.524	0.306	—	—	—	.69571	0.633	.86679	0.365	—	—
2456979	.71325	11.084	0.380	.71582	10.796	0.399	.71486	10.490	0.272	—	—	—	.71405	0.594	.72445	0.363	—	—
2456982	.80728	11.175	0.471	.80822	10.843	0.446	.80889	10.522	0.304	—	—	—	.80809	0.653	.74682	0.342	—	—

Observers: B. Steals.

Table A.3. Photometry in standard *UBVRI* filters obtained at Suchora Observatory (Poland) during and near the 2014 eclipse (E = 11). The 0.6 m Cassegrain telescope with a CCD camera was used. Differential magnitudes are given with respect to $BD + 55\,2690$. The columns labeled 'HJD+' denote the fraction part of the day.

HJD	*HJD+*	ΔU	*HJD+*	ΔB	*HJD+*	ΔV	*HJD+*	ΔR	*HJD+*	ΔI	*JD+*	$B - R_C$	*JD+*	$B - V$	*JD+*	$V - R_C$
2456755	—	—	.59526	0.437	.59546	0.385	.59023	0.290	.59054	0.118	.59275	0.147	.59536	0.052	.59285	0.095
2456765	—	—	.52500	0.459	.52521	0.403	.52535	0.288	.52547	0.131	.52517	0.171	.52511	0.056	.52528	0.115
2456765	—	—	—	—	—	—	—	—	—	—	.54358	0.159	.54115	0.053	.54369	0.103
2456765	—	—	—	—	—	—	—	—	—	—	.56264	0.173	.56258	0.058	.54133	0.118
2456765	.59236	0.124	.59994	0.461	.55730	0.406	.56217	0.300	.56483	0.131	.58105	0.161	.57862	0.055	.55974	0.106
2456779	—	—	.48204	0.466	.48454	0.422	.48854	0.316	.48705	0.138	.48529	0.150	.48329	0.044	.48654	0.106
2456783	—	—	.51704	0.455	.52378	0.402	.52390	0.305	.52399	0.129	.52047	0.150	.52041	0.053	.52384	0.097
2456784	—	—	.55680	0.452	.55566	0.402	.55288	0.301	.55302	0.126	.55484	0.151	.55623	0.050	.55427	0.101
2456790	—	—	.49805	0.444	.49824	0.390	.49747	0.294	.49939	0.116	.49776	0.150	.49815	0.054	.49786	0.096
2456796	—	—	.53863	0.450	.53895	0.399	.53915	0.296	.53930	0.126	.53889	0.154	.53879	0.051	.53905	0.103
2456803	—	—	.41025	0.482	.41045	0.426	.41090	0.336	.41069	0.161	.41058	0.146	.41035	0.056	.41067	0.090
2456813	—	—	.52387	0.453	.52407	0.408	.52420	0.296	.52430	0.123	.52404	0.157	.52397	0.045	.52414	0.112
2456818	—	—	.51016	0.458	.50558	0.417	.49973	0.304	.49818	0.125	.50494	0.154	.50787	0.041	.50265	0.113
2456824	—	—	.38574	0.450	.38828	0.406	.39060	0.300	.39215	0.121	.38817	0.150	.38701	0.044	.38944	0.106
2456825	.56586	0.163	.56642	0.477	.56675	0.441	.56702	0.325	.56729	0.137	.56672	0.152	.56659	0.036	.56689	0.116
2456826	—	—	.50712	0.460	.50959	0.418	.51130	0.311	.51418	0.124	.50921	0.149	.50836	0.042	.51044	0.107
2456827	—	—	.47577	0.456	.47160	0.415	.45491	0.310	.45643	0.129	.46534	0.146	.47369	0.041	.46325	0.105
2456827	—	—	—	—	—	—	—	—	—	—	.49688	0.170	.50522	0.065	.49836	0.135
2456827	—	—	—	—	—	—	—	—	—	—	.51010	0.126	.50879	0.011	.50801	0.085
2456827	—	—	.53884	0.480	.54182	0.445	.54442	0.330	.54731	0.140	.54163	0.150	.54033	0.035	.54312	0.115
2456832	—	—	.38676	0.466	.38695	0.423	.39673	0.311	.38720	0.123	.39175	0.155	.38686	0.043	.39184	0.112
2456835	—	—	.38938	0.465	.38990	0.420	.38972	0.320	.39015	0.117	.38955	0.145	.38964	0.045	.38981	0.100
2456837	—	—	.38249	0.468	.38269	0.430	.38281	0.322	.38293	0.124	.38265	0.146	.38259	0.038	.38275	0.108
2456840	—	—	.39187	0.465	.39206	0.420	.39220	0.308	.39131	0.128	.39204	0.157	.39196	0.045	.39213	0.112
2456842	—	—	.42796	0.471	.42816	0.429	.42929	0.317	.42840	0.133	.42862	0.154	.42806	0.042	.42873	0.112
2456845	—	—	.37878	0.492	.37897	0.444	.38013	0.329	.38023	0.145	.37946	0.163	.37887	0.048	.37955	0.115
2456846	.41245	0.175	.40958	0.485	.41054	0.446	.41433	0.328	.41624	0.141	.41195	0.157	.41006	0.039	.41243	0.118
2456855	—	—	.37808	0.486	.37973	0.437	.38073	0.336	.38150	0.156	.37941	0.150	.37891	0.049	.38023	0.101
2456857	.56861	0.179	.56992	0.492	.57165	0.450	.57327	0.339	.57438	0.157	.57160	0.153	.57078	0.042	.57246	0.111
2456858	—	—	.42623	0.490	.42858	0.440	.42987	0.328	.43289	0.143	.42805	0.162	.42740	0.050	.42923	0.112
2456859	.56568	0.193	.56647	0.500	.56697	0.452	.56738	0.341	.56771	0.160	.56692	0.159	.56672	0.048	.56717	0.111
2456864	—	—	.50256	0.499	.49625	0.452	.48779	0.338	.48979	0.155	.49518	0.161	.49940	0.047	.49202	0.114
2456865	—	—	.47556	0.492	.47137	0.445	.46604	0.338	.46466	0.156	.47080	0.154	.47347	0.047	.46870	0.107
2456865	—	—	—	—	—	—	—	—	—	—	.51749	0.162	.52016	0.055	.51778	0.115
2456865	—	—	—	—	—	—	—	—	—	—	.52276	0.155	.52253	0.039	.52067	0.108
2456865	.57317	0.187	.56894	0.500	.56951	0.453	.56996	0.337	.57028	0.153	.56945	0.163	.56923	0.047	.56973	0.116
2456867	—	—	.40680	0.494	.40844	0.454	.40944	0.353	.41022	0.163	.40812	0.141	.40762	0.040	.40894	0.101
2456867	—	—	—	—	—	—	—	—	—	—	.48576	0.158	.48526	0.057	.48961	0.107
2456867	—	—	—	—	—	—	—	—	—	—	.48882	0.141	.48830	0.034	.48964	0.101
2456867	.56646	0.192	.56208	0.511	.56979	0.460	.57085	0.353	.57165	0.166	.56646	0.158	.56593	0.051	.57032	0.107
2456869	.57376	0.203	.57148	0.511	.57271	0.465	.57377	0.355	.57457	0.175	.57263	0.156	.57210	0.046	.57324	0.110
2456872	.42060	0.227	.42135	0.532	.42188	0.488	.42211	0.374	.42235	0.193	.42173	0.158	.42161	0.044	.42199	0.114
2456878	—	—	.47862	0.651	.47458	0.583	.47003	0.467	.46662	0.267	.47433	0.184	.47660	0.068	.47230	0.116
2456880	—	—	.42888	0.697	.42329	0.632	.41872	0.503	.41552	0.304	.42380	0.194	.42608	0.065	.42100	0.129
2456884	.59954	0.495	.59059	0.760	.58960	0.690	.59424	0.569	.59629	0.375	.59242	0.191	.59010	0.070	.59192	0.121
2456887	—	—	.35980	0.855	.35912	0.784	.35926	0.655	.35936	0.454	.35953	0.200	.35946	0.071	.35919	0.129
2456888	—	—	.34759	0.960	.34778	0.883	.34792	0.744	.34802	0.535	.34775	0.216	.34768	0.077	.34785	0.139
2456889	—	—	.53688	1.069	.53709	0.985	.53722	0.841	.53733	0.617	.53705	0.228	.53699	0.084	.53716	0.144
2456889	—	—	—	—	—	—	—	—	—	—	.57040	0.231	.57094	0.088	.57050	0.147
2456889	—	—	—	—	—	—	—	—	—	—	.57150	0.222	.57144	0.078	.57111	0.140
2456889	.60129	0.775	.60579	1.063	.60500	0.981	.60391	0.838	.60498	0.618	.60485	0.225	.60539	0.082	.60445	0.143
2456891	—	—	.37427	1.127	.37591	1.043	.37691	0.899	.37769	0.667	.37559	0.228	.37509	0.084	.37641	0.144
2456891	—	—	—	—	—	—	—	—	—	—	.48654	0.232	.48604	0.088	.48734	0.149

Table A.3. continued.

HJD	$HJD+$	ΔU	$HJD+$	ΔB	$HJD+$	ΔV	$HJD+$	ΔR	$HJD+$	ΔI	$JD+$	$B-R_C$	$JD+$	$B-V$	$JD+$	$V-R_C$
2456891	—	—	—	—	—	—	—	—	—	—	.48684	0.232	.48602	0.079	.48766	0.148
2456891	.59323	0.861	.59616	1.131	.59778	1.048	.59941	0.895	.60099	0.673	.59778	0.236	.59697	0.083	.59859	0.153
2456892	—	—	.30455	1.137	.30475	1.066	.30488	0.910	.30410	0.681	.29999	0.230	.29831	0.077	.30009	0.159
2456892	—	—	—	—	—	—	—	—	—	—	.30472	0.227	.30465	0.071	.30481	0.156
2456892	—	—	—	—	—	—	—	—	—	—	.31166	0.232	.30998	0.079	.29375	0.153
2456892	.33147	0.880	.32789	1.139	.29208	1.060	.29543	0.907	.29828	0.694	.31639	0.229	.31632	0.073	.29848	0.150
2456894	.37951	0.967	.38497	1.210	.35603	1.124	.35909	0.969	.36085	0.739	.37203	0.241	.37050	0.086	.35756	0.155
2456895	—	—	.29892	1.194	.30024	1.106	.30105	0.944	.30227	0.713	.29998	0.250	.29958	0.088	.30064	0.162
2456895	—	—	—	—	—	—	—	—	—	—	.31857	0.242	.31845	0.088	.31923	0.154
2456895	—	—	—	—	—	—	—	—	—	—	.31934	0.244	.31893	0.082	.31952	0.162
2456895	.32934	0.925	.33763	1.188	.33798	1.106	.33823	0.952	.33844	0.714	.33793	0.236	.33781	0.082	.33810	0.154
2456898	.33905	0.768	.34452	1.034	.33200	0.972	.33428	0.837	.33598	0.623	.33940	0.197	.33826	0.062	.33314	0.135
2456898	—	—	—	—	—	—	—	—	—	—	.34399	0.203	.34654	0.067	.33773	0.141
2456898	—	—	—	—	—	—	—	—	—	—	.34424	0.191	.34310	0.056	.34142	0.130
2456898	—	—	.35421	1.028	.34856	0.967	.34346	0.831	.33726	0.610	.34883	0.197	.35139	0.061	.34601	0.136
2456900	—	—	.51656	0.887	.51205	0.831	.50988	0.703	.50714	0.503	.51322	0.184	.51431	0.056	.51096	0.128
2456904	—	—	.59376	0.702	.58941	0.656	.58223	0.541	.58511	0.349	.58800	0.161	.59159	0.046	.58582	0.115
2456905	.34069	0.346	.34615	0.653	.34931	0.605	.35158	0.496	.35328	0.305	.34887	0.157	.34773	0.048	.35044	0.109
2456905	—	—	—	—	—	—	—	—	—	—	.36713	0.168	.37007	0.054	.36871	0.120
2456905	—	—	—	—	—	—	—	—	—	—	.37591	0.150	.37477	0.041	.37279	0.103
2456905	—	—	—	—	—	—	.38811	0.485	.38553	0.297	.39418	0.161	.39712	0.047	.39106	0.114
2456908	—	—	.43802	0.515	.43966	0.471	.44033	0.367	.38143	0.186	.43917	0.148	.43884	0.044	.44000	0.104
2456908	—	—	—	—	—	—	—	—	—	—	.45704	0.157	.45671	0.053	.45861	0.117
2456908	—	—	—	—	—	—	—	—	—	—	.45859	0.144	.45745	0.031	.45941	0.100
2456908	.46828	0.213	.47375	0.524	.47689	0.484	.47916	0.371	.48086	0.197	.47646	0.153	.47532	0.040	.47803	0.113
2456909	—	—	.53105	0.487	.53269	0.448	.53369	0.342	.53446	0.161	.53237	0.145	.53187	0.039	.53319	0.106
2456913	—	—	.57160	0.476	.57324	0.429	.57424	0.327	.57502	0.137	.57292	0.149	.57242	0.047	.57374	0.102
2456914	—	—	.55476	0.487	.55497	0.430	.55422	0.335	.55521	0.150	.55449	0.152	.55486	0.057	.55460	0.095
2456915	—	—	.38386	0.483	.38405	0.439	.38418	0.330	.38429	0.148	.38402	0.153	.38395	0.044	.38412	0.109
2456917	.37749	0.207	.38559	0.497	.39139	0.446	.39366	0.336	.39536	0.155	.38962	0.161	.38849	0.051	.39253	0.110
2456918	—	—	.28276	0.473	.28296	0.429	.28308	0.318	.28320	0.137	.28292	0.155	.28286	0.044	.28302	0.111
2456918	—	—	—	—	—	—	—	—	—	—	.40908	0.178	.40902	0.067	.40967	0.128
2456918	—	—	—	—	—	—	—	—	—	—	.40991	0.132	.40951	0.027	.41001	0.088
2456918	.53423	0.181	.53509	0.496	.53626	0.446	.53706	0.341	.54728	0.160	.53607	0.155	.53567	0.050	.53666	0.105
2456920	—	—	.25916	0.473	.25934	0.436	.26122	0.328	.26133	0.134	.26019	0.145	.25925	0.037	.26028	0.108
2456925	—	—	.29926	0.470	.29573	0.430	.29335	0.326	.29202	0.141	.29630	0.144	.29750	0.040	.29454	0.104
2456925	—	—	—	—	—	—	—	—	—	—	.45051	0.154	.45169	0.050	.45105	0.117
2456925	—	—	—	—	—	—	—	—	—	—	.45438	0.137	.45401	0.027	.45261	0.097
2456925	.60541	0.197	.60766	0.480	.60875	0.443	.60949	0.333	.61006	0.162	.60858	0.147	.60820	0.037	.60912	0.110
2456928	—	—	.53865	0.485	.53968	0.440	.54216	0.331	.55156	0.149	.54041	0.154	.53916	0.045	.54092	0.109
2456937	—	—	.48049	0.475	.47570	0.437	.46689	0.331	.46869	0.143	.47369	0.144	.47809	0.038	.47130	0.106
2456943	—	—	.27128	0.473	.27060	0.440	.27072	0.348	.26995	0.142	.27100	0.125	.27094	0.033	.27066	0.092
2456949	—	—	.50549	0.464	.50569	0.426	.50583	0.318	.50595	0.137	.50566	0.146	.50559	0.038	.50576	0.108

Observers: S. Zola.

Table A.4. $UBV(RI)_C$ photometry obtained at Wyspa Pucka Observatory (Poland) during and near the 2014 eclipse (E = 11). The 0.203 Schmidt-Cassegrain telescope with an Audine CCD camera was used. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory. Comparison was made against star $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	JD+	B	ΔB	JD+	V	ΔV	JD+	R_C	ΔR_C	JD+	$B-R_C$	JD+	$B-V$	JD+	$V-R_C$
2456840	—	—	—	—	—	—	.45061	10.532	0.314	—	—	—	—	—	—
2456841	—	—	—	—	—	—	.45282	10.529	0.311	—	—	—	—	—	—
2456842	—	—	—	—	—	—	.46125	10.529	0.311	—	—	—	—	—	—
2456843	—	—	—	—	—	—	.47591	10.517	0.299	—	—	—	—	—	—
2456844	—	—	—	—	—	—	.37384	10.522	0.304	—	—	—	—	—	—
2456845	—	—	—	—	—	—	.45994	10.519	0.301	—	—	—	—	—	—
2456846	—	—	—	—	—	—	.40497	10.514	0.296	—	—	—	—	—	—
2456848	—	—	—	—	—	—	.47192	10.514	0.296	—	—	—	—	—	—
2456849	—	—	—	—	—	—	.44527	10.536	0.318	—	—	—	—	—	—
2456850	.68993	11.166	0.462	—	—	—	.50859	10.532	0.314	—	—	—	—	—	—
2456853	.67847	11.186	0.482	—	—	—	.40874	10.539	0.321	—	—	—	—	—	—
2456854	.67250	11.166	0.462	—	—	—	—	—	—	—	—	—	—	—	—
2456855	.66736	11.184	0.480	—	—	—	—	—	—	—	—	—	—	—	—
2456856	.67741	11.191	0.487	—	—	—	.42522	10.541	0.323	—	—	—	—	—	—
2456857	.66954	11.189	0.485	—	—	—	.46851	10.548	0.330	—	—	—	—	—	—
2456858	.66224	11.191	0.487	—	—	—	.45203	10.546	0.328	—	—	—	—	—	—
2456859	.65346	11.189	0.485	—	—	—	.43215	10.549	0.331	—	—	—	—	—	—
2456860	.65156	11.204	0.500	.65105	10.856	0.459	.45956	10.552	0.334	.65104	0.630	.65131	0.348	.65079	0.282
2456860	—	—	—	—	—	—	.65052	10.574	0.356	—	—	—	—	—	—
2456861	—	—	—	—	—	—	.45354	10.557	0.339	—	—	—	—	—	—
2456862	.64968	11.208	0.504	.64915	10.862	0.465	.64862	10.565	0.347	.64915	0.643	.64941	0.346	.64889	0.297
2456863	.64557	11.214	0.510	.64505	10.855	0.458	.64451	10.572	0.354	.64504	0.642	.64531	0.359	.64478	0.283
2456864	.64160	11.216	0.512	.64486	10.847	0.450	.64043	10.570	0.358	.64102	0.640	.64323	0.369	.64265	0.271
2456865	.64848	11.212	0.508	.64796	10.860	0.463	.45241	10.552	0.334	.64795	0.626	.64822	0.352	.64769	0.274
2456867	.65061	11.203	0.499	.64489	10.852	0.455	.44325	10.554	0.336	.64875	0.647	.64775	0.351	.64590	0.296
2456867	—	—	—	—	—	—	.64690	10.556	0.338	—	—	—	—	—	—
2456868	.64941	11.190	0.486	.63554	10.834	0.437	.63506	10.552	0.334	.64223	0.638	.64248	0.356	.63530	0.282
2456869	.67528	11.192	0.488	.67413	10.862	0.465	.67365	10.583	0.365	.67446	0.609	.67471	0.330	.67389	0.279
2456870	—	—	—	—	—	—	.44194	10.561	0.343	—	—	—	—	—	—
2456871	.65589	11.207	0.503	.65471	10.868	0.471	.39455	10.578	0.360	.65255	0.619	.65530	0.339	.65196	0.280
2456871	—	—	—	—	—	—	.64921	10.588	0.370	—	—	—	—	—	—
2456872	.64116	11.219	0.515	.64471	10.883	0.486	.63985	10.621	0.403	.64051	0.598	.64294	0.336	.64228	0.262
2456873	.64085	11.236	0.532	.64038	10.877	0.480	.63989	10.594	0.376	.64037	0.642	.64062	0.359	.64014	0.283
2456874	.62852	11.310	0.606	.62806	10.950	0.553	.62757	10.661	0.440	.62805	0.649	.62829	0.360	.62781	0.289
2456875	.62349	11.344	0.640	.63672	10.968	0.571	.63733	10.671	0.453	.63041	0.673	.63010	0.376	.63702	0.297
2456876	.63217	11.355	0.651	.64042	10.992	0.595	.63121	10.702	0.484	.63169	0.653	.63630	0.363	.63582	0.290
2456878	.62132	11.361	0.657	.62062	10.999	0.602	.38952	10.685	0.467	.62085	0.650	.62097	0.362	.62050	0.288
2456878	—	—	—	—	—	—	.62039	10.711	0.493	—	—	—	—	—	—
2456879	.66141	11.392	0.688	.66094	11.019	0.622	.42223	10.712	0.494	.66093	0.656	.66118	0.373	.66069	0.283
2456879	—	—	—	—	—	—	.66045	10.736	0.518	—	—	—	—	—	—
2456880	.60200	11.430	0.726	.60988	11.051	0.654	.60811	10.752	0.534	.60505	0.678	.60594	0.379	.60899	0.299
2456881	.65504	11.459	0.755	.65457	11.079	0.682	.39535	10.748	0.530	.65342	0.679	.65480	0.380	.65318	0.299
2456881	—	—	—	—	—	—	.65180	10.780	0.562	—	—	—	—	—	—
2456882	.59378	11.453	0.749	.59331	11.092	0.695	.40976	10.766	0.548	.59330	0.677	.59355	0.361	.59307	0.316
2456882	—	—	—	—	—	—	.59282	10.776	0.558	—	—	—	—	—	—
2456883	.62424	11.465	0.761	.62377	11.096	0.699	.62328	10.798	0.580	.62376	0.667	.62401	0.369	.62353	0.298
2456885	.65325	11.491	0.787	.65278	11.122	0.725	.65132	10.834	0.616	.65229	0.657	.65301	0.369	.65205	0.288
2456888	—	—	—	—	—	—	.36939	10.979	0.761	—	—	—	—	—	—
2456890	—	—	—	—	—	—	.40576	11.103	0.885	—	—	—	—	—	—
2456891	—	—	—	—	—	—	.41982	11.122	0.904	—	—	—	—	—	—
2456894	—	—	—	—	—	—	.39407	11.183	0.965	—	—	—	—	—	—
2456895	.63773	11.906	1.202	.63725	11.522	1.125	.36990	11.174	0.956	.63725	0.713	.63749	0.384	.63701	0.329

Table A.4. continued.

JD	*JD+*	*B*	Δ*B*	*JD+*	*V*	Δ*V*	*JD+*	R_C	ΔR_C	*JD+*	$B-R_C$	*JD+*	$B-V$	*JD+*	$V-R_C$
2456895	—	—	—	—	—	—	.63677	11.193	0.975	—	—	—	—	—	—
2456896	.62311	11.809	1.105	.61158	11.432	1.035	.41711	11.150	0.932	—	—	—	—	—	—
2456897	—	—	—	—	—	—	.38273	11.102	0.880	—	—	—	—	—	—
2456897	—	—	—	—	—	—	.51822	11.090	0.872	—	—	—	—	—	—
2456898	.68193	11.724	1.020	.68145	11.373	0.976	.68097	11.073	0.855	.68145	0.651	.61734	0.377	.68121	0.300
2456899	.66701	11.667	0.963	.66653	11.304	0.907	.66605	11.010	0.792	.66653	0.657	.68169	0.351	.66629	0.294
2456901	.64204	11.521	0.817	.64156	11.179	0.782	.64107	10.895	0.677	.64156	0.626	.66677	0.363	.64132	0.284
2456904	.62905	11.406	0.702	.62858	11.067	0.670	.36783	10.763	0.545	.62857	0.630	.64180	0.342	.62834	0.291
2456904	—	—	—	—	—	—	.54764	10.769	0.551	—	—	—	—	—	—
2456904	—	—	—	—	—	—	.62809	10.776	0.558	—	—	—	—	—	—
2456905	.60729	11.333	0.629	.60682	10.993	0.596	.35186	10.713	0.495	.60682	0.608	.62881	0.339	.60658	0.268
2456905	—	—	—	—	—	—	.54216	10.708	0.490	—	—	—	—	—	—
2456905	—	—	—	—	—	—	.60634	10.725	0.507	—	—	—	—	—	—
2456906	—	—	—	—	—	—	.53894	10.668	0.450	—	—	—	—	—	—
2456907	.61932	11.244	0.540	.61886	10.906	0.509	.36264	10.617	0.399	.61884	0.602	.60706	0.340	.61861	0.264
2456907	—	—	—	—	—	—	.54196	10.615	0.397	—	—	—	—	—	—
2456907	—	—	—	—	—	—	.61836	10.642	0.424	—	—	—	—	—	—
2456908	.61748	11.214	0.510	.61700	10.889	0.492	.61652	10.601	0.383	.61700	0.613	.61909	0.338	.61676	0.288
2456909	.58919	11.183	0.479	.58872	10.851	0.454	.58823	10.584	0.366	.58871	0.599	.61724	0.325	.58848	0.267
2456912	.61327	11.197	0.493	.61280	10.862	0.465	.61231	10.580	0.366	.61279	0.613	—	—	.61255	0.278
2456916	—	—	—	—	—	—	.33928	10.553	0.335	—	—	—	—	—	—
2456916	—	—	—	—	—	—	.52218	10.567	0.349	—	—	—	—	—	—
2456917	—	—	—	—	—	—	.34730	10.553	0.335	—	—	—	—	—	—
2456918	—	—	—	—	—	—	.33646	10.557	0.339	—	—	—	—	—	—
2456918	—	—	—	—	—	—	.51882	10.562	0.344	—	—	—	—	—	—
2456919	—	—	—	—	—	—	.35885	10.547	0.329	—	—	—	—	—	—
2456919	—	—	—	—	—	—	.46118	10.552	0.334	—	—	—	—	—	—
2456920	—	—	—	—	—	—	.47522	10.564	0.346	—	—	—	—	—	—
2456922	.56720	11.191	0.487	.56673	10.854	0.457	.56625	10.580	0.362	.56672	0.611	—	—	.56649	0.274
2456924	.51686	11.193	0.489	.51639	10.855	0.458	.51590	10.575	0.357	.51638	0.618	—	—	.51615	0.280
2456928	—	—	—	—	—	—	.41140	10.549	0.331	—	—	—	—	—	—
2456931	.57064	11.196	0.492	.57017	10.853	0.456	.56968	10.570	0.352	.57016	0.626	—	—	.56992	0.283
2456932	.52330	11.184	0.480	.52283	10.843	0.446	.52235	10.572	0.354	.52282	0.612	—	—	.52259	0.271
2456933	.54654	11.174	0.470	.54606	10.858	0.461	.54558	10.582	0.364	.54606	0.592	—	—	.54582	0.276
2456934	.51919	11.163	0.459	.51871	10.827	0.430	.51823	10.558	0.340	.51871	0.605	—	—	—	—
2456935	—	—	—	—	—	—	.28408	10.541	0.323	—	—	—	—	—	—
2456935	—	—	—	—	—	—	.46198	10.543	0.325	—	—	—	—	—	—

Observers: A. Arminski.

Table A.5. $BV(RI)_C$ photometry obtained at Białków (Poland) Observatory during and near the 2014 eclipse (E = 11). The 0.6 Cassegrain telescope with aANDOR DW-432 BV CCD camera was used. Comparisons were made against star: $BD+55\,2690$. The apparent magnitudes are also given with respect to $BD+55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD+55\,2690$ given by Athens Observatory). Comparison was made against star $BD+55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	JD+	B	ΔB	JD+	V	ΔV	JD+	R_C	ΔR_C	JD+	I_C	ΔI_C	JD+	$B-R_C$	JD+	$B-V$	JD+	$V-R_C$
2456798	.53712	11.184	0.480	.53880	10.828	0.431	.53867	10.534	0.316	.54226	10.164	0.149	.53790	0.650	.53796	0.356	.53874	0.294
2456799	.54637	11.188	0.484	.54523	10.831	0.434	.54727	10.538	0.320	.54862	10.179	0.164	.54682	0.650	.54580	0.357	.54625	0.293
2456800	.54626	11.182	0.478	.54885	10.825	0.428	.54997	10.530	0.312	.55065	10.167	0.152	.54812	0.652	.54756	0.357	.54941	0.295
2456815	.52560	11.181	0.477	.52870	10.826	0.429	.53052	10.532	0.314	.53198	10.168	0.153	.52806	0.649	.52715	0.355	.52961	0.294
2456827	.52511	11.181	0.477	.52822	10.828	0.431	.53112	10.532	0.314	.53136	10.167	0.152	.52811	0.649	.52667	0.353	.52967	0.296
2456845	.51170	11.194	0.490	.51466	10.839	0.442	.51638	10.540	0.322	.51758	10.183	0.168	.51404	0.654	.51318	0.355	.51552	0.299
2456857	.44986	11.209	0.505	.45340	10.850	0.453	.45509	10.552	0.334	.45627	10.190	0.175	.45248	0.657	.45163	0.359	.45425	0.298
2456858	.42078	11.206	0.502	.42257	10.846	0.449	.42496	10.550	0.332	.42782	10.183	0.168	.42287	0.656	.42167	0.360	.42376	0.296
2456859	.47033	11.205	0.501	.47332	10.845	0.448	.47504	10.552	0.334	.47732	10.180	0.165	.47268	0.653	.47182	0.360	.47418	0.293
2456861	.49764	11.220	0.516	.50060	10.856	0.459	.50232	10.562	0.344	.50353	10.190	0.175	.49998	0.658	.49912	0.364	.50146	0.294
2456864	.45989	11.217	0.513	.46876	10.855	0.458	.47054	10.558	0.340	.47168	10.187	0.172	.46522	0.659	.46433	0.362	.46965	0.297
2456865	.53944	11.206	0.502	.54240	10.844	0.447	.54412	10.552	0.334	.54531	10.182	0.167	.54178	0.654	.54092	0.362	.54326	0.292
2456867	.47776	11.214	0.510	.47991	10.850	0.453	.48251	10.556	0.338	.48373	10.189	0.174	.48014	0.658	.47884	0.364	.48121	0.294
2456868	.56414	11.212	0.508	.56623	10.852	0.455	.56882	10.560	0.342	.57002	10.192	0.177	.56648	0.652	.56519	0.360	.56753	0.292
2456872	.57910	11.240	0.536	.58206	10.879	0.482	.58428	10.588	0.370	.58499	10.219	0.204	.58169	0.652	.58058	0.361	.58317	0.291
2456875	.47957	11.337	0.633	.48113	10.959	0.562	.48425	10.651	0.433	.48545	10.271	0.256	.48191	0.686	.48035	0.378	.48269	0.308
2456876	.50150	11.350	0.646	.50377	10.971	0.574	.50682	10.666	0.448	.50679	10.283	0.268	.50416	0.684	.50263	0.379	.50530	0.305
2456891	.43278	11.844	1.140	.43570	11.447	1.050	.43728	11.117	0.899	.43871	10.706	0.691	.43503	0.727	.43424	0.397	.43649	0.330
2456892	.51500	11.863	1.159	.51781	11.465	1.068	.51463	11.132	0.914	.52421	10.725	0.710	.51481	0.731	.51641	0.398	.51622	0.333
2456894	.56433	11.922	1.218	.55975	11.522	1.125	.56169	11.182	0.964	.56191	10.762	0.747	.56301	0.740	.56204	0.400	.56072	0.340
2456897	.52340	11.807	1.103	.52590	11.421	1.024	.52850	11.094	0.876	.52771	10.686	0.671	.52595	0.713	.52465	0.386	.52720	0.327
2456898	.44010	11.746	1.042	.44435	11.365	0.968	.44607	11.044	0.826	.44727	10.641	0.626	.44308	0.702	.44222	0.381	.44521	0.321
2456905	.43872	11.354	0.650	.44090	10.996	0.599	.44262	10.700	0.482	.44381	10.328	0.313	.44067	0.654	.43981	0.358	.44176	0.296
2456906	.47297	11.305	0.601	.46188	10.940	0.543	—	—	—	.46580	10.284	0.269	—	—	—	—	—	—
2456907	.45535	11.252	0.548	.45844	10.894	0.497	.46179	10.605	0.387	.46135	10.239	0.224	.52595	0.713	.52465	0.386	.52720	0.327
2456910	.40117	11.196	0.492	.40472	10.842	0.445	.40587	10.555	0.337	.40840	10.189	0.174	.40352	0.641	.45690	0.358	.40529	0.287
2456916	.31737	11.196	0.492	.31592	10.834	0.437	.31572	10.544	0.326	.31710	10.180	0.165	.31654	0.652	.40294	0.354	.31582	0.290
2456917	.53604	11.200	0.496	.53953	10.840	0.443	.54067	10.548	0.330	.54243	10.176	0.161	.53836	0.652	.31665	0.362	.54010	0.292
2456918	.52082	11.206	0.502	.52378	10.845	0.448	.52550	10.553	0.335	.52670	10.181	0.166	.52316	0.653	.53779	0.360	.52464	0.292
2456924	.40604	11.195	0.491	.40900	10.839	0.442	.41072	10.547	0.329	.41192	10.176	0.161	.40838	0.648	.52230	0.361	.40986	0.292
2456928	.47025	11.185	0.481	.47277	10.832	0.435	.47449	10.542	0.324	.47569	10.170	0.155	.47237	0.643	.40752	0.356	.47363	0.290
2456936	.44554	11.184	0.480	.44850	10.830	0.433	.45022	10.540	0.322	.45143	10.169	0.154	.44788	0.644	.47151	0.353	.44936	0.290
2456940	.53994	11.181	0.477	.54291	10.829	0.432	—	—	—	.54582	10.169	0.154	—	—	—	—	—	—
2456950	.39366	11.176	0.472	.39662	10.823	0.426	.39834	10.534	0.316	.39954	10.167	0.152	.39600	0.642	.44702	0.354	.39748	0.289
2456955	.27691	11.168	0.464	.27987	10.820	0.423	.28160	10.530	0.312	.28279	10.164	0.149	.27925	0.638	.54142	0.352	.28074	0.290
2456957	.40663	11.165	0.461	.40959	10.814	0.417	.40932	10.525	0.307	.41251	10.156	0.141	.40798	0.640	.39514	0.353	.40945	0.289
2456958	.33228	11.175	0.471	.33524	10.824	0.427	.33651	10.533	0.315	.33816	10.166	0.151	.33439	0.642	.27839	0.348	—	—
2456959	.39888	11.173	0.469	.40196	10.818	0.421	.40311	10.529	0.311	.40392	10.159	0.144	.40100	0.644	.40811	0.351	—	—

Observers: Z. Kolaczkowski, D. Mo"zdzierski, E. Zahajkiewicz, P. Bru"s, A. Pigulski

Table A.6. $UBV(RI)_C$ photometry obtained at Slovak Academy (Slovakia) Observatory during and near the 2014 eclipse (E = 11). The 0.6 Cassegrain telescope with a Moravian Instruments G4-9000 CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $UBV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory). Comparison was made against star BD + 55,2690. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	U	ΔU	*JD+*	B	ΔB	*JD+*	V	ΔV	*JD+*	R_C	ΔR_C	*JD+*	I_C	ΔI_C	*JD+*	$B - R_C$	*JD+*	$B - V$	*JD+*	$V - R_C$
2456783	—	—	—	.56595	11.150	0.446	.56676	10.832	0.435	.56758	10.533	0.315	.56840	10.159	0.144	.56677	0.617	.56636	0.318	.56717	0.299
2456786	—	—	—	.54058	11.131	0.427	.54195	10.793	0.396	.54331	10.513	0.295	.54358	10.120	0.105	.54195	0.618	.54126	0.338	.54263	0.280
2456787	—	—	—	.53645	11.146	0.442	.53727	10.825	0.428	.53808	10.521	0.303	.53909	10.160	0.145	.53726	0.625	.53686	0.321	.53767	0.304
2456799	.38924	10.973	0.113	.39133	11.242	0.538	.38942	10.828	0.431	.39005	10.536	0.318	.39056	10.153	0.138	.39069	0.706	.39037	0.414	.38974	0.292
2456824	.35969	10.965	0.105	.36043	11.231	0.527	.36117	10.817	0.420	.36180	10.526	0.308	.36232	10.159	0.144	.36112	0.705	.36080	0.414	.36148	0.291
2456830	—	—	—	.51439	11.140	0.436	—	—	—	—	—	—	—	—	—	.51658	0.598	—	—	—	—
2456830	—	—	—	.51714	11.162	0.458	.51796	10.839	0.442	.51878	10.542	0.324	.51959	10.162	0.147	.51796	0.620	.51755	0.323	.51837	0.297
2456835	.50993	10.973	0.113	.51244	11.267	0.563	.50688	10.853	0.456	.50745	10.563	0.345	.50784	10.173	0.158	.50995	0.704	.50966	0.414	.50716	0.290
2456836	.48089	10.949	0.089	.48164	11.242	0.538	.48278	10.828	0.431	.48300	10.536	0.318	.48351	10.154	0.139	.48232	0.706	.48221	0.414	.48289	0.292
2456846	—	—	—	.49143	11.156	0.452	.49225	10.827	0.430	.49685	10.535	0.317	.49860	10.148	0.133	.49414	0.621	.49184	0.329	.49455	0.292
2456851	—	—	—	.54754	11.144	0.440	.54741	10.819	0.422	.54870	10.529	0.311	.55236	10.140	0.125	.54812	0.615	.54747	0.325	.54806	0.290
2456853	—	—	—	.54273	11.159	0.455	.54355	10.826	0.429	.54417	10.540	0.322	.54304	10.152	0.137	.54345	0.619	.54314	0.333	.54386	0.286
2456869	—	—	—	.34367	11.180	0.476	.34449	10.852	0.455	.34856	10.557	0.339	.34938	10.179	0.164	.34611	0.623	.34408	0.328	.34652	0.295
2456871	—	—	—	.55650	11.192	0.488	.55732	10.866	0.469	.55896	10.569	0.351	.56144	10.188	0.173	.55773	0.623	.55691	0.326	.55814	0.297
2456872	—	—	—	.33117	11.217	0.513	.33331	10.885	0.488	.33501	10.593	0.375	.33362	10.207	0.192	.33309	0.624	.33224	0.332	.33416	0.292
2456873	—	—	—	.32656	11.230	0.526	.32737	10.901	0.504	.32820	10.615	0.397	.33232	10.232	0.217	.32738	0.615	.32697	0.329	.32779	0.286
2456878	—	—	—	.31511	11.338	0.634	.31593	10.991	0.594	.31674	10.693	0.475	.31756	10.301	0.286	.31593	0.645	.31552	0.347	.31634	0.298
2456886	.36820	11.342	0.482	.36894	11.566	0.862	.36968	11.152	0.755	.37024	10.843	0.625	.37021	10.450	0.435	.36959	0.723	.36931	0.414	.36996	0.309
2456898	—	—	—	.33306	11.730	1.026	.33387	11.394	0.997	.33229	11.066	0.848	.33770	10.657	0.642	.33267	0.664	.33347	0.336	.33308	0.328
2456906	.30051	11.140	0.280	.30024	11.412	0.708	.29997	10.998	0.601	.30155	10.709	0.491	.30093	10.315	0.300	.30089	0.703	.30010	0.414	.30076	0.289
2456907	.28817	11.083	0.223	.28770	11.351	0.647	.29510	10.937	0.540	.29204	10.632	0.414	.29122	10.250	0.235	.28987	0.719	.29140	0.414	.29357	0.305
2456908	.32399	11.048	0.188	.32397	11.361	0.657	.32471	10.947	0.550	.32604	10.597	0.379	.32871	10.243	0.228	.32500	0.764	.32434	0.414	.32538	0.350
2456909	.62288	11.011	0.151	.62262	11.302	0.598	.62336	10.888	0.491	.62494	10.596	0.378	.62433	10.205	0.190	.62378	0.706	.62299	0.414	.62415	0.292
2456917	—	—	—	.42109	11.160	0.456	.42191	10.837	0.440	.42255	10.541	0.323	.42302	10.159	0.144	.42182	0.619	.42150	0.323	.42223	0.296
2456918	—	—	—	.32147	11.166	0.462	.32228	10.837	0.440	.32293	10.544	0.326	.32340	10.161	0.146	.32220	0.622	.32187	0.329	.32260	0.293
2456919	—	—	—	.21548	11.165	0.461	.21630	10.837	0.440	.21694	10.543	0.325	.21741	10.163	0.148	.21621	0.622	.21589	0.328	.21662	0.294
2456920	—	—	—	.38361	11.162	0.458	.38443	10.838	0.441	.38508	10.544	0.326	.38555	10.161	0.146	.38434	0.618	.38402	0.324	.38476	0.294
2456923	—	—	—	.26270	11.158	0.454	.26352	10.833	0.436	.26779	10.539	0.321	.26608	10.159	0.144	.26524	0.619	.26311	0.325	.26565	0.294
2456925	—	—	—	.26647	11.159	0.455	.26809	10.833	0.436	.26873	10.541	0.323	.26920	10.125	0.110	.26760	0.618	.26728	0.326	.26841	0.292
2456928	—	—	—	.25150	11.170	0.466	.25232	10.843	0.446	.25296	10.552	0.334	.25343	10.163	0.148	.25223	0.618	.25191	0.327	.25264	0.291

Observers: L. Hambalek, Pribulla, Kundra, Nedoroscik, J. Lopatovsky, E. Kundra, J. Nedoroscik, Z. Garai

Table A.7. $BV(RI)_C$ photometry obtained at Furze Hill (United Kingdom) Observatory during and near the 2014 eclipse (E = 11). The 0.35 Schmidt-Cassegrain telescope with a CCD camera was used. Comparisons were made against three stars: $BD+55\,2690$, GSC-3973 2150, $BD+55\,2691$. The apparent magnitudes are also given with respect to $BD+55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD+55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	JD+	B	ΔB	JD+	V	ΔV	JD+	R_C	ΔR_C	JD+	I_C	ΔI_C	JD+	$B-R_C$	JD+	$B-V$	JD+	$V-R_C$
2456820	.47548	11.192	0.488	.48224	10.824	0.427	.48615	10.543	0.325	.49028	10.198	0.183	.48081	0.649	.47886	0.368	.48419	0.281
2456823	.45086	11.196	0.492	.45447	10.836	0.439	.45847	10.547	0.329	.46238	10.196	0.181	.45467	0.649	.45267	0.360	.45647	0.289
2456826	.45197	11.193	0.489	.45647	10.833	0.436	.45979	10.543	0.325	.46814	10.196	0.181	.45588	0.650	.45422	0.360	.45813	0.290
2456830	.44714	11.185	0.481	.45155	10.826	0.429	.45502	10.542	0.324	.45889	10.200	0.185	.45108	0.643	.44935	0.359	.45329	0.284
2456839	.43823	11.197	0.493	.44659	10.844	0.447	.45481	10.552	0.334	.46400	10.208	0.193	.44652	0.645	.44241	0.353	.45070	0.292
2456845	.42790	11.209	0.505	.43367	10.844	0.447	.43572	10.561	0.343	.44082	10.214	0.199	.43181	0.648	.43079	0.365	.43469	0.283
2456848	.42752	11.199	0.495	.43177	10.838	0.441	.43524	10.556	0.338	.44006	10.207	0.192	.43138	0.643	.42965	0.361	.43351	0.282
2456854	.41838	11.206	0.502	.42318	10.852	0.455	.42698	10.570	0.352	.43163	10.214	0.199	.42268	0.636	.42078	0.354	.42508	0.282
2456858	.42901	11.218	0.514	.43277	10.859	0.462	.43557	10.567	0.349	.43963	10.220	0.205	.43229	0.651	.43089	0.359	.43417	0.292
2456861	.44813	11.237	0.533	.45301	10.873	0.476	.45675	10.587	0.369	.46859	10.239	0.224	.45244	0.650	.45057	0.364	.45488	0.286
2456863	.46184	11.249	0.545	.46554	10.882	0.485	.47057	10.589	0.371	.49090	10.240	0.225	.46620	0.660	.46369	0.367	.46805	0.293
2456864	.45718	11.234	0.530	.46853	10.867	0.470	.47164	10.586	0.368	.48979	10.234	0.219	.46441	0.648	.46286	0.367	.47009	0.281
2456867	.42647	11.199	0.495	.43167	10.863	0.466	.43544	10.585	0.367	.43974	10.231	0.216	.43096	0.614	.42907	0.336	.43355	0.278
2456868	.42792	11.229	0.525	.43217	10.870	0.473	.43568	10.588	0.370	.44146	10.231	0.216	.43180	0.641	.43005	0.359	.43393	0.282
2456872	.43577	11.260	0.556	.43944	10.896	0.499	.45259	10.611	0.393	.45718	10.258	0.243	.44418	0.649	.43761	0.364	.44601	0.285
2456873	.48057	11.230	0.526	.48444	10.903	0.506	.48725	10.619	0.401	.49652	10.268	0.253	.48391	0.611	.48251	0.327	.48584	0.284
2456876	.44568	11.373	0.669	.44964	10.983	0.586	.45331	10.690	0.472	.45813	10.330	0.315	.44949	0.683	.44766	0.390	.45148	0.293
2456878	.44739	11.327	0.623	.45243	10.993	0.596	.45553	10.703	0.485	.46563	10.344	0.329	.45146	0.624	.44991	0.334	.45398	0.290
2456880	.46178	11.388	0.684	.46592	11.037	0.640	.46901	10.740	0.522	.47308	10.374	0.359	.46539	0.648	.46385	0.351	.46747	0.297
2456882	.44288	11.420	0.716	.44637	11.070	0.673	.44889	10.773	0.555	.45562	10.412	0.397	.44588	0.647	.44463	0.350	.44763	0.297
2456884	.46056	11.466	0.762	.46647	11.098	0.701	.47058	10.807	0.589	.47542	10.437	0.422	.46557	0.659	.46351	0.368	.46852	0.291
2456885	.39163	11.495	0.791	.39538	11.116	0.719	.40115	10.822	0.604	.41139	10.447	0.432	.39639	0.673	.39351	0.379	.39826	0.294
2456887	.39566	11.601	0.897	.39951	11.210	0.813	.40227	10.906	0.688	.40675	10.549	0.534	.39897	0.695	.39758	0.391	.40089	0.304
2456889	.39324	11.762	1.058	.39748	11.378	0.981	.40007	11.062	0.844	.40389	10.683	0.668	.39665	0.700	.39536	0.384	.39878	0.316
2456890	.39417	11.854	1.150	.39780	11.442	1.045	.40105	11.120	0.902	.41104	10.726	0.711	.39761	0.734	.39598	0.412	.39942	0.322
2456892	.44206	11.862	1.158	.47103	11.458	1.061	.47734	11.161	0.943	.48509	10.779	0.764	.45970	0.701	.45654	0.404	.47419	0.297
2456893	.38060	11.910	1.206	.38399	11.507	1.110	.38951	11.179	0.961	.39330	10.773	0.758	.38505	0.731	.38229	0.403	.38675	0.328
2456896	.39098	11.896	1.192	.39667	11.489	1.092	.40088	11.177	0.959	.40680	10.776	0.761	.39593	0.719	.39383	0.407	.39878	0.312
2456902	.37537	11.515	0.811	.37954	11.155	0.758	.38881	10.864	0.646	.39286	10.499	0.484	.38209	0.651	.37745	0.360	.38417	0.291
2456904	.51416	11.412	0.708	.51766	11.064	0.667	.52029	10.782	0.564	.53438	10.421	0.406	.51723	0.630	.51591	0.348	.51897	0.282
2456905	.37194	11.379	0.675	.37558	11.015	0.618	.37815	10.720	0.502	.38732	10.373	0.358	.37504	0.659	.37376	0.364	.37686	0.295
2456907	.36661	11.267	0.563	.37060	10.909	0.512	.37369	10.632	0.414	.37820	10.282	0.267	.37015	0.635	.36860	0.358	.37214	0.277
2456908	.46431	11.232	0.528	.46823	10.880	0.483	.47213	10.606	0.388	.47622	10.257	0.242	.46822	0.626	.46627	0.352	.47018	0.274
2456910	.34713	11.214	0.510	.35133	10.863	0.466	.35389	10.584	0.366	.35754	10.229	0.214	.35051	0.630	.34923	0.351	.35261	0.279
2456911	.35177	11.203	0.499	.35522	10.853	0.456	.35810	10.573	0.355	.37167	10.218	0.203	.35493	0.630	.35349	0.350	.35666	0.280
2456912	.34421	11.202	0.498	.34880	10.846	0.449	.35228	10.571	0.353	.36530	10.217	0.202	.34825	0.631	.34650	0.356	.35054	0.275
2456915	.39612	11.210	0.506	.40086	10.848	0.451	.40579	10.576	0.358	.43005	10.212	0.197	.40095	0.634	.39849	0.362	.40332	0.272
2456916	.42538	11.206	0.502	.42906	10.853	0.456	.43461	10.578	0.360	.43838	10.226	0.211	.42999	0.628	.42722	0.353	.43183	0.275
2456917	.36059	11.222	0.518	.36641	10.862	0.465	.37120	10.573	0.355	.37593	10.217	0.202	.36590	0.649	.36350	0.360	.36880	0.289
2456922	.33879	11.183	0.479	.34393	10.853	0.456	.35114	10.564	0.346	.35603	10.212	0.197	.34496	0.619	.34136	0.330	2.34754	0.289
2456923	.33677	11.183	0.479	.34244	10.841	0.444	.34567	10.562	0.344	.35015	10.214	0.199	.34122	0.621	.33960	0.342	.34405	0.279

Observers: I. Miller

Table A.8. Photometry in standard *BVI* filters obtained at Szczecin Observatory (Poland) during and near the 2014 eclipse (E = 11). The 0.2 m Newton telescope with an Artemis 285 CCD camera was used. Differential magnitudes are given with respect to *BD* + 55 2690. The columns labeled 'HJD+' denote the fraction part of the day.

JD	*JD+*	ΔB	*JD+*	ΔV	*JD+*	ΔI	*JD+*	$B-V$
2456857	.51180	0.495	—	—	—	—	—	—
2456859	.40070	0.498	.43820	0.425	—	—	.41945	0.073
2456860	.41810	0.492	.46940	0.416	—	—	.44375	0.076
2456861	.44440	0.503	.46040	0.439	—	—	.45240	0.064
2456862	.52360	0.502	.51040	0.450	—	—	.51700	0.052
2456866	.47010	0.500	.41180	0.440	.51390	0.165	.44095	0.060
2456868	.52500	0.497	.51530	0.436	—	—	.52015	0.061
2456870	.39650	0.500	.40830	0.434	—	—	.40240	0.066
2456872	.49580	0.529	.48820	0.458	—	—	.49200	0.071
2456875	.56250	0.618	.55970	0.553	—	—	.56110	0.065
2456876	.45620	0.638	.46740	0.547	—	—	.46180	0.091
2456877	.57640	0.621	.56940	0.546	—	—	.57290	0.075
2456878	.43960	0.661	.45210	0.563	—	—	.44585	0.098
2456879	.50830	0.670	.50280	0.581	—	—	.50555	0.089
2456881	.40280	0.717	.41390	0.619	—	—	.40835	0.098
2456882	.42710	0.730	.40070	0.640	—	—	.41390	0.090
2456888	.42885	0.955	.42360	0.865	—	—	.42623	0.090
2456889	.50970	1.082	—	—	—	—	—	—
2456890	.46250	1.112	.47920	1.009	—	—	.47085	0.103
2456891	—	—	.34030	1.010	—	—	—	—
2456894	.38750	1.187	.38060	1.088	—	—	.38405	0.099
2456896	.42290	1.147	.43330	1.044	—	—	.42810	0.103
2456897	.44240	1.075	.45070	1.004	—	—	.44655	0.071
2456904	.46600	0.721	.45070	0.643	—	—	.45835	0.078
2456905	.44170	0.643	.42780	0.564	—	—	.43475	0.079
2456906	.44030	0.584	.42290	0.538	—	—	.43160	0.046
2456907	.48260	0.536	.48260	0.480	—	—	.48260	0.056
2456911	.49170	0.490	.48190	0.419	—	—	.48680	0.071
2456912	.38130	0.479	.37360	0.421	—	—	.37745	0.058
2456915	.32850	0.480	.32010	0.426	—	—	.32430	0.054
2456918	.42990	0.478	.42640	0.432	—	—	.42815	0.046
2456919	.41460	0.490	.40760	0.421	—	—	.41110	0.069
2456920	.50140	0.493	.48330	0.441	—	—	.49235	0.052
2456924	.36740	0.465	.34720	0.425	—	—	—	—

Observers: T. Smela

Table A.9. VI_C photometry obtained at West Challow Observatory (United Kingdom) during and near the 2014 eclipse (E = 11). The 0.356 Schmidt-Cassegrain telescope with a CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD{+}55\,2691$. The apparent magnitudes are also given with respect to $BD{+}55\,2690$ (calculated with the adoption of VI_C magnitudes of $BD{+}55\,2690$ given by Athens Observatory. Comparison was made against star $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*V*	ΔV	*JD+*	I_C	ΔI_C
2456848	.45307	10.819	0.422	.45307	10.200	0.185
2456849	.46785	10.821	0.424	.46785	10.211	0.196
2456852	.43945	10.828	0.431	.43945	10.216	0.201
2456854	.45390	10.828	0.431	.45390	10.210	0.195
2456860	.43867	10.846	0.449	.43867	10.228	0.213
2456862	.40210	10.857	0.460	.40210	10.233	0.218
2456869	.39980	10.849	0.452	.39980	10.236	0.221
2456876	.37018	10.961	0.564	.37018	10.327	0.312
2456880	.42367	11.019	0.622	.42367	10.368	0.353
2456882	.37153	11.047	0.650	.37153	10.405	0.390
2456884	.42277	11.076	0.679	.42277	10.435	0.420
2456885	.37084	11.088	0.691	.37084	10.445	0.430
2456887	.38371	11.193	0.796	.38371	10.539	0.524
2456893	.35294	11.468	1.071	.35294	10.767	0.752
2456895	.41132	11.502	1.105	.41132	10.787	0.772
2456898	.36443	11.348	0.951	.36443	10.680	0.665
2456900	.44934	11.214	0.817	.44934	10.566	0.551
2456901	.34490	11.168	0.771	.34490	10.515	0.500
2456902	.43158	11.127	0.730	.43158	10.494	0.479
2456903	.40173	11.089	0.692	.40173	10.440	0.433
2456904	.43023	11.044	0.647	.43023	10.420	0.408
2456908	.37117	10.862	0.465	.37117	10.251	0.236
2456917	.37384	10.829	0.432	.37384	10.211	0.196
2456918	.32256	10.819	0.422	.32256	10.205	0.190
2456922	.30666	10.834	0.437	.30666	10.210	0.195
2456923	.41103	10.824	0.427	.41103	10.208	0.193
2456925	.49281	10.818	0.421	.49281	10.201	0.186
2456929	.30899	10.822	0.425	.30899	10.204	0.189

Observers: D. Boyd

Table A.10. Photometry in standard V filter obtained at Las Pegueras Observatory (Spain) during and near the 2014 eclipse (E = 11). The 0.35 Schmidt-Cassegrain telescope with a CCD camera was used. Comparisons were made against star $GSC - 3973\,2150$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of V magnitudes of $BD + 55\,2690$ given in Mikolajewski et al, 2003, IBVS 5412. The columns labeled 'HJD+' denote the fraction of the day.

HJD	$HJD+$	V	$V-B$
2456811	.53653	10.792	0.412
2456814	.47751	10.829	0.449
2456817	.49962	10.831	0.451
2456820	.48747	10.831	0.451
2456824	.47660	10.831	0.451
2456828	.50271	10.844	0.464
2456830	.52584	10.833	0.453
2456835	.46567	10.846	0.466
2456838	.52344	10.841	0.461
2456846	.50911	10.867	0.487
2456850	.48169	10.880	0.500
2456853	.49617	10.870	0.490
2456860	.55278	10.887	0.507
2456863	.51020	10.897	0.517
2456865	.49432	10.887	0.507
2456867	.50434	10.868	0.488
2456869	.49779	10.863	0.483
2456871	.51341	10.909	0.529
2456874	.49996	10.948	0.568
2456875	.53327	11.007	0.627
2456877	.51711	11.007	0.627
2456879	.49828	11.042	0.662
2456880	.48319	11.061	0.681
2456883	.39038	11.090	0.710
2456885	.49869	11.133	0.753
2456886	.49027	11.155	0.775
2456887	.49858	11.241	0.861
2456888	.40162	11.331	0.951
2456889	.40903	11.413	1.033
2456890	.37220	11.469	1.089
2456892	.52498	11.507	1.127
2456893	.49749	11.543	1.163
2456894	.49323	11.482	1.102
2456895	.50047	11.543	1.163
2456896	.48507	11.514	1.134
2456897	.48982	11.457	1.077
2456899	.48980	11.313	0.933
2456900	.52493	11.270	0.890
2456901	.50386	11.214	0.834
2456902	.50145	11.171	0.791
2456904	.49901	11.068	0.688
2456905	.50056	11.037	0.657
2456906	.45866	10.989	0.609
2456907	.46891	10.941	0.561
2456908	.48233	10.914	0.534
2456909	.41807	10.893	0.513
2456910	.46402	10.897	0.517
2456912	.47640	10.890	0.510
2456916	.47879	10.857	0.477
2456920	.43637	10.874	0.494
2456925	.49370	10.817	0.437

Observers: T. A. Heras

Table A.11. $UBV(RI)_C$ photometry obtained at Rohzen (Bulgaria) Observatory during and near the 2014 eclipse (E = 11). The 0.7 Schmidt telescope with a FLI PL 9000 CCD camera was used. Comparisons were made against three stars: $BD+55\,2690$, $GSC-3973\,2150$, $BD+55\,2691$. The apparent magnitudes are also given with respect to $BD+55\,2690$ (calculated with the adoption of $UBV(RI)_C$ magnitudes of $BD+55\;\;2690$ given by Athens Observatory). Comparison was made against star $BD+55\;\;2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	U	ΔU	*JD+*	B	ΔB	*JD+*	V	ΔV	*JD+*	R_C	ΔR_C	*JD+*	I_C	ΔI_C
2456838	.35610	10.975	0.115	.35610	11.159	0.455	.35610	10.819	0.422	.35610	10.543	0.325	.35610	10.159	0.144
2456839	.42961	10.983	0.123	.42961	11.168	0.464	.42961	10.829	0.432	.42961	10.549	0.331	.42961	10.160	0.145
2456859	.48300	11.015	0.155	.48300	11.203	0.499	.48300	10.854	0.457	.48300	10.561	0.343	.48300	10.174	0.159
2456860	.49993	11.031	0.171	.49993	11.208	0.504	.49993	10.874	0.477	.49993	10.565	0.347	.49993	10.181	0.166
2456863	.44882	11.033	0.173	.44882	11.206	0.502	.44882	10.868	0.471	.44882	10.587	0.369	.44882	10.187	0.172
2456873	.37146	11.067	0.207	.37146	11.243	0.539	.37146	10.897	0.500	.37146	10.607	0.389	.37146	10.225	0.210
2456874	.39731	11.107	0.247	.39731	11.274	0.570	.39731	10.935	0.538	.39731	10.648	0.430	.39731	10.236	0.221
2456888	.43818	11.512	0.652	.43818	11.670	0.966	.43818	11.288	0.891	.43818	10.976	0.758	.43818	10.581	0.566
2456889	.35421	11.601	0.741	.35421	11.759	1.055	.35421	11.319	0.922	.35421	11.058	0.840	.35421	10.636	0.621
2456892	.38144	11.695	0.835	.38144	11.852	1.148	.38144	11.480	1.083	.38144	11.160	0.942	.38144	10.732	0.717

Observers: E. Semkov

Table A.12. V photometry obtained at Glyfada Observatory during and near the 2014 eclipse (E = 11). The 0.28 m Schmidt-Cassegrain telescope with a QHY9 CCD camera was used. Comparisons were made against star $BD + 55\,2690$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of V magnitudes of $BD + 55\,2690$ given in Mikolajewski et al, 2003, IBVS 5412. The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	V	ΔV
2456850	.32540	10.784	0.404
2456858	.36738	10.810	0.43
2456859	.28847	10.872	0.492
2456873	.33900	10.899	0.519
2456874	.34757	10.927	0.547
2456877	.43292	10.952	0.572
2456881	.29096	11.034	0.654
2456882	.28657	11.051	0.671
2456883	.29194	11.075	0.695
2456884	.28295	11.079	0.699
2456885	.35672	11.112	0.732
2456886	.29675	11.127	0.747
2456887	.26844	11.173	0.793
2456888	.34863	11.257	0.877
2456889	.31082	11.359	0.979
2456890	.27857	11.434	1.054
2456893	.27404	11.490	1.11
2456894	.34278	11.500	1.12
2456895	.36446	11.515	1.135
2456896	.32600	11.478	1.098
2456897	.32652	11.429	1.049
2456898	.36048	11.358	0.978
2456899	.29681	11.296	0.916
2456900	.27005	11.240	0.86
2456901	.32824	11.172	0.792
2456903	.25820	11.098	0.718
2456904	.34492	11.059	0.679
2456905	.31117	11.003	0.623
2456906	.38529	10.940	0.56
2456907	.31894	10.902	0.522
2456909	.29523	10.839	0.459
2456910	.29686	10.835	0.455
2456911	.30723	10.801	0.421
2456912	.31867	10.842	0.462
2456914	.23755	10.831	0.451
2456916	.32898	10.847	0.467
2456917	.33236	10.831	0.451
2456920	.39080	10.813	0.433
2456921	.24265	10.835	0.455
2456922	.26192	10.840	0.46
2456923	.24980	10.822	0.442
2456924	.30176	10.839	0.459
2456925	.25019	10.829	0.449
2456927	.36289	10.813	0.433

Observers: M. Kardasis

Table A.13. Photometry obtained at PTMA Szczecin Observatory (Poland) in standard *BV* filters during and near the 2014 eclipse (E = 11). The 0.2 m Newton telescope with an Artemis 285 CCD camera was used. Differential magnitudes are given with respect to $BD+55\,2690$. The columns labeled 'HJD+' denote the fraction of the day.

JD	*JD+*	ΔB	*JD+*	ΔV	*JD+*	$B-V$
2456859	.39860	0.506	—	—	—	—
2456866	.47710	0.486	.41320	0.424	.44515	0.062
2456868	—	—	.52080	0.442	—	—
2456872	.50070	0.532	.49030	0.468	.49550	0.064
2456875	.56740	0.635	—	—	—	—
2456876	—	—	.46810	0.550	—	—
2456877	.57780	0.639	—	—	—	—
2456878	—	—	.45280	0.555	—	—
2456881	.39720	0.716	.41460	0.624	.40590	0.092
2456888	.34720	0.957	.35760	0.861	.35240	0.096
2456888	—	—	—	—	.41875	0.082
2456888	—	—	—	—	.42845	0.118
2456888	.49930	0.979	.49030	0.875	.49480	0.104
2456890	.43750	1.122	.49310	1.010	.46530	0.112
2456894	.39240	1.184	.37710	1.080	.38475	0.100
2456896	.42710	1.158	.43750	1.044	.43230	0.114
2456897	.43920	1.082	.45830	1.004	.44875	0.078
2456904	.47080	0.715	.45140	0.644	.46110	0.071
2456905	.44650	0.642	.43060	0.580	.43855	0.062
2456912	.38330	0.486	.37500	0.420	.37915	0.066
2456915	.34030	0.483	.32290	0.424	.33160	0.059
2456918	.43400	0.490	.42290	0.426	.42845	0.064
2456919	.41880	0.482	.40970	0.421	.41425	0.061
2456919	.50560	0.490	—	—	.45765	0.069
2456920	—	—	.47570	0.433	—	—
2456924	.36390	0.473	.34930	0.424	.35660	0.049

Observers: M. Biskupski

Table A.14. BVR_C photometry obtained at Spain Observatory during and near the 2014 eclipse (E = 11). The 0.431 Corrected Dall-Kirkham telescope with a SBIG STL-11000M CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of BVR_C magnitudes of $BD + 55\,2690$ given by Athens Observatory). Comparison was made against star $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	B	ΔB	$JD+$	V	ΔV	$JD+$	R_C	ΔR_C
2456850	.87207	11.185	0.481	—	—	—	—	—	—
2456852	.53206	11.180	0.476	.52920	10.841	0.444	.53495	10.582	0.364
2456855	—	—	—	.92490	10.842	0.445	—	—	—
2456857	—	—	—	.39680	10.855	0.458	—	—	—
2456859	—	—	—	.53700	10.855	0.458	—	—	—
2456859	—	—	—	.57560	10.849	0.452	—	—	—
2456860	—	—	—	.57660	10.854	0.457	—	—	—
2456862	—	—	—	.58230	10.859	0.462	—	—	—
2456864	—	—	—	.85620	10.847	0.450	—	—	—
2456866	—	—	—	.55240	10.844	0.447	—	—	—
2456868	—	—	—	.55070	10.862	0.465	—	—	—
2456870	—	—	—	.55000	10.862	0.465	—	—	—
2456872	—	—	—	.53500	10.886	0.489	—	—	—
2456873	—	—	—	.56940	10.908	0.511	—	—	—
2456875	—	—	—	.57640	10.967	0.570	—	—	—
2456877	—	—	—	.55540	10.963	0.566	—	—	—
2456879	—	—	—	.53810	11.014	0.617	—	—	—
2456882	—	—	—	.53380	11.058	0.661	—	—	—
2456883	—	—	—	.53910	11.080	0.683	—	—	—
2456885	—	—	—	.52140	11.099	0.702	—	—	—
2456887	—	—	—	.52050	11.219	0.822	—	—	—
2456889	—	—	—	.52300	11.382	0.985	—	—	—
2456890	—	—	—	.53460	11.434	1.037	—	—	—
2456892	—	—	—	.52390	11.459	1.062	—	—	—
2456893	—	—	—	.53440	11.508	1.111	—	—	—
2456894	—	—	—	.41230	11.513	1.116	—	—	—
2456894	—	—	—	.53870	11.526	1.129	—	—	—
2456895	—	—	—	.50840	11.505	1.108	—	—	—
2456896	—	—	—	.50790	11.480	1.083	—	—	—
2456897	—	—	—	.50850	11.418	1.021	—	—	—
2456898	—	—	—	.56250	11.360	0.963	—	—	—
2456899	—	—	—	.50620	11.284	0.887	—	—	—

Observers: R. Kneip

Table A.15. BVR_C photometry obtained at Guadarrama (Spain) Observatory during and near the 2014 eclipse (E = 11). The 0.25 Schmidt-Cassegrain telescope with a SBIG ST8XME CCD camera was used. Comparisons were made against three stars: $BD+55\,2690$, $GSC-3973\,2150$, $BD+55\,2691$. The apparent magnitudes are also given with respect to $BD+55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD+55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*B*	Δ*B*	*JD+*	*V*	Δ*V*	*JD+*	R_C	ΔR_C	*JD+*	*B − V*	*JD+*	$V-R_C$
2456824	—	—	—	.51935	10.828	0.431	.52410	10.578	0.360	—	—	—	—
2456844	—	—	—	.50280	10.825	0.428	.50383	10.557	0.339	—	—	.50331	0.268
2456847	.48485	11.149	0.445	.47808	10.831	0.434	—	—	—	.48146	0.318	.52172	0.250
2456853	—	—	—	.43723	10.840	0.443	.43862	10.545	0.327	—	—	.43792	0.295
2456862	—	—	—	.45141	10.851	0.454	.45359	10.557	0.339	—	—	.45250	0.294
2456868	—	—	—	.44130	10.864	0.467	.44329	10.585	0.367	—	—	.44229	0.279
2456874	—	—	—	.42506	10.916	0.519	.42350	10.634	0.416	—	—	.42428	0.282
2456880	—	—	—	.42607	11.038	0.641	.43028	10.763	0.545	—	—	.42818	0.275
2456886	—	—	—	.45042	11.144	0.747	.45226	10.858	0.640	—	—	.45134	0.286
2456890	—	—	—	.36885	11.425	1.028	.37039	11.093	0.875	—	—	.36962	0.332
2456892	—	—	—	.41203	11.462	1.065	—	—	—	—	—	—	—
2456894	—	—	—	.41315	11.517	1.120	—	—	—	—	—	—	—
2456895	—	—	—	.45013	11.483	1.086	.45154	11.211	0.993	—	—	—	—
2456897	—	—	—	.47512	11.396	0.999	—	—	—	—	—	—	—
2456910	—	—	—	.43759	10.846	0.449	—	—	—	—	—	—	—
2456916	—	—	—	.42097	10.841	0.444	—	—	—	—	—	—	—

Observers: D. Rodriguez

Table A.16. V photometry obtained at Zillebeke (Belgium) during and near the 2014 eclipse (E = 11). The 0.68 m Newton telescope with an SBIG STL-6303E CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of V magnitudes of $BD + 55\,2690$ given in Mikolajewski et al, 2003, IBVS 5412. The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	V	ΔV
2456822	.41101	10.810	0.430
2456829	.39743	10.820	0.440
2456832	.41820	10.807	0.427
2456838	.44653	10.815	0.435
2456842	.44393	10.823	0.443
2456845	.44125	10.824	0.444
2456853	.40167	10.840	0.460
2456856	.50551	10.840	0.460
2456861	.38245	10.845	0.465
2456868	.37139	10.844	0.464
2456871	.36254	10.853	0.473
2456873	.38770	10.888	0.508
2456876	.40966	10.961	0.581
2456880	.36377	11.018	0.638
2456885	.34749	11.093	0.713
2456889	.39466	11.357	0.977
2456892	.34973	11.464	1.084
2456896	.62099	11.575	1.195
2456897	.33568	11.321	0.941
2456898	.32146	11.363	0.983
2456901	.33859	11.169	0.789
2456903	.32816	11.096	0.716
2456907	.35213	10.889	0.509
2456909	.31654	10.847	0.467
2456912	.31542	10.834	0.454

Observers: F. Dubois

Table A.17. Photometry obtained at Rozhen Observatory (Bulgaria) in standard $BV(RI)_C$ filters during and near the 2014 eclipse (E = 11). The 0.6 m Cassegrain telescope with a FLI PL 9000 CCD camera was used. Differential magnitudes are given with respect to $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	ΔB	$JD+$	ΔV	$JD+$	ΔR_C	$JD+$	ΔI_C
2456865	.54979	0.497	.55260	0.460	.54670	0.348	.55906	0.159
2456866	.55503	0.489	.55722	0.451	.55885	0.346	.56049	0.156
2456890	.58708	1.117	.59086	1.047	.58452	0.894	—	—
2456890	.59653	1.128	.59984	1.049	.60226	0.893	—	—
2456891	.57730	1.145	.57992	1.072	.57503	0.921	—	—
2456891	.58583	1.147	.58900	1.067	.59110	0.912	—	—
2456894	.43321	1.219	.43608	1.164	.43828	0.999	—	—

Observers: G. Apostolovska

Table A.18. $BV(RI)_C$ photometry obtained at Tenerife (Spain) Observatory during and near the 2014 eclipse (E = 11). The 0.356 Schmidt-Cassegrain telescope with a FLI MicroLine CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory). Comparison was made against star $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	B	ΔB	*JD+*	V	ΔV	*JD+*	R_C	ΔR_C	*JD+*	I_C	ΔI_C	*JD+*	$B - R_C$	*JD+*	$B - V$	*JD+*	$V - R_C$
2456858	—	—	—	.65831	10.850	0.453	.65933	10.540	0.322	—	—	—	—	—	—	—	—	—
2456864	.65036	11.220	0.516	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456867	—	—	—	.63928	10.860	0.463	—	—	—	—	—	—	—	—	—	—	—	—
2456874	—	—	—	.66275	10.940	0.543	—	—	—	—	—	—	—	—	—	—	—	—
2456880	—	—	—	.63422	11.060	0.663	.63100	10.730	0.512	—	—	—	—	—	—	—	.63261	0.330
2456883	.64933	11.480	0.776	—	—	—	—	—	—	.58116	10.420	0.405	—	—	—	—	—	—
2456891	—	—	—	.56484	11.480	1.083	.56608	11.140	0.922	.56351	10.730	0.715	—	—	—	—	.56546	0.340
2456897	—	—	—	—	—	—	—	—	—	.61608	10.670	0.655	—	—	—	—	—	—
2456897	—	—	—	—	—	—	—	—	—	.61829	10.680	0.665	.63073	0.710	.57480	0.350	.65882	0.310
2456897	.64186	11.820	1.116	—	—	—	.61959	11.110	0.892	.62059	10.680	0.665	—	—	—	—	—	—
2456905	.57350	11.350	0.646	.57609	11.000	0.603	.57481	10.700	0.482	.57253	10.340	0.325	—	—	—	—	—	—
2456935	—	—	—	—	—	—	—	—	—	.52112	10.180	0.165	—	—	—	—	—	—

Observers: A. Capetillo Blanco

Table A.19. Photometry in standard *UBVR* filters obtained at Jan Kochanowski Observatory (Poland) during and near the 2014 eclipse (E = 11). The 0.35 m Schmidt-Cassegrain telescope with a SBIG ST-7XE CCD camera was used. Differential magnitudes are given with respect to $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction part of the day.

JD	*JD+*	ΔU	*HJD+*	ΔB	*JD+*	ΔV	*JD+*	ΔR	*JD+*	$B - R_C$	*JD+*	$B - V$	*JD+*	$V - R_C$
2456799	.36752	0.157	.37804	0.470	.38497	0.421	.38925	0.316	.38364	0.154	.38150	0.049	.38711	0.105
2456820	.34564	0.148	.35475	0.429	.33470	0.413	.33892	0.298	.34683	0.131	.34472	0.016	.33681	0.115
2456892	.33113	0.892	.34005	1.189	.31967	1.055	.32369	0.907	.33187	0.282	.32986	0.134	.32168	0.148
2456895	.31833	0.954	.31833	1.037	.31833	1.098	.28860	0.952	.30347	0.085	.31833	-0.061	.30347	0.146
2456905	.29905	0.386	.31709	0.660	.28324	0.596	.28740	0.484	.30224	0.176	.30016	0.064	.28532	0.112

Observers: P. Kankiewicz

Table A.20. BVI_C photometry obtained at Magnago (Italy) Observatory during and near the 2014 eclipse (E = 11). The 0.25 Schmidt-Cassegrain telescope with a SBIG ST9 CCD camera was used. Comparisons were made against star $BD + 55\,2690$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of BVI_C magnitudes of $BD + 55\,2690$ given by Athens Observatory). Comparison was made against star $BD + 55\,2690$. The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	B	ΔB	$JD+$	V	ΔV	$JD+$	I_C	ΔI_C	$JD+$	$B-V$
2456801	.59070	11.175	0.471	.59150	10.819	0.422	.59200	10.147	0.132	.59110	0.356
2456842	.47750	11.170	0.466	.47860	10.810	0.413	.47910	10.167	0.152	.47805	0.360
2456854	.48830	11.173	0.469	.48940	10.847	0.450	.48990	10.199	0.184	.48885	0.326
2456903	.45240	11.462	0.758	.45360	11.089	0.692	.45410	10.450	0.435	.45300	0.373
2456933	.46070	11.156	0.452	.46180	10.845	0.448	.46230	10.186	0.171	.46125	0.311

Observers: M. Martigoni

Table A.21. BVR_B photometry in Bessell obtained at Horten VGS (Norway) Observatory during and near the 2014 eclipse (E = 11). The 0.46 Ritchey-Chretien telescope with a SBIG STL-1301E CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*B*	ΔB	*JD+*	*V*	ΔV	*JD+*	R_C	ΔR_C	*JD+*	$B - R_C$	*JD+*	$B - V$	*JD+*	$V - R_C$
2456895	.33888	11.842	1.138	—	—	—	—	—	—	—	—	—	—	—	—
2456895	—	—	—	.33986	11.460	1.063	.33783	11.135	0.917	.33836	0.707	.33937	0.382	.33885	0.325
2456896	—	—	—	.35777	11.460	1.063	.35714	11.124	0.906	—	—	—	—	—	—
2456901	.41431	11.546	0.842	.41207	11.184	0.787	.41375	10.890	0.672	.41403	0.656	.41319	0.362	.35746	0.336
2456906	.32484	11.291	0.587	.32369	10.990	0.593	.32419	10.682	0.464	—	—	.32426	0.301	.41291	0.294
2456906	—	—	—	—	—	—	—	—	—	—	—	—	—	.32394	0.308

Observers: J. Kare Trandem Qvam

Table A.22. *BV* photometry obtained at New Mexico Skies Observatory (Mexic) during and near the 2014 eclipse (E = 11). The 0.508 m Corrected Dall-Kirkham telescope with a CCD camera was used. Comparisons were made against three stars: $BD+55\,2690$, $GSC-3973\,2150$, $BD+55\,2691$. The apparent magnitudes are also given with respect to $BD+55\,2690$ (calculated with the adoption of *BV* magnitudes of $BD+55\,2690$ given in Mikolajewski et al, 2003, IBVS 5412. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*B*	ΔB	*JD+*	*V*	ΔV	*JD+*	$B-V$
2456891	.42903	11.819	1.139	.41951	11.407	1.027	.42427	0.412
2456904	.43329	11.392	0.712	.42443	11.070	0.690	.42886	0.322
2456910	.83485	11.198	0.518	.82513	10.723	0.343	.82999	0.475
2456930	—	—	—	.86875	10.796	0.420	—	—
2456931	.90024	11.186	0.506	.89397	10.836	0.452	.89710	0.350

Observers: S. Dean

Table A.23. *V* photometry obtained at Cerro del Viento Observatory (Spain) during and near the 2014 eclipse (E = 11). The 0.2 m Schmidt-Cassegrain telescope with a CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of V magnitudes of $BD + 55\,2690$ given in Mikolajewski et al, 2003, IBVS 5412. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*V*	ΔV
2456850	.59363	10.820	0.44
2456873	.45576	10.883	0.503
2456876	.49886	10.972	0.592
2456884	.46233	11.097	0.717
2456890	.46404	11.434	1.054
2456891	.47348	11.453	1.073
2456892	.48637	11.454	1.074
2456892	.53796	11.452	1.072
2456893	.48934	11.491	1.111

Observers: J. L. Gonzalez Carballo

Table A.24. BVR_C photometry obtained at private Observatory in France during and near the 2014 eclipse (E = 11). The 0.203 homemade telescope with a SBIG ST7XE CCD camera was used. Comparisons were made against three stars: $BD + 55\,2690$, $GSC - 3973\,2150$, $BD + 55\,2691$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	B	ΔB	$JD+$	V	ΔV	$JD+$	R_C	ΔR_C	$JD+$	$B-R_C$	$JD+$	$B-V$
2456854	.55186	11.195	0.491	.55291	10.811	0.414	—	—	—	—	—	—	—
2456886	.55105	11.479	0.775	.55198	11.195	0.798	.55275	10.683	0.465	—	—	.55151	0.284
2456886	—	—	—	—	—	—	—	—	—	.55190	0.796	.55239	0.384

Observers: L. Corp

Table A.25. BVR_C photometry obtained at Leicester (United Kingdom) Observatory during and near the 2014 eclipse (E = 11). The 0.508 Corrected Dall-Kirkham telescope with a SBIG ST-2000XM CCD camera was used. Comparisons were made against three stars: $BD+55\,2690$, $GSC-3973\,2150$, $BD+55\,2691$. The apparent magnitudes are also given with respect o $BD+55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD+55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*B*	ΔB	*JD+*	*V*	ΔV	*JD+*	R_C	ΔR_C
2456898	.46008	11.720	1.016	.44566	11.370	0.973	.45241	11.010	0.792

Observers: K. Wiersema

Table A.26. $V(RI)_C$ photometry obtained at Gualba (Spain) Observatory during and near the 2014 eclipse (E = 11). The 0.356 Schmidt-Cassegrain telescope with a SBIG ST8-XME CCD camera was used. Comparisons were made against star: $BD + 55\,2690$. The apparent magnitudes are also given with respect to $BD + 55\,2690$ (calculated with the adoption of $BV(RI)_C$ magnitudes of $BD + 55\,2690$ given by Athens Observatory). The columns labeled 'JD+' denote the fraction of the day.

JD	$JD+$	V	ΔV	$JD+$	R_C	ΔR_C	$JD+$	I_C	ΔI_C
2456891	.33125	11.393	0.996	.32986	11.138	0.920	.33333	11.252	1.237

Observers: A. Sanchez

Table A.27. *V* photometry obtained at Madrid-Ventila Observatory during and near the 2014 eclipse (E = 11). The 0.06 m refractor telescope with a QHY-Img0S ICX-618AL CCD camera was used. Comparisons were made against star *BD* + 55 2690. The apparent magnitudes are also given with respect to *BD* + 55 2690 (calculated with the adoption of *V* magnitudes of *BD* + 55 2690 given in Mikolajewski et al, 2003, IBVS 5412. The columns labeled 'JD+' denote the fraction of the day.

JD	*JD+*	*V*	ΔV
2456885	.68780	11.170	0.790

Observers: M. Rodriguez

Table A.28. JHK_S photometry obtained with with CAIN infrared camera operating on 1.5 m Carlos Sánchez telescope at Teide Observatory compared to 2MASS data.

Julian Date	orbital phase	J	ΔJ	H	ΔH	K_S	ΔK_S	Source
HJD = 2455350.67	0.247	9.52	0.04	9.01	0.07	8.37	0.04	1.5 m Carlos Sánchez telescope
JD = 2451436.79	0.338	9.601	0.029	9.219	0.030	8.555	0.023	2MASS

Table A.29. The mean points of the average *UBVRI* in Johnson photometric system and $(RI)_C$ in Cousins photometric system light curves obtained during and near the 2014 (E = 11) eclipse. Magnitudes and the corresponding standard deviations are given. Mean magnitudes were obtained by averaging the differential magnitude data from Tables A.1-A.27 The columns labeled 'JD+' denote the fraction of the day.

JD	JD+	U	N_U	$e_U mag$	JD+	Bmag	N_B	$e_B mag$	JD+	Vmag	N_V	$e_V mag$	JD+	Rcmag	N_{RC}	$e_{RC} mag$	JD+	Icmag	N_{IC}	$e_{IC} mag$	JD+	Rmag	N_{RC}	$e_R mag$	JD+	Imag	N_{IC}	$e_I mag$
2456739	—	—	—	—	.731	0.474	1	0.000	.730	0.427	1	0.000	.730	0.315	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456741	—	—	—	—	.734	0.476	1	0.000	.734	0.430	1	0.000	.733	0.341	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456755	—	—	—	—	.646	0.459	2	0.015	.646	0.404	2	0.021	.696	0.288	1	0.000	—	—	—	—	.590	0.290	1	0.000	.595	0.385	1	0.000
2456761	—	—	—	—	.987	0.475	1	0.000	.987	0.422	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456762	—	—	—	—	.697	0.474	1	0.000	.696	0.427	1	0.000	.696	0.315	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456763	—	—	—	—	.986	0.484	1	0.000	.987	0.425	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456765	.592	0.124	1	0.000	.562	0.467	2	0.001	.541	0.403	2	0.002	—	—	—	—	—	—	—	—	.544	0.294	2	0.006	.541	0.405	2	0.002
2456767	—	—	—	—	.984	0.483	1	0.000	.985	0.428	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456768	—	—	—	—	.977	0.494	1	0.000	.978	0.421	1	0.000	.979	0.325	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456771	—	—	—	—	.846	0.478	2	0.004	.845	0.431	2	0.001	.846	0.352	2	0.015	.984	0.149	1	0.000	—	—	—	—	—	—	—	—
2456773	—	—	—	—	.689	0.474	1	0.000	.688	0.424	1	0.000	.688	0.354	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456776	—	—	—	—	.711	0.476	1	0.000	.851	0.421	2	0.008	.851	0.318	2	0.004	.993	0.135	1	0.000	—	—	—	—	—	—	—	—
2456777	—	—	—	—	—	—	—	—	.966	0.426	1	0.000	.966	0.327	1	0.000	.967	0.142	1	0.000	—	—	—	—	—	—	—	—
2456778	—	—	—	—	.836	0.475	2	0.001	.836	0.428	2	0.004	.836	0.338	2	0.003	.966	0.139	1	0.000	—	—	—	—	—	—	—	—
2456779	—	—	—	—	.482	0.473	1	0.000	.485	0.421	1	0.000	—	—	—	—	—	—	—	—	.489	0.316	1	0.000	.485	0.422	1	0.000
2456781	—	—	—	—	.976	0.494	1	0.000	.977	0.435	1	0.000	.977	0.336	1	0.000	.978	0.143	1	0.000	—	—	—	—	—	—	—	—
2456783	—	—	—	—	.541	0.471	2	0.009	.546	0.415	2	0.014	.568	0.333	1	0.000	.568	0.167	1	0.000	.524	0.305	1	0.000	.524	0.402	1	0.000
2456784	—	—	—	—	.557	0.459	1	0.000	.556	0.401	1	0.000	—	—	—	—	—	—	—	—	.553	0.301	1	0.000	.556	0.402	1	0.000
2456786	—	—	—	—	.541	0.461	1	0.000	.542	0.393	1	0.000	.543	0.318	1	0.000	.544	0.131	1	0.000	—	—	—	—	—	—	—	—
2456787	—	—	—	—	.746	0.486	2	0.010	.746	0.427	2	0.004	.747	0.328	2	0.005	.748	0.159	2	0.009	—	—	—	—	—	—	—	—
2456790	—	—	—	—	.726	0.467	2	0.016	.726	0.405	2	0.017	.954	0.330	1	0.000	.954	0.152	1	0.000	.497	0.294	1	0.000	.498	0.390	1	0.000
2456791	—	—	—	—	.953	0.494	1	0.000	.954	0.434	1	0.000	.954	0.347	1	0.000	.955	0.157	1	0.000	—	—	—	—	—	—	—	—
2456792	—	—	—	—	.956	0.490	1	0.000	.957	0.430	1	0.000	.957	0.332	1	0.000	.958	0.145	1	0.000	—	—	—	—	—	—	—	—
2456794	—	—	—	—	.666	0.476	1	0.000	.665	0.430	1	0.000	.665	0.368	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456796	—	—	—	—	.744	0.481	2	0.024	.745	0.412	2	0.014	.950	0.333	1	0.000	.951	0.173	1	0.000	.539	0.296	1	0.000	.539	0.399	1	0.000
2456798	—	—	—	—	.537	0.481	1	0.000	.539	0.431	1	0.000	.539	0.323	1	0.000	.542	0.156	1	0.000	—	—	—	—	—	—	—	—
2456799	.379	0.146	2	0.029	.438	0.514	3	0.040	.440	0.429	3	0.004	.468	0.331	2	0.004	.470	0.166	2	0.005	.389	0.333	1	0.000	—	—	—	—
2456800	—	—	—	—	.749	0.494	2	0.015	.751	0.431	2	0.002	.752	0.331	2	0.012	.752	0.159	2	0.000	—	—	—	—	—	—	—	—
2456801	—	—	—	—	.591	0.487	1	0.000	.592	0.425	1	0.000	—	—	—	—	.592	0.115	1	0.000	—	—	—	—	—	—	—	—
2456802	—	—	—	—	.955	0.506	1	0.000	.955	0.436	1	0.000	.956	0.349	1	0.000	.956	0.146	1	0.000	—	—	—	—	—	—	—	—
2456803	—	—	—	—	.686	0.497	2	0.008	.686	0.432	2	0.007	.963	0.345	1	0.000	.964	0.155	1	0.000	.411	0.336	1	0.000	.410	0.426	1	0.000
2456804	—	—	—	—	.958	0.492	1	0.000	.958	0.436	1	0.000	.959	0.333	1	0.000	.959	0.159	2	0.000	—	—	—	—	—	—	—	—
2456806	—	—	—	—	.947	0.494	1	0.000	.947	0.441	1	0.000	.948	0.341	1	0.000	.948	0.145	1	0.000	—	—	—	—	—	—	—	—
2456807	—	—	—	—	.945	0.496	1	0.000	.946	0.432	1	0.000	.946	0.349	1	0.000	.947	0.162	1	0.000	—	—	—	—	—	—	—	—
2456808	—	—	—	—	.948	0.518	1	0.000	.948	0.426	1	0.000	.949	0.335	1	0.000	.949	0.153	1	0.000	—	—	—	—	—	—	—	—
2456809	—	—	—	—	.791	0.489	2	0.013	.791	0.431	2	0.002	.791	0.348	2	0.006	.949	0.160	1	0.000	—	—	—	—	—	—	—	—
2456810	—	—	—	—	.791	0.481	2	0.007	.791	0.429	2	0.002	.791	0.352	2	0.016	.945	0.154	1	0.000	—	—	—	—	—	—	—	—
2456811	—	—	—	—	.942	0.494	1	0.000	.740	0.409	2	0.038	.943	0.337	1	0.000	.943	0.160	1	0.000	—	—	—	—	—	—	—	—
2456812	—	—	—	—	.791	0.483	2	0.007	.791	0.432	2	0.006	.791	0.371	2	0.036	.943	0.150	1	0.000	—	—	—	—	—	—	—	—
2456813	—	—	—	—	.713	0.471	3	0.008	.713	0.423	3	0.011	.808	0.370	2	0.038	.948	0.147	1	0.000	.524	0.296	1	0.000	.524	0.408	1	0.000
2456814	—	—	—	—	.944	0.498	1	0.000	.711	0.416	2	0.010	.945	0.329	1	0.000	.945	0.161	1	0.000	—	—	—	—	—	—	—	—
2456815	—	—	—	—	.695	0.481	3	0.005	.697	0.428	3	0.002	.697	0.326	3	0.004	.738	0.151	2	0.009	—	—	—	—	—	—	—	—
2456816	—	—	—	—	.942	0.500	1	0.000	.943	0.429	1	0.000	.943	0.338	1	0.000	.944	0.148	1	0.000	—	—	—	—	—	—	—	—
2456817	—	—	—	—	—	—	—	—	.500	0.408	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456818	—	—	—	—	.510	0.465	1	0.000	.506	0.416	1	0.000	—	—	—	—	—	—	—	—	.500	0.304	1	0.000	.506	0.417	1	0.000
2456820	.346	0.108	1	0.000	.415	0.461	2	0.014	.411	0.413	2	0.005	.486	0.306	1	0.000	.490	0.151	1	0.000	.339	0.315	1	0.000	—	—	—	—
2456822	—	—	—	—	—	—	—	—	.411	0.424	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456823	—	—	—	—	.525	0.478	2	0.000	.599	0.427	1	0.000	.529	0.346	2	0.035	.462	0.149	1	0.000	—	—	—	—	—	—	—	—
2456824	.360	0.166	2	0.000	.373	0.508	2	0.051	.421	0.415	5	0.010	.443	0.335	2	0.008	.362	0.167	2	0.000	.391	0.300	1	0.000	.388	0.406	1	0.000
2456825	.566	0.163	1	0.000	.756	0.486	2	0.001	.757	0.437	2	0.003	.947	0.334	1	0.000	.947	0.155	1	0.000	.567	0.325	1	0.000	.567	0.441	1	0.000
2456826	—	—	—	—	.631	0.476	4	0.007	.691	0.426	3	0.009	.675	0.317	3	0.019	.468	0.149	1	0.000	.511	0.311	1	0.000	.510	0.418	1	0.000
2456827	—	—	—	—	.621	0.479	4	0.010	.621	0.430	4	0.011	.737	0.329	2	0.009	.737	0.157	2	0.002	.499	0.320	2	0.010	.507	0.430	2	0.015

Table A.29. continued.

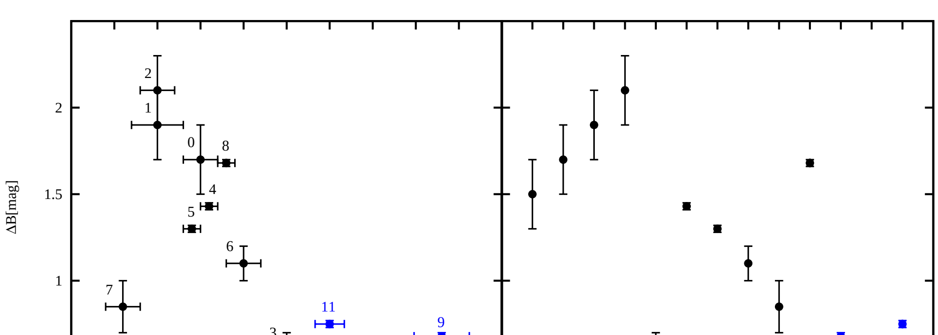
JD	*JD+*	*U*	N_U	$e_U mag$	*JD+*	*B*	N_B	$e_B mag$	*JD+*	*V*	N_V	$e_V mag$	*JD+*	R_C	N_{RC}	$e_{RC} mag$	*JD+*	I_C	N_{IC}	$e_{IC} mag$	*JD+*	*R*	N_{RC}	$e_R mag$	*JD+*	*I*	N_{IC}	$e_I mag$
2456828	—	—	—	—	—	—	—	—	.503	0.421	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2456829	—	—	—	—	.613	0.476	1	0.000	.505	0.430	2	0.004	.612	0.354	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456830	—	—	—	—	.481	0.469	2	0.002	.522	0.423	2	0.013	.487	0.323	2	0.017	.490	0.162	2	0.008	—	—	—	—	—	—	—	—
2456832	—	—	—	—	.499	0.474	2	0.001	.471	0.426	3	0.007	.609	0.275	1	0.000	—	—	—	—	.397	0.311	1	0.000	.387	0.423	1	0.000
2456833	—	—	—	—	.624	0.474	1	0.000	.623	0.434	1	0.000	.623	0.341	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456834	—	—	—	—	.606	0.475	1	0.000	.606	0.425	1	0.000	.606	0.368	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456835	.510	0.174	1	0.000	.463	0.474	2	0.002	.475	0.429	4	0.012	.521	0.355	2	0.001	.508	0.180	1	0.000	.390	0.320	1	0.000	.390	0.420	1	0.000
2456836	.481	0.150	1	0.000	—	—	—	—	.483	0.426	1	0.000	.483	0.335	1	0.000	.484	0.163	1	0.000	—	—	—	—	—	—	—	—
2456837	—	—	—	—	.659	0.488	2	0.013	.660	0.433	2	0.004	.937	0.342	1	0.000	.938	0.153	1	0.000	.383	0.322	1	0.000	.383	0.430	1	0.000
2456838	.356	0.112	1	0.000	.356	0.469	1	0.000	.442	0.420	3	0.006	.356	0.313	1	0.000	.356	0.162	1	0.000	—	—	—	—	—	—	—	—
2456839	.430	0.122	1	0.000	.416	0.481	3	0.003	.405	0.428	2	0.004	.422	0.319	3	0.003	.425	0.162	3	0.001	—	—	—	—	—	—	—	—
2456840	—	—	—	—	.670	0.482	2	0.010	.671	0.428	2	0.009	.700	0.323	2	0.024	.950	0.168	1	0.000	.392	0.308	1	0.000	.392	0.420	1	0.000
2456841	—	—	—	—	—	—	—	—	—	—	—	—	.453	0.296	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456842	—	—	—	—	.453	0.480	2	0.002	.450	0.427	3	0.009	.461	0.296	1	0.000	.479	0.135	1	0.000	.429	0.317	1	0.000	.428	0.429	1	0.000
2456843	—	—	—	—	.945	0.497	1	0.000	.945	0.437	1	0.000	.711	0.311	2	0.027	.946	0.155	1	0.000	—	—	—	—	—	—	—	—
2456844	—	—	—	—	.946	0.502	1	0.000	.725	0.443	2	0.014	.608	0.320	3	0.025	.948	0.176	1	0.000	—	—	—	—	—	—	—	—
2456845	—	—	—	—	.440	0.494	3	0.004	.445	0.441	3	0.002	.471	0.313	3	0.019	.479	0.171	2	0.004	.380	0.329	1	0.000	.379	0.444	1	0.000
2456846	.412	0.175	1	0.000	.450	0.489	2	0.003	.471	0.438	3	0.009	.451	0.308	2	0.027	.499	0.157	1	0.000	.414	0.328	1	0.000	.411	0.446	1	0.000
2456847	—	—	—	—	.718	0.493	2	0.009	.715	0.434	2	0.001	.952	0.339	1	0.000	.953	0.157	1	0.000	—	—	—	—	—	—	—	—
2456848	—	—	—	—	.428	0.481	1	0.000	.702	0.435	2	0.002	.620	0.313	3	0.025	.615	0.164	3	0.005	—	—	—	—	—	—	—	—
2456849	—	—	—	—	—	—	—	—	.468	0.435	1	0.000	.445	0.303	1	0.000	.468	0.171	1	0.000	—	—	—	—	—	—	—	—
2456850	—	—	—	—	.839	0.485	3	0.014	.677	0.444	3	0.009	.732	0.324	2	0.025	.955	0.169	1	0.000	—	—	—	—	—	—	—	—
2456851	—	—	—	—	.751	0.485	2	0.011	.751	0.434	2	0.017	.752	0.340	2	0.010	.754	0.157	2	0.007	—	—	—	—	—	—	—	—
2456852	—	—	—	—	.532	0.481	1	0.000	.484	0.442	2	0.001	.535	0.321	1	0.000	.439	0.176	1	0.000	—	—	—	—	—	—	—	—
2456853	—	—	—	—	.610	0.491	2	0.003	.470	0.442	4	0.011	.464	0.318	3	0.015	.543	0.161	1	0.000	—	—	—	—	—	—	—	—
2456854	—	—	—	—	.533	0.483	4	0.005	.499	0.447	3	0.005	.427	0.333	1	0.000	.459	0.168	3	0.002	—	—	—	—	—	—	—	—
2456855	—	—	—	—	.522	0.493	2	0.001	.652	0.439	2	0.003	—	—	—	—	—	—	—	—	.381	0.336	1	0.000	.380	0.437	1	0.000
2456856	—	—	—	—	.677	0.499	1	0.000	.506	0.454	1	0.000	.425	0.308	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456857	.569	0.179	1	0.000	.630	0.504	5	0.006	.593	0.456	4	0.006	.625	0.342	3	0.022	.456	0.183	1	0.000	.573	0.339	1	0.000	.572	0.450	1	0.000
2456858	—	—	—	—	.484	0.500	4	0.002	.503	0.445	3	0.004	.493	0.330	4	0.010	.434	0.174	2	0.001	.430	0.328	1	0.000	.429	0.440	1	0.000
2456859	.524	0.177	2	0.016	.510	0.506	7	0.006	.525	0.450	7	0.002	.497	0.333	4	0.011	.519	0.175	3	0.002	.567	0.341	1	0.000	.567	0.452	1	0.000
2456860	.500	0.182	1	0.000	.542	0.508	4	0.007	.541	0.456	7	0.009	.631	0.350	5	0.033	.513	0.180	3	0.008	—	—	—	—	—	—	—	—
2456861	—	—	—	—	.463	0.516	3	0.004	.448	0.460	3	0.002	.471	0.342	3	0.013	.487	0.188	2	0.005	—	—	—	—	—	—	—	—
2456862	—	—	—	—	.701	0.522	3	0.014	.587	0.465	6	0.008	.678	0.341	3	0.020	.666	0.192	2	0.001	—	—	—	—	—	—	—	—
2456863	.449	0.184	1	0.000	.519	0.523	3	0.007	.535	0.462	3	0.010	.522	0.350	3	0.008	.470	0.192	2	0.002	—	—	—	—	—	—	—	—
2456864	—	—	—	—	.602	0.517	7	0.011	.661	0.451	6	0.006	.617	0.350	5	0.010	.617	0.178	4	0.007	.488	0.338	1	0.000	.496	0.452	1	0.000
2456865	.573	0.187	1	0.000	.559	0.505	6	0.007	.550	0.451	7	0.006	.553	0.340	5	0.011	.560	0.174	3	0.001	.518	0.338	2	0.001	.520	0.449	2	0.004
2456866	—	—	—	—	.518	0.500	4	0.006	.501	0.448	5	0.008	.564	0.344	2	0.001	.565	0.173	2	0.002	—	—	—	—	.514	0.454	1	0.000
2456867	.566	0.192	1	0.000	.516	0.503	6	0.012	.545	0.451	7	0.005	.516	0.336	5	0.012	.499	0.180	3	0.004	.490	0.353	2	0.000	.489	0.457	2	0.003
2456868	—	—	—	—	.547	0.505	5	0.005	.521	0.456	8	0.011	.531	0.344	5	0.013	.528	0.184	3	0.001	—	—	—	—	—	—	—	—
2456869	.574	0.203	1	0.000	.540	0.507	4	0.008	.510	0.454	6	0.009	.532	0.351	3	0.001	.441	0.187	3	0.007	.574	0.355	1	0.000	.573	0.465	1	0.000
2456870	—	—	—	—	.621	0.518	3	0.007	.607	0.468	4	0.009	.637	0.356	3	0.023	.735	0.195	2	0.005	—	—	—	—	—	—	—	—
2456871	—	—	—	—	.667	0.523	4	0.006	.590	0.474	6	0.012	.613	0.508	5	0.304	.731	0.211	4	0.013	—	—	—	—	—	—	—	—
2456872	.421	0.227	1	0.000	.507	0.539	9	0.006	.518	0.484	9	0.004	.529	0.378	6	0.006	.508	0.213	5	0.003	.422	0.374	1	0.000	.422	0.488	1	0.000
2456873	.371	0.227	1	0.000	.494	0.547	6	0.016	.487	0.497	8	0.011	.495	0.382	6	0.011	.469	0.226	5	0.005	—	—	—	—	—	—	—	—
2456874	.397	0.277	1	0.000	.539	0.598	4	0.010	.535	0.532	7	0.008	.517	0.416	5	0.010	.511	0.247	3	0.006	—	—	—	—	—	—	—	—
2456875	—	—	—	—	.559	0.639	5	0.007	.559	0.569	6	0.008	.562	0.438	3	0.000	.525	0.266	2	0.001	—	—	—	—	—	—	—	—
2456876	—	—	—	—	.512	0.653	5	0.004	.485	0.578	8	0.005	.528	0.457	4	0.007	.464	0.282	4	0.004	—	—	—	—	—	—	—	—
2456877	—	—	—	—	.628	0.643	5	0.007	.604	0.573	6	0.006	.662	0.463	3	0.014	.665	0.287	3	0.002	—	—	—	—	—	—	—	—
2456878	—	—	—	—	.496	0.659	7	0.020	.498	0.588	7	0.009	.492	0.469	6	0.011	.488	0.302	4	0.003	.470	0.467	1	0.000	.475	0.583	1	0.000
2456879	—	—	—	—	.575	0.691	4	0.005	.555	0.615	6	0.005	.553	0.491	4	0.009	.566	0.320	2	0.001	—	—	—	—	—	—	—	—
2456880	—	—	—	—	.533	0.712	5	0.021	.490	0.639	8	0.006	.552	0.516	6	0.008	.518	0.337	4	0.010	.419	0.503	1	0.000	.423	0.632	1	0.000
2456881	—	—	—	—	.525	0.733	5	0.013	.531	0.653	5	0.010	.555	0.525	4	0.013	.587	0.340	2	0.007	—	—	—	—	—	—	—	—
2456882	—	—	—	—	.526	0.741	5	0.018	.512	0.673	6	0.011	.524	0.541	5	0.007	.500	0.368	4	0.005	—	—	—	—	—	—	—	—
2456883	—	—	—	—	.597	0.764	4	0.005	.534	0.681	5	0.010	.579	0.557	3	0.007	.566	0.387	3	0.010	—	—	—	—	—	—	—	—

Table A.29. continued.

JD	*JD+*	U	N_U	$e_U mag$	*JD+*	B	N_B	$e_B mag$	*JD+*	V	N_V	$e_V mag$	*JD+*	R_C	N_{RC}	$e_{RC} mag$	*JD+*	I_C	N_{IC}	$e_{IC} mag$	*JD+*	R	N_{RC}	$e_R mag$	*JD+*	I	N_{IC}	$e_I mag$
2456884	.600	0.495	1	0.000	.552	0.768	4	0.010	.526	0.696	5	0.006	.543	0.569	3	0.004	.514	0.395	4	0.002	.594	0.569	1	0.000	.590	0.690	1	0.000
2456885	—	—	—	—	.548	0.785	4	0.004	.528	0.710	8	0.007	.550	0.589	4	0.008	.483	0.409	4	0.007	—	—	—	—	—	—	—	—
2456886	.368	0.543	1	0.000	.590	0.841	5	0.025	.556	0.746	7	0.013	.567	0.618	6	0.022	.601	0.450	4	0.009	—	—	—	—	—	—	—	—
2456887	—	—	—	—	.549	0.901	5	0.019	.536	0.820	7	0.020	.599	0.697	4	0.019	.556	0.512	5	0.011	.359	0.655	1	0.000	.359	0.784	1	0.000
2456888	.438	0.782	1	0.000	.498	0.992	7	0.015	.485	0.900	8	0.015	.558	0.765	4	0.018	.621	0.596	3	0.025	.348	0.744	1	0.000	.348	0.883	1	0.000
2456889	.478	0.834	2	0.059	.530	1.080	8	0.014	.533	0.977	8	0.025	.521	0.837	5	0.007	.550	0.643	4	0.005	.570	0.840	2	0.002	.571	0.983	2	0.002
2456890	—	—	—	—	.559	1.138	7	0.011	.534	1.038	10	0.007	.542	0.881	7	0.012	.615	0.692	3	0.008	—	—	—	—	—	—	—	—
2456891	.593	0.861	1	0.000	.509	1.150	7	0.003	.480	1.051	11	0.005	.499	0.899	7	0.005	.477	0.711	4	0.007	.488	0.897	2	0.002	.487	1.046	2	0.003
2456892	.348	0.920	3	0.064	.473	1.161	9	0.005	.472	1.070	14	0.007	.554	0.923	6	0.008	.558	0.728	6	0.008	.308	0.908	3	0.001	.298	1.063	2	0.003
2456893	—	—	—	—	.555	1.193	3	0.009	.526	1.098	6	0.010	.558	0.941	3	0.003	.508	0.736	4	0.010	—	—	—	—	—	—	—	—
2456894	.380	0.967	1	0.000	.517	1.223	7	0.005	.493	1.121	11	0.026	.570	0.966	5	0.009	.673	0.761	3	0.009	.359	0.969	1	0.000	.356	1.124	1	0.000
2456895	.323	0.929	2	0.004	.441	1.163	5	0.074	.453	1.108	9	0.008	.518	0.960	4	0.017	.513	0.739	2	0.009	.309	0.949	3	0.004	.319	1.106	2	0.000
2456896	—	—	—	—	.580	1.149	5	0.041	.569	1.083	8	0.043	.569	0.924	4	0.012	.622	0.716	3	0.012	—	—	—	—	—	—	—	—
2456897	—	—	—	—	.533	1.105	5	0.008	.483	1.012	8	0.031	.534	0.871	5	0.006	.600	0.671	5	0.010	—	—	—	—	—	—	—	—
2456898	.339	0.768	1	0.000	.492	1.034	7	0.021	.466	0.965	10	0.009	.548	0.812	5	0.036	.495	0.631	4	0.015	.339	0.834	2	0.003	.340	0.970	2	0.003
2456899	—	—	—	—	.643	0.950	2	0.004	.572	0.884	4	0.009	.645	0.768	2	0.011	.623	0.565	1	0.000	—	—	—	—	—	—	—	—
2456900	—	—	—	—	.566	0.890	2	0.014	.526	0.830	4	0.007	.617	0.700	1	0.000	.533	0.520	2	0.006	.510	0.703	1	0.000	.512	0.831	1	0.000
2456901	—	—	—	—	.628	0.820	2	0.007	.489	0.777	5	0.007	.627	0.657	2	0.007	.481	0.465	2	0.010	—	—	—	—	—	—	—	—
2456902	—	—	—	—	.496	0.797	2	0.006	.516	0.742	3	0.002	.503	0.624	2	0.004	.481	0.453	3	0.002	—	—	—	—	—	—	—	—
2456903	—	—	—	—	.464	0.752	2	0.000	.415	0.702	4	0.007	.477	0.574	1	0.000	.444	0.409	3	0.000	—	—	—	—	—	—	—	—
2456904	—	—	—	—	.568	0.714	8	0.012	.546	0.657	9	0.014	.584	0.539	6	0.005	.523	0.376	3	0.006	.582	0.541	1	0.000	.589	0.656	1	0.000
2456905	.320	0.349	2	0.003	.486	0.650	11	0.016	.493	0.596	11	0.009	.538	0.479	8	0.011	.499	0.321	4	0.005	.342	0.492	3	0.005	.372	0.602	2	0.003
2456906	.301	0.341	1	0.000	.404	0.645	3	0.065	.411	0.564	4	0.014	.421	0.452	2	0.017	.383	0.296	2	0.017	—	—	—	—	—	—	—	—
2456907	.288	0.284	1	0.000	.442	0.574	5	0.051	.446	0.508	6	0.010	.442	0.396	6	0.011	.377	0.240	3	0.009	—	—	—	—	—	—	—	—
2456908	.396	0.231	2	0.018	.463	0.556	5	0.066	.452	0.490	6	0.022	.472	0.373	3	0.006	.392	0.223	3	0.016	.459	0.369	2	0.002	.458	0.477	2	0.007
2456909	.623	0.212	1	0.000	.638	0.529	4	0.058	.549	0.462	6	0.013	.675	0.367	3	0.013	.624	0.210	1	0.000	.534	0.342	1	0.000	.533	0.448	1	0.000
2456910	—	—	—	—	.598	0.499	4	0.005	.588	0.418	5	0.078	.523	0.357	3	0.016	.383	0.182	2	0.001	—	—	—	—	—	—	—	—
2456911	—	—	—	—	.556	0.490	4	0.005	.622	0.442	3	0.002	.581	0.341	3	0.012	.482	0.171	2	0.000	—	—	—	—	—	—	—	—
2456912	—	—	—	—	.510	0.492	6	0.007	.500	0.450	7	0.008	.576	0.344	4	0.008	.465	0.176	2	0.005	—	—	—	—	—	—	—	—
2456913	—	—	—	—	.657	0.490	3	0.005	.658	0.445	3	0.013	.700	0.343	2	0.005	.586	0.172	1	0.000	.574	0.327	1	0.000	.573	0.429	1	0.000
2456914	—	—	—	—	.573	0.491	2	0.003	.573	0.439	2	0.010	.591	0.329	1	0.000	.591	0.166	1	0.000	.554	0.335	1	0.000	.555	0.430	1	0.000
2456915	—	—	—	—	.407	0.491	5	0.002	.404	0.444	4	0.004	.498	0.336	2	0.003	.510	0.168	2	0.002	.384	0.330	1	0.000	.384	0.439	1	0.000
2456916	—	—	—	—	.541	0.491	4	0.002	.526	0.445	6	0.007	.507	0.333	7	0.009	.467	0.174	4	0.007	—	—	—	—	—	—	—	—
2456917	.377	0.207	1	0.000	.513	0.496	6	0.006	.517	0.440	6	0.007	.510	0.329	6	0.009	.460	0.169	5	0.002	.394	0.336	1	0.000	.391	0.446	1	0.000
2456918	.534	0.181	1	0.000	.421	0.494	6	0.009	.405	0.441	7	0.009	.426	0.334	4	0.008	.391	0.169	3	0.003	.410	0.330	2	0.012	.410	0.438	2	0.009
2456919	—	—	—	—	.426	0.491	5	0.007	.403	0.438	4	0.004	.404	0.323	4	0.011	.396	0.164	2	0.007	—	—	—	—	—	—	—	—
2456920	—	—	—	—	.531	0.488	5	0.010	.508	0.449	7	0.012	.593	0.349	4	0.019	.492	0.169	2	0.000	.261	0.328	1	0.000	.259	0.436	1	0.000
2456922	—	—	—	—	.562	0.480	4	0.013	.555	0.451	4	0.005	.566	0.334	4	0.008	.392	0.165	3	0.005	—	—	—	—	—	—	—	—
2456923	—	—	—	—	.466	0.482	4	0.010	.485	0.450	4	0.016	.470	0.343	4	0.015	.384	0.173	4	0.008	—	—	—	—	—	—	—	—
2456924	—	—	—	—	.488	0.487	6	0.009	.483	0.442	6	0.007	.480	0.337	3	0.003	.464	0.166	2	0.003	—	—	—	—	—	—	—	—
2456925	—	—	—	—	.495	0.486	5	0.005	.495	0.429	7	0.015	.525	0.331	3	0.006	.426	0.153	3	0.012	.451	0.330	2	0.004	.452	0.436	2	0.007
2456926 —	—	—	—	.778	0.491	1	0.000	—	—	—	—	.780	0.339	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—	
2456927	—	—	—	—	—	—	—	—	.773	0.442	1	0.000	.774	0.386	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456928	—	—	—	—	.420	0.491	3	0.007	.422	0.438	3	0.000	.379	0.331	3	0.013	.365	0.167	2	0.004	.542	0.331	1	0.000	.540	0.440	1	0.000
2456929	—	—	—	—	.646	0.471	2	0.007	.534	0.435	3	0.010	.647	0.357	2	0.032	.400	0.165	2	0.001	—	—	—	—	—	—	—	—
2456930	—	—	—	—	.496	0.497	1	0.000	.683	0.400	2	0.048	.497	0.338	1	0.000	.497	0.163	1	0.000	—	—	—	—	—	—	—	—
2456931	—	—	—	—	.678	0.491	4	0.009	.604	0.440	3	0.006	.604	0.337	3	0.010	.494	0.157	1	0.000	—	—	—	—	—	—	—	—
2456932	—	—	—	—	.633	0.485	3	0.005	.633	0.436	3	0.002	.504	0.334	2	0.004	.486	0.159	1	0.000	—	—	—	—	—	—	—	—
2456933	—	—	—	—	.557	0.477	4	0.005	.557	0.441	4	0.011	.589	0.335	3	0.013	.473	0.152	2	0.001	—	—	—	—	—	—	—	—
2456934	—	—	—	—	.567	0.476	2	0.004	.567	0.422	2	0.001	.564	0.316	2	0.008	.616	0.151	1	0.000	—	—	—	—	—	—	—	—
2456935	—	—	—	—	.455	0.474	1	0.000	.456	0.436	1	0.000	.401	0.314	3	0.007	.488	0.153	2	0.001	—	—	—	—	—	—	—	—
2456936	—	—	—	—	.446	0.481	1	0.000	.448	0.433	1	0.000	.450	0.329	1	0.000	.451	0.161	1	0.000	—	—	—	—	—	—	—	—
2456937	—	—	—	—	.584	0.476	3	0.012	.583	0.442	3	0.008	.638	0.318	2	0.002	.441	0.145	1	0.000	.467	0.331	1	0.000	.476	0.437	1	0.000
2456940	—	—	—	—	.540	0.478	1	0.000	.543	0.432	1	0.000	—	—	—	—	.546	0.161	1	0.000	—	—	—	—	—	—	—	—
2456941	—	—	—	—	.804	0.445	1	0.000	.802	0.451	1	0.000	.802	0.338	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—

Table A.29. continued.

JD	*JD+*	*U*	N_U	$e_U mag$	*JD+*	*B*	N_B	$e_B mag$	*JD+*	*V*	N_V	$e_V mag$	*JD+*	R_C	N_{Rc}	$e_{Rc} mag$	*JD+*	I_C	N_{Ic}	$e_{Ic} mag$	*JD+*	*R*	N_{Rc}	$e_R mag$	*JD+*	*I*	N_{Ic}	$e_I mag$
2456943	—	—	—	—	.544	0.482	2	0.002	.271	0.439	1	0.000	—	—	—	—	—	—	—	—	.271	0.348	1	0.000	.271	0.440	1	0.000
2456944	—	—	—	—	.735	0.466	1	0.000	.734	0.437	1	0.000	.735	0.349	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456949	—	—	—	—	.598	0.476	2	0.005	.598	0.424	2	0.001	.691	0.333	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456950	—	—	—	—	.630	0.484	2	0.011	.632	0.433	2	0.006	.633	0.333	2	0.011	.400	0.159	1	0.000	—	—	—	—	—	—	—	—
2456954	—	—	—	—	.724	0.488	1	0.000	.725	0.434	1	0.000	.726	0.330	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—
2456955	—	—	—	—	.508	0.469	2	0.004	.516	0.431	2	0.008	.501	0.328	2	0.010	.283	0.156	1	0.000	—	—	—	—	—	—	—	—
2456957	—	—	—	—	.584	0.464	2	0.002	.586	0.418	2	0.001	.586	0.320	2	0.006	.413	0.148	1	0.000	—	—	—	—	—	—	—	—
2456958	—	—	—	—	.498	0.476	2	0.004	.499	0.429	2	0.002	.501	0.331	2	0.010	.338	0.158	1	0.000	—	—	—	—	—	—	—	—
2456959	—	—	—	—	.547	0.470	2	0.000	.549	0.416	2	0.006	.550	0.319	2	0.001	—	—	—	—	—	—	—	—	—	—	—	—
2456979	—	—	—	—	—	—	—	—	.716	0.418	1	0.000	.715	0.287	1	0.000	—	—	—	—	—	—	—	—	—	—	—	—



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