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Improved elements of the eclipsing binary ASASSN-V J190602.85+284752.5 Lyr

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Abstract: *The authors present a phased light curve with the Min II and an improved period of ASASSN-V J190602.85+284752.5 Lyr. The published periods from ASAS-SN and ATLAS could be significantly improved.*

Introduction

ASASSN-V J190602.85+284752.5 Lyr was discovered as a photometric variable by the ASAS-SN-project [2] and classified as eclipsing binary. The amplitude is given as 1.42 mag, 15.19-16.61 mag (V). Two different ASAS-SN periods exist for this variable. The ASAS-SN Variable Stars Database (https://asas-sn.osu.edu/variables) lists a period of P = 2.3061997 d. However, the VSX [5] gives a period of P = 2.30606 d, which was obviously imported from a more recent ASAS-SN publication [6].

During these studies, we furthermore discovered several period solutions for this star in an extensive datasheet prepared by the ATLAS project [4]. One of these periods (P = 2.3061997 d) is similar to ours. We have at our disposal 21 time series with approx. 3000 images that were taken between 2009 and 2020. The observation time per night was between 2 and 7 hours.

Because the minima derived from our data cannot be well represented by either the ASAS-SN or ATLAS periods, we aim to use our data to present an improved period solution.

Periods known so far:

Simbad	no information
ASAS-SN	2.3061997 d
ATLAS	2.306545 d
VSX	2.30606 d

Observations

400mm ASA Astrograph f/3.7
f = 1471 mm
FLI Proline 16803 CCD-Camera
V-filter
t = 120 sec.
Wolfgang Moschner, Astrocamp/Nerpio, Spain

102mm f/5.0 TeleVue Refractor
f = 509 mm
SIGMA 1603 CCD-Camera, Kodak KAF1603ME
IR & UV cut-off filter
t = 90 sec.
Peter Frank, Velden, Germany

Data analysis

Muniwin [1] and self-written programs by Franz Agerer and Lienhard Pagel were used for the analysis of the frames, after bias, dark and flatfield correction of the exposures. The weighted average of five comparison stars was used.

Explanations:

HJD = heliocentric UTC timings (JD) of the observed minima
mag = (raw instrumental) magnitude

G-band mean magnitude (Vega) = 350-1000 nm
Integrated BP mean magnitude (Vega) = 330- 680 nm
Integrated RP mean magnitude (Vega) = 640-1000 nm

Explanations to the light curve:
The colors of the symbols denote different nights.

All coordinates are taken from the Gaia DR2 catalogue [3].

The coordinates (epoch J2000) are computed by VizieR, and are not part of the original data from Gaia (note that the computed coordinates are computed from the positions and the proper motions).

ASASSN-V J190602.85+284752.5 Lyr

Cross-ID
= UCAC3 238-156521
= Gaia DR2 2037664052966323200
= ATOID J286.5118+28.7979

Right ascension: 19h06m02.8536s at epoch and equinox J2000
Declination: +28° 47' 52.509" at epoch and equinox J2000
Barycentric right ascension (ICRS) at Epoch=2015.5: 286.511886132° +/- 0.02 mas
Barycentric declination (ICRS) at Epoch=2015.5: 28.797915250° +/- 0.02 mas

Gaia DR2 Catalog:
15.1230 mag G-band mean magnitude (Vega)
15.4272 mag Integrated BP mean magnitude (Vega)
14.6538 mag Integrated RP mean magnitude (Vega)
0.7734 mag BP-RP colour (photBpMeanMag-photRMeanMag)

Results

With our observations obtained with the 400 mm ASA astrograph in Nerpio we have created a phased light curve. The presented elements were calculated by the method of least squares, taking into account all our minima (see table below).

Our ephemeris represents a significant improvement of the ATLAS, VSX- and ASAS-SN periods, since our minima are not represented well with these periods

The Min II can be seen in the phase-related light curves of ATLAS and also of ASAS-SN.

ASASSN-V J190602.85+284752.5 Lyr **new elements**

Amplitude: Min I: 1.70 mag (instr.) Min II: 0.15 mag (instr.)
Type: EA type eclipsing binary

Min I = HJD (UTC) 2457921.6068 + 2.3061305*E
+-0.0014 +-0.0000026

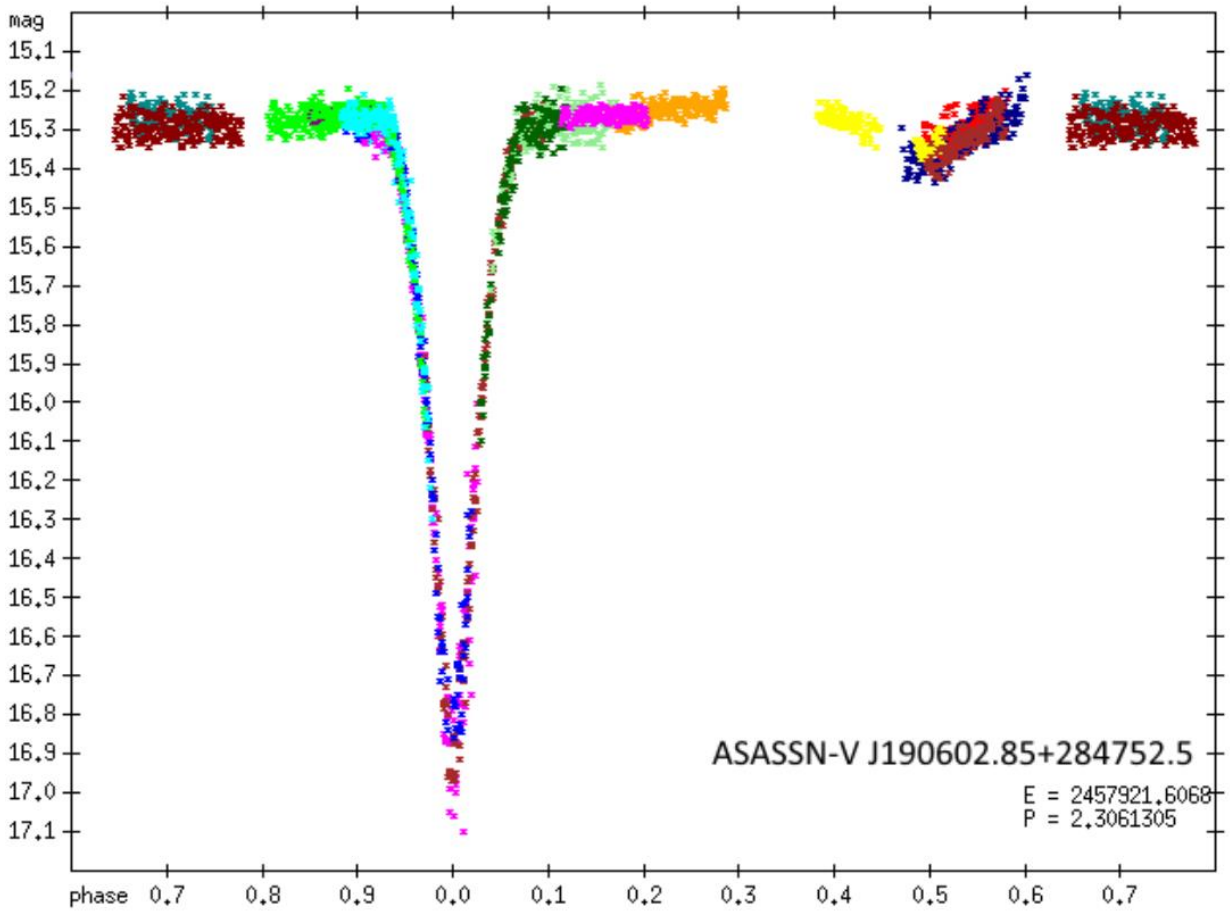

Figure 1: Phased light curve of ASASSN-V J190602.85+284752.5 Lyr using the ephemeris given by the authors. The vertical axis shows raw instrumental magnitudes. A FLI Proline 16803 camera + an V-filter (2016-2020) was used. Presented elements were calculated by taking into account all minima (see table below) with the method of least squares.

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Source
P. Frank	**2456918,4394**	**I**	**-435**	**-0,0006**	
W. Moschner	**2457921,6068**	**I**	**0**	**0,0000**	
W. Moschner	**2457935,4413**	**I**	**6**	**-0,0023**	
Moschner/Frank	**2457949,2821**	**I**	**12**	**0,0018**	**reduced min.**
Moschner/Frank	**2458009,2396**	**I**	**38**	**-0,0002**	**reduced min.**
W. Moschner	**2458682,6271**	**I**	**330**	**-0,0027**	
Moschner/Frank	**2458705,6923**	**I**	**340**	**0,0011**	**reduced min.**
Moschner/Frank	**2458712,6103**	**I**	**343**	**0,0007**	**reduced min.**

Table 1: Minima ASASSN-V J190602.85+284752.5 Lyr, O-C using the ephemeris given by the authors.

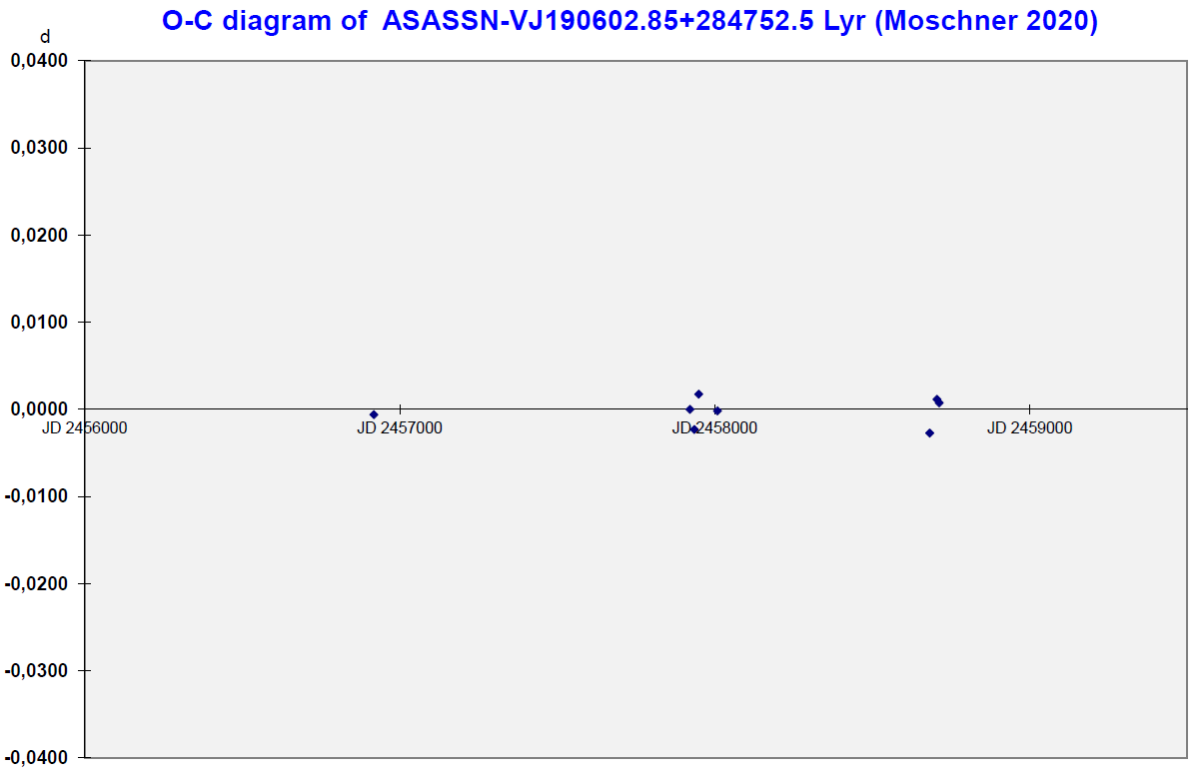

Figure 2: O-C-diagram for ASASSN-V J190602.85+284752.5 Lyr using the ephemeris given by the authors.

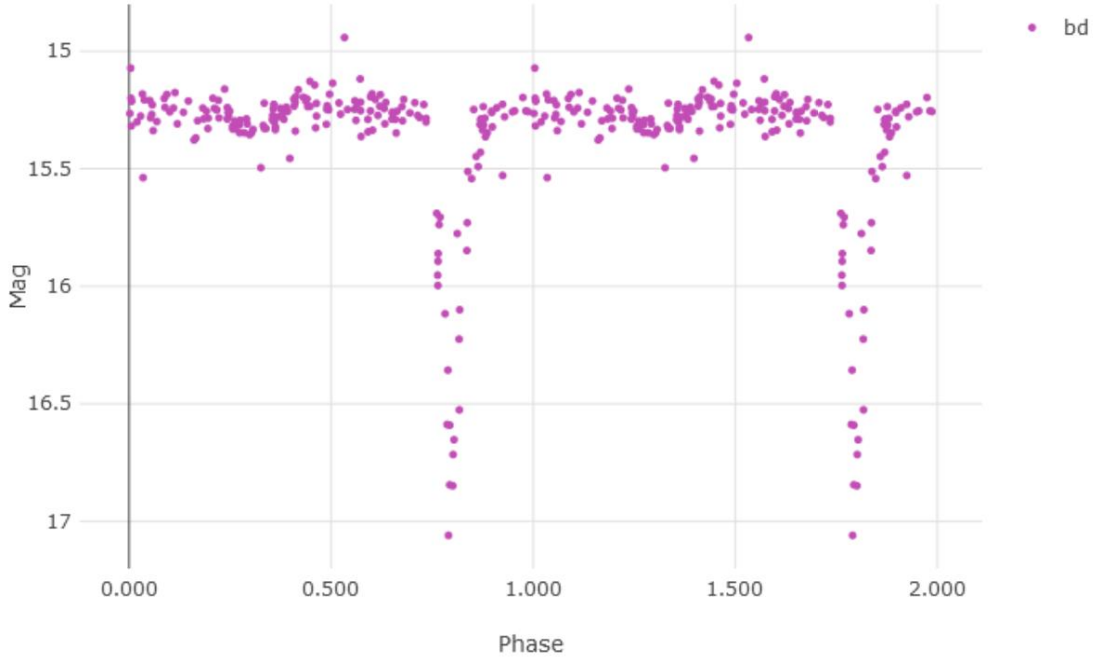

Figure 3: Phased light curve of ASASSN-V J190602.85+284752.5 Lyr using the ephemeris and data from ASAS-SN with the period 2.3061997 d.

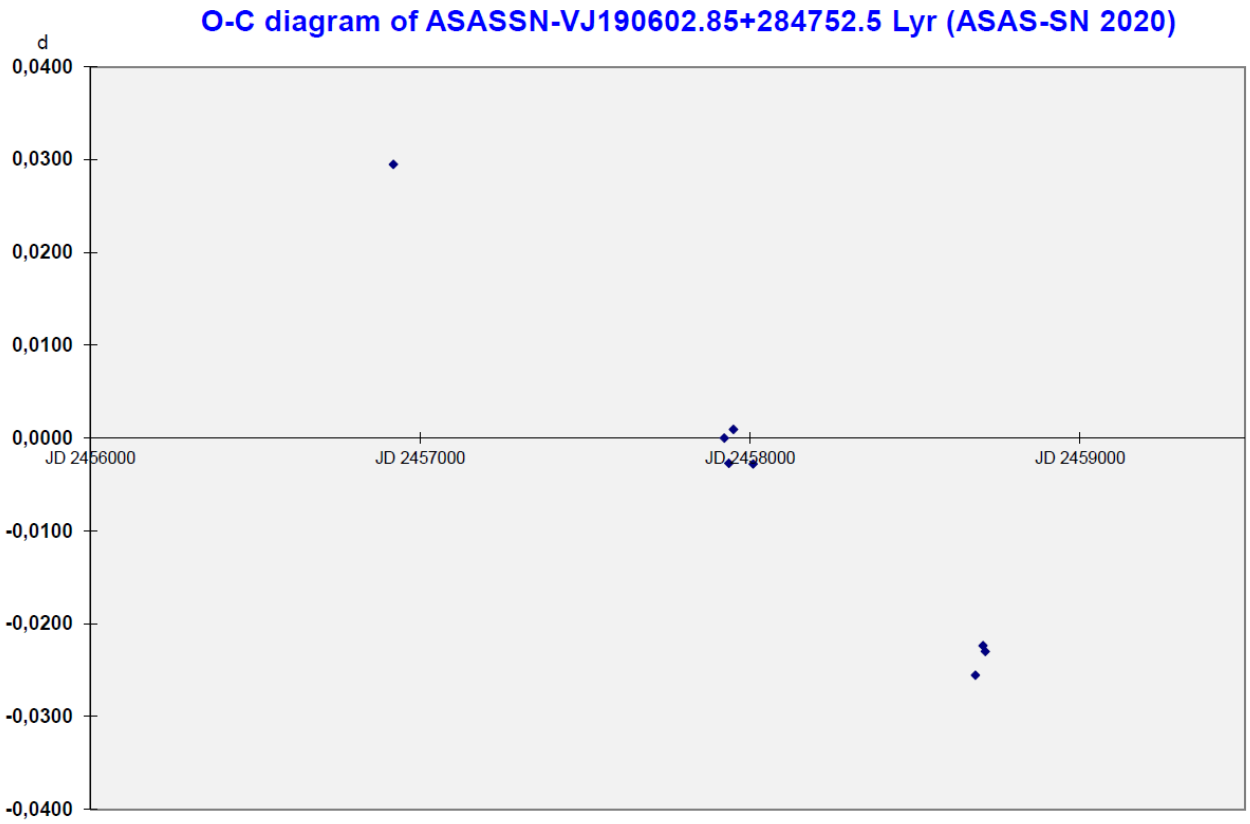

Figure 4: O-C-diagram for ASASSN-V J190602.85+284752.5 Lyr using the ephemeris HJD 2457921.6068 + 2.3061997 d*E (period from ASAS-SN, minima from the authors).

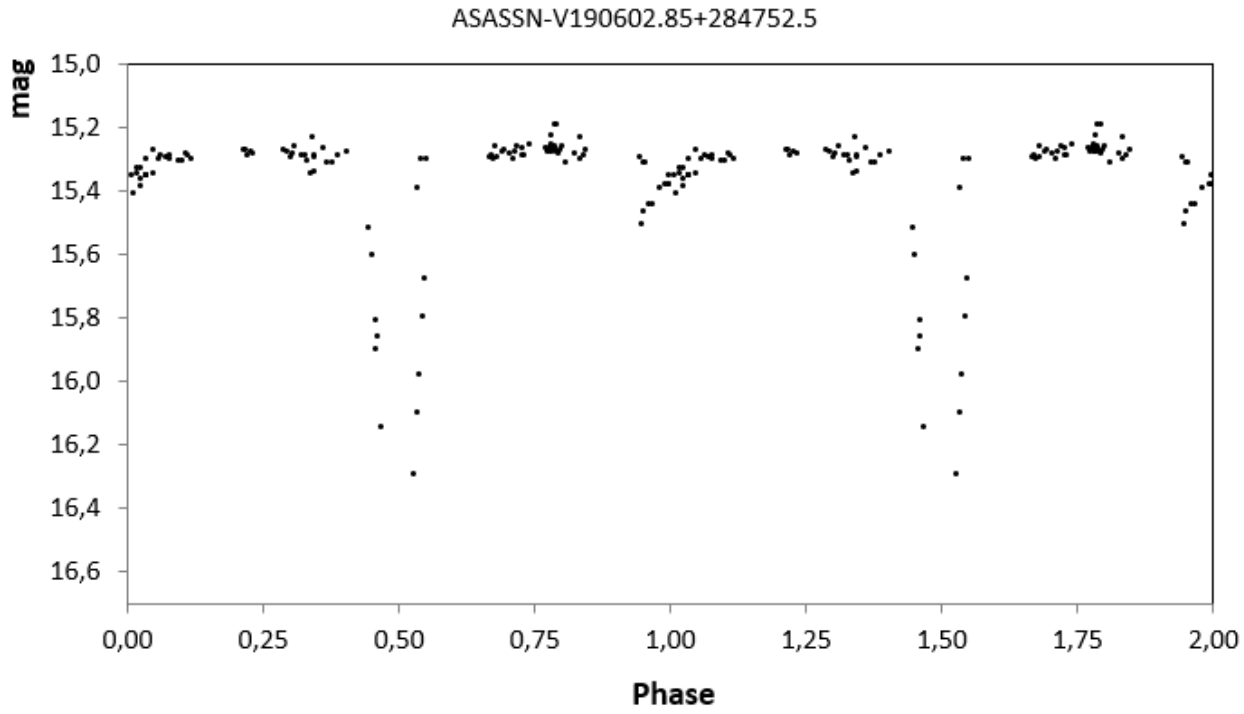

Figure 5: Phased light curve of ASASSN-V J190602.85+284752.5 Lyr using the ATLAS data and the ephemeris HJD 2457921.6068 + 2.306545 d*E (period from ATLAS).

Acknowledgements

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