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Improved elements of the eclipsing binary ASASSN-V J190646.62+293110.4 Lyr

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Abstract: *The authors present a phased light curve and an improved period of ASASSN-V J190646.62+293110.4 Lyr. Because a weak Min II was discovered, the period listed in the ASAS-SN catalogue had to be halved. In addition, the ATLAS period could be significantly improved.*

Introduction

ASASSN-V J190646.62+293110.4 Lyr was discovered as a photometric variable by the ASAS-SN-project [2] and classified as eclipsing binary. The amplitude is given as 0.58 mag, 15.04-15.62 mag (V). With this data, the variable is listed in the VSX [5]. The same star can be found in the ASAS-SN database under the ID ASASSN-V J190646.66 + 293110.2. This confusing situation concerning the ASAS-SN identifiers is commented on in more detail below (see Section Results).

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 = 0.687538 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, VSX or ATLAS periods, we aim to use our data to present an improved period solution. Furthermore, the phased light curves from the ATLAS and ASAS-SN databases clearly indicate the presence of a Min II that was not taken into account in the period determinations.

Periods known so far:

Simbad	no information
ASAS-SN	1.3749641 d
VSX	1.37496 d
ATLAS	0.687538 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 J190646.62+293110.4 Lyr

Cross-ID
= ASASSN-V J190646.66+293110.2 (designation in the ASAS-SN database)
= UCAC3 240-156658
= Gaia DR2 2037861346585848960
= ATOID J286.6942+29.5195

Right ascension: 19h06m46.6161s at epoch and equinox J2000
Declination: +29° 31' 10.436" at epoch and equinox J2000
Barycentric right ascension (ICRS) at Epoch=2015.5: 286.694233176° +/- 0.02 mas
Barycentric declination (ICRS) at Epoch=2015.5: 29.519543351° +/- 0.03 mas

Gaia DR2 Catalog:
14.9725 mag G-band mean magnitude (Vega)
15.3747 mag Integrated BP mean magnitude (Vega)
14.3833 mag Integrated RP mean magnitude (Vega)
0.9914 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. For this purpose we first used the ASAS-SN period (1.3749641 d). ASAS-SN data clearly indicate the presence of a secondary minimum with a depth of about 0.10 mag (V). Half the ASAS-SN period was therefore the starting point for the search for the new correct period. 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 period, since our minima are not represented with this period. The O-C diagram shows a slightly curved line. The period may not be constant. For this reason, further monitoring of this variable is advisable.

Some cautionary words are due concerning the perplexing situation that the star has two different ASAS-SN identifiers. While the ASAS-SN database lists this object under the designation of ASASSN-V J190646.66+293110.2, the VSX contains a recent entry that assigns the identifier ASASSN-V J190646.62+293110.4 to a star with similar parameters at a distance of 0.04 arcmin from the aforementioned object. Obviously, both identifiers belong to the same star.

According to the VSX, the identifier ASASSN-V J190646.62+293110.4 goes back to a paper by "Jayasinghe et al. (2020, in preparation)" [6]; no further information is given. We checked the recently published papers by these authors that present new additions to the ASAS-SN catalogue and found that the VSX entry obviously goes back to [6]. However, the variable star discussed here is not mentioned in this paper. Unfortunately, the more recent elements from the VSX (P = 1.3749641 d; magnitude range: 15.15 - 15.90 mag (V)) are not suited to represent our data either.

To avoid confusion as best as possible, we here chose to use the more recent identifier from [6] that is also contained in the VSX. However, we caution that care needs to be taken when dealing with ASAS-SN identifiers.

ASASSN-V J190646.62+293110.4 Lyr **new elements**

Amplitude: Min I: 1.15 mag (instr.) Min II: 0.10 mag (instr.)
Type: EA type eclipsing binary

Min I = HJD (UTC) 2455074.5737 + 0.6874777*E
+-0.0012 +-0.0000022

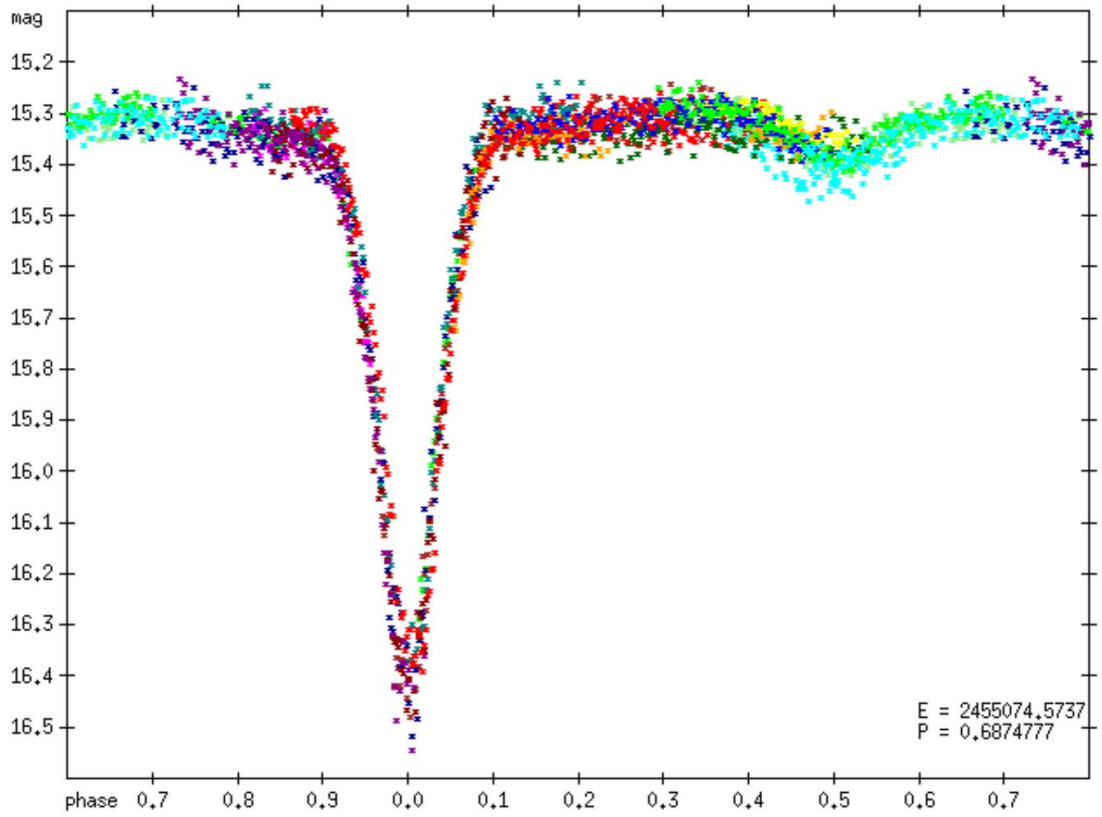

Figure 1: Phased light curve of ASASSN-V J190646.62+293110.4 Lyr using the ephemeris given by the authors. The vertical axis shows raw instrumental magnitudes. An FLI Proline 16803 camera + a V-filter (2016-2020) was used. Presented elements were calculated by taking into account all minima (see table below) with the method of least squares.

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)
P. Frank	2455074,5737	I	0	0,0000
P. Frank	2455380,5004	I	445	-0,0008
P. Frank	2455387,3747	I	455	-0,0013
P. Frank	2455409,3737	I	487	-0,0016
P. Frank	2456500,4013	I	2074	-0,0011
P. Frank	2456568,4605	I	2173	-0,0022
P. Frank	2456918,3854	I	2682	-0,0035
W. Moschner	2457626,4866	I	3712	-0,0043
W. Moschner	2457893,5715	II	4100,5	-0,0044
W. Moschner	2457921,4178	I	4141	-0,0010
W. Moschner	2457935,5139	II	4161,5	0,0018
W. Moschner	2457949,6049	I	4182	-0,0005
W. Moschner	2457978,4797	I	4224	0,0002
W. Moschner	2458009,4153	I	4269	-0,0007
W. Moschner	2458300,5608	II	4692,5	-0,0019
W. Moschner	2458324,6252	II	4727,5	0,0007
W. Moschner	2458601,6752	II	5130,5	-0,0028
W. Moschner	2458682,4609	I	5248	0,0042
W. Moschner	2458705,4880	II	5281,5	0,0008
W. Moschner	2458712,3655	II	5291,5	0,0036
P. Frank	2458988,3888	I	5693	0,0046
W. Moschner	2459025,5116	I	5747	0,0036

Table 1: Minima ASASSN-V J190646.62+293110.4 Lyr, O-C using the ephemeris given by the authors.

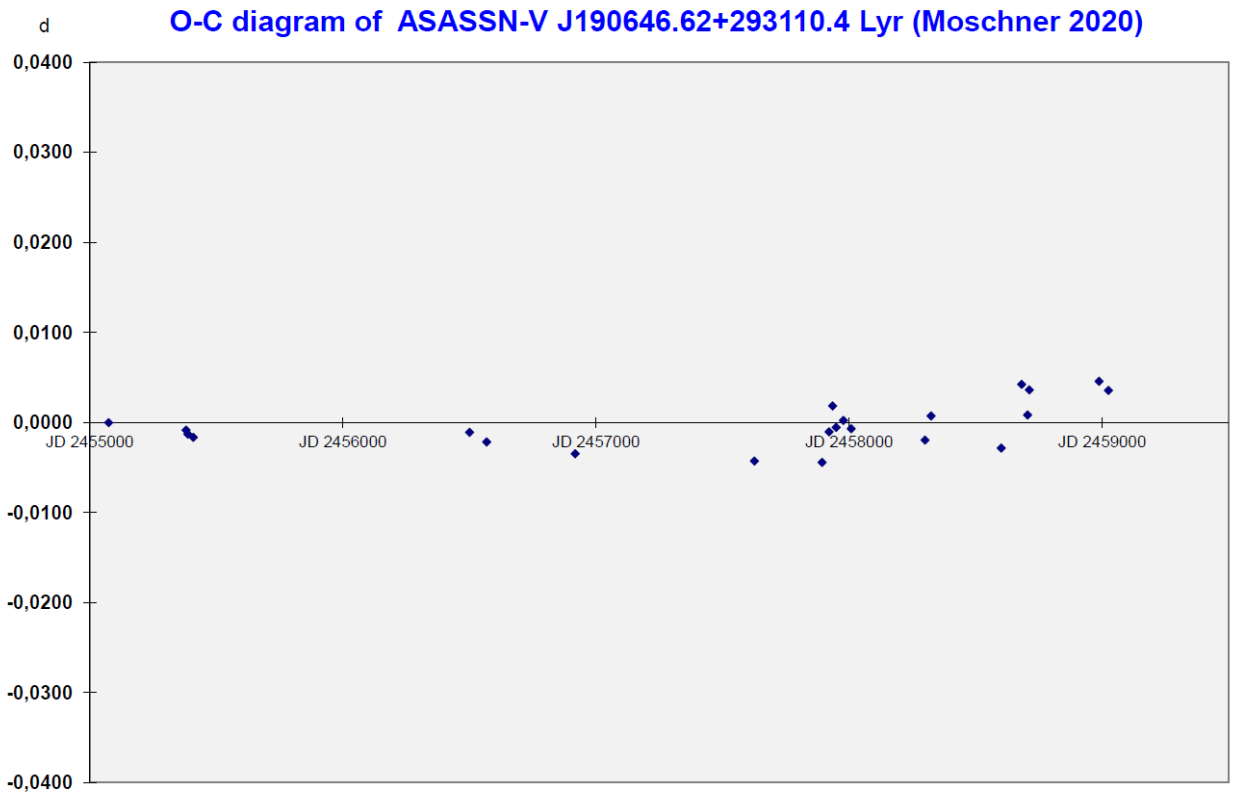

Figure 2: O-C-diagram for ASASSN-V J190646.62+293110.4 Lyr using the ephemeris given by the authors.

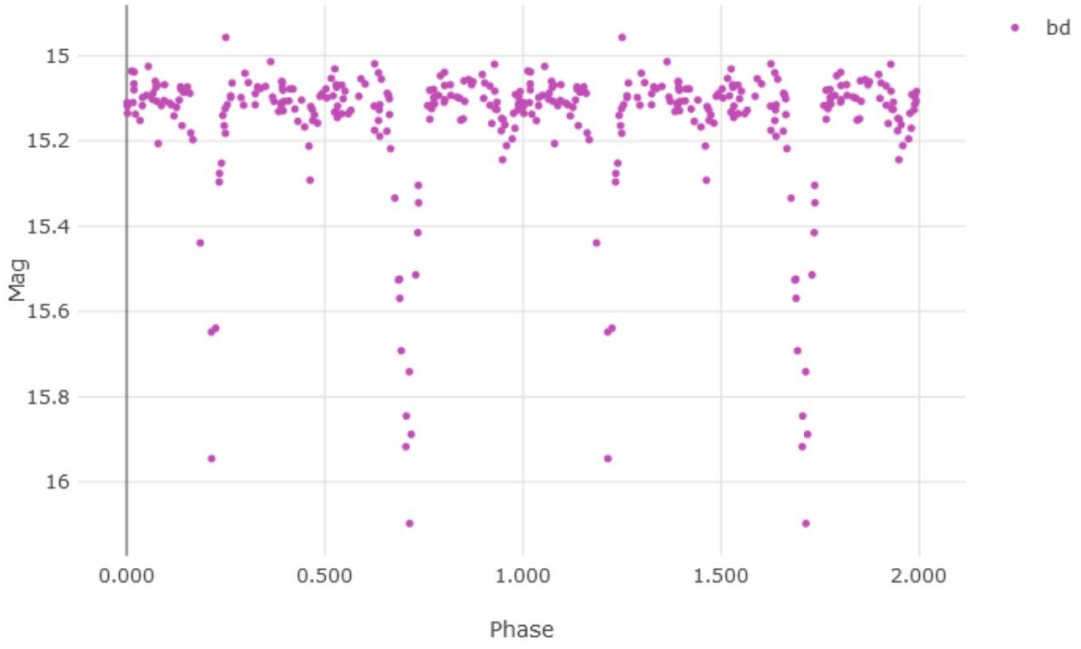

Figure 3: Phased light curve of ASASSN-V J190646.62+293110.4 Lyr using the ephemeris and data from ASAS-SN with the period 1.3749641 d.

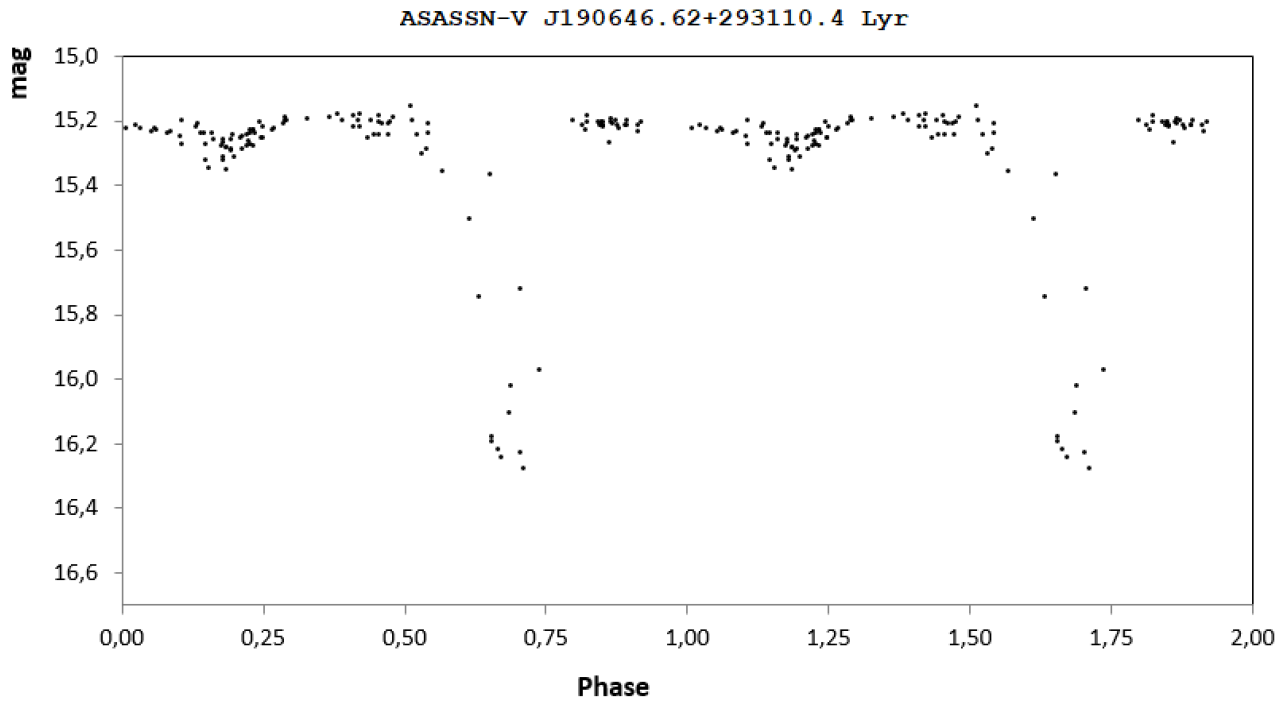

Figure 4: Phased light curve of ASASSN-V J190646.62+293110.4 Lyr using the ATLAS data and the ephemeris HJD 2455074.5737 + 0.687538 d*E (period from ATLAS).

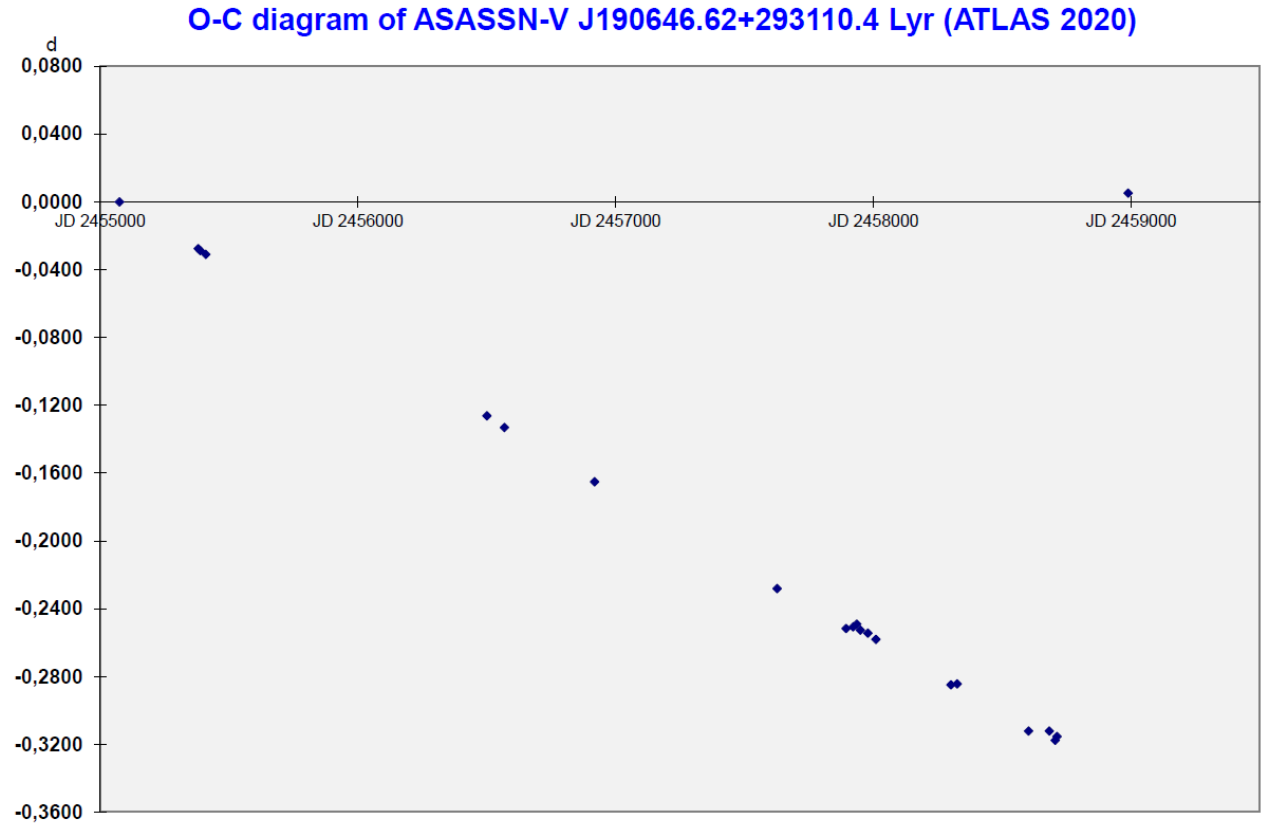

Figure 5: O-C-diagram for ASASSN-V J190646.62+293110.4 Lyr using the ephemeris HJD 2455074.5737 + 0.687538 d*E (period from ATLAS, minima from the authors).

Acknowledgements

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