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The period of the eclipsing binary GSC 02134-00688 Lyr

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Abstract: *The authors present a period solution and a phased light curve of GSC 02134-00688 Lyr. GSC 02134-00688 Lyr was discovered by Peter Frank in 2010. The variable is not listed in the ASAS-SN catalogue and the period solution from the ATLAS catalogue is wrong. No Min II is discernible in our light curves.*

Introduction

GSC 02134-00688 Lyr was discovered as a photometric variable by Peter Frank in 2010 and classified as eclipsing binary. The amplitude was given as 0.50 mag, 13.9-14.4 mag (V). The variable is not listed in the VSX [5] and the ASAS-SN catalogue of variable stars [2].

During this study, we discovered several period solutions for this star in an extensive datasheet prepared by the ATLAS project [4]. All of these periods are obviously wrong (see e. g. Fig 4 below). 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.

Since the minima derived from our data cannot be represented by the ATLAS periods at all, we have used our data to present a correct period solution.

Periods known so far:

Simbad	no information
ASAS-SN	no information
ATLAS	1.794486 d
VSX	no information

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 [6] 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	= 350-1000 nm
Integrated BP mean magnitude	= 330- 680 nm
Integrated RP mean magnitude	= 640-1000 nm

Explanations to the light curve:
Different colors denote different observing 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).

GSC 02134-00688 Lyr

Cross-ID
= Fr282 Lyr
= Gaia DR2 2037815407615040384
= ATOID J286.4911+29.1835

Right ascension: 19h 05m 57.9125s at epoch and equinox J2000
Declination: +29° 11' 01.649" at epoch and equinox J2000
Barycentric right ascension (ICRS) at Epoch=2015.5: 286.491176261° +/- 0.01 mas
Barycentric declination (ICRS) at Epoch=2015.5: 29.183569817° +/- 0.02 mas

Gaia DR2 Catalog:
13.6481 mag G-band mean magnitude
14.7677 mag Integrated BP mean magnitude
12.6026 mag Integrated RP mean magnitude
2.1651 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 the first correct period solution for this star.

In the accuracy limit of our observations, no Min II was found. It is therefore possible that the period is actually twice the value presented here. This, however, cannot be determined with the available data.

GSC 02134-00688 Lyr new elements

Amplitude: Min I: 0.50 mag (instr.) Min II: 0.00 mag (instr.)
Type: EA type eclipsing binary

Min I = HJD (UTC) 2455096.3561 + 1.9249815*E
+-0.0011 +-0.0000016

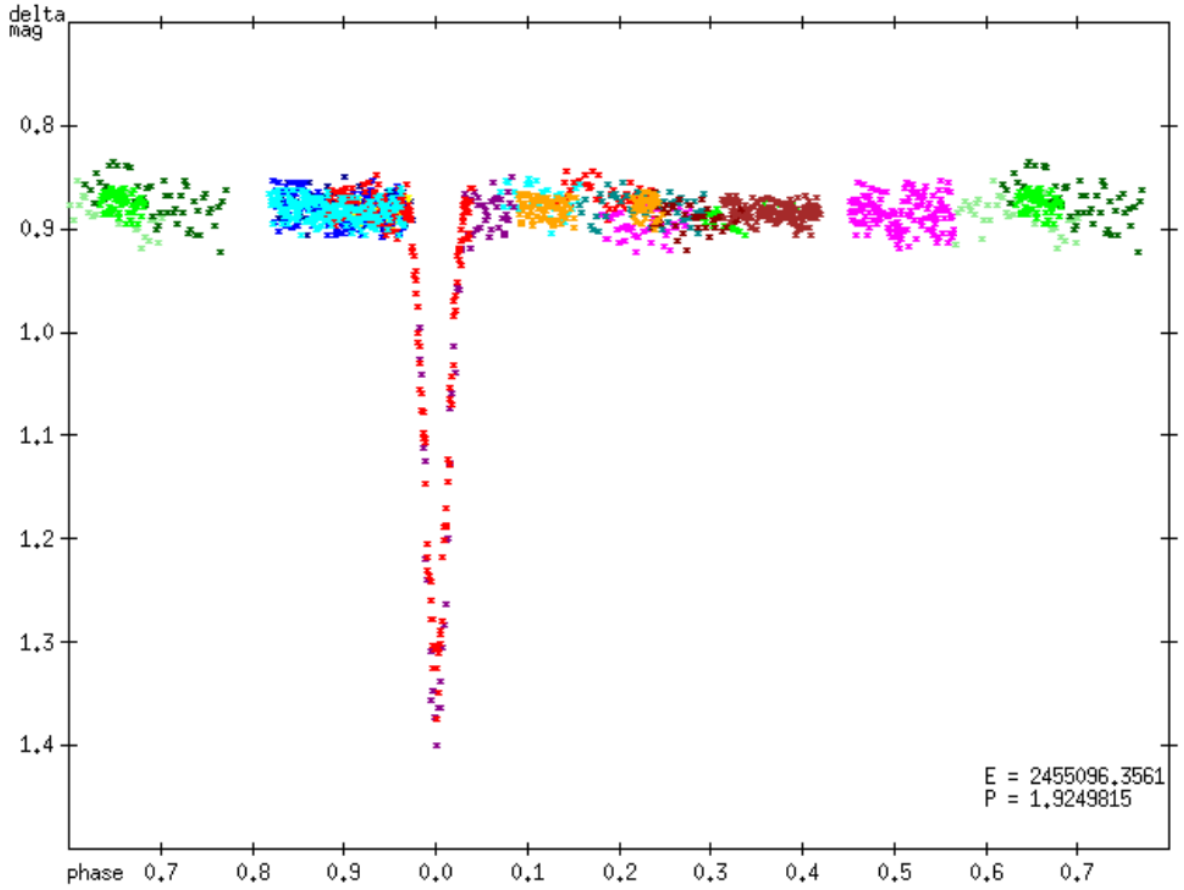

Figure 1: Phased light curve of GSC 02134-00688 Lyr using the ephemeris given by the authors. The vertical axis shows raw differential magnitudes. Different colors denote different observing nights. Only the data points from the better nights were used to display the light curve. An FLI Proline 16803 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	2455096,3561	I	0	0,0000
P. Frank	2455429,3758	I	173	-0,0021
Moschner/Frank	2458022,3280	I	1520	0,0000
W. Moschner	2458324,5510	I	1677	0,0009
W. Moschner	2458682,5959	I	1863	-0,0007
W. Moschner	2458990,5938	I	2023	0,0001
P. Frank	2459069,5201	I	2064	0,0022
P. Frank	2459071,4431	I	2065	0,0002

Table 1: Minima GSC 02134-00688 Lyr, O-C using the ephemeris given by the authors.

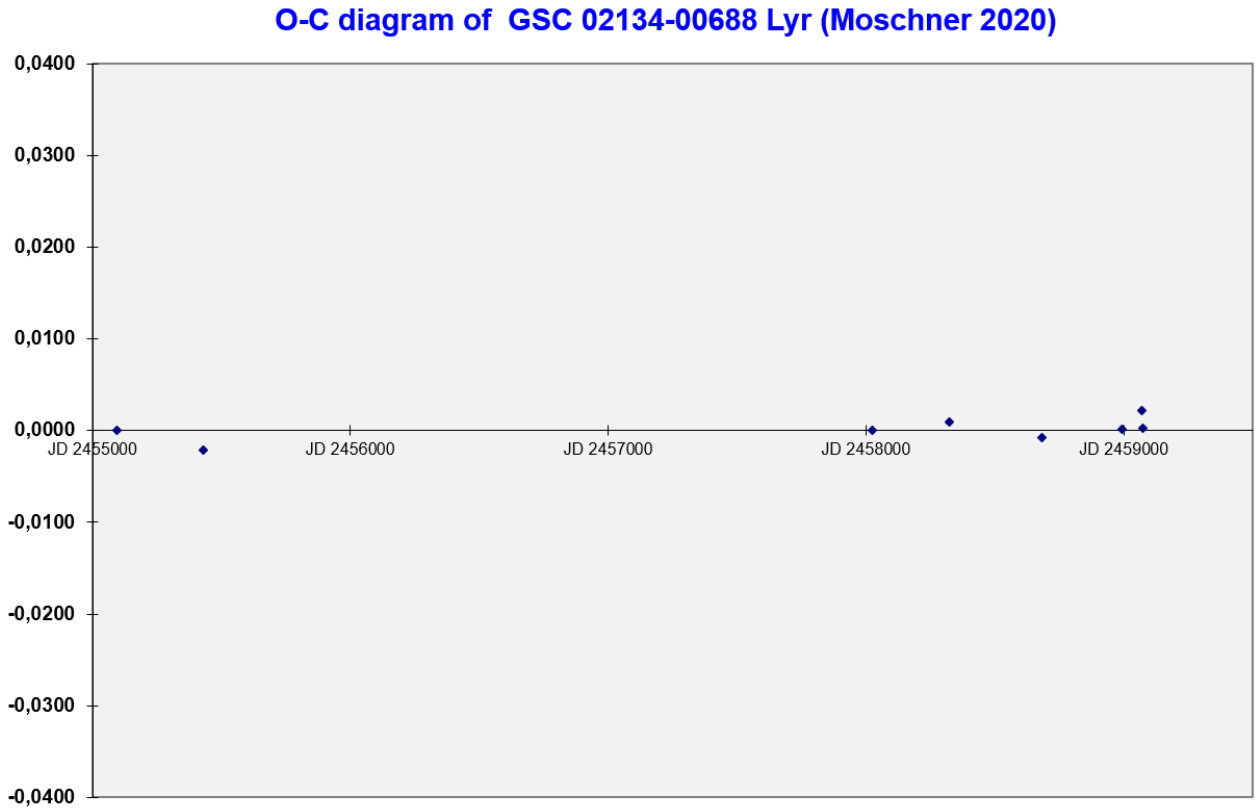

Figure 2: O-C-diagram for GSC 02134-00688 Lyr using the ephemeris given by the authors.

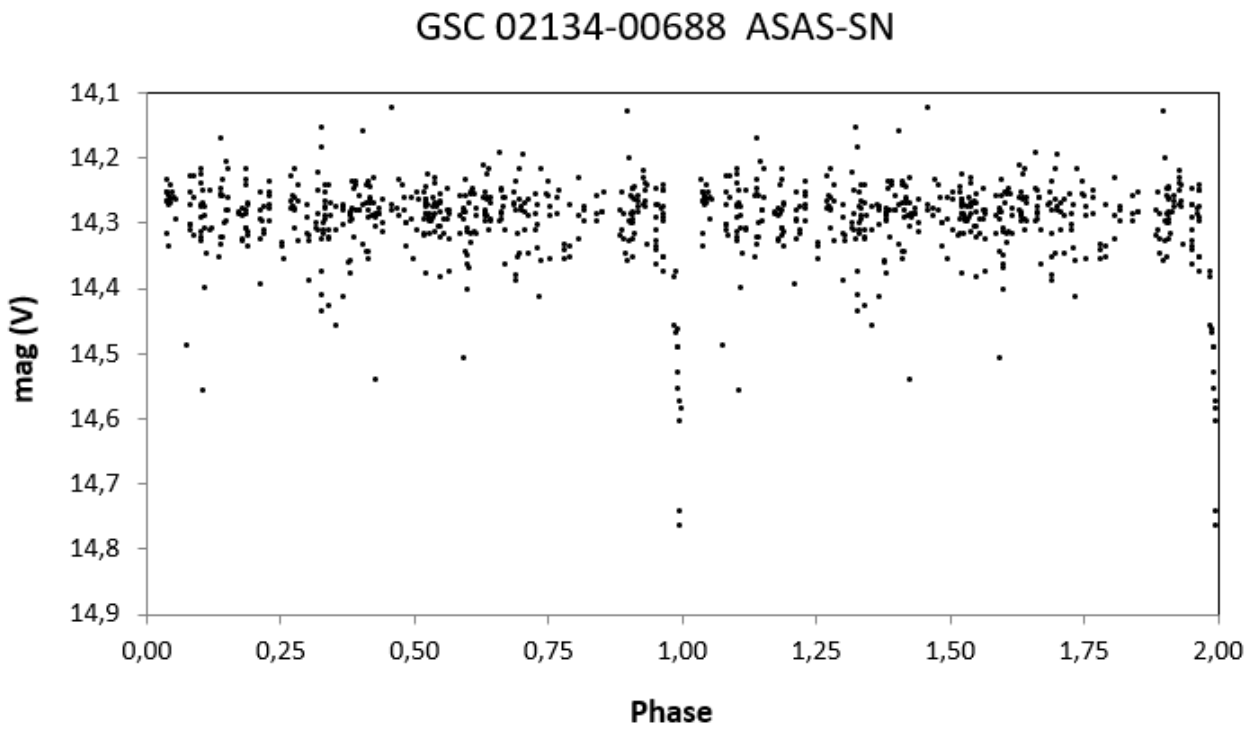

Figure 3: Phased light curve of GSC 02134-00688 Lyr using the period from the authors and data from ASAS-SN.

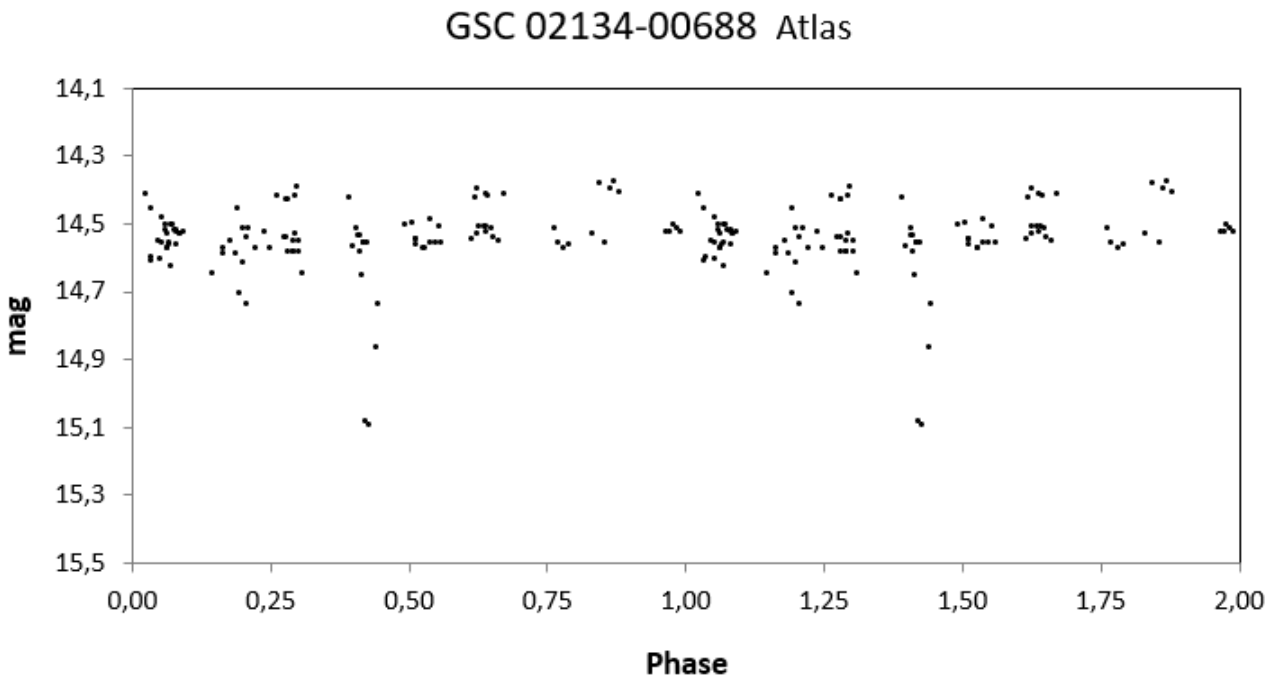

Figure 4: Phased light curve of GSC 02134-00688 Lyr using the ATLAS data and the ephemeris HJD 2455096.3561 + 1.794486 d*E (period from ATLAS).

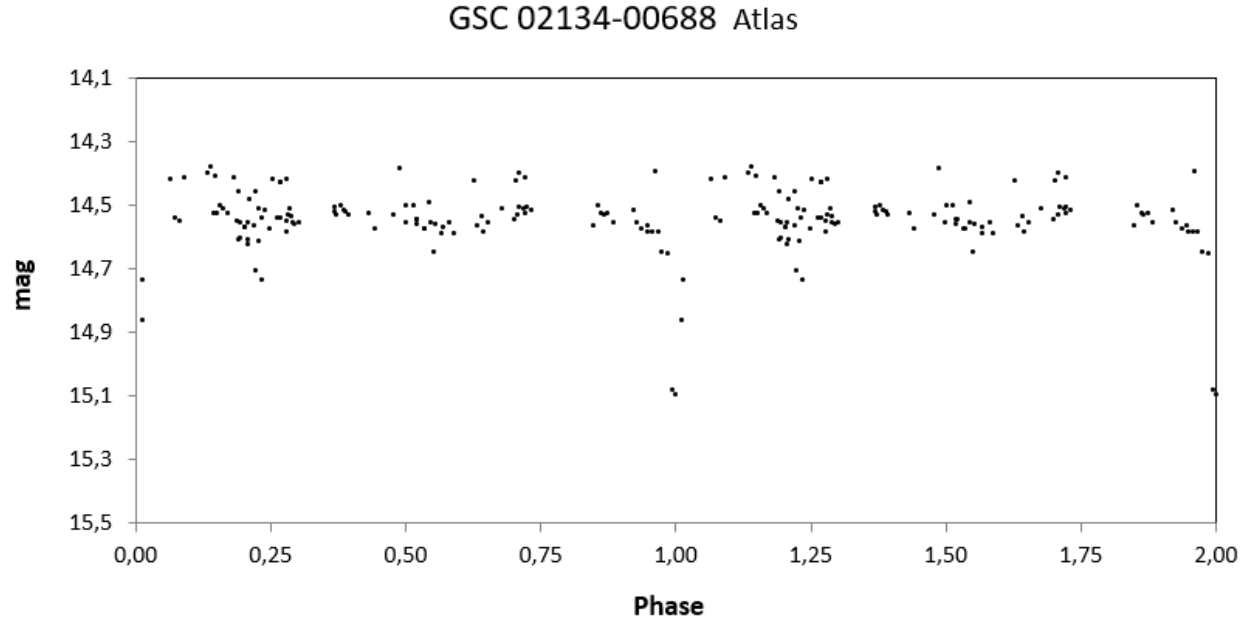

Figure 5: Phased light curve of GSC 02134-00688 Lyr using the ATLAS data and the ephemeris HJD 2455096.3561 + 1.9249815 d*E (period from the authors).

Acknowledgements

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