



The period of V1457 Cyg

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January 2024

Abstract: *The variability of V1457 Cyg was discovered by G. Romano in 1972, who classified it as an eclipsing binary. The authors present phased light curves from ASAS-SN, from ZTF project and their own data, a list of primary and secondary minima, O-C diagrams and an improved period solution of the star.*

Observations

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

Data analysis

Muniwin [1] and self-written programs by Franz Agerer and Lienhard Pagel [2] were used for the analysis of the frames, after bias, dark and flatfield correction. The weighted average of 5 comparison stars was used.

Explanations:

HJD = heliocentric UTC timings (JD) of the observed minima

All coordinates are taken from the Gaia DR3 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).

V1457 Cyg

Cross-IDs

= **ASASSN-V J195441.10+332902.0**

= **ATO J298.6716+33.4840**

= **Gaia DR3 2035109956205576320**

= **ZTFJ195441.19+332902.6**

= **2MASS J19544117+3329023**

= **GR 224**

Gaia DR3 catalogue:

Right ascension: 19h54m41.1734s at Epoch J2000

Declination: +33° 29' 02.387" at Epoch J2000

13.8185 mag G-band mean magnitude (350-1000 nm)

14.2186 mag Integrated BP mean magnitude (330-680 nm)

13.2431 mag Integrated RP mean magnitude (640-1000 nm)

0.9755 mag BP-RP

Periods known so far:

VSX [4] 0.683733 d

ASAS-SN [5] 1.1607417 d

ZTF g-band [6] 0.5803660 d

ZTF r-band [6] 0.5803694 d

ATLAS [7] 0.580328 d

B.R.N.O. O-C gateway [8] 0.683733 d

Results

The VSX database, the ZTF database, the B.R.N.O. O-C gateway, the ASAS SN variable stars database and the ATLAS database also list the star as variable, but with different periods. The discoverer G. Romano published a first period (0.6837 d) in 1972 [9], which he determined from only 4 minima. In 1975, the variable star (GR 224) received its final designation V1457 Cyg in the 60th namelist of variable stars (Kukarkin et al.) [10]. The period of the discoverer is still recorded in the GCVS [11]. ASAS-SN does not recognise the Min. II and thus determines a period that is approximately twice as long as the correct period. ZTF determines the periods separately for the g-band and the r-band. The period for the r-band data is in good agreement with the period determined by us.

The presented improved elements were calculated by the method of least squares, taking into account the minima between JD 2452901 to 2460174 (see table below) and assuming that the true phase of Min. II is exactly at 0.5. We had 6622 of our own data points available for our analyses. The minima of the discoverer were not included in the calculation of the period, as it is possible that a period change has taken place due to the large gap between the discovery minima and the recent minima.

From our data (Figure 1) we derive a variability approx. between 14.03 and 14.75 mag, with an amplitude for Min. I given as 0.72 mag and for Min. II as 0.11 mag (uncalibrated V). Our observations do not show evidence for a period change between 2003 and 2023. A period change between 1959 and 2003 is possible.

V1457 Cyg improved elements

Type = EA
 Min. I = HJD 2458322.5650 + 0.5803694*E
 ±0.0004 ±0.0000002

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)	Source
Pinto & Romano	2436848.3550	I	-37001	0.0382	MSAI 43.145 [9]
Pinto & Romano	2437259.2580	I	-36293	0.0396	MSAI 43.145
Pinto & Romano	2437524.4980	I	-35836	0.0508	MSAI 43.145
Pinto & Romano	2438342.2370	I	-34427	0.0493	MSAI 43.145
F. Agerer	2452901.3379	I	-9341	0.0035	
N. Ruocco	2456137.4735	I	-3765	-0.0007	
W. Moschner	2457943.5821	I	-653	-0.0017	
W. Moschner	2457977.5326	II	-594.5	-0.0028	
W. Moschner	2458012.3569	II	-534.5	-0.0006	
W. Moschner	2458036.4416	I	-493	-0.0012	
W. Moschner	2458037.3099	II	-491.5	-0.0035	
W. Moschner	2458041.3722	II	-484.5	-0.0039	
W. Moschner	2458050.3706	I	-469	-0.0011	
W. Moschner	2458075.3278	I	-426	0.0001	
W. Moschner	2458322.5647	I	-426	0.0001	
W. Moschner	2458322.5647	I	0	-0.0003	
W. Moschner	2458328.6620	II	10.5	0.0031	
W. Moschner	2458390.4677	I	117	-0.0005	
W. Moschner	2458706.4808	II	661.5	0.0014	
W. Moschner	2459043.3840	I	1242	0.0002	
W. Moschner	2459066.5983	I	1282	-0.0003	
W. Moschner	2459422.6563	II	1895.5	0.0011	
W. Moschner	2459778.4227	II	2508.5	0.0011	
W. Moschner	2459786.5486	II	2522.5	0.0017	
W. Moschner	2460153.6321	I	3155	0.0016	
W. Moschner	2460174.5254	I	3191	0.0017	

Table 1: Minima of V1457 Cyg using the elements from the authors. The O-C of the secondary minima were calculated assuming that the true phase is at exactly at 0.5. Source MSAI = Memorie della Societa Astronomica Italiana.

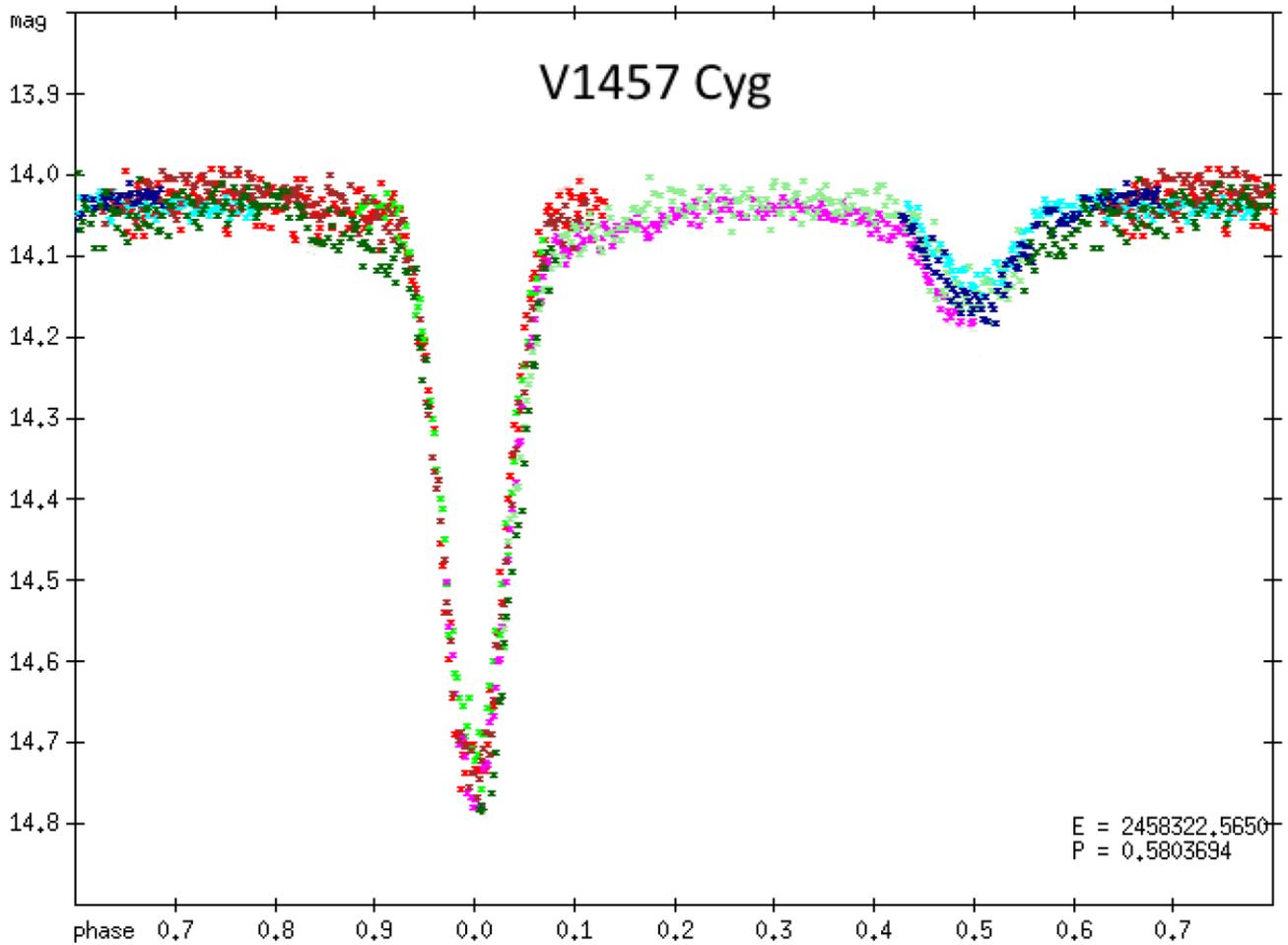


Figure 1: Phased light curve of V1457 Cyg using the ephemeris given by the authors. The vertical axis shows uncalibrated V magnitudes. Different colors denote different observing nights. Only the data points from the better nights were used to display the light curve. A FLI Proline 16803 camera + V-filter (2017-2022) was used.

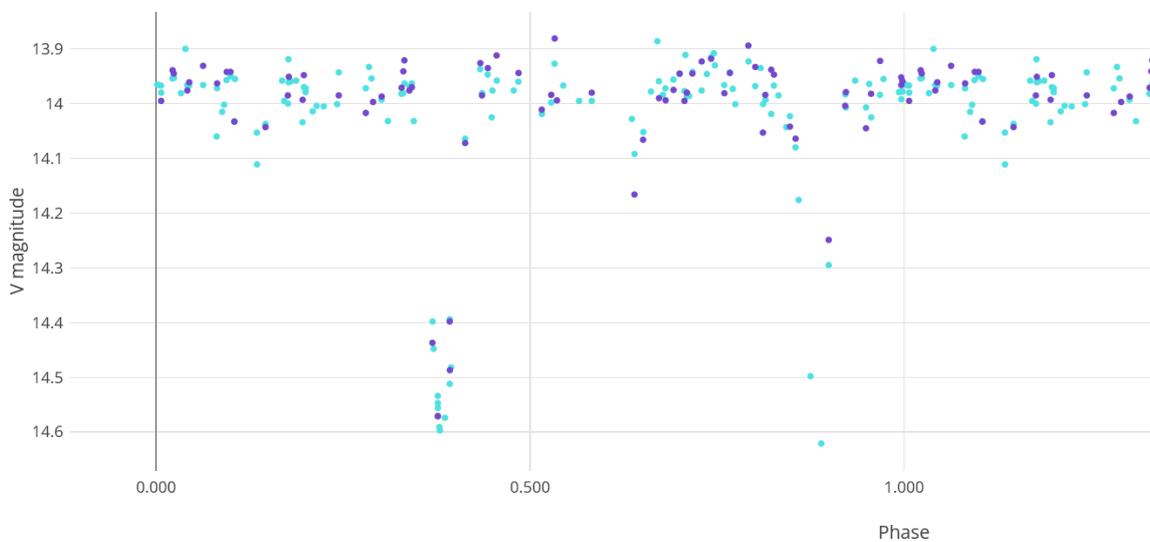


Figure 2: Phased light curve of V1457 Cyg using the period and data (V-Band) from ASAS-SN. This graphic is taken from the ASAS-SN website.

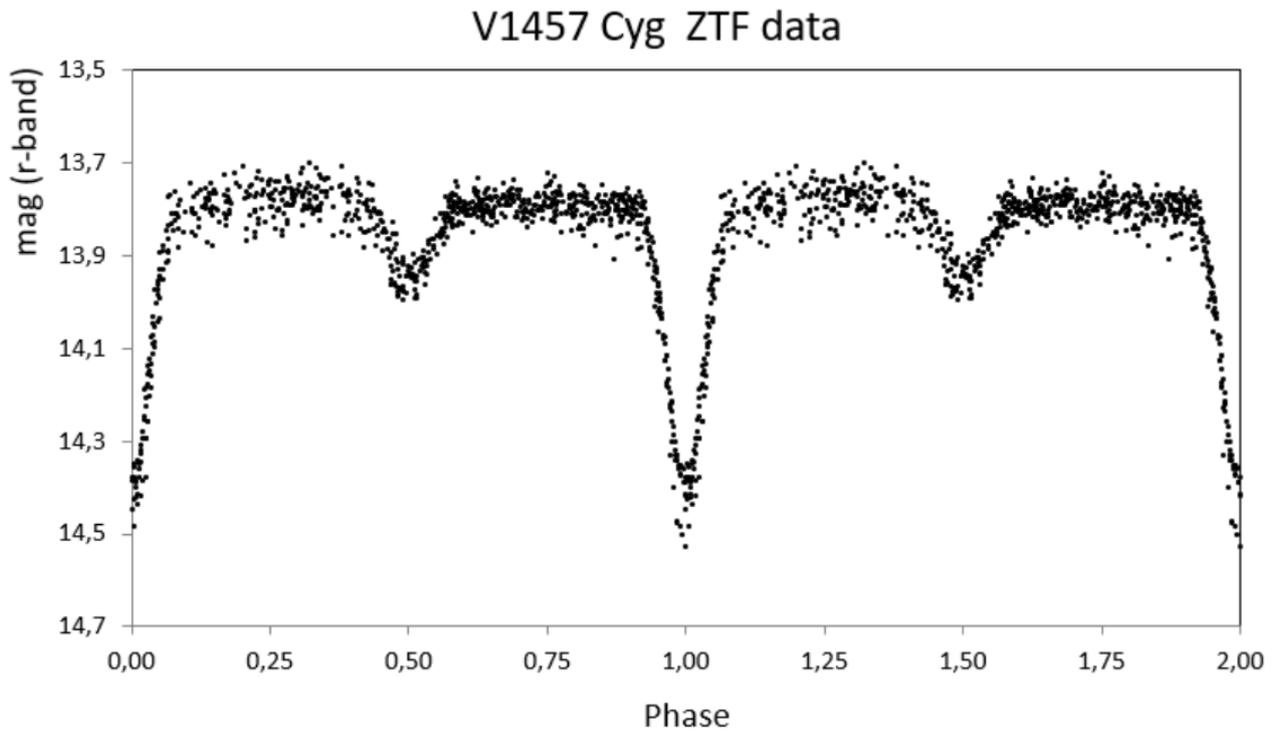


Figure 3: Phased light curve of V1457 Cyg using the improved elements from the authors and data from ZTF (r-band 420-550 nm).

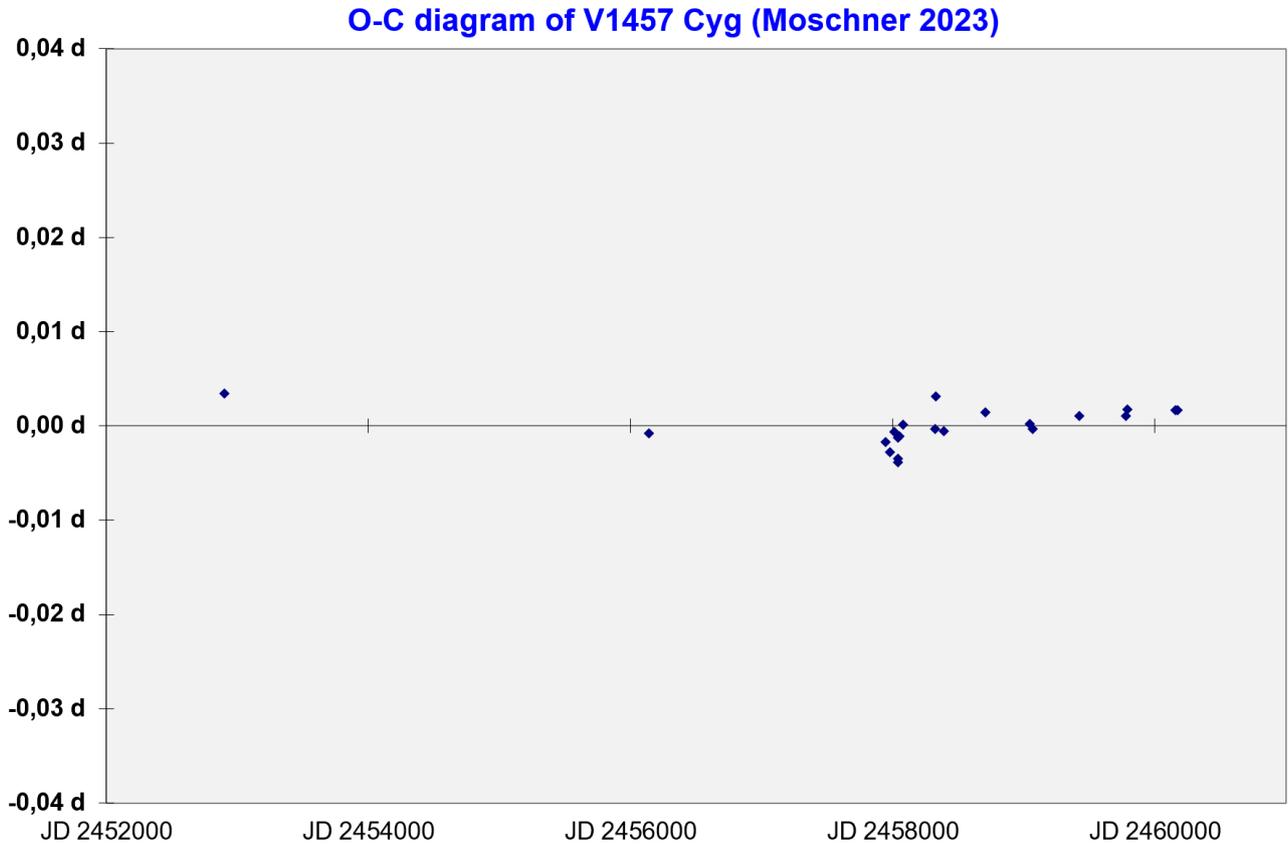


Figure 4: O-C-diagram of V1457 Cyg using the improved ephemeris from the authors. These CCD minima between 2003 and 2023 were used to calculate the period.

O-C diagram of V1457 Cyg (Moschner 2023)

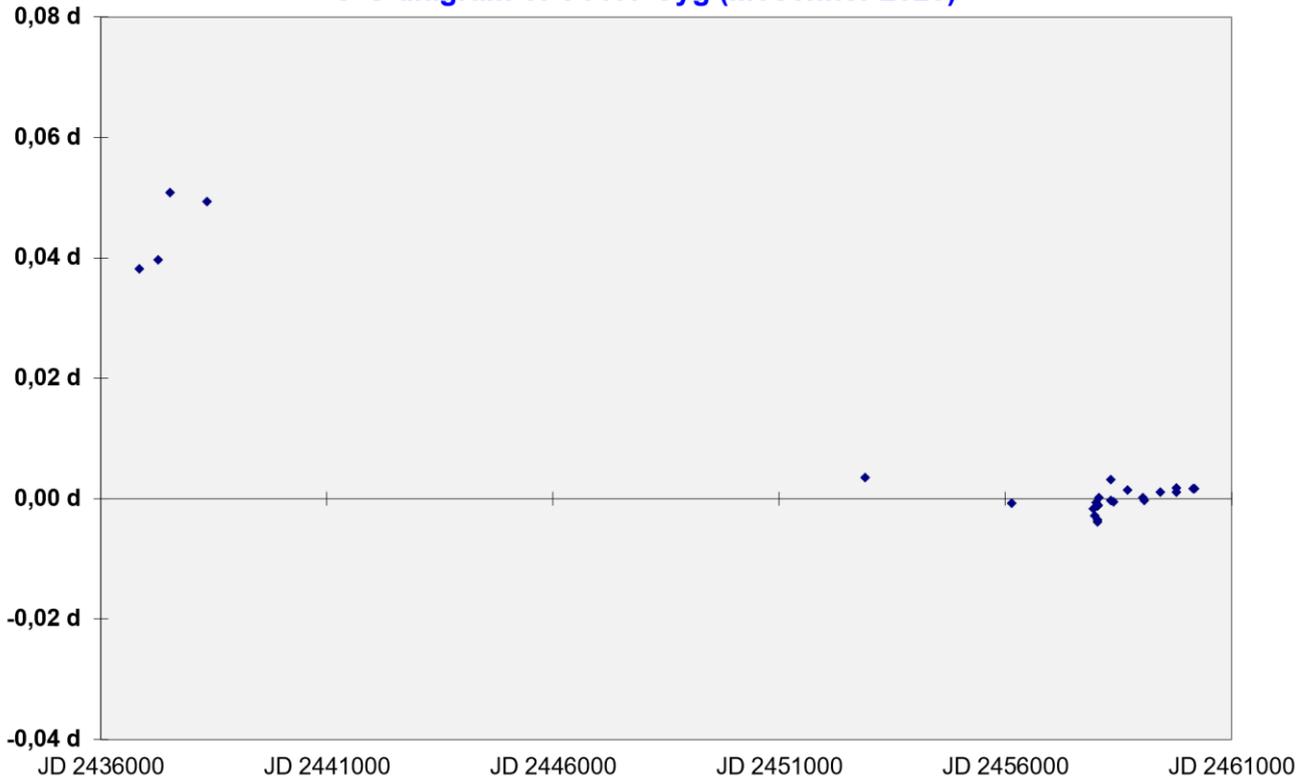


Figure 5: O-C-diagram of V1457 Cyg using the improved ephemeris from the authors. Presentation of all available minima including the discoverer's observations.

O-C diagram of V1457 Cyg (ATLAS 2023)

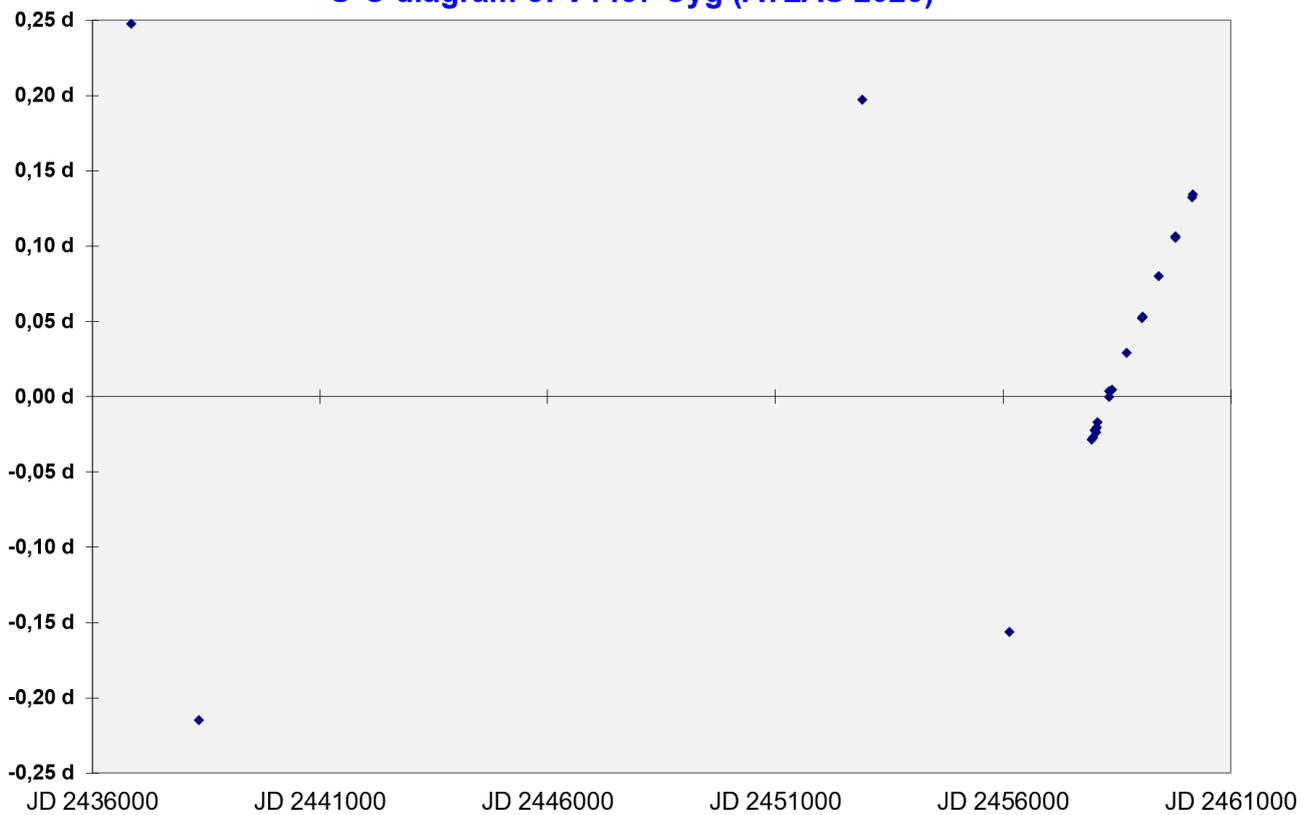


Figure 6: O-C-diagram of V1457 Cyg using the period from the ATLAS project (0.580328 d).

Acknowledgements

This research has made use of the SIMBAD database [12], operated at CDS, Strasbourg, France, the International Variable Star Index (VSX) database, operated at AAVSO, Cambridge, Massachusetts, USA, the O-C gateway from the CAS - Czech Astronomical Society, Praha, the ATLAS-Project developed by the University of Hawaii and funded by NASA and the ZTF-Project, operations are conducted by COO, IPAC and University of Washington.

The authors thank David Motl for providing his MuniWin photometry program, Franz Agerer (BAV) and Lienhard Pagel (BAV) for providing their personal data analysis program.

References

- [1] Motl, David: MuniWin
<http://c-munipack.sourceforge.net>
- [2] Pagel, Lienhard: Starcurve
<https://www.bav-astro.eu/index.php/weiterbildung/tutorials>
- [3] Gaia DR3 (Gaia Collaboration. 2020) European Space Agency.
<http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=I/355>
- [4] The International Variable Star Index (VSX)
<https://www.aavso.org/vsx/index.php?view=search.top>
- [5] All-Sky Automated Survey for Supernovae ASAS-SN
<http://www.astronomy.ohio-state.edu/asassn/index.shtml>
Shappee et al., 2014, ApJ, 788, 48S
<https://ui.adsabs.harvard.edu/abs/2014ApJ...788..48S>
Jayasinghe et al., 2019, MNRAS, 485, 961J
<https://ui.adsabs.harvard.edu/abs/2019MNRAS.485..961J>:
- [6] ZTF Zwicky Transient Facility, Systematic Exploration of the Dynamic Sky
<https://www.ztf.caltech.edu/>
- [7] A first catalog of variable stars measured by ATLAS (Heinze+, 2018)
<http://vizier.u-strasbg.fr/cgi-bin/VizieR-3?-source=J/AJ/156/241/table4>
- [8] CAS Czech Astronomical Society O-C Gateway
<http://var2.astro.cz/ocgate/ocgate.php?star=V1457+Cyg&submit=Submit&lang=en>
- [9] Mem. Soc. Astron. Ital., 43, 135-155 (1972)
Researches with the Schmidt Telescope. V. New variable stars in the field of eta Cygni.
[https://ui.adsabs.harvard.edu/search/p_0&q=identifier%3A\(1972MmSAI..43..135P\)&sort=date%20desc%2C%20bibcode%20desc](https://ui.adsabs.harvard.edu/search/p_0&q=identifier%3A(1972MmSAI..43..135P)&sort=date%20desc%2C%20bibcode%20desc)
- [10] IAU Inform. Bull. Var. Stars, 961, 1-15 (1975)
60th namelist of variable stars, KUKARKIN B.V., KHOLOPOV P.N., KUKARKINA N.P. and PEROVA N.B.
<https://ui.adsabs.harvard.edu/abs/1975IBVS..961....1K/abstract>
- [11] General Catalog of Variable Stars (GCVS database, Version 2023 Nov.
Samus N.N., Kazarovets E.V., Durlevich O.V., Kireeva N.N., Pastukhova E.N.,
<http://www.sai.msu.su/gcvs/cgi-bin/search2.cgi?search=V1457+Cyg>
- [12] SIMBAD Astronomical Database - CDS (Strasbourg)
<http://simbad.u-strasbg.fr/simbad/sim-id?Ident=V1457+Cyg&NbIdent=1&Radius=2&Radius.unit=arcmin&submit=submit+id>