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Improved period of MoFr28 And = V803 And

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Abstract: *MoFr28 And = V803 And was independently discovered in 2013 by Peter Frank and Martin Vrastek. The authors published their discovery in BAV Rundbrief 2015 Nr. 2 [1] in 2015 with a first period and a phased light curve. The variable has been regularly observed by Wolfgang Moschner until this year. The authors present a phased light curve from ASAS-SN, 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
320 mm RC-Telescope f/5.9 – f =1740 mm, SBIG ST-9XE CCD-Camera without filter, t = 60 sec.
Wolfgang Moschner, Lennestadt, Germany

Data analysis

MuniWin [2] and self-written programs by Franz Agerer and Lienhard Pagel [3] were used for the analysis of the frames, after bias, dark and flatfield correction of the exposures. 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 [4]. 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).

MoFr28 And = V803 And

Cross-ID's
= ASASSN-V J020947.57+470433.3
= ATOID J032.4481+47.0757
= 2MASS J02094754+4704326
= SvkV36
= Gaia DR3 353419870806883584
= GSC 03285-01170
= WISE J020947.5+470432

Gaia DR3 Catalog:
Right ascension: 02h09m47.5497s at Epoch=J2000
Declination: +47° 04' 32.632" at Epoch=J2000
12.9713 mag G-band mean magnitude (350-1000 nm)
13.3534 mag Integrated BP mean magnitude (330-680 nm)
12.4287 mag Integrated RP mean magnitude (640-1000 nm)
0.9247 mag BP-RP

Periods known so far:

VSX [5]	0.3376611 d
ASAS-SN [6]	0.3376623 d
ATLAS [7]	0.3376610 d
SIMBAD [8]	0.3376610 d
WISE [9]	0.3379749 d
Gaia [10]	0.33766301 d (derived from given frequency)

Results

After the discovery of the variable by Peter Frank in 2013, we have systematically continued to observe the variable until today in order to improve the period. The minima of Martin Vrastek are also included in our list of minima (Table 1) and have been taken into account. The presented elements were calculated by the method of least squares, taking into account all minima (see table below) and assuming that the true phase of Min II is exactly 0.5.

The ASAS-SN database, the VSX database, the WISE database, the ATLAS database and the Gaia DR3 database (Part 4. Variability) also list the variable with different periods. Our new ephemeris represents an improvement over our first period published in BAV Rundbrief 2015 Nr. 2 and the VSX, ASAS-SN, WISE, the ATLAS and Gaia periods. The Gaia period is derived from the frequency 2.9615326020418888398 c/d given in [10] .

From the ASAS-SN data (Figure 1) we derive a variability approx. between 12.80 and 13.09 mag, with an amplitude for Min I given as 0.29 mag and for Min II as 0.24 mag (uncalibrated V).

The lower amplitude of the ASAS-SN measurements is strikingly different from our own observations (Figure 2).

Here the amplitude for Min I is about 0.37 mag and for Min II 0.28 mag. The reason could be a similarly bright close companion (Gaia DR3 353419875104305792, 13.8 mag, Distance: 12.016 arcsec). Since most surveys work with small focal lengths, the companion could have been in the measuring aperture and thus affected the amplitude. We presented a similar effect with the SWASP data from MoFr28 And = V803 And in BAV Rundbrief 2015 Nr. 2.

MoFr28 And = V803 And **improved elements**

Min I = HJD 2457712.5361 + 0.3376634*E
±0.0002 ±0.0000001

Observer	HJD-Date Minimum	Type	Epoch	O-C (d)
M. Vrastek	2456154.5564	I	-4614	-0.0008
M. Vrastek	2456155.4010	II	-4611.5	-0.0003
M. Vrastek	2456155.5667	I	-4611	-0.0035
M. Vrastek	2456157.4290	II	-4605.5	0.0017
M. Vrastek	2456930.3409	II	-2316.5	0.0021
M. Vrastek	2456930.5090	I	-2316	0.0013
Moschner/Frank	2456932.3647	II	-2310.5	-0.0001
Moschner/Frank	2456987.2331	I	-2148	-0.0020
Moschner/Frank	2456990.7819	II	-2137.5	0.0013
W. Moschner	2457276.6127	I	-1291	0.0000
W. Moschner	2457387.3655	I	-963	-0.0007
W. Moschner	2457693.6253	I	-56	-0.0016
W. Moschner	2457694.4717	II	-53.5	0.0006
W. Moschner	2457694.6383	I	-53	-0.0016
W. Moschner	2457710.5098	I	-6	-0.0003
W. Moschner	2457712.5352	I	0	-0.0009
W. Moschner	2457733.3034	II	61.5	0.0010
W. Moschner	2457733.4705	I	62	-0.0007
W. Moschner	2457748.3273	I	106	-0.0011
W. Moschner	2457759.3042	II	138.5	0.0017
W. Moschner	2457759.4700	I	139	-0.0013
W. Moschner	2458009.6787	I	880	-0.0012
W. Moschner	2458017.6148	II	903.5	-0.0002

W. Moschner	**2458029.6015**	**I**	**939**	**-0.0005**
W. Moschner	**2458042.6034**	**II**	**977.5**	**0.0013**
W. Moschner	**2458078.3925**	**II**	**1083.5**	**-0.0019**
W. Moschner	**2458080.4207**	**II**	**1089.5**	**0.0003**
W. Moschner	**2458112.3311**	**I**	**1184**	**0.0015**
W. Moschner	**2458124.3178**	**II**	**1219.5**	**0.0012**
W. Moschner	**2458124.4866**	**I**	**1220**	**0.0012**
W. Moschner	**2458381.6190**	**II**	**1981.5**	**0.0029**
W. Moschner	**2458384.6574**	**II**	**1990.5**	**0.0023**
W. Moschner	**2458434.4612**	**I**	**2138**	**0.0008**
W. Moschner	**2458730.5917**	**I**	**3015**	**0.0004**
W. Moschner	**2458750.6836**	**II**	**3074.5**	**0.0014**
W. Moschner	**2458759.6310**	**I**	**3101**	**0.0007**
W. Moschner	**2458766.5526**	**II**	**3121.5**	**0.0002**
W. Moschner	**2458766.7219**	**I**	**3122**	**0.0007**
W. Moschner	**2458815.3458**	**I**	**3266**	**0.0010**
W. Moschner	**2458815.5126**	**II**	**3266.5**	**-0.0010**
W. Moschner	**2458818.3826**	**I**	**3275**	**-0.0011**
W. Moschner	**2458829.3597**	**II**	**3307.5**	**0.0019**
W. Moschner	**2458829.5274**	**I**	**3308**	**0.0008**
W. Moschner	**2458857.3859**	**II**	**3390.5**	**0.0020**
W. Moschner	**2459083.6184**	**II**	**4060.5**	**0.0000**
W. Moschner	**2459097.6296**	**I**	**4102**	**-0.0018**
W. Moschner	**2459103.7074**	**I**	**4120**	**-0.0020**
W. Moschner	**2459119.5789**	**I**	**4167**	**-0.0006**
W. Moschner	**2459129.5408**	**II**	**4196.5**	**0.0002**
W. Moschner	**2459129.7083**	**I**	**4197**	**-0.0011**
W. Moschner	**2459150.6422**	**I**	**4259**	**-0.0024**
W. Moschner	**2459156.3827**	**II**	**4276**	**-0.0021**
W. Moschner	**2459177.3183**	**I**	**4338**	**-0.0016**
W. Moschner	**2459186.2692**	**II**	**4364.5**	**0.0012**
W. Moschner	**2459199.4377**	**II**	**4403.5**	**0.0009**
W. Moschner	**2459446.6058**	**II**	**5135.5**	**-0.0007**
W. Moschner	**2459455.5561**	**I**	**5162**	**0.0015**
W. Moschner	**2459489.4878**	**II**	**5262.5**	**-0.0019**
W. Moschner	**2459489.6594**	**I**	**5263**	**0.0008**
W. Moschner	**2459561.4137**	**II**	**5475.5**	**0.0017**
W. Moschner	**2459590.2814**	**I**	**5561**	**-0.0009**
W. Moschner	**2459595.3478**	**I**	**5576**	**0.0006**
W. Moschner	**2459827.6558**	**I**	**6264**	**-0.0039**
W. Moschner	**2459854.6716**	**I**	**6344**	**-0.0011**
W. Moschner	**2459883.5460**	**II**	**6429.5**	**0.0031**
W. Moschner	**2459933.3467**	**I**	**6577**	**-0.0016**
W. Moschner	**2459933.5182**	**II**	**6577.5**	**0.0011**
W. Moschner	**2459940.2705**	**II**	**6597.5**	**0.0001**
W. Moschner	**2459940.4393**	**I**	**6598**	**0.0001**
W. Moschner	**2459955.2943**	**I**	**6642**	**-0.0021**

Table 1: Minima of MoFr28 And = V803 And, O-C using the elements from the authors.
The O-C of the secondary minima were calculated assuming that the true phase is at exactly 0.5.

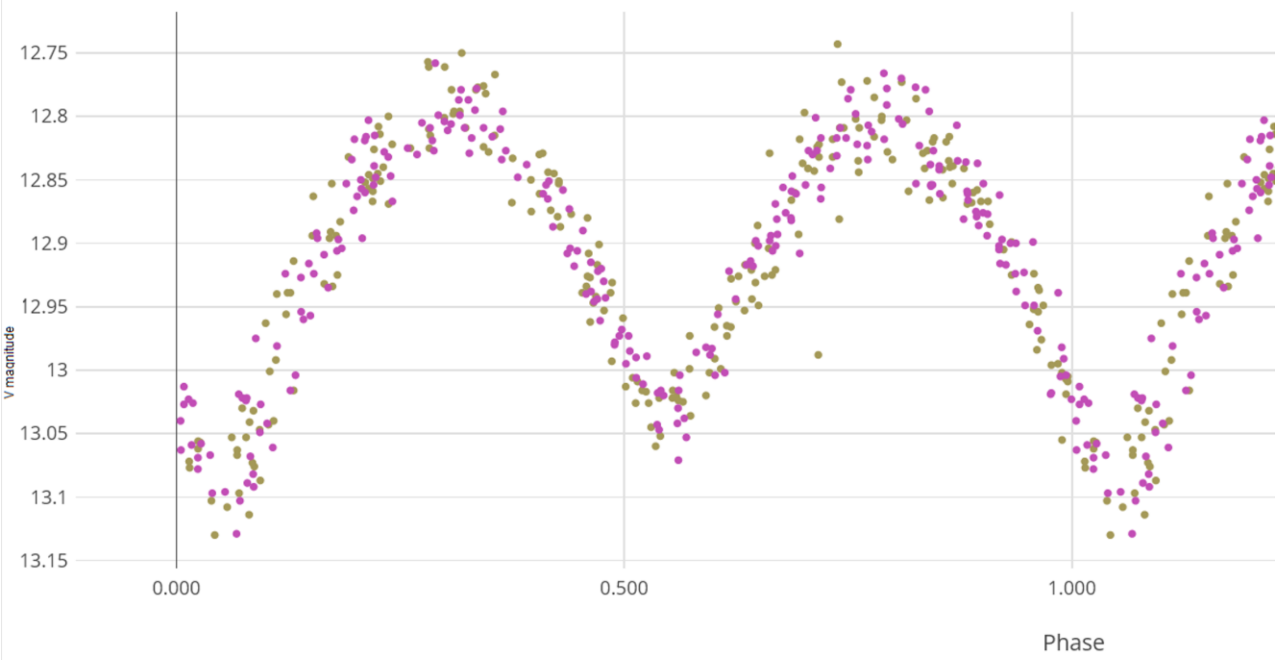

Figure 1: Phased light curve of MoFr28 And = V803 And using the period and data (V-Band) from ASAS-SN.
This graphic is taken from the ASAS-SN website.

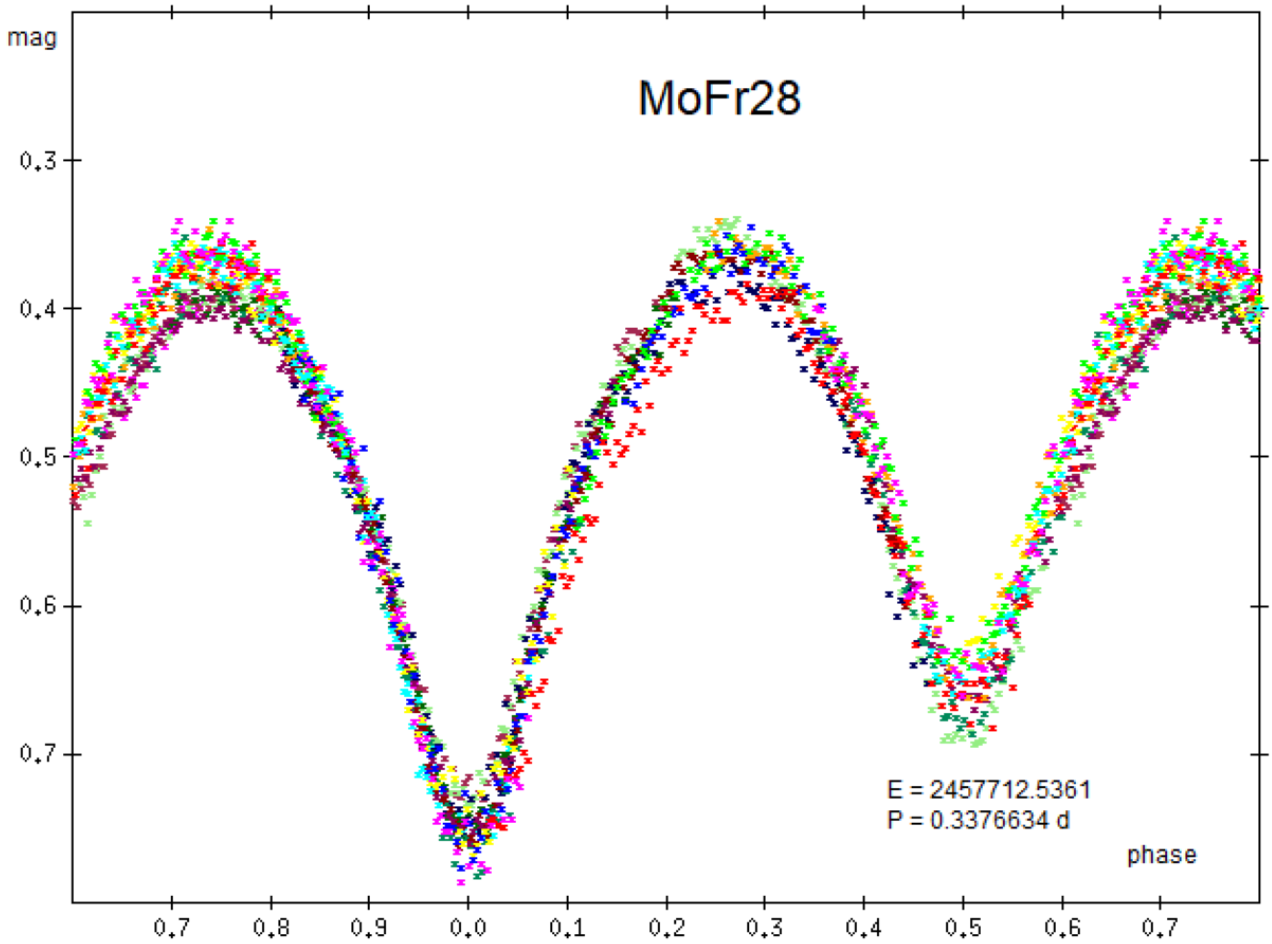

Figure 2: Phased light curve of MoFr28 And = V803 And using the improved elements and data from the authors. The vertical axis shows differential magnitudes. Different colours denote different observing nights. Only the data points from the better nights were used to display the light curve. An FLI Proline 16803 camera + a V-filter (2015-2017) was used.

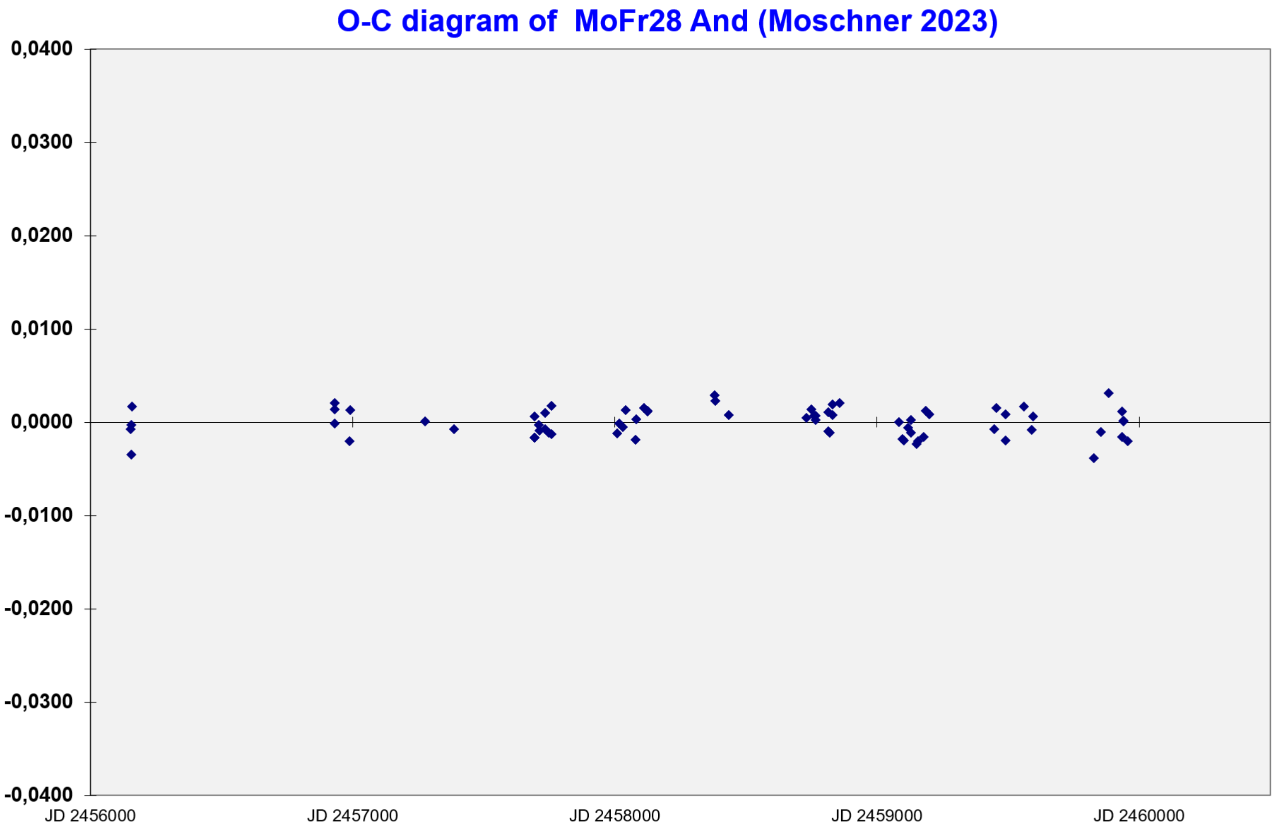

Figure 3: O-C-diagram of MoFr28 And = V803 And using the ephemeris given by the authors.

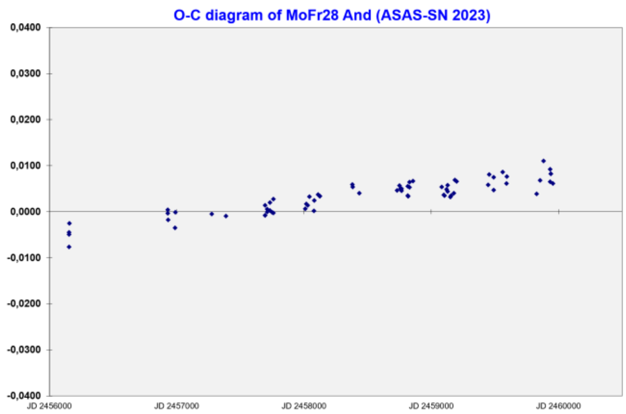

Figure 4

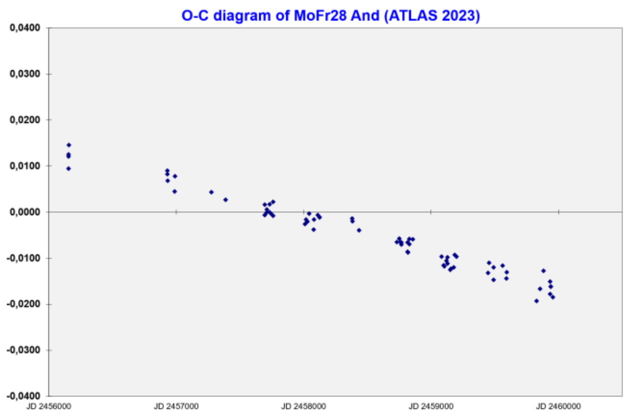

Figure 5

Figure 4: O-C-diagram of MoFr28 And = V803 And using the period from the ASAS-SN project (0.3376623 d).

Figure 5: O-C-diagram of MoFr28 And = V803 And using the period from the ATLAS project (0.3376610 d).

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