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NEW LIGHT ELEMENTS FOR 63 LONG PERIOD VARIABLE STARS FROM ASAS-3 DATABASE

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We present new light elements of 63 long period variable stars in the southern hemisphere ($-83° < \mathrm{DEC} < -15°$). All observations were obtained from the ASAS-3 database. The observations were made between 2001 and 2009. An average of 400 data points was available for each star, and never less than 100. All observations were made in the V-band (Pojmanski 2002, 2003).

The names, alternative names and positions of Table 1 were obtained from the VSX catalog (Watson et al. 2006). Almost all the stars studied were classified as Mira-type variables in VSX. In some particular cases, we refine the periods already in VSX.

When enough data points were available, we also calculated 287 times of maxima of these variable stars. The method used for these calculations was to adjust the best bi-gaussian profile for each period (see Buys and De Clerk 1972 for a complete description of bi-gaussian profiles), which showed better results than the method of bisected chords (Knott et al. 1863), especially when there were few or none observations near maximum. This was performed by Origin 8.6.0 software (OriginLab, Northampton, MA). These times of extrema were used both to determine the epoch and to build an O−C diagram for the stars. Potentially interesting O−C diagrams are presented in Figures 1 to 4, and were made with a spreadsheet made by the author.

The periods were determined using Scargle Periodogram in the AVE software (Barberá, 1999). In some cases, the period was refined using the O−C diagrams for each star.

Table 1. New elements for 63 variables.

Star Variable	Name Other ID	Position RA J2000	Position DEC J2000	Epoch (HJD2450000+)	Period (days)	Spectral type
OV Pup		07 33 51.50	−28 23 45.8	2912.3	138.0	M8:e (1)
V0470 Pup		07 40 42.81	−22 10 35.6	1959.8	108.9	M8-M9 (2)
NR Pup		07 59 42.63	−50 08 34.1	4261.9	174.9	Me (1)
II Pup		08 03 25.75	−27 55 26.0	2605.1	153.1	M8-M9 (4)
OY Pup		08 06 08.18	−37 17 46.6	3405.6	217.3	Me (1)
DP Pup	NSVS J0810431-151944	08 10 43.09	−15 19 46.9	2755.0	322.0	M8e (5)
LZ Pup		08 12 10.82	−23 43 48.5	2974.2	132.1	M8 (4)
FT Pup	ASAS J082543-2337.3	08 25 42.70	−23 37 14.1	2925.7	266.0	S (1)

Table 1. New elements for 63 variables (cont).

Star Variable	Name Other ID	Position RA J2000	Position DEC J2000	Epoch (HJD2450000+)	Period (days)	Spectral type
WY Pyx	ASAS J083649-3627.7	08 36 48.98	−36 27 36.4	2515.6	362.6	Me (2)
UU Pyx		08 43 12.06	−33 05 45.1	2690.5	162.3	Me (1)
RU Cha		10 14 29.93	−81 19 44.0	2010.4	104.2	
XZ Cha	ASAS J111209-7854.7	11 12 08.82	−78 54 39.8	1949.5	231.0	
CK Cha	ASAS J113324-7727.4	11 33 23.75	−77 27 21.7	2082.2	203.0	Me (1)
AK Cha	ASAS J120841-8235.3	12 08 43.65	−82 35 16.4	2964.6	186.1	
OS Mus	ASAS J120846-6545.5	12 08 46.00	−65 45 30.0	2954.0	611.4	M4 (1)
AM Cha		12 12 02.18	−77 00 34.9	2463.0	106.6	
AO Cha	ASAS J121611-8045.0	12 16 10.63	−80 45 01.2	3068.1	214.0	
CH Mus	ASAS J122046-7532.9	12 20 45.75	−75 32 52.8	2067.1	343.4	Me (1)
AV Cha		12 37 09.07	−77 18 17.7	1894.8	86.3	
CO Cha	ASAS J124007-8031.9	12 40 08.14	−80 31 55.2	2014.7	209.8	
CS Mus		13 02 59.73	−74 12 00.6	3410.3	191.0	
BU Cha	ASAS J134300-7947.7	13 43 00.02	−79 47 41.6	2076.7	185.0	Me (1)
VZ Cir	ASAS J142402-6605.9	14 24 02.00	−66 05 54.	2082.5	81.8	M6 (2)
TBR V0151		14 44 30.90	−59 51 57.0	3555.6	143.0	
TBR V0200		14 48 59.20	−68 36 20.0	1970.0	429.5	
CT Cir		14 58 41.16	−57 51 04.0	1958.6	40.0	M4III (6)
FF Lup	ASAS J151138-4354.7	15 11 37.80	−43 54 41.9	3152.8	218.2	Me (1)
AS Cir	ASAS J151339-6020.3	15 13 39.51	−60 20 18.3	2621.2	517.9	C (1)
FG Lup	ASAS J151508-3641.1	15 15 08.05	−36 40 57.2	2874.4	148.7	
FM Lup	ASAS J152022-3735.3	15 20 21.67	−37 35 15.7	1972.3	162.6	Me (1)
MW Aps		15 21 51.71	−74 33 49.9	2700.1	196.4	Me (2)
AQ Lup	ASAS J152218-4905.7	15 22 18.66	−49 05 39.2	2435.0	150.3	
GN Lup	ASAS J152409-3302.7	15 24 08.39	−33 02 41.5	2792.1	324.0	S3,8 (1)
TBR V0116		15 26 06.20	−60 49 47.0	1939.2	282.3	
GP Lup		15 28 35.61	−37 34 02.1	3843.3	70.4	Me (1)
V0344 Nor		15 40 30.64	−51 12 55.6	2064.5	91.2	M2/5e (2)
AW Aps		15 48 32.17	−73 28 16.3	2125.8	158.6	
IR TrA	ASAS J155247-6441.8	15 52 47.14	−64 41 52.6	2090.6	223.6	Me (1)
NU Lup		15 57 33.91	−30 08 27.9	1944.5	219.4	
BE Aps		16 06 07.10	−79 34 55.2	3778.9	389.0	Me (3)
BO Nor	ASAS J160648-5934.0	16 06 48.19	−59 34 04.3	2856.2	58.1	
NSV 7536		16 14 14.23	−53 34 47.3	2725.6	302.2	
CR Nor		16 14 17.50	−58 34 44.7	3482.8	271.5	
ER TrA	ASAS J161602-6312.4	16 16 01.78	−63 12 21.4	2054.3	352.	Me (1)
NSV 7610	ASAS J162058-6711.6	16 20 57.79	−67 11 33.2	1983.9	205.5	
PV Nor		16 21 02.08	−55 18 15.4	3451.6	208.3	
IX Nor	ASAS J162216-5528.6	16 22 14.62	−55 28 40.7	2165.1	254.8	
EX TrA	ASAS J162242-6124.7	16 22 42.65	−61 24 36.3	3572.4	212.7	Me (1)
X Nor	ASAS J162526-5155.6	16 25 25.76	−51 55 37.3	2715.2	520.2	C(Nb) (1)
NW Nor		16 29 47.32	−57 40 52.4	3147.5	251.9	
CC Aps		16 31 18.86	−79 51 28.8	2165.3	141.1	
LO Nor		16 33 21.13	−56 04 02.4	2118.4	281.6	
NSV 7825		16 36 36.89	−70 09 01.8	2066.9	289.4	
FV Aps		16 37 40.90	−75 08 24.6	2076.8	114.0	
V0356 Ara		16 40 10.47	−55 17 41.9	4201.1	222.9	
FW Aps		16 54 27.08	−75 11 12.9	2901.4	256.5	Me (3)
DH Aps	ASAS J170914-7338.8	17 09 13.50	−73 38 46.9	2107.4	188.8	
DX Aps		17 27 32.91	−76 38 47.2	1992.4	103.7	
EO Aps		17 38 24.01	−74 27 58.0	4741.9	79.2	Me (3)
DG Pav	ASAS J183627-6756.0	18 36 26.81	−67 56 01.4	2104.1	268.4	Me (1)
DI Pav	ASAS J193720-5657.9	19 37 20.09	−56 57 51.4	2696.1	256.0	Me (1)
NO Pav	ASAS J195905-6216.9	19 59 05.26	−62 16 51.2	3372.7	425.9	Me (1)
DM Pav		21 20 53.88	−61 34 27.7	2521.3	143.4	M8 (2)

Sources of spectral type:

(1) GCVS, Samus et al. (2013), (2) Skiff (2013), (3) Stock et al. (1972), (4) MacConnell (1993), (5) Vyssotsky (1943), (6) Kharchenko et al. (2009)

Notes on individual stars:
DP Pup = Period from the VSX
FT Pup = Period from the VSX
WY Pyx = Wrong period of 353 days in VSX
XZ Cha = Wrong period of 226 days in VSX
CK Cha = The period is from VSX
AK Cha = The period is from VSX
OS Mus = Wrong period of 734.56 days in VSX
AO Cha = Period of 212.83 days in VSX is not completely accurate
CH Mus = Period of 344.89 days in VSX is slightly inaccurate
CO Cha = Period of 209.09 days in VSX is slightly inaccurate
BU Cha = The period is from VSX
VZ Cir = The epoch is from VSX but the period of 78.864 in VSX is slightly inaccurate
FF Lup = Wrong period of 224.97 days in VSX
AS Cir = Wrong period of 532.14 days in VSX
FG Lup = Wrong period of 169.8 days in VSX
FM Lup = Period of 164.05 days in VSX is slightly inaccurate
AQ Lup = The epoch is from VSX but the period of 148.96 in VSX is slightly inaccurate
GN Lup = Period of 323.44 days in VSX is slightly inaccurate
IR TrA = Wrong period of 219.03 days in VSX
BO Nor = Period of 59.072 days in VSX is slightly inaccurate
ER TrA = The period is from VSX
NSV 7610 = Wrong period of 106.76 days in VSX
IX Nor = Period of 253.99 days in VSX is slightly inaccurate
EX TrA = Period of 209.61 days in VSX is slightly inaccurate
X Nor = Wrong period of 526.57 days in VSX
DH Aps= Wrong period of 184.66 days in VSX
DG Pav = Period of 266.01 days in VSX is slightly inaccurate
DI Pav = Period of 260.31 days in VSX is slightly inaccurate

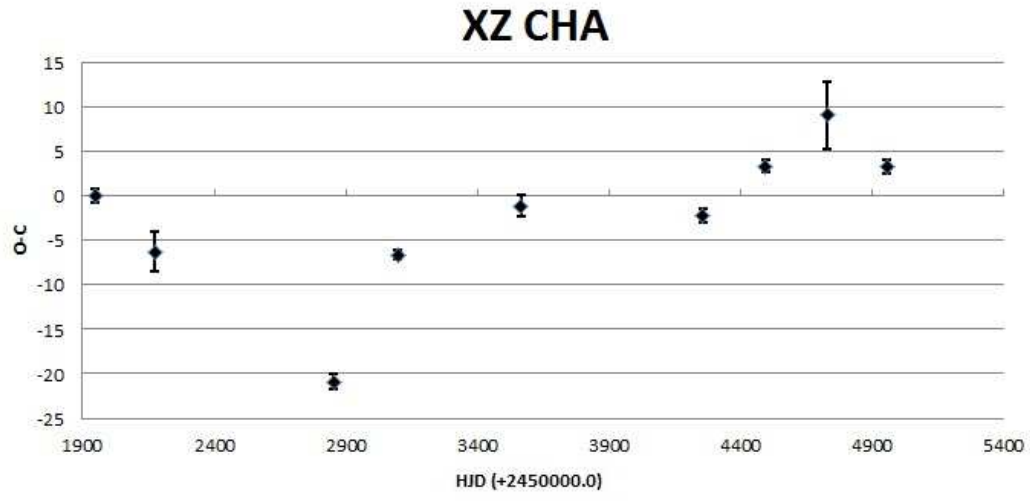

Figure 1. O−C diagram of XZ Cha.

Table 2. New Times of Maxima

Star Name	Time of Maxima HJD (+2450000)	Standard Error
OV Pup	2912.3	0.6
	3462.0	0.6
	3742.5	0.7
	4579.0	2.4
	4847.5	5.7
	5121.6	1.2
V470 Pup	1959.9	1.0
	2939.4	0.8
	4575.1	0.6
NR Pup	4262.0	1.6
II Pup	2605.2	2.4
	3066.5	1.1
	3517.7	1.8
	4447.6	1.4
OY Pup	2551.6	1.9
	2986.8	1.1
	3405.6	0.5
	3837.6	0.6
	4274.0	3.7
LZ Pup	2974.2	1.8
	3757.0	1.4
	4164.7	1.4
	4559.4	0.4
FT Pup	2925.7	3.8
	3158.6	2.4
	3486.7	3.3
	4543.4	4.7
	4798.4	7.4
WY Pyx	2145.9	6.0
	2515.6	7.7
	2879.2	4.8
	5054.5	8.7
UU Pyx	2690.5	0.3
	3030.5	0.6
	3669.9	1.3
	4969.3	1.9
RU Cha	2010.4	0.9
	2842.5	2.5
	3063.2	0.8
	3482.0	0.8
	3702.1	3.3
	4308.4	1.5
	4524.1	0.9
	4927.0	0.6
XZ Cha	1949.5	0.7
	2174.2	2.3
	2852.6	0.8
	3097.9	0.5
	3565.4	1.2
	4257.3	0.8
	4493.8	0.7
	4730.5	3.8
	4955.7	0.7
CK Cha	2082.2	0.8
	2494.7	2.0
	3127.0	2.8
	4307.9	1.6
	4511.3	0.9
AK Cha	2212.0	0.8
	2794.7	1.4
	2964.6	2.3
	3535.5	1.1

Table 2. New Times of Maxima (cont.)

Star Name	Time of Maxima HJD (+2450000)	Standard Error
AK Cha (cont.)	4284.1	0.9
	4457.0	0.6
	4632.7	0.4
AO Cha	2007.0	1.4
	2648.2	2.6
	2846.7	2.4
	3068.1	1.4
	3494.8	1.1
	4140.8	1.1
	4561.7	1.1
	4990.5	0.9
CH Mus	2067.1	0.5
	2758.6	1.4
	3098.5	0.6
	3443.4	0.5
	3786.4	0.8
	4123.3	1.9
	4468.4	0.8
	4814.8	1.6
AV Cha	1894.8	1.2
	3457.3	2.5
	4481.2	1.7
CO Cha	2014.7	1.2
	2643.3	1.3
	3062.1	2.5
	3471.2	0.8
	4326.1	1.0
	4529.0	0.5
	4952.6	0.8
CS Mus	3410.3	2.0
	3791.8	1.6
	4165.4	0.6
	4941.9	1.1
BU Cha	2076.7	1.5
	2465.1	4.0
	2822.5	1.3
	3556.1	1.4
	3746.2	4.5
	4304.5	2.8
	4484.9	4.2
	4665.4	2.7
	5039.1	4.2
VZ Cir	2473.6	1.1
	3819.8	2.8
	3883.8	2.3
	4532.7	4.7
	4693.2	1.5
TBR V0151	3555.6	1.4
	4842.3	1.6
TBR V0200	1970.0	0.8
	2818.4	1.4
	4975.9	1.6
CT Cir	1958.6	1.9
	3120.5	4.8
FF Lup	2057.5	1.1
	2502.9	2.0
	2709.9	0.9
	3152.8	1.3
	3589.5	1.4
	3806.9	1.2
	4250.4	1.5
	4895.9	1.2

Table 2. New Times of Maxima (cont.)

Star Name	Time of Maxima HJD (+2450000)	Standard Error
AS Cir	2621.2	3.9
	3154.5	1.2
	3671.6	8.6
	4168.3	2.5
	4716.4	5.7
FG Lup	1999.6	1.4
	2874.4	0.7
	3170.2	1.4
	3459.4	1.4
	4653.0	1.5
	4953.6	2.0
FM Lup	1972.3	1.5
	2786.3	1.6
	3432.7	1.0
	4244.4	1.9
	5050.0	4.7
	4872.7	0.8
MW Aps	2700.2	1.7
	3079.1	0.9
	3453.6	1.2
	4638.4	0.6
	5051.1	0.5
AQ Lup	2131.8	1.4
	2734.7	0.9
	3033.1	2.7
	3633.8	1.0
	4236.1	1.4
	4534.0	1.1
GN Lup	2455.0	0.9
	2792.1	1.0
	3117.4	1.9
	3435.4	1.2
	3764.7	1.5
	5061.2	1.3
TBR V0116	1939.2	2.0
	2502.7	2.6
	2777.2	2.8
	3068.9	4.1
GP Lup	2876.2	2.2
	3574.2	2.3
	3843.3	1.1
V0344 Nor	2064.5	3.8
	2894.0	1.6
	3433.5	1.2
	4527.0	1.9
	5075.4	1.9
AW Aps	2125.9	1.6
	3077.8	3.3
	3405.9	3.9
	4343.7	2.0
	4657.3	6.0
IR TrA	2090.6	1.4
	2536.2	1.6
	2753.1	0.5
	3419.8	0.7
	3642.0	0.9
	3864.5	1.1
	4317.0	0.9
	4547.4	0.9
	4995.5	1.6

Table 2. New Times of Maxima (cont.)

Star Name	Time of Maxima HJD (+2450000)	Standard Error
NU Lup	1944.5	2.1
	2836.1	1.6
	3055.4	4.6
	3479.4	1.6
	4562.9	1.0
	4998.5	1.2
BE Aps	3778.9	2.1
	4553.2	1.2
	4950.0	5.7
BO Nor	2856.2	2.2
	3153.5	6.6
	4364.1	10.5
	4543.8	15.4
CR Nor	3482.8	2.9
	4569.1	3.1
ER TrA	2054.3	5.5
	2753.7	1.5
	3099.0	1.4
	3819.6	5
	4174.2	2.6
	4858.1	6.5
NSV 7610	1983.9	1.4
	2081.7	2.4
	2819.5	1.3
	3829.0	3.5
	4241.6	3.4
	4655.5	2.9
PV Nor	3451.6	2.4
	4284.9	2.8
IX Nor	2165.1	4.8
	2674.7	2.0
	3436.8	3.5
	4213.1	3.6
	4712.6	1.4
EX TrA	2077.4	8.0
	2516.5	2.1
	2726.4	2.4
	3572.4	3.4
	4628.7	2.2
	5064.7	5.7
X Nor	2715.2	0.8
	4278.8	1.4
	4792.9	2.4
	5053.4	2.2
CC Aps	2165.3	0.8
	2727.6	1.2
	3578.2	1.3
	3854.6	1.3
	4706.5	1.7
	4988.4	6.7
LO Nor	2118.4	4.4
NSV 7825	2066.9	0.6
	3805.8	2.5
	4381.0	3.2
	4967.0	16.4
FV Aps	2076.9	0.7
	2528.6	0.7
	2764.3	0.9
	3443.7	0.7
	4126.9	1.1
	4358.5	0.9
	4596.1	4.4
V0356 Ara	4201.1	6.2

Table 2. New Times of Maxima (cont.)

Star Name	Time of Maxima HJD (+2450000)	Standard Error
FW Aps	2901.4	6.8
	3412.4	3.5
DH Aps	2107.5	1.1
	2520.6	2.0
	2920.1	6.0
	3059.5	2.8
	3477.5	1.7
	3842.3	1.4
	4237.3	2.4
	4374.9	1.7
	4566.7	1.2
	4972.4	2.9
DX Aps	1992.4	4.7
	2183.2	1.3
	3431.9	0.8
	3650.3	3.0
	3862.2	8.2
	4892.6	4.3
EO Aps	3545.0	2.7
	4255.6	4.7
	4741.9	2.6
DG Pav	2104.1	0.7
	2913.8	0.7
	3454.0	0.9
	4268.4	1.6
	5058.5	0.7
DI Pav	2185.4	0.4
	2945.1	0.5
	4242.1	0.7
	4750.7	0.6
	5009.1	0.9
NO Pav	2090.4	0.8
	2510.5	1.3
	2942.2	0.8
	4222.9	1.6
DM Pav	2521.3	1.8
	2796.7	1.0
	3114.1	7.3
	3663.3	1.1
	5102.4	3.9

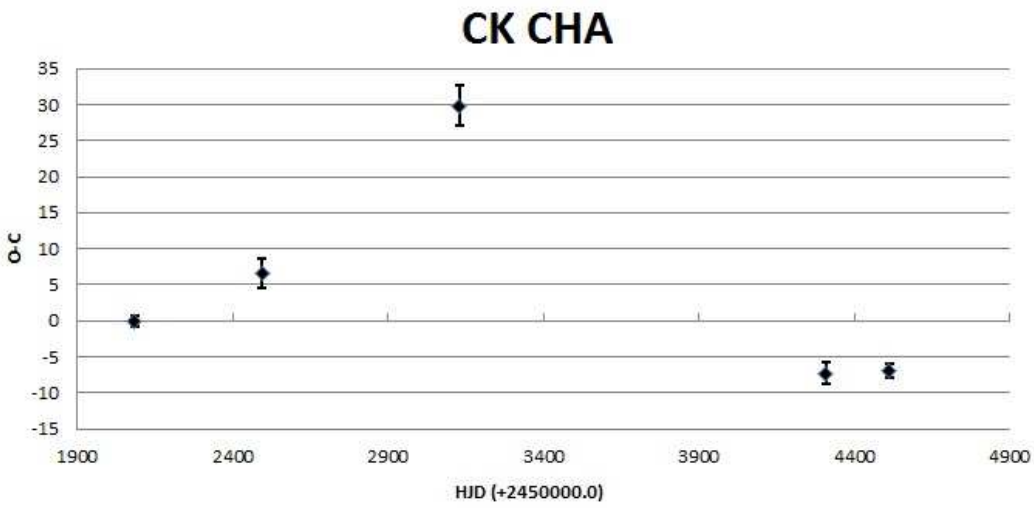

Figure 2. O−C diagram of CK Cha.

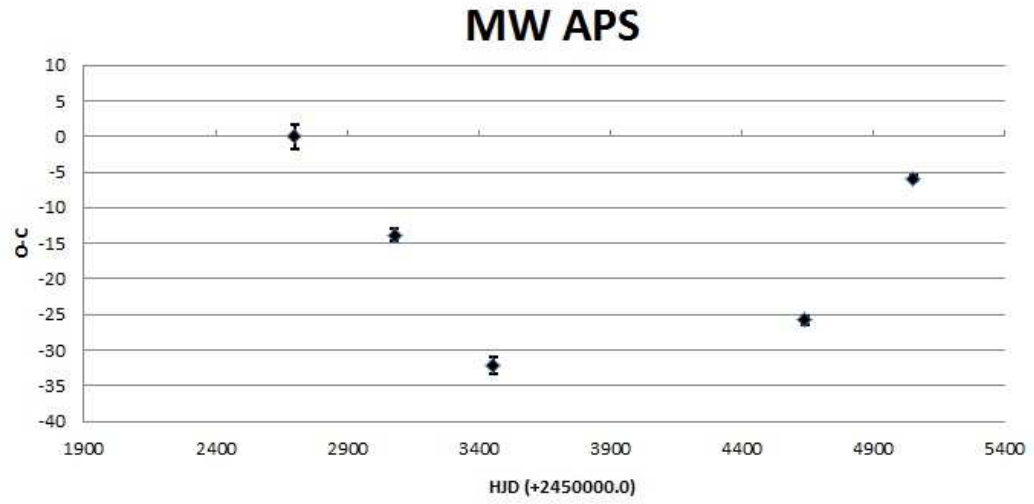

Figure 3. O−C diagram of MW Aps.

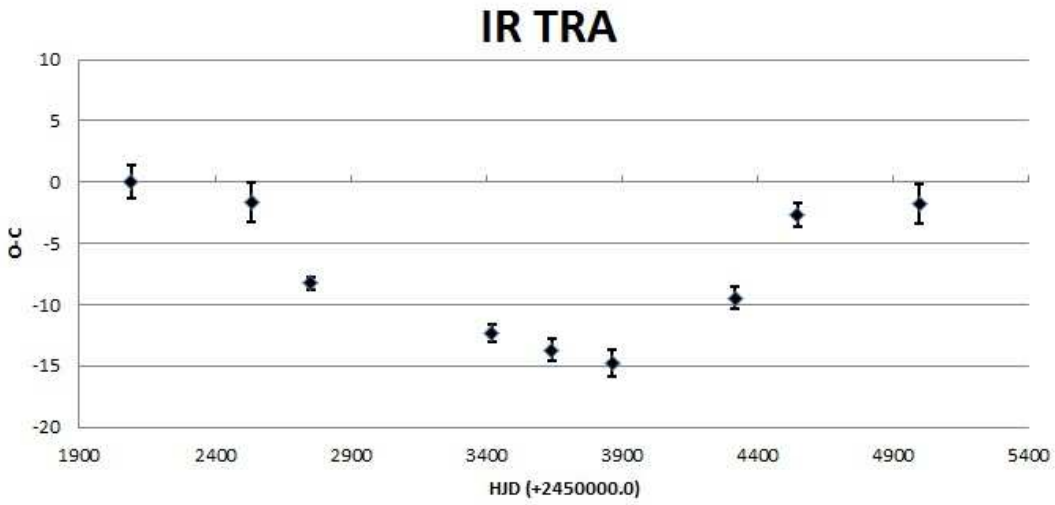

Figure 4. O−C diagram of IR TrA.

References:

Barberá, R., 1999, `http://www.astrogea.org/soft/ave/introave.htm`
Buys, T. S., De Clerk, K., 1972, *Anal. Chem.*, 44, (7), 1273
Kharchenko, N. V., Roeser, S., 2009 All-sky Compiled Catalogue of 2.5 million stars
Knott, G., Baxendell, J., 1863, *Astronomical Register*, **1**, A1-A16
MacConnell, D., 1993, IRAS Point Source Identifications
Pojmanski, G., 2002, *AcA*, **52**, 397
Pojmanski, G., 2003, *AcA*, **53**, 341
Samus, N. et al., 2013, General Catalog of Variable Stars (GCVS database)
Skiff, B. A., 2013, Catalogue of Stellar Spectral Classifications
Stock, J., Wroblewski, H., 1972, *Publ. Obs. Astron. Nacional, Cerro Calan*, **2**, 59
Vyssotsky, A. N., 1943, *PASP*, **55**, 325, 198
Watson C., Henden A. A., Price A., 2006, The AAVSO International Variable Star Index (VSX)