

Moments of Minima of 25 Eclipsing Binaries

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Abstract: In this paper, 1168 minima for 25 stars are listed. All of them were determined using the AAVSO observations. To compute the moments of minima and their errors, the software MAVKA was used.

Keywords: Variable stars; eclipsing binaries; data analysis

1 Introduction

During previous two years 4 articles related to the topic of third components in eclipsing binaries were published. All of them were limit in number of pages. Thus, we were not able to publish any long tables with moments of minima there. List of these articles is provided below:

1. Tvardovskyi D.E., Marsakova V.I., Andronov I.L., 2017 [10] - 235 minima
2. Tvardovskyi D.E., Marsakova V.I., Andronov I.L., 2019, submitted [13] - 549 minima
3. Tvardovskyi D.E., 2019 (1), submitted [12] - 213 minima
4. Tvardovskyi D.E., 2019 (2), submitted [11] - 171 minima

The software MAVKA [4], [5], [6], [7], [8], kindly provided by Kateryna D. Andrych, Ivan L. Andronov and their coauthors, was actively used for this research. In different articles various approximation methods, available in MAVKA, were used. In (Tvardovskyi, Marsakova, Andronov, 2017) only symmetric polynomial was used. In three other articles all MAVKA methods of approximation were used.

For calculations we used large amount of data from AAVSO database [1]. First, data points were sorted by observer and filter, then splited onto separate minima. Both primary and secondary minima were processed. For all moments of minima barycentric correction was done.

2 Researched stars and their light elements

Table 1. All light elements of the researched stars (taken from GCVS [9]).

Star ID	Minima obtained	P, days	T_0 , JD-2400000	Reference
BF Aur	1	1.583223	52500.95	[10]
SX Aur	24	1.210082	52500.32	[10]
U Peg	166	0.374781	36511.67	[10]
V0388 Cyg	27	0.859037	41953.34	[10]
V0523 Cas	17	0.233693	57330.11	[10]
AR Lac	28	1.983192	41593.71	[13]
U CrB	36	3.452201	16747.97	[13]

S Equ	22	3.436097	42596.74	[13]
SW Cyg	18	4.573134	41867.82	[13]
R CMa	77	1.13595	55607.97	[13]
TX UMa	49	3.063238	44998.15	[13]
TZ Eri	8	2.606065	42414.26	[13]
VV UMa	46	0.68738	45815.34	[13]
WW Gem	19	1.237811	25984.26	[13]
YY Eri	221	0.321494	41581.62	[13]
HP Aur	25	1.422819	46353.24	[13]
AB Cas	160	1.366892	56541.88	[12]
AF Gem	30	1.243503	27162.31	[12]
BF Vir	1	0.64057	46070.68	[12]
CL Aur	22	1.244375	50097.27	[12]
EQ Tau	38	0.341348	40213.33	[11]
IR Cas	13	0.680685	56521.64	[11]
IV Cas	12	0.998507	56507.37	[11]
RY Aqr	31	1.966577	52500.02	[11]
RZ Com	77	0.338506	34837.42	[11]

3 Tvardovskyi D.E., Marsakova V.I., Andronov I.L., 2017

Table 2. Moments of minima for BF Aur, SX Aur, U Peg, V0388 Cyg and V523 Cas

Star ID	Observer code	Filter	JD - 2 400 000	Error
BF Aur	CDSA	CV	57749.3361	0.00021
SX Aur	BIZ	V	53388.5176	0.00055
SX Aur	MIQ	V	53733.3899	0.00028
SX Aur	PVA	V	53758.8032	0.00057
SX Aur	PVA	V	53815.6825	0.00063
SX Aur	SAH	V	53994.773	0.00061
SX Aur	BIZ	V	54201.6981	0.0011
SX Aur	PRX	V	54437.6588	0.00043
SX Aur	BIZ	V	54535.6796	0.00028
SX Aur	BIZ	V	54869.6588	0.0013
SX Aur	SAH	V	55238.7354	0.00018
SX Aur	PRX	V	55543.6741	0.00022
SX Aur	SAH	V	55612.6529	0.00036
SX Aur	SET	Vis	55917.5838	0.0012
SX Aur	PRX	V	55923.6405	0.00018
SX Aur	SAH	V	55929.6949	0.00042
SX Aur	DAT	Vis	55985.3564	0.00075
SX Aur	SNE	V	56229.7915	0.00007
SX Aur	MZK	V	56235.8424	0.00013
SX Aur	PRX	V	56263.6737	0.00042

SX Aur	SAH	V	56603.7069	0.00007
SX Aur	SAH	V	56966.7323	0.0001
SX Aur	SNE	V	57312.8177	0.00007
SX Aur	MZK	V	57335.805	0.00018
SX Aur	SAH	V	57698.8327	0.00008
U Peg	BM	Vis	40566.6216	0.0011
U Peg	CK	Vis	41234.667	0.00088
U Peg	SDA	Vis	42270.7686	0.0024
U Peg	SAH	Vis	42341.5855	0.00066
U Peg	SKL	Vis	42365.6052	0.004
U Peg	FT	Vis	42370.6197	0.0012
U Peg	WED	Vis	42376.6215	0.00058
U Peg	WED	Vis	42377.5697	0.00042
U Peg	SDA	Vis	42377.5697	0.0021
U Peg	BM	Vis	42386.5407	0.0031
U Peg	BM	Vis	42391.6167	0.00077
U Peg	SDA	Vis	42401.5621	0.0013
U Peg	SAH	Vis	42407.5427	0.00087
U Peg	WED	Vis	42581.818	0.0014
U Peg	WED	Vis	42599.8101	0.0014
U Peg	SAH	Vis	42618.7433	0.00098
U Peg	GAN	Vis	42618.7536	0.00062
U Peg	BM	Vis	42664.6312	0.0018
U Peg	BM	Vis	42665.75	0.0019
U Peg	BM	Vis	42668.7522	0.0014
U Peg	SAH	Vis	42682.6427	0.00095
U Peg	BM	Vis	42688.626	0.0017
U Peg	RUO	Vis	42768.6464	0.00063
U Peg	SAH	Vis	42985.8231	0.0011
U Peg	SAH	Vis	43008.6883	0.0013
U Peg	SAH	Vis	43017.8558	0.0016
U Peg	SAH	Vis	43035.8497	0.00097
U Peg	SAH	Vis	43100.6943	0.0016
U Peg	RUO	Vis	43373.7168	0.00014
U Peg	BM	Vis	43423.7451	0.0015
U Peg	SAH	Vis	43436.6881	0.00036
U Peg	WGM	Vis	43775.6752	0.0012
U Peg	WGM	Vis	43789.7324	0.00057
U Peg	SAH	Vis	43798.7149	0.0017
U Peg	BM	Vis	43815.582	0.0021
U Peg	SAH	Vis	43883.6038	0.00085
U Peg	BM	Vis	44127.5811	0.0026
U Peg	BM	Vis	44128.7064	0.0015
U Peg	SAH	Vis	44160.7603	0.001
U Peg	BM	Vis	44217.5352	0.0068

U Peg	HSG	Vis	44525.6072	0.0018
U Peg	SAH	Vis	44525.6147	0.00079
U Peg	SAH	Vis	44944.6278	0.00024
U Peg	SAH	Vis	45235.6346	0.00063
U Peg	SAH	Vis	45937.7906	0.00095
U Peg	SAH	Vis	45959.7017	0.00088
U Peg	CK	Vis	46008.6145	0.001
U Peg	CK	Vis	46017.6123	0.001
U Peg	SAH	Vis	46017.6148	0.0014
U Peg	CK	Vis	46035.5908	0.0016
U Peg	CK	Vis	46044.5901	0.00087
U Peg	ATW	Vis	46323.7908	0.0017
U Peg	CK	Vis	46331.6639	0.0015
U Peg	SAH	Vis	46406.6229	0.001
U Peg	SAH	Vis	46445.5996	0.0012
U Peg	SAH	Vis	46659.784	0.00082
U Peg	BM	Vis	46682.6463	0.00074
U Peg	ATW	Vis	46708.7056	0.001
U Peg	SAH	Vis	46709.6468	0.0016
U Peg	BM	Vis	46736.6111	0.0011
U Peg	SAH	Vis	46759.6615	0.001
U Peg	SAH	Vis	46769.5957	0.0011
U Peg	SAH	Vis	46779.5395	0.00083
U Peg	SAH	Vis	46793.5875	0.0015
U Peg	BM	Vis	46793.5888	0.0019
U Peg	SAH	Vis	47062.6792	0.00078
U Peg	BM	Vis	47084.5928	0.0017
U Peg	SAH	Vis	47161.6391	0.0018
U Peg	SAH	Vis	47418.3626	0.0029
U Peg	SAH	Vis	47465.376	0.0012
U Peg	BM	Vis	47477.5453	0.00085
U Peg	SAH	Vis	47481.3108	0.00051
U Peg	SAH	Vis	47524.6037	0.0014
U Peg	SAH	Vis	47799.6988	0.0017
U Peg	SAH	Vis	47851.5793	0.00001
U Peg	BM	Vis	48129.6675	0.00048
U Peg	SAH	Vis	48135.8527	0.0019
U Peg	SAH	Vis	48154.5885	0.002
U Peg	SAH	Vis	48210.6222	0.00065
U Peg	SAH	Vis	48506.6938	0.00065
U Peg	SAH	Vis	48537.6154	0.0016
U Peg	SAH	Vis	48568.5527	0.0022
U Peg	SAH	Vis	48601.5227	0.0016
U Peg	SAH	Vis	48885.793	0.0017
U Peg	SAH	Vis	48888.5885	0.00072

U Peg	SAH	Vis	48897.5813	0.0011
U Peg	SAH	Vis	48954.5614	0.0026
U Peg	SAH	Vis	49241.6465	0.0013
U Peg	SAH	Vis	49270.8584	0.0017
U Peg	SAH	Vis	49333.6499	0.0005
U Peg	SAH	Vis	49625.5945	0.0014
U Peg	SAH	Vis	49637.5987	0.0023
U Peg	SAH	Vis	49679.5677	0.0016
U Peg	PLA	Vis	49925.7917	0.00008
U Peg	SAH	Vis	49955.7884	0.00015
U Peg	SAH	Vis	50000.5616	0.0024
U Peg	SAH	Vis	50003.5684	0.00049
U Peg	SAH	Vis	50320.8058	0.001
U Peg	SAH	Vis	50376.6553	0.0005
U Peg	SET	Vis	50390.5212	0.0017
U Peg	SAH	Vis	50425.5548	0.00042
U Peg	SAH	Vis	50455.5515	0.0015
U Peg	SAH	Vis	50726.6868	0.0012
U Peg	SAH	Vis	50731.5593	0.00064
U Peg	SAH	Vis	50749.5582	0.001
U Peg	MMN	V	50766.4057	0.00067
U Peg	SAH	Vis	50770.5363	0.00073
U Peg	SAH	Vis	50799.5917	0.00075
U Peg	SAH	Vis	51041.6957	0.002
U Peg	SAH	Vis	51084.6029	0.00072
U Peg	SAH	Vis	51099.5893	0.00063
U Peg	SAH	Vis	51130.5244	0.00089
U Peg	SAH	Vis	51141.5615	0.00083
U Peg	SAH	Vis	51156.5569	0.00098
U Peg	BIZ	V	52968.5962	0.00016
U Peg	MKE	V	53197.7753	0.00041
U Peg	SAH	V	53314.7023	0.0002
U Peg	SAH	V	53709.5281	0.00014
U Peg	PVA	V	53998.852	0.00005
U Peg	BKL	V	54065.5644	0.0001
U Peg	SAH	V	54104.5451	0.0001
U Peg	SAH	V	54302.7958	0.00034
U Peg	DDI	Vis	54356.7574	0.00076
U Peg	DDI	Vis	54383.7497	0.00072
U Peg	SRIC	V	54388.6184	0.00074
U Peg	SAH	V	54429.6588	0.00022
U Peg	SAH	V	54440.5285	0.0001
U Peg	MZK	V	54706.8024	0.00012
U Peg	SAH	V	54727.789	0.0002
U Peg	VJA	CV	54731.3519	0.00019

U Peg	SET	Vis	54736.5978	0.00097
U Peg	OYE	V	54786.2557	0.00006
U Peg	BIZ	V	54801.6226	0.00007
U Peg	SAH	V	54803.3099	0.00027
U Peg	SAH	V	55077.8279	0.00016
U Peg	SAH	V	55086.6376	0.00018
U Peg	SAH	V	55175.6477	0.00012
U Peg	PLN	TG	55473.4044	0.00006
U Peg	PRX	V	55502.6392	0.00045
U Peg	SNE	V	55511.6337	0.00019
U Peg	CLZ	R	55541.4297	0.00066
U Peg	SAH	V	55844.6202	0.00009
U Peg	SAH	V	56163.745	0.00023
U Peg	MKE	TG	56169.7394	0.00031
U Peg	MKE	TG	56185.6665	0.0001
U Peg	MKE	TG	56185.8555	0.00017
U Peg	CLZ	R	56206.4677	0.00033
U Peg	CLZ	R	56247.3213	0.00028
U Peg	CLZ	R	56506.4797	0.00051
U Peg	SRIC	V	56535.8988	0.0004
U Peg	SNE	V	56620.5989	0.00004
U Peg	CLZ	V	56624.316	0.0002
U Peg	SAH	V	56634.6539	0.0001
U Peg	CLZ	R	56886.5022	0.00012
U Peg	SRIC	V	56925.6654	0.00011
U Peg	MKE	TG	56952.65	0.00021
U Peg	CLZ	R	56957.3344	0.00016
U Peg	MZK	V	56976.6369	0.0002
U Peg	SAH	V	57234.8598	0.00007
U Peg	CLZ	V	57305.5013	0.00016
U Peg	SNE	V	57328.5524	0.00005
U Peg	SNE	V	57606.8261	0.00007
U Peg	SAH	V	57606.8263	0.00008
U Peg	HBB	V	57638.8676	0.00007
U Peg	CLZ	V	57683.4677	0.00022
U Peg	SAH	V	57951.8108	0.00007
V0388 Cyg	BM	Vis	43724.6696	0.003
V0388 Cyg	HK	Vis	45167.6927	0.0024
V0388 Cyg	SAH	CV	51805.584	0.00023
V0388 Cyg	HES	V	52182.6921	0.0006
V0388 Cyg	SAH	V	52219.6428	0.00018
V0388 Cyg	GHS	V	54023.5923	0.0014
V0388 Cyg	SAH	V	54296.7659	0.00054
V0388 Cyg	BIZ	V	54619.7574	0.0022
V0388 Cyg	MZK	V	54619.7616	0.00021

V0388 Cyg	SAH	V	54649.8276	0.0002
V0388 Cyg	MZK	V	54650.5176	0.0002
V0388 Cyg	OYE	V	55030.3711	0.00006
V0388 Cyg	SAH	V	55138.6143	0.0004
V0388 Cyg	SAH	V	55381.715	0.00014
V0388 Cyg	CLZ	CV	55426.3884	0.0019
V0388 Cyg	SNE	V	55790.6112	0.00017
V0388 Cyg	SAH	V	56186.6236	0.00015
V0388 Cyg	SAH	V	56515.633	0.00028
V0388 Cyg	SAH	V	56843.7771	0.00022
V0388 Cyg	SAH	V	57222.6114	0.0004
V0388 Cyg	SNE	V	57227.7618	0.00015
V0388 Cyg	RIZ	V	57557.6297	0.00094
V0388 Cyg	SAH	V	57611.7482	0.00022
V0388 Cyg	SET	Vis	57624.6373	0.001
V0388 Cyg	RIZ	V	57630.6419	0.0004
V0388 Cyg	SAH	V	57673.597	0.00008
V0388 Cyg	SAH	V	57909.8301	0.0001
V0523 Cas	CDSA	Vis	50372.3543	0.0013
V0523 Cas	CDSA	Vis	50375.3845	0.0014
V0523 Cas	DKS	V	54441.6601	0.00006
V0523 Cas	OYE	CV	55460.3294	0.00003
V0523 Cas	TPV	V	56191.6715	0.00014
V0523 Cas	TPV	I	56191.6718	0.00025
V0523 Cas	TPV	B	56191.6719	0.00023
V0523 Cas	TPV	B	56191.7875	0.00042
V0523 Cas	TPV	I	56191.7879	0.00025
V0523 Cas	TPV	V	56191.7889	0.00018
V0523 Cas	TPV	I	56191.9053	0.00018
V0523 Cas	TPV	B	56191.9053	0.00027
V0523 Cas	TPV	V	56191.9054	0.00012
V0523 Cas	KTU	V	57301.48	0.00003
V0523 Cas	KTU	V	57301.5968	0.00003
V0523 Cas	HBB	V	57573.8568	0.00004
V0523 Cas	KTU	V	57573.8568	0.00004

4 Tvardovskyi D.E., Marsakova V.I., Andronov I.L., 2019, submitted

Table 3. Moments of minima for AR Lac, U CrB, S Equ, SW Cyg, R CMa, TX UMa, TZ Eri, VV UMa, WW Gem, YY Eri and HP Aur

Star ID	Observer code	Filter	JD - 2 400 000	Error
AR Lac	SAH	Vis.	42997.8221	0.0022
AR Lac	SAH	Vis.	44191.7047	0.0013

AR Lac	SAH	Vis.	44419.7566	0.0015
AR Lac	HSG	Vis.	44560.5555	0.00098
AR Lac	SAH	Vis.	45131.7406	0.0014
AR Lac	SAH	Vis.	45264.6	0.0011
AR Lac	LX	Vis.	48202.6572	0.0012
AR Lac	LX	Vis.	48211.5865	0.0013
AR Lac	LX	Vis.	48214.5584	0.0012
AR Lac	LX	Vis.	48216.5589	0.0021
AR Lac	LX	Vis.	48238.52904	0.00023
AR Lac	FSE	Vis.	48963.259	0.001
AR Lac	FSE	Vis.	49288.46525	0.00046
AR Lac	FSE	Vis.	49308.32855	0.00036
AR Lac	FSE	Vis.	51204.24978	0.00015
AR Lac	BEB	Vis.	51489.7083	0.0022
AR Lac	BEB	Vis.	51499.6321	0.0014
AR Lac	FSE	Vis.	51543.26191	0.00074
AR Lac	SSW	Vis.	53655.3953	0.0014
AR Lac	SYF	Vis.	54004.3991	0.0025
AR Lac	SYI	Vis.	54716.4096	0.0043
AR Lac	SAH	V	54797.72134	0.00032
AR Lac	SAH	V	55146.76368	0.0003
AR Lac	SNE	V	57278.72664	0.00015
AR Lac	SAH	V	57643.63501	0.00011
AR Lac	SNE	V	57978.79306	0.00013
AR Lac	PGD	V	57991.68523	0.00017
AR Lac	SAH	V	58341.71694	0.00041
U CrB	MOR	Vis.	38938.7416	0.001
U CrB	GNT	Vis.	41151.59059	0.00075
U CrB	CR	Vis.	41824.7586	0.0018
U CrB	HRJ	Vis.	42518.67165	0.00035
U CrB	SAH	Vis.	42549.7242	0.0015
U CrB	VOL	Vis.	42967.4224	0.0011
U CrB	SET	Vis.	43350.62079	0.00023
U CrB	WEM	Vis.	43992.761	0.0021
U CrB	HSG	Vis.	44382.85854	0.00089
U CrB	WI	Vis.	45511.7214	0.0011
U CrB	ATW	Vis.	46947.87372	0.00049
U CrB	LBB	Vis.	46961.6747	0.0012
U CrB	LTB	Vis.	47320.7152	0.002
U CrB	ATW	Vis.	47351.8246	0.0015
U CrB	ATW	Vis.	47672.8229	0.001
U CrB	HRI	Vis.	47679.75	0.0014
U CrB	SAH	Vis.	48794.78467	0.00053
U CrB	SAH	Vis.	49198.7096	0.001
U CrB	SAH	Vis.	49602.6301	0.0025

U CrB	MMN	Vis.	49799.40213	0.00074
U CrB	SQR	Vis.	50365.5628	0.00017
U CrB	SAH	Vis.	50572.7153	0.0016
U CrB	BEB	Vis.	50938.666	0.0029
U CrB	SET	Vis.	51663.6314	0.0017
U CrB	SET	Vis.	52816.6625	0.002
U CrB	SSW	Vis.	53517.4605	0.003
U CrB	SSW	Vis.	54204.48702	0.00093
U CrB	SAH	V	54939.79896	0.00025
U CrB	SAH	V	55336.79891	0.00019
U CrB	SAH	V	56061.76166	0.00008
U CrB	SAH	V	57138.85458	0.00008
U CrB	SAH	V	57511.69746	0.00011
U CrB	CK	V	57580.73892	0.00063
U CrB	SAH	CV	58191.78791	0.00023
U CrB	NAL	TG	58250.47708	0.00045
U CrB	ATE	V	58288.4543	0.00007
S Equ	WED	Vis.	43723.7921	0.0019
S Equ	HK	Vis.	44472.8369	0.0062
S Equ	HK	Vis.	44479.7324	0.0013
S Equ	SAH	Vis.	45173.82556	0.0005
S Equ	HRI	Vis.	47087.76706	0.00058
S Equ	SAH	Vis.	48922.638	0.0011
S Equ	WI	Vis.	50341.75927	0.00042
S Equ	WI	Vis.	50719.7366	0.001
S Equ	WI	Vis.	50726.60658	0.00066
S Equ	HRI	Vis.	51097.7114	0.0019
S Equ	BM	Vis.	51420.69352	0.00067
S Equ	SAH	Vis.	51451.6249	0.0014
S Equ	HRI	Vis.	51791.79482	0.00038
S Equ	SSW	Vis.	53585.4559	0.0013
S Equ	SSW	Vis.	53616.3764	0.0027
S Equ	KTZ	Vis.	54712.493	0.002
S Equ	SAH	V	55138.56168	0.00013
S Equ	SNE	V	55777.67353	0.00009
S Equ	SAH	V	56966.56663	0.00004
S Equ	CLZ	V	57241.45601	0.00019
S Equ	SAH	V	57313.61492	0.00008
S Equ	CK	V	57629.73511	0.00043
SW Cyg	SAH	Vis.	42960.77945	0.00041
SW Cyg	SAH	Vis.	43015.6776	0.0012
SW Cyg	SAH	Vis.	43646.76354	0.0009
SW Cyg	HEF	Vis.	44021.752	0.0012
SW Cyg	HEF	Vis.	44053.7516	0.0012
SW Cyg	HEF	Vis.	44117.7714	0.0015

SW Cyg	HEF	Vis.	44803.6961	0.001
SW Cyg	HRI	Vis.	45617.7684	0.002
SW Cyg	ATW	Vis.	46623.8183	0.00069
SW Cyg	ATW	Vis.	46710.71102	0.00098
SW Cyg	ATW	Vis.	47085.7023	0.0013
SW Cyg	SAH	V	55074.72481	0.00021
SW Cyg	SAH	V	56487.78894	0.0002
SW Cyg	SAH	V	57205.75616	0.00016
SW Cyg	SAH	V	57635.62515	0.00032
SW Cyg	SAH	V	57923.72566	0.00014
SW Cyg	SAH	V	58243.8403	0.00014
SW Cyg	ATE	V	58344.449	0.00029
R CMa	BM	Vis.	39169.675	0.0017
R CMa	BM	Vis.	39528.6372	0.0015
R CMa	BM	Vis.	39896.6747	0.0012
R CMa	SKL	Vis.	40973.5627	0.0012
R CMa	LNS	Vis.	40975.805	0.0027
R CMa	SLB	Vis.	41717.58586	0.00076
R CMa	WED	Vis.	42404.8226	0.0022
R CMa	MAN	Vis.	42428.6958	0.002
R CMa	THS	Vis.	42444.5998	0.0016
R CMa	THS	Vis.	42445.7381	0.0012
R CMa	BM	Vis.	42453.66729	0.0009
R CMa	SKL	Vis.	42469.58865	0.00025
R CMa	HRJ	Vis.	42470.5693	0.0025
R CMa	SAH	Vis.	42486.6223	0.0012
R CMa	HRJ	Vis.	42487.6284	0.0037
R CMa	WED	Vis.	42738.79906	0.00019
R CMa	BM	Vis.	42837.6264	0.0034
R CMa	SET	Vis.	42887.58683	0.00065
R CMa	SAH	Vis.	43098.9141	0.0013
R CMa	SAH	Vis.	43123.85	0.0021
R CMa	SAH	Vis.	43556.6767	0.0014
R CMa	SAH	Vis.	44576.7588	0.0011
R CMa	SAH	Vis.	44593.8	0.0015
R CMa	CAH	Vis.	44617.6444	0.0013
R CMa	SAH	Vis.	44634.7018	0.0018
R CMa	SAH	Vis.	45060.6597	0.0013
R CMa	SAH	Vis.	45671.8085	0.0015
R CMa	SAH	Vis.	45762.6868	0.0014
R CMa	CK	Vis.	46056.8943	0.002
R CMa	CK	Vis.	46064.8476	0.0012
R CMa	CK	Vis.	46080.7615	0.0011
R CMa	CK	Vis.	46129.5998	0.00092
R CMa	SAH	Vis.	46472.6482	0.00082

R CMa	ATW	Vis.	46832.75824	0.00041
R CMa	SAH	Vis.	47174.6877	0.0015
R CMa	HRI	Vis.	47183.7476	0.0018
R CMa	ATW	Vis.	47233.73386	0.00054
R CMa	SAH	Vis.	47566.5958	0.0022
R CMa	SAH	Vis.	48335.6123	0.0014
R CMa	SAH	Vis.	49012.6511	0.0017
R CMa	SAH	Vis.	49037.6341	0.0013
R CMa	SAH	Vis.	50125.8971	0.0014
R CMa	SAH	Vis.	50165.62854	0.00091
R CMa	SAH	Vis.	50376.9157	0.002
R CMa	SET	Vis.	50466.66464	0.00094
R CMa	SAH	Vis.	50474.63188	0.00038
R CMa	SAH	Vis.	50499.60635	0.00097
R CMa	SQR	Vis.	50541.61569	0.0002
R CMa	SQR	Vis.	50842.66838	0.00053
R CMa	SQR	Vis.	50858.57408	0.00077
R CMa	SAH	Vis.	50867.6563	0.0013
R CMa	SQR	Vis.	50884.68514	0.00039
R CMa	SQR	Vis.	50900.5983	0.00091
R CMa	SAH	Vis.	51144.8338	0.0013
R CMa	SAH	Vis.	51160.7386	0.0017
R CMa	SET	Vis.	51193.663	0.0014
R CMa	SQR	Vis.	51217.54794	0.00013
R CMa	SQR	Vis.	51218.66268	0.00038
R CMa	SQR	Vis.	51234.56321	0.00038
R CMa	SAH	Vis.	51544.6923	0.0012
R CMa	SAH	Vis.	51586.6728	0.0015
R CMa	SAH	Vis.	51602.61665	0.00088
R CMa	SAH	Vis.	51610.5614	0.0015
R CMa	SET	Vis.	51928.6407	0.00098
R CMa	SET	Vis.	52354.6108	0.0012
R CMa	SSW	Vis.	53814.30375	0.00062
R CMa	SSW	Vis.	54500.4188	0.0014
R CMa	SET	Vis.	54502.6864	0.0012
R CMa	BIZ	V	54861.6465	0.0012
R CMa	SET	Vis.	54869.59523	0.00085
R CMa	SET	Vis.	55947.62518	0.00095
R CMa	SAH	V	56340.65755	0.0002
R CMa	SAH	V	57476.61101	0.0001
R CMa	SAH	V	57712.89082	0.00011
R CMa	SAH	V	57786.72788	0.00014
R CMa	SAH	R	58170.68046	0.00023
R CMa	SNE	V	58488.74757	0.00025
TX UMa	CK	Vis.	39891.7424	0.0011

TX UMa	ATW	Vis.	41049.683	0.0015
TX UMa	ATW	Vis.	41055.7474	0.0022
TX UMa	ATW	Vis.	42458.7228	0.0014
TX UMa	THS	Vis.	42461.785	0.002
TX UMa	SAH	Vis.	42844.69227	0.00071
TX UMa	SAH	Vis.	43190.8527	0.001
TX UMa	SAH	Vis.	44348.743	0.0012
TX UMa	SAH	Vis.	44593.7978	0.0013
TX UMa	WI	Vis.	44734.7153	0.0014
TX UMa	WI	Vis.	44737.7748	0.0011
TX UMa	HK	Vis.	45022.6607	0.0017
TX UMa	WI	Vis.	45077.79319	0.00086
TX UMa	SAH	Vis.	45463.7564	0.0011
TX UMa	SAH	Vis.	45797.6684	0.0016
TX UMa	SAH	Vis.	46091.7325	0.0008
TX UMa	ATW	Vis.	46575.7335	0.001
TX UMa	SAH	Vis.	46814.6829	0.0016
TX UMa	BBT	Vis.	46860.63252	0.00093
TX UMa	PIJ	Vis.	47142.4672	0.0016
TX UMa	ATW	Vis.	47203.7178	0.0019
TX UMa	ATW	Vis.	47206.7851	0.0013
TX UMa	SAH	Vis.	47540.6952	0.0013
TX UMa	LX	Vis.	47972.616	0.0014
TX UMa	CK	Vis.	48652.6729	0.0015
TX UMa	SAH	Vis.	48661.8762	0.0014
TX UMa	MMN	Vis.	49032.5433	0.0032
TX UMa	CK	Vis.	49041.7104	0.0013
TX UMa	MMN	Vis.	49415.4319	0.0018
TX UMa	SQR	Vis.	50104.6727	0.0013
TX UMa	HAB	Vis.	50110.8078	0.0011
TX UMa	CK	V	50150.6364	0.002
TX UMa	WI	Vis.	51265.6937	0.0013
TX UMa	FSE	Vis.	51299.45141	0.00094
TX UMa	FSE	Vis.	51584.32931	0.00059
TX UMa	FSE	Vis.	51587.3338	0.0012
TX UMa	SAH	Vis.	51602.65781	0.00095
TX UMa	WI	Vis.	51608.77129	0.00045
TX UMa	WI	Vis.	51657.78295	0.00075
TX UMa	SSW	Vis.	53814.3298	0.0011
TX UMa	SSW	Vis.	54203.36522	0.0007
TX UMa	SSW	Vis.	54500.50388	0.00094
TX UMa	BIZ	V	54950.79656	0.00026
TX UMa	PLN	TG	55563.44938	0.00014
TX UMa	SAH	V	55921.85071	0.00007
TX UMa	CK	V	57465.74597	0.00055

TX UMa	CDSA	CV	57744.50917	0.00007
TX UMa	SAH	V	57802.7119	0.00009
TX UMa	SAH	V	58148.86866	0.00004
TZ Eri	SET	Vis.	55215.549	0.0011
TZ Eri	SAH	V	55929.62144	0.00023
TZ Eri	SAH	V	56609.81629	0.00013
TZ Eri	SAH	V	57701.7763	0.0001
TZ Eri	SAH	V	57761.71717	0.00018
TZ Eri	SAH	V	58139.604	0.00021
TZ Eri	SAH	V	58415.85316	0.00018
TZ Eri	ATE	V	58538.34178	0.00018
VV UMa	MMN	Vis.	49799.37023	0.00069
VV UMa	BEB	Vis.	51245.5842	0.0012
VV UMa	BEB	Vis.	51253.8348	0.0017
VV UMa	BEB	Vis.	51634.6468	0.0014
VV UMa	SET	Vis.	52342.6431	0.001
VV UMa	SET	Vis.	52694.57978	0.0004
VV UMa	SET	Vis.	52762.624	0.0011
VV UMa	PVA	V	53839.75998	0.00023
VV UMa	PVA	V	54105.77667	0.00007
VV UMa	SET	Vis.	54246.6816	0.0011
VV UMa	MZK	V	54527.82882	0.00009
VV UMa	MZK	V	54547.76302	0.00009
VV UMa	DDI	Vis.	54591.75618	0.0003
VV UMa	HMB	V	54862.58332	0.00013
VV UMa	OYE	V	54865.33319	0.00009
VV UMa	DKS	V	54870.83157	0.00016
VV UMa	HMB	V	54893.5155	0.00006
VV UMa	HMB	V	54897.63984	0.00009
VV UMa	PRX	V	54908.6378	0.00018
VV UMa	HMB	V	54910.35478	0.00064
VV UMa	SAH	V	54912.76267	0.00016
VV UMa	BIZ	V	54923.76027	0.00015
VV UMa	DKS	V	55253.70275	0.00005
VV UMa	SAH	V	55257.82736	0.00013
VV UMa	MZK	V	55262.64108	0.00011
VV UMa	SET	Vis.	55282.57695	0.00054
VV UMa	DAT	Vis.	55298.38688	0.00084
VV UMa	DAT	Vis.	55311.443	0.00046
VV UMa	PRX	V	55594.64269	0.00031
VV UMa	MZK	V	55605.63933	0.00029
VV UMa	SET	Vis.	55625.58249	0.00073
VV UMa	SAH	V	55914.96071	0.00006
VV UMa	PRX	V	55994.69599	0.0001
VV UMa	HBB	V	56302.64134	0.00023

VV UMa	KTU	V	56355.56818	0.00004
VV UMa	KTU	V	56359.34801	0.00018
VV UMa	KTU	V	56366.56634	0.00005
VV UMa	SAH	V	56766.61763	0.0001
VV UMa	SAH	V	57003.76144	0.00006
VV UMa	RIZ	V	57498.66878	0.00022
VV UMa	MZK	V	57830.66824	0.00005
VV UMa	MZK	V	58102.8665	0.0001
VV UMa	MZK	V	58104.92843	0.00005
VV UMa	ATE	V	58209.40986	0.00003
VV UMa	SAH	V	58425.92824	0.00006
VV UMa	CGRD	TG	58516.66074	0.00018
WW Gem	SAH	V	54873.55694	0.00028
WW Gem	DKS	V	55269.64921	0.00015
WW Gem	MZK	V	55858.84603	0.0002
WW Gem	MZK	V	56258.66591	0.00017
WW Gem	SNE	V	56274.75841	0.00011
WW Gem	SAH	V	56737.70559	0.00027
WW Gem	SAH	V	57096.67389	0.00023
WW Gem	MZK	V	57326.90503	0.00014
WW Gem	SAH	V	57445.73386	0.00017
WW Gem	SAH	V	57701.95873	0.00016
WW Gem	ATE	V	57805.30999	0.00025
WW Gem	ATE	V	57808.40847	0.00027
WW Gem	ATE	V	57813.35952	0.00008
WW Gem	ATE	V	57821.40493	0.00018
WW Gem	SAH	V	58137.66207	0.0002
WW Gem	SAH	V	58461.96548	0.00026
WW Gem	SAH	V	58486.72088	0.00013
WW Gem	ATE	V	58490.43515	0.0001
WW Gem	ATE	V	58521.37721	0.00007
YY Eri	SLB	Vis.	40999.55229	0.00027
YY Eri	SLB	Vis.	41370.55791	0.00075
YY Eri	SLB	Vis.	41388.55031	0.00067
YY Eri	SLB	Vis.	41690.60066	0.00016
YY Eri	SLB	Vis.	41702.6643	0.0017
YY Eri	SLB	Vis.	41735.6094	0.0012
YY Eri	SLB	Vis.	41744.61582	0
YY Eri	SLB	Vis.	41745.56994	0.00026
YY Eri	SLB	Vis.	41746.54584	0.00032
YY Eri	SLB	Vis.	41754.5811	0.0011
YY Eri	SKL	Vis.	42429.56781	0.00035
YY Eri	DEV	Vis.	42464.59797	0.0007
YY Eri	SKL	Vis.	42469.5911	0.0013
YY Eri	SKL	Vis.	42473.6024	0.0013

YY Eri	HRJ	Vis.	42474.61272	0.00028
YY Eri	HRJ	Vis.	42479.5604	0.0011
YY Eri	SAH	Vis.	42486.61525	0.00001
YY Eri	SAH	Vis.	42721.7931	0.0012
YY Eri	SET	Vis.	42760.70733	0.00078
YY Eri	SAH	Vis.	42832.56303	0.00038
YY Eri	SAH	Vis.	42844.60474	0.00085
YY Eri	SAH	Vis.	43050.85054	0.00008
YY Eri	SAH	Vis.	43069.80781	0.00018
YY Eri	SAH	Vis.	43098.747	0.0017
YY Eri	HES	Vis.	43144.7299	0.0011
YY Eri	SAH	Vis.	43203.56175	0.00065
YY Eri	SAH	Vis.	43436.8087	0.0011
YY Eri	SET	Vis.	43461.7251	0.001
YY Eri	SAH	Vis.	43556.55744	0.00097
YY Eri	SAH	Vis.	43856.6833	0.0015
YY Eri	SAH	Vis.	43879.66872	0.00069
YY Eri	SAH	Vis.	44236.69195	0.00048
YY Eri	SAH	Vis.	44562.65592	0
YY Eri	SAH	Vis.	44576.66693	0.00038
YY Eri	HSG	Vis.	44593.54479	0.00048
YY Eri	SAH	Vis.	44608.6587	0.0015
YY Eri	HSG	Vis.	44623.61064	0.00089
YY Eri	SAH	Vis.	44938.67173	0.00072
YY Eri	SAH	Vis.	45291.68372	0.00025
YY Eri	SAH	Vis.	45352.5971	0.0013
YY Eri	SAH	Vis.	45671.69786	0.00089
YY Eri	SAH	Vis.	46038.68781	0.00098
YY Eri	CK	Vis.	46043.67498	0.00048
YY Eri	CK	Vis.	46089.6404	0.001
YY Eri	CK	Vis.	46090.6013	0.0011
YY Eri	CK	Vis.	46108.6111	0.002
YY Eri	SAH	Vis.	46406.6257	0.0014
YY Eri	SAH	Vis.	46413.67624	0.0006
YY Eri	SAH	Vis.	46756.733	0.0012
YY Eri	ATW	Vis.	46792.76285	0.00024
YY Eri	SAH	Vis.	46814.6015	0.0022
YY Eri	SAH	Vis.	47161.67	0.0011
YY Eri	SAH	Vis.	47170.66469	0.0008
YY Eri	ATW	Vis.	47184.66367	0.0004
YY Eri	SAH	Vis.	47212.62656	0.0008
YY Eri	SAH	Vis.	47508.4044	0.0013
YY Eri	SAH	Vis.	47524.6249	0.0024
YY Eri	CK	Vis.	47528.65243	0.00077
YY Eri	SAH	Vis.	47554.6982	0.0017

YY Eri	ATW	Vis.	47557.7533	0.0034
YY Eri	SET	Vis.	47887.6202	0.0012
YY Eri	SET	Vis.	47894.6695	0.0022
YY Eri	SAH	Vis.	47950.619	0.002
YY Eri	SAH	Vis.	48137.8921	0.00032
YY Eri	SAH	Vis.	48237.7142	0.0012
YY Eri	SAH	Vis.	48237.7142	0.0012
YY Eri	SAH	Vis.	48276.6336	0.0006
YY Eri	SET	Vis.	48297.68115	0.00002
YY Eri	SAH	Vis.	48571.7437	0.0022
YY Eri	SET	Vis.	48601.65877	0.0005
YY Eri	SAH	Vis.	48653.57537	0.00067
YY Eri	SET	Vis.	49005.6144	0.0015
YY Eri	SAH	Vis.	49005.6144	0.0015
YY Eri	CK	Vis.	49009.63524	0.00071
YY Eri	SET	Vis.	49038.5831	0.0027
YY Eri	SAH	Vis.	49283.8719	0.0016
YY Eri	SAH	Vis.	49330.65165	0
YY Eri	SAH	Vis.	49361.67389	0.00056
YY Eri	SAH	Vis.	49361.67389	0.00056
YY Eri	SET	Vis.	49389.64152	0.00004
YY Eri	SET	Vis.	49682.69412	0.00094
YY Eri	SET	Vis.	49689.6104	0.0013
YY Eri	SET	Vis.	49716.60478	0.00001
YY Eri	SET	Vis.	49698.60632	0.00052
YY Eri	SAH	Vis.	49716.60478	0.00001
YY Eri	SET	Vis.	49743.61461	0.00044
YY Eri	SAH	Vis.	49744.5847	0.0018
YY Eri	MMN	Vis.	49761.61046	0.00024
YY Eri	SAH	Vis.	49990.53808	0.00001
YY Eri	SAH	Vis.	50044.6929	0.0011
YY Eri	SAH	Vis.	50053.6957	0.00081
YY Eri	SET	Vis.	50067.68396	0.00062
YY Eri	SAH	Vis.	50096.62469	0.00082
YY Eri	SET	Vis.	50097.57893	0.00008
YY Eri	SET	Vis.	50101.6028	0.0015
YY Eri	SAH	Vis.	50107.54831	0.00042
YY Eri	SAH	Vis.	50125.86567	0.0009
YY Eri	SET	Vis.	50127.6266	0.0018
YY Eri	SET	Vis.	50128.6022	0.0014
YY Eri	SAH	Vis.	50376.80259	0.00089
YY Eri	SET	Vis.	50395.77	0.0011
YY Eri	SET	Vis.	50396.73688	0.0004
YY Eri	SET	Vis.	50428.56709	0.00006
YY Eri	SAH	Vis.	50455.56642	0.00095

YY Eri	SET	Vis.	50466.65498	0.00002
YY Eri	SET	Vis.	50481.60194	0.00019
YY Eri	SET	Vis.	50491.5732	0.0013
YY Eri	SAH	Vis.	50499.60754	0.00081
YY Eri	SAH	Vis.	50503.63151	0.00064
YY Eri	SAH	Vis.	50814.6707	0.00041
YY Eri	SAH	Vis.	50824.65577	0.00076
YY Eri	SET	Vis.	50830.61022	0.00088
YY Eri	SAH	Vis.	50867.56601	0.00071
YY Eri	SET	Vis.	50871.58995	0.00075
YY Eri	SET	Vis.	50872.5604	0.00044
YY Eri	SAH	Vis.	51144.8648	0.0015
YY Eri	SAH	Vis.	51156.6015	0.0011
YY Eri	SET	Vis.	51169.6268	0.0011
YY Eri	SAH	Vis.	51172.6663	0.0016
YY Eri	SET	Vis.	51187.6225	0.0012
YY Eri	SET	Vis.	51201.61156	0.00093
YY Eri	SET	Vis.	51215.5845	0.0012
YY Eri	SAH	Vis.	51223.6345	0.00094
YY Eri	SET	Vis.	51229.5754	0.0012
YY Eri	SAH	Vis.	51496.73889	0.00091
YY Eri	SAH	Vis.	51510.7276	0.0014
YY Eri	SET	Vis.	51516.67657	0.00054
YY Eri	SET	Vis.	51539.6779	0.0014
YY Eri	SAH	Vis.	51544.64001	0.00082
YY Eri	SET	Vis.	51546.5816	0.001
YY Eri	SQR	Vis.	51551.54928	0.00066
YY Eri	SET	Vis.	51574.55158	0.00063
YY Eri	SAH	Vis.	51576.63084	0.0008
YY Eri	SET	Vis.	51581.61767	0.00051
YY Eri	SAH	Vis.	51582.5945	0.0011
YY Eri	SET	Vis.	51586.59952	0.00098
YY Eri	SET	Vis.	51592.5624	0.0011
YY Eri	SAH	Vis.	51595.5955	0.0013
YY Eri	SET	Vis.	51601.55424	0.00082
YY Eri	SAH	Vis.	51609.58488	0.001
YY Eri	SET	Vis.	51887.6968	0.0013
YY Eri	SET	Vis.	51911.63685	0.00086
YY Eri	SET	Vis.	51922.5785	0.0011
YY Eri	SET	Vis.	51929.63798	0.0007
YY Eri	SET	Vis.	51930.5921	0.0018
YY Eri	SET	Vis.	51936.565	0.0014
YY Eri	SET	Vis.	52230.7112	0.0019
YY Eri	SET	Vis.	52256.61399	0.0009
YY Eri	SET	Vis.	52261.594	0.00038

YY Eri	SET	Vis.	52265.6181	0.0013
YY Eri	SET	Vis.	52276.54988	0.00072
YY Eri	SET	Vis.	52295.6575	0.0013
YY Eri	SET	Vis.	52310.61856	0.00063
YY Eri	SET	Vis.	52323.63013	0.00071
YY Eri	SET	Vis.	52586.77663	0.00076
YY Eri	SET	Vis.	52609.61436	0.00072
YY Eri	SET	Vis.	52643.67526	0.00064
YY Eri	SET	Vis.	52644.64821	0.00067
YY Eri	SET	Vis.	53038.6595	0.00095
YY Eri	SET	Vis.	53335.72622	0.00007
YY Eri	SET	Vis.	53366.58957	0.00006
YY Eri	DKS	N/A	53373.6673	0.0007
YY Eri	DKS	N/A	53391.66651	0.00076
YY Eri	SET	Vis.	53708.01655	0.00025
YY Eri	SET	Vis.	53712.19602	0.00012
YY Eri	DSI	V	53714.12497	0.00009
YY Eri	DSI	V	53719.1072	0.00007
YY Eri	DSI	V	53722.96539	0.00006
YY Eri	DSI	V	53723.92991	0.00006
YY Eri	DSI	B	53729.07396	0.00008
YY Eri	DSI	V	53746.11289	0.00048
YY Eri	DSI	V	53758.6556	0.001
YY Eri	SET	Vis.	53762.99238	0.00024
YY Eri	DSI	V	53776.01318	0.00018
YY Eri	DSI	V	53776.66627	0.00091
YY Eri	SET	Vis.	54032.08778	0.00025
YY Eri	DSI	V	54036.10617	0.00005
YY Eri	DSI	V	54127.5756	0.001
YY Eri	SET	Vis.	54449.07075	0.00011
YY Eri	DSI	V	54501.63858	0.00087
YY Eri	SET	Vis.	54502.60366	0.00061
YY Eri	SET	Vis.	54503.5688	0.0011
YY Eri	SET	Vis.	54750.79709	0.00022
YY Eri	SAH	V	54792.75206	0.00012
YY Eri	SAH	V	54821.68695	0.00018
YY Eri	BIZ	V	54822.65651	0.0007
YY Eri	SET	Vis.	54828.6046	0.0015
YY Eri	DSI	V	54836.95884	0.00006
YY Eri	SET	Vis.	54848.53937	0.00069
YY Eri	MZK	V	54860.58848	0.00026
YY Eri	BIZ	V	54867.66109	0.00027
YY Eri	SAH	V	55114.89442	0.00012
YY Eri	SAH	V	55147.84678	0.00011
YY Eri	SET	Vis.	55148.64683	0.00005

YY Eri	SET	Vis.	55163.60225	0.00073
YY Eri	SET	Vis.	55194.63017	0.001
YY Eri	SAH	V	55210.53936	0.00009
YY Eri	SET	Vis.	55263.583	0.0014
YY Eri	SET	Vis.	55548.5905	0.0019
YY Eri	CLZ	R	55600.35661	0.00016
YY Eri	SAH	V	55836.81816	0.00005
YY Eri	SET	Vis.	55892.59877	0.00094
YY Eri	SAH	V	55906.7429	0.0001
YY Eri	SET	Vis.	55916.54996	0.00054
YY Eri	SET	Vis.	55919.60125	0.00097
YY Eri	SET	Vis.	55924.59186	0.00084
YY Eri	SNE	V	55946.60935	0.00022
YY Eri	SET	Vis.	55947.57453	0.00063
YY Eri	SRIC	V	56589.92523	0.00011
YY Eri	SAH	V	57329.8482	0.00006
YY Eri	SAH	V	57431.60197	0.00008
YY Eri	SAH	V	57684.94242	0.00014
YY Eri	SAH	V	57760.65473	0.00007
YY Eri	SAH	V	57786.53445	0.00008
YY Eri	SAH	V	58043.89399	0.00009
YY Eri	SAH	V	58148.54195	0.00008
YY Eri	ATE	V	58167.35057	0.00005
YY Eri	ATE	V	58170.40426	0.00009
YY Eri	SAH	V	58467.78884	0.00014
YY Eri	ATE	V	58498.33088	0.00006
YY Eri	ATE	V	58510.38804	0.00008
HP Aur	SAH	Vis.	43055.84317	0.00096
HP Aur	SET	Vis.	52310.6026	0.0015
HP Aur	SET	Vis.	54097.6358	0.001
HP Aur	VMAE	V	54428.44913	0.00027
HP Aur	BIZ	V	54844.62103	0.00014
HP Aur	BIZ	V	54846.75587	0.00024
HP Aur	BJRA	I	55514.77321	0.00009
HP Aur	SRIC	V	55797.91404	0.00017
HP Aur	ZDAB	V	55978.61273	0.00006
HP Aur	SAH	V	56194.8784	0.00015
HP Aur	HOA	V	56226.8907	0.0015
HP Aur	SAH	V	56549.87183	0.00018
HP Aur	MZK	V	56559.83037	0.0001
HP Aur	SAH	V	56956.79902	0.0002
HP Aur	SNE	V	57321.75325	0.00008
HP Aur	SAH	V	57743.61924	0.00021
HP Aur	MZK	V	57832.54454	0.00039
HP Aur	SAH	V	58043.83123	0.00013

HP Aur	ATE	V	58076.55532	0.00009
HP Aur	SAH	V	58132.75781	0.00015
HP Aur	MZK	V	58162.63463	0.00007
HP Aur	SAH	V	58388.86725	0.00018
HP Aur	SAH	V	58425.85892	0.00019
HP Aur	SAH	V	58470.67861	0.00025
HP Aur	ATE	V	58508.38207	0.00015

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Table 4. Moments of minima for AB Cas, AF Gem, BF Vir and CL Aur

Star ID	Observer code	Filter	JD - 2 400 000	Error
AB Cas	ATW	Vis.	46418.69815	0.00093
AB Cas	ATW	Vis.	46735.818	0.00047
AB Cas	ATW	Vis.	47085.7375	0.0011
AB Cas	ATW	Vis.	47111.70579	0.0008
AB Cas	BEB	Vis.	51429.71107	0.00079
AB Cas	BIZ	V	54834.6303	0.00013
AB Cas	BKY	Vis.	45200.81306	0.00058
AB Cas	BM	Vis.	39436.69456	0.00056
AB Cas	BM	Vis.	39440.79144	0.00074
AB Cas	BM	Vis.	39473.5997	0.001
AB Cas	BM	Vis.	39477.7006	0.0012
AB Cas	BM	Vis.	39492.73279	0.00091
AB Cas	BM	Vis.	39801.652	0.00047
AB Cas	BM	Vis.	40129.70473	0.00035
AB Cas	BM	Vis.	40211.7159	0.0014
AB Cas	BM	Vis.	40278.6927	0.0013
AB Cas	BM	Vis.	40293.73203	0.00088
AB Cas	BM	Vis.	40323.79956	0.00049
AB Cas	BM	Vis.	40442.71968	0.00096
AB Cas	BM	Vis.	40457.76331	0.00062
AB Cas	BM	Vis.	40468.68946	0.00055
AB Cas	BM	Vis.	40554.80299	0.00078
AB Cas	BM	Vis.	41988.65342	0.00054
AB Cas	BM	Vis.	42003.6914	0.0013
AB Cas	BM	Vis.	42491.6571	0.0013
AB Cas	BM	Vis.	42633.82195	0.00099
AB Cas	BM	Vis.	42692.58938	0.00027
AB Cas	BM	Vis.	42722.6673	0.0014
AB Cas	BM	Vis.	42871.6544	0.0013
AB Cas	BM	Vis.	42994.67462	0.00062
AB Cas	BM	Vis.	43009.7048	0.0012

AB Cas	BM	Vis.	43046.61863	0.00042
AB Cas	BM	Vis.	43113.58994	0.00051
AB Cas	BM	Vis.	43128.6248	0.0011
AB Cas	BM	Vis.	43374.666	0.0011
AB Cas	BM	Vis.	43493.5761	0.0014
AB Cas	BM	Vis.	43717.74865	0.0006
AB Cas	BM	Vis.	43754.6455	0.0021
AB Cas	BM	Vis.	43780.62576	0.00053
AB Cas	BM	Vis.	43784.7175	0.0013
AB Cas	BM	Vis.	43791.5627	0.0013
AB Cas	BM	Vis.	43832.5633	0.00095
AB Cas	BM	Vis.	44134.65085	0.00075
AB Cas	BM	Vis.	44190.687	0.0017
AB Cas	BM	Vis.	44216.6581	0.0013
AB Cas	BM	Vis.	44227.5944	0.0011
AB Cas	BM	Vis.	44514.6364	0.0014
AB Cas	BM	Vis.	44853.6302	0.001
AB Cas	BM	Vis.	45993.60045	0.00094
AB Cas	BM	Vis.	46034.609	0.0011
AB Cas	BM	Vis.	46038.70523	0.00068
AB Cas	BM	Vis.	46142.5931	0.0011
AB Cas	BM	Vis.	46295.68744	0.00016
AB Cas	BM	Vis.	46414.60008	0.00073
AB Cas	BM	Vis.	46701.64327	0.00045
AB Cas	BM	Vis.	46712.5786	0.0013
AB Cas	BM	Vis.	46768.62115	0.00078
AB Cas	BM	Vis.	46809.62851	0.00069
AB Cas	BM	Vis.	47029.6916	0.0011
AB Cas	BM	Vis.	47040.62789	0.00059
AB Cas	BM	Vis.	47081.63009	0.00056
AB Cas	BM	Vis.	47118.5417	0.00083
AB Cas	BM	Vis.	47420.62315	0.00085
AB Cas	BM	Vis.	47446.59422	0.00049
AB Cas	BM	Vis.	47498.53356	0.00044
AB Cas	BM	Vis.	47554.5782	0.0011
AB Cas	BM	Vis.	47569.6127	0.0014
AB Cas	BM	Vis.	47789.6861	0.0012
AB Cas	BM	Vis.	48158.7413	0.00081
AB Cas	BM	Vis.	48191.54319	0.00025
AB Cas	BM	Vis.	48236.65195	0.00076
AB Cas	BM	Vis.	48471.7594	0.00094
AB Cas	BM	Vis.	48482.69561	0.0006
AB Cas	BM	Vis.	48538.7313	0.0011
AB Cas	BM	Vis.	48683.6264	0.0012
AB Cas	BM	Vis.	48888.66341	0.00042

AB Cas	BM	Vis.	48914.63214	0.0005
AB Cas	BM	Vis.	49007.58035	0.00097
AB Cas	BM	Vis.	49220.81477	0.00061
AB Cas	BM	Vis.	49268.65705	0.0009
AB Cas	BM	Vis.	49443.62503	0.00071
AB Cas	BM	Vis.	49581.678	0.00041
AB Cas	BM	Vis.	49607.64996	0.00042
AB Cas	BM	Vis.	49767.57307	0.00051
AB Cas	BM	Vis.	49920.66476	0.00045
AB Cas	BM	Vis.	49928.87008	0.00077
AB Cas	BM	Vis.	49965.76941	0.00073
AB Cas	BM	Vis.	50054.61939	0.00039
AB Cas	BM	Vis.	50110.66472	0.00069
AB Cas	BM	Vis.	50308.85911	0.00078
AB Cas	BM	Vis.	50326.63167	0.0004
AB Cas	BM	Vis.	50546.70493	0.00098
AB Cas	BM	Vis.	50632.81637	0.00079
AB Cas	BM	Vis.	50695.69375	0.0003
AB Cas	BM	Vis.	50732.59765	0.00054
AB Cas	BM	Vis.	51079.7849	0.00051
AB Cas	BM	Vis.	51101.6543	0.0011
AB Cas	BM	Vis.	51138.55783	0.00047
AB Cas	BM	Vis.	51157.6962	0.0013
AB Cas	BM	Vis.	51224.67657	0.0009
AB Cas	BM	Vis.	51276.6166	0.0022
AB Cas	BM	Vis.	51407.83911	0.00084
AB Cas	BM	Vis.	51429.70816	0.00056
AB Cas	BM	Vis.	51492.58174	0.00061
AB Cas	BRJ	Vis.	40561.64289	0.00088
AB Cas	DJX	V	56943.74446	0.00012
AB Cas	HEF	Vis.	44503.70505	0.001
AB Cas	HK	Vis.	44790.7495	0.001
AB Cas	HK	Vis.	44883.69352	0.00068
AB Cas	HK	Vis.	45200.81575	0.00085
AB Cas	HRI	Vis.	46392.7264	0.0012
AB Cas	HRI	Vis.	46403.6672	0.0018
AB Cas	HRI	Vis.	46511.65688	0.00015
AB Cas	HZL	Vis.	40587.60704	0.00048
AB Cas	KGE	V	53422.63113	0.00012
AB Cas	LBG	I	54059.60268	0.00009
AB Cas	LBG	R	53258.60359	0.00011
AB Cas	LBG	V	54059.60252	0.00011
AB Cas	LR	Vis.	45200.8048	0.0022
AB Cas	MOR	Vis.	39186.54679	0.00063
AB Cas	MYR	Vis.	43020.6441	0.0005

AB Cas	PLN	B	55463.40124	0.00043
AB Cas	PLN	V	55463.40022	0.00017
AB Cas	PRX	V	55527.64437	0.0001
AB Cas	RUO	Vis.	43054.8216	0.0018
AB Cas	SAH	V	54845.5654	0.0001
AB Cas	SAH	V	55114.84302	0.00013
AB Cas	SAH	V	55199.58993	0.0001
AB Cas	SAH	V	56194.68814	0.00009
AB Cas	SAH	V	56541.87839	0.00009
AB Cas	SAH	V	56924.60775	0.00007
AB Cas	SAH	V	57278.63287	0.0001
AB Cas	SAH	V	57330.57459	0.00009
AB Cas	SAH	V	57640.85947	0.00017
AB Cas	SAH	V	57673.66377	0.00008
AB Cas	SAH	V	57736.54087	0.00008
AB Cas	SAH	V	57964.81082	0.00008
AB Cas	SAH	V	57997.61687	0.00012
AB Cas	SAH	V	58385.81166	0.00009
AB Cas	SAH	V	58470.55825	0.0001
AB Cas	SAH	V	58750.76971	0.00006
AB Cas	SAH	Vis.	42618.77627	0.00052
AB Cas	SAH	Vis.	42860.71744	0.00074
AB Cas	SAH	Vis.	43028.84741	0.00083
AB Cas	SAH	Vis.	43452.58075	0.00032
AB Cas	SAH	Vis.	44160.6208	0.0013
AB Cas	SAH	Vis.	44488.66953	0.001
AB Cas	SAH	Vis.	45315.6241	0.0011
AB Cas	SAH	Vis.	46779.5527	0.0013
AB Cas	SAH	Vis.	48154.64598	0.00095
AB Cas	SAH	Vis.	48251.6971	0.0018
AB Cas	SAH	Vis.	48601.61613	0.00099
AB Cas	SAH	Vis.	49007.5844	0.0012
AB Cas	SAH	Vis.	50669.72527	0.00054
AB Cas	SET	Vis.	53225.79932	0.00055
AB Cas	TDM	Vis.	45259.59087	0.00045
AB Cas	VMAE	V	54506.57724	0.00006
AB Cas	WI	Vis.	45311.52651	0.00027
AB Cas	WI	Vis.	45643.67881	0.00087
AB Cas	WI	Vis.	51440.64448	0.00035
AF Gem	ATE	V	58171.48418	0.00004
AF Gem	ATE	V	58498.52635	0.00004
AF Gem	ATE	V	58498.52635	0.00004
AF Gem	ATE	V	58523.3968	0.00014
AF Gem	ATE	V	58533.34624	0.00004
AF Gem	ATE	V	58559.46147	0.00004

AF Gem	BIZ	V	54873.71523	0.00013
AF Gem	DKS	V	54857.54997	0.00006
AF Gem	GOP	Vis.	45364.6748	0.0083
AF Gem	HRI	Vis.	50512.74881	0.00078
AF Gem	HSG	Vis.	44629.78559	0.00094
AF Gem	PRX	V	55940.64373	0.00009
AF Gem	SAH	V	57320.92942	0.00005
AF Gem	SAH	V	57698.95684	0.00009
AF Gem	SAH	V	58086.92721	0.00007
AF Gem	SAH	V	58136.66636	0.00005
AF Gem	SAH	V	58192.62534	0.00008
AF Gem	SAH	Vis.	43556.6348	0.0017
AF Gem	SAH	Vis.	43883.67329	0.00098
AF Gem	SAH	Vis.	44271.64972	0.00089
AF Gem	SAH	Vis.	44608.64325	0.00018
AF Gem	SAH	Vis.	45298.78405	0.00005
AF Gem	SAH	Vis.	45405.70854	0.00093
AF Gem	SAH	Vis.	45762.60808	0.00074
AF Gem	SAH	Vis.	47539.5655	0.0012
AF Gem	SAH	Vis.	48295.61019	0.00097
AF Gem	SAH	Vis.	49061.60064	0.00092
AF Gem	SET	Vis.	55618.57821	0.00074
AF Gem	SET	Vis.	55654.63267	0.00069
AF Gem	WI	Vis.	46436.57474	0.00084
BF Vir	DKS	V	53097.80672	0.00009
CL Aur	ATE	V	58464.47436	0.00008
CL Aur	ATE	V	58489.36111	0.00013
CL Aur	ATE	V	58494.33902	0.00005
CL Aur	ATE	V	58520.47138	0.00005
CL Aur	ATE	V	58530.42758	0.00005
CL Aur	CGF	Vis.	50521.6102	0.0018
CL Aur	CGIA	CR	58499.32094	0.00012
CL Aur	HOA	V	56210.90268	0.00048
CL Aur	HRI	Vis.	50873.7763	0.00069
CL Aur	RIZ	V	57711.62699	0.00011
CL Aur	SAH	V	54885.62982	0.00012
CL Aur	SAH	V	56336.58487	0.00011
CL Aur	SAH	V	56566.79629	0.00008
CL Aur	SAH	V	56953.79989	0.00002
CL Aur	SAH	V	57330.84799	0.00013
CL Aur	SAH	V	57696.69596	0.00013
CL Aur	SAH	V	57787.53563	0.00011
CL Aur	SAH	V	57828.6001	0.00018
CL Aur	SAH	V	58043.87769	0.00008
CL Aur	SAH	V	58088.67539	0.00013

CL Aur	SAH	Vis.	47950.7142	0.0013
CL Aur	VMAE	V	54512.31372	0.00017

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Table 5. Moments of minima for EQ Tau, IR Cas, IV Cas, RY Aqr and RZ Com

Star ID	Observer code	Filter	JD - 2 400 000	Error
EQ Tau	AKV	B	54079.55638	0.00045
EQ Tau	AKV	B	54089.6265	0.0002
EQ Tau	AKV	B	54089.6265	0.0002
EQ Tau	AKV	B	54103.62176	0.00021
EQ Tau	AKV	B	54111.64371	0.0002
EQ Tau	AKV	B	54491.56462	0.00014
EQ Tau	AKV	B	54499.58656	0.0003
EQ Tau	AKV	B	54508.63195	0.00021
EQ Tau	AKV	B	54513.58141	0.00029
EQ Tau	AKV	B	54520.57889	0.00019
EQ Tau	AKV	B	54798.6081	0.00028
EQ Tau	AKV	I	54079.55639	0.0003
EQ Tau	AKV	I	54089.62536	0.00024
EQ Tau	AKV	I	54103.62313	0.00028
EQ Tau	AKV	I	54111.64351	0.00019
EQ Tau	AKV	I	54491.56465	0.00014
EQ Tau	AKV	I	54499.58659	0.00018
EQ Tau	AKV	I	54508.63186	0.0002
EQ Tau	AKV	I	54513.58196	0.00016
EQ Tau	AKV	I	54520.57908	0.00019
EQ Tau	AKV	I	54798.60771	0.00018
EQ Tau	AKV	R	53748.61898	0.00017
EQ Tau	AKV	V	53776.60984	0.00015
EQ Tau	AKV	V	53795.55406	0.00018
EQ Tau	AKV	V	53796.57837	0.00017
EQ Tau	AKV	V	54079.55669	0.00015
EQ Tau	AKV	V	54089.62669	0.00013
EQ Tau	AKV	V	54103.62163	0.00014
EQ Tau	AKV	V	54111.6437	0.0001
EQ Tau	AKV	V	54388.81836	0.00006
EQ Tau	AKV	V	54388.98939	0.00014
EQ Tau	AKV	V	54491.56459	0.0001
EQ Tau	AKV	V	54499.58641	0.00016
EQ Tau	AKV	V	54508.6317	0.00012
EQ Tau	AKV	V	54513.58153	0.00016
EQ Tau	AKV	V	54520.57898	0.00011
EQ Tau	AKV	V	54781.71091	0.00009

EQ Tau	AKV	V	54798.60835	0.00012
IR Cas	LBG	R	53993.57275	0.00046
IR Cas	MZK	V	55088.7956	0.00005
IR Cas	SAH	V	55058.8458	0.00012
IR Cas	SAH	V	55157.54412	0.00012
IR Cas	SAH	V	56521.63911	0.00011
IR Cas	SAH	V	56898.73895	0.00007
IR Cas	SAH	V	57280.60533	0.00012
IR Cas	SAH	V	57606.65496	0.00012
IR Cas	SAH	V	57938.82935	0.00009
IR Cas	SAH	V	58326.82138	0.00008
IR Cas	SAH	V	58412.58815	0.0001
IR Cas	SET	Vis.	53613.748	0.0013
IR Cas	SNE	V	57310.55512	0.00013
IV Cas	SAH	V	57568.77868	0.00009
IV Cas	SAH	V	57649.65852	0.00013
IV Cas	SAH	V	57684.60565	0.00014
IV Cas	SAH	V	57702.57874	0.00012
IV Cas	VMAE	V	54508.35503	0.00008
IV Cas	VMAE	V	54509.3535	0.00008
IV Cas	VMAE	V	54813.3966	0.0011
IV Cas	VMAE	V	54828.37824	0.00051
IV Cas	VMAE	V	55832.37345	0.00007
IV Cas	VMAE	V	55837.366	0.00007
IV Cas	VMAE	V	55851.34637	0.00029
IV Cas	VMAE	V	55858.33457	0.00007
RY Aqr	ATE	V	58006.4082	0.0001
RY Aqr	ATE	V	58008.37387	0.00008
RY Aqr	ATE	V	58069.33876	0.00009
RY Aqr	BM	Vis.	49992.6473	0.0012
RY Aqr	CK	Vis.	46344.62673	0.00055
RY Aqr	HES	Vis.	43040.7714	0.0023
RY Aqr	HMH	B	56838.26736	0.00033
RY Aqr	HMH	B	56899.23054	0.00019
RY Aqr	HMH	B	56901.1963	0.00015
RY Aqr	HMH	B	56970.02614	0.00037
RY Aqr	HMH	I	56899.2298	0.00024
RY Aqr	HMH	I	56900.2086	0.0021
RY Aqr	HMH	I	56901.19612	0.00014
RY Aqr	HMH	I	56970.02578	0.00037
RY Aqr	HMH	I	57193.2284	0.0016
RY Aqr	HMH	V	56899.23021	0.00034
RY Aqr	HMH	V	56901.19674	0.00018
RY Aqr	HMH	V	56970.02603	0.00036
RY Aqr	HMH	V	57193.2301	0.002

RY Aqr	HRI	Vis.	47109.6291	0.0022
RY Aqr	MYR	Vis.	43050.6123	0.0006
RY Aqr	SAH	V	56515.74951	0.00007
RY Aqr	SAH	V	57634.72591	0.00006
RY Aqr	SAH	V	58407.58783	0.00005
RY Aqr	SAH	Vis.	43337.7487	0.0016
RY Aqr	SAH	Vis.	45221.7102	0.00053
RY Aqr	SAH	Vis.	50692.75185	0.00053
RY Aqr	SLB	Vis.	41577.6318	0.0015
RY Aqr	SNE	V	58407.58781	0.00005
RY Aqr	WED	Vis.	43337.7369	0.0023
RY Aqr	WI	Vis.	51463.63749	0.00059
RZ Com	BEB	Vis.	51257.1862	0.0012
RZ Com	BEB	Vis.	51262.2599	0.002
RZ Com	BEB	Vis.	51298.1409	0.0014
RZ Com	BEB	Vis.	51299.1707	0.0015
RZ Com	BEB	Vis.	51301.1922	0.0015
RZ Com	BEB	Vis.	51610.24508	0.00032
RZ Com	BEB	Vis.	51612.2713	0.0012
RZ Com	BIZ	V	54923.21795	0.00022
RZ Com	CGRD	TG	58627.16907	0.00018
RZ Com	CK	V	57563.2373	0.00044
RZ Com	DKS	V	53093.2504	0.00009
RZ Com	MMN	Vis.	99810.91827	0.00094
RZ Com	MZK	V	54888.34967	0.00012
RZ Com	MZK	V	55311.14779	0.00009
RZ Com	MZK	V	55667.08745	0.00017
RZ Com	MZK	V	56385.22922	0.00008
RZ Com	MZK	V	57129.26884	0.00007
RZ Com	MZK	V	57749.4125	0.00006
RZ Com	SAH	V	57494.18099	0.00014
RZ Com	SAH	V	57494.34944	0.00008
RZ Com	SAH	V	57845.21323	0.00017
RZ Com	SAH	V	57906.14777	0.00008
RZ Com	SAH	V	58133.45049	0.00012
RZ Com	SAH	V	58244.14717	0.00009
RZ Com	SAH	V	58489.39026	0.0001
RZ Com	SAH	V	58524.42693	0.00007
RZ Com	SAH	Vis.	93539.37881	0.00059
RZ Com	SAH	Vis.	93604.2126	0.0014
RZ Com	SAH	Vis.	93910.2203	0.00045
RZ Com	SAH	Vis.	93981.31181	0.00054
RZ Com	SAH	Vis.	94280.3691	0.0013
RZ Com	SAH	Vis.	94671.1832	0.00099
RZ Com	SAH	Vis.	95061.14104	0.00059

RZ Com	SAH	Vis.	95443.3259	0.0013
RZ Com	SAH	Vis.	95763.20772	0.00098
RZ Com	SAH	Vis.	96143.1892	0.0014
RZ Com	SAH	Vis.	96211.22653	0.00086
RZ Com	SAH	Vis.	96231.1912	0.0011
RZ Com	SAH	Vis.	96231.1912	0.0011
RZ Com	SAH	Vis.	96554.3081	0.0016
RZ Com	SAH	Vis.	96561.2407	0.0013
RZ Com	SAH	Vis.	96876.2234	0.0017
RZ Com	SAH	Vis.	96916.1487	0.0016
RZ Com	SAH	Vis.	97220.3059	0.0012
RZ Com	SAH	Vis.	98358.1999	0.0014
RZ Com	SAH	Vis.	98398.1388	0.0012
RZ Com	SAH	Vis.	98655.4164	0.0013
RZ Com	SAH	Vis.	98683.3316	0.0012
RZ Com	SAH	Vis.	98710.2637	0.00081
RZ Com	SAH	Vis.	98718.21132	0.00065
RZ Com	SAH	Vis.	98771.1717	0.0014
RZ Com	SAH	Vis.	99061.28757	0.00056
RZ Com	SAH	Vis.	99443.1255	0.001
RZ Com	SAH	Vis.	99802.11218	0.00082
RZ Com	SAH	Vis.	99844.2535	0.0011
RZ Com	SAH	Vis.	99859.31642	0.001
RZ Com	SAH	Vis.	50153.3082	0.0012
RZ Com	SAH	Vis.	50184.11187	0.00047
RZ Com	SAH	Vis.	50489.27965	0.00074
RZ Com	SAH	Vis.	50524.32032	0.0005
RZ Com	SAH	Vis.	50524.32032	0.0005
RZ Com	SAH	Vis.	50573.23578	0.00082
RZ Com	SAH	Vis.	50579.33142	0.00094
RZ Com	SAH	Vis.	50922.2306	0.00084
RZ Com	SAH	Vis.	50927.14388	0.00065
RZ Com	SAH	Vis.	50964.20419	0.00069
RZ Com	SAH	Vis.	51161.39165	0.00085
RZ Com	SAH	Vis.	51630.22215	0.00063
RZ Com	SAH	Vis.	51686.26041	0.00071
RZ Com	SET	Vis.	52735.1214	0.0013
RZ Com	SET	Vis.	52736.13312	0.00038
RZ Com	SET	Vis.	53531.28719	0.0007
RZ Com	SET	Vis.	54198.1352	0.0011
RZ Com	SET	Vis.	54613.15019	0.00097
RZ Com	SET	Vis.	54940.1447	0.0012
RZ Com	SET	Vis.	55319.1131	0.0012
RZ Com	SET	Vis.	56006.09876	0.00084

7 Conclusions and future work

In this research 1168 times of minima were provided. All of them were previously used to construct more precise O-C diagrams for 25 eclipsing binaries. In average, our minima increased total amount of data for O-C diagrams on 15%. This increasing of data quantity caused smaller errors of calculations due to longer time scale and more detailed series.

Thus, it is quite useful to compute such large amounts of extra minima from international databases. We will continue to use AAVSO data for obtaining additional extrema while making further articles of this series. This research was done as the part of the projects Inter-Longitude Astronomy [2], [3], UkrVO [14], [16] and AstroInformatics [15], [17] as well as previous ones.

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