Cepheid Variables in the AAVSO International Database

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Abstract There are 205,500 visual observations for 148 Cepheids as well as 182 photoelectric observations for 7 Cepheids in the AAVSO International Database. These data were reduced with Hertzsprung's method and 2,010 times of maximum brightness were obtained. O–C diagrams for 21 well-observed Cepheids are presented and results obtained are compared with existing data.

1. Discussion

During the 20th century, 1,198 observers had contributed to the AAVSO International Database 206,212 observations for 148 Cepheids, including 182 photoelectric *V* measurements of 7 of them.

Visual observations span the time interval of about 89 years starting in 1912 (JD 2419597–2452154). Photoelectric observations were obtained between 1972 and 2000 (JD 241550–2451850).

All of these data were processed with our version of Hertzsprung's method (Berdnikov 1992) and ~2000 times of maximum light were derived. Because of the low quality of many series of observations, only 439 times of maximum light have proven to be useful (see Table 1) .

O–C diagrams for 21 of the most intensively observed Cepheids were constructed. In Figures 1–21, AAVSO data (plotted as triangles) are compared with all existing published data for these Cepheids. This comparison shows that the high quality AAVSO International Database observations of Cepheids are very useful for science.

Reference

Berdnikov, L. N. 1992, *Soviet Astron. Let.*, **18**, 207.

Table 1. Times of maximum light of AAVSO Cepheids.

Star	Julian Date of Maximum	Error (days)	Number of obs.	Star	Julian Date of Maximum	Error (days)	Number of obs.
U Aql	2434929.36	.07	55		2440992.86	.06	34
	2442669.87	.05	38		2441954.84	.01	234
	2443182.81	.11	42		2442562.52	.03	35
	2446413.70	.02	488		2442756.38	.02	174
	2448324.25	.09	80		2442804.88	.03	196
	2450951.25	.02	578		2443826.38	.03	32
	2451183.16	.06	55		2444288.75	.07	135
					2446074.57	.01	1354
SZ Aql	2420037.08	.31	13		2446261.00	.04	32
	2442144.62	.09	34		2449046.03	.02	96
	2442487.58	.07	89		2449232.39	.06	32
	2442521.74	.13	59		2449444.95	.03	141
	2443858.80	.06	51		2449664.90	.01	52
	2444407.38	.15	134		2450138.45	.03	63
	2444475.82	.08	14		2450239.10	.01	416
	2444716.05	.14	13		2450716.29	.01	230
	2444801.43	.04	480		2450731.20	.03	57
	2445949.68	.09	60		2450809.52	.01	460
	2446189.54	.11	9		2450857.92	.03	122
	2446223.99	.11	67		2450861.63	.01	177
	2451400.50	.10	26		2451070.46	.02	125
	2451863.09	.06	78		2451103.96	.03	79
					2451368.77	.03	57
TT Aql	2441926.54	.01	46		2451376.14	.04	60
	2442476.80	.06	87		2451484.31	.03	53
	2444374.76	.09	131		2451502.94	.01	141
	2444773.89	.03	472		2451536.53	.04	53
	2445956.86	.08	58		2451715.45	.03	50
	2445984.27	.05	156		2451767.68	.07	42
	2446231.92	.01	1177		2451998.79	.03	42
	2446259.40	.02	737				
	2446699.53	.02	439	RX Cam	2446113.47	.02	784
	2447277.27	.02	668		2448732.44	.02	991
	2450949.79	.02	537		2450876.57	.03	372
	2451445.09	.08	32				
	2451857.64	.05	85	l Car	2422186.98	.43	32
					2422187.20	.64	21
RT Aur	2421829.98	.03	76		2422968.32	.16	325
	2440929.58	.07	60		2423964.13	.10	242

(Table 1 continued on following pages)

Table 1. Times of maximum light, continued.

Star	Julian Date of Maximum	Error (days)	Number of obs.	Star	Julian Date of Maximum	Error (days)	Number of obs.
l Car	2426308.39	.54	15		2438959.95	.22	85
cont.	2426486.81	.78	62		2438994.89	.24	94
	2426521.26	.60	29		2438996.78	.19	137
	2426521.44	.36	64		2439067.13	.36	116
	2426983.04	.26	87		2439102.46	.14	337
	2428369.47	.20	236		2439138.79	.21	40
	2428796.41	.15	216		2439173.07	.20	49
	2428937.51	.54	142		2439173.13	.32	43
	2429009.41	.07	368		2439279.91	.17	267
	2429436.03	.37	16		2439386.56	.32	279
	2430182.15	.07	378		2439422.26	.11	407
	2431284.66	.11	376		2439564.12	.34	27
	2431816.40	.51	153		2440062.15	.18	267
	2432243.92	.30	62		2440523.00	.37	95
	2432278.95	.38	21		2441056.62	.21	248
	2432990.54	.16	187		2443190.18	.24	40
	2433025.99	.27	34		2444007.65	.20	47
	2433098.03	.13	286		2445714.02	.24	137
	2435158.46	.20	228		2446708.66	.24	152
	2435337.60	.21	243		2447278.24	.23	103
	2436330.32	.29	131		2447383.29	.28	35
	2436579.68	.29	103		2448592.90	.09	822
	2436865.33	.25	51		2448806.84	.27	73
	2436971.04	.13	423		2451331.48	.25	67
	2437007.81	.15	352		2451650.88	.22	46
	2437041.13	.22	96		2452006.06	.23	81
	2437078.09	.36	35				
	2437182.68	.28	93	SU Cas	2438951.89	.03	76
	2437184.06	.17	234		2442074.77	.01	219
	2437361.22	.30	73		2442182.00	.02	145
	2437433.20	.30	70		2442265.80	.03	52
	2437433.41	.18	105		2442456.88	.02	388
	2437574.39	.18	119		2442493.85	.03	78
	2437681.85	.32	88		2442493.90	.02	39
	2437752.86	.33	19		2442610.82	.01	634
	2437823.78	.11	427		2442626.41	.01	626
	2438000.95	.32	128		2447320.41	.01	380
	2438391.55	.38	107		2449215.20	.02	181
	2438925.89	.38	27		2449655.72	.02	362

(Table 1 continued on following pages)

Table 1. Times of maximum light, continued.

Star	*Julian Date of Maximum*	*Error (days)*	*Number of obs.*
SU Cas cont.	2449827.24	.01	1110
	2450835.07	.03	182
	2451361.37	.04	51
	2451739.50	.02	205
X Cyg	2434834.62	.07	314
	2440012.29	.22	24
	2440832.01	.13	35
	2440848.11	.09	45
	2441552.90	.17	21
	2441617.91	.16	54
	2441618.34	.02	35
	2441667.34	.05	302
	2441732.83	.10	153
	2441880.35	.07	116
	2442126.33	.09	81
	2442126.33	.12	21
	2442191.74	.07	107
	2442208.29	.06	61
	2442240.56	.10	51
	2442241.34	.13	40
	2442257.36	.20	18
	2442290.04	.12	28
	2442290.35	.14	40
	2442306.47	.07	68
	2442306.49	.10	31
	2442322.79	.08	89
	2442339.53	.12	38
	2442437.37	.12	23
	2442453.90	.11	111
	2442535.96	.22	25
	2442617.68	.14	65
	2442634.30	.19	33
	2442650.25	.13	64
	2442879.94	.10	184
	2442912.85	.10	162
	2442929.15	.06	171
	2443044.03	.19	29
	2443371.63	.11	61
	2443404.31	.19	17
	2443420.70	.04	192
	2443863.11	.17	84
	2443879.46	.03	387
	2443912.29	.13	75
	2443994.29	.04	529
	2444272.94	.03	411
	2444452.92	.11	39
	2445075.66	.01	1539
	2445927.68	.01	1268
	2446239.11	.01	1980
	2446353.66	.22	17
	2446681.52	.03	229
	2447468.03	.13	37
	2447729.97	.12	16
	2447812.16	.03	640
	2449090.86	.15	15
	2450155.27	.02	756
	2450286.44	.04	504
	2450417.43	.12	75
	2450909.04	.03	754
	2451072.95	.07	127
	2451286.05	.12	98
	2451417.24	.08	62
	2451466.03	.21	18
	2451498.92	.03	283
	2451515.34	.09	42
	2451515.41	.11	19
	2451695.62	.08	106
	2451957.88	.12	82
	2451973.98	.11	84
SU Cyg	2438779.44	.04	59
	2440071.71	.10	81
	2440110.04	.06	34
	2442036.65	.02	134
	2442259.66	.02	42
	2442305.89	.02	59
	2442317.43	.05	30

(Table 1 continued on following pages)

Table 1. Times of maximum light, continued.

Star	*Julian Date of Maximum*	*Error (days)*	*Number of obs.*	*Star*	*Julian Date of Maximum*	*Error (days)*	*Number of obs.*
SU Cyg	2442325.10	.03	51		2451653.31	.10	30
cont.	2446093.74	.01	965				
	2449089.37	.02	32	W Gem	2442106.25	.06	76
	2449950.79	.01	49		2442778.97	.09	107
	2450212.24	.03	70		2442818.57	.04	105
	2450650.69	.01	194		2446031.43	.01	797
	2450866.02	.02	134		2448666.70	.02	596
	2450942.97	.01	746		2450826.87	.02	425
	2451858.15	.02	104		2451182.94	.05	59
					2451815.83	.09	45
SZ Cyg	2419690.56	.09	115				
	2420339.87	.05	274				
	2420354.90	.14	51	T Mon	2422383.97	.13	42
	2420672.36	.11	210		2438785.53	.07	189
	2420883.83	.05	306		2440650.13	.27	134
	2420929.06	.09	72		2441406.28	.21	30
	2425734.11	.03	1922		2441730.62	.06	30
	2442475.79	.23	28		2441784.05	.19	80
	2444470.36	.19	75		2441865.61	.10	85
	2451572.12	.06	134		2442135.55	.22	60
	2451753.44	.07	162		2442135.81	.07	94
					2442352.19	.16	41
beta Dor	2429419.38	.28	172		2442433.00	.15	32
	2429537.39	.02	429		2442461.04	.43	33
	2431073.14	.42	23		2442487.62	.44	43
	2431633.93	.16	90		2443135.43	.13	112
	2433012.06	.17	35		2443351.58	.13	77
	2434931.06	.10	509		2443540.94	.09	170
	2438011.73	.16	28		2443567.76	.23	46
	2438760.04	.06	576		2443892.05	.23	52
	2439015.08	.12	91		2443946.53	.11	267
	2439154.22	.16	31		2445189.36	.03	984
	2439173.06	.11	43		2445216.66	.04	568
	2439183.62	.20	28		2445729.58	.19	40
	2439193.04	.15	33		2446108.74	.04	940
	2439301.35	.07	256		2446162.36	.04	710
	2439390.21	.17	236		2450487.49	.10	85
	2447066.61	.12	76		2450865.69	.22	74
	2448779.48	.05	574		2450946.62	.08	303

(Table 1 continued on following pages)

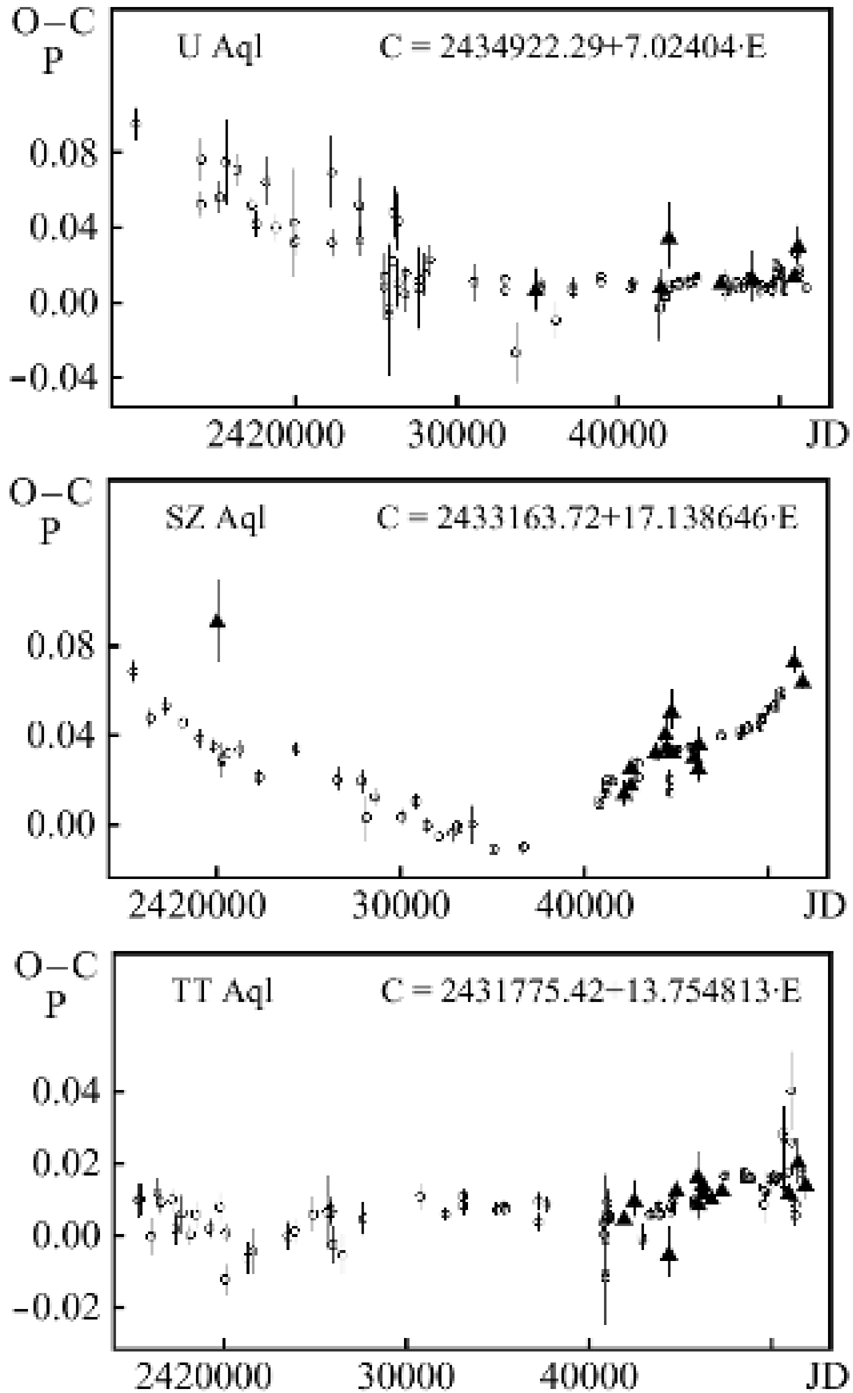
Table 1. Times of maximum light, continued.

Star	*Julian Date of Maximum*	*Error (days)*	*Number of obs.*	*Star*	*Julian Date of Maximum*	*Error (days)*	*Number of obs.*
T Mon	2451136.57	.27	98		2451393.00	.05	81
cont.	2451325.66	.16	31		2451986.32	.04	109
	2451433.33	.20	43				
	2451595.16	.12	82	Y Oph	2432405.40	.13	198
					2440196.02	.29	215
SV Mon	2440641.22	.14	145		2440521.47	.80	52
	2441753.20	.10	41		2441531.37	.39	41
	2441753.21	.16	30		2445402.31	.10	301
	2443535.30	.07	142		2445864.86	.07	1215
	2443992.47	.09	161		2449221.83	.18	75
	2444525.66	.06	243		2450968.02	.12	584
	2445759.64	.09	91		2451122.07	.35	57
	2446384.11	.04	289		2451532.85	.53	31
	2446719.33	.03	236		2451601.85	.10	137
	2446749.73	.04	216				
	2447892.24	.07	248	X Pup	2432515.29	.45	29
	2450725.85	.14	38		2436149.68	.17	104
	2450969.86	.03	225		2437369.78	.04	672
	2451609.71	.12	58		2442017.38	.13	99
					2443082.33	.10	57
R Mus	2436440.08	.09	330		2443601.31	.12	97
	2438092.24	.08	246		2444120.65	.11	163
	2438903.30	.08	50		2444744.01	.07	256
	2438986.03	.13	56		2445704.52	.10	120
	2439030.96	.15	167		2445808.46	.19	57
	2439053.33	.08	87		2447833.64	.05	551
	2439541.33	.15	34				
	2439624.01	.18	91	S Sge	2420659.12	.09	147
	2439894.62	.04	992		2421011.10	.05	186
	2440750.88	.11	110		2421472.05	.07	60
	2441291.53	.06	68		2421497.14	.16	32
	2441471.54	.20	66		2421782.26	.03	409
	2441652.04	.29	33		2432419.23	.03	233
	2446548.72	.06	137		2438521.34	.02	181
	2448253.64	.03	785		2441421.54	.09	144
	2448726.94	.11	84		2442108.81	.04	136
	2449966.00	.07	135		2442259.67	.06	42
	2451167.63	.04	55		2442326.66	.09	52
	2451385.35	.13	33		2442460.87	.04	99

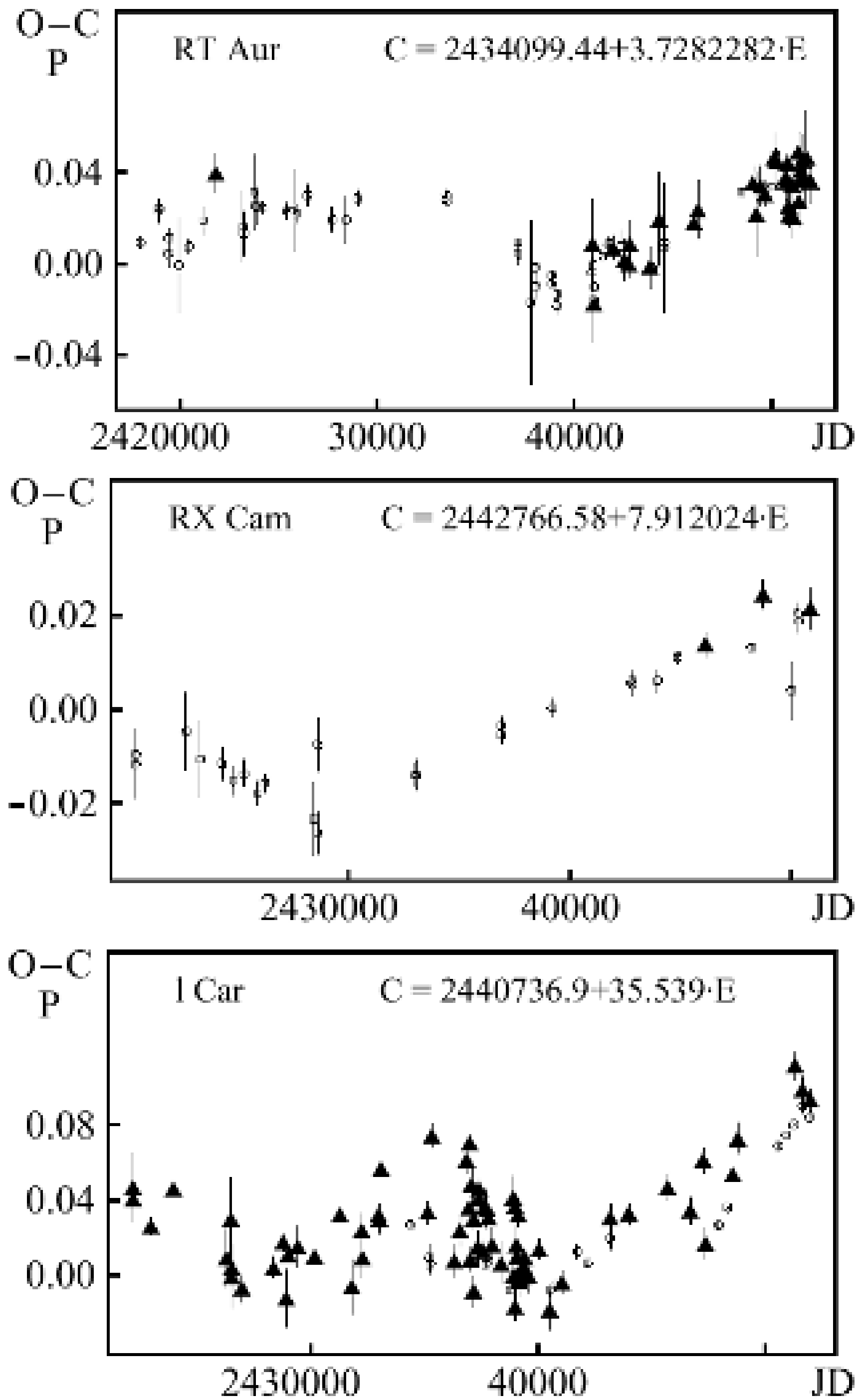
(Table 1 continued on following page)

Table 1. Times of maximum light, continued.

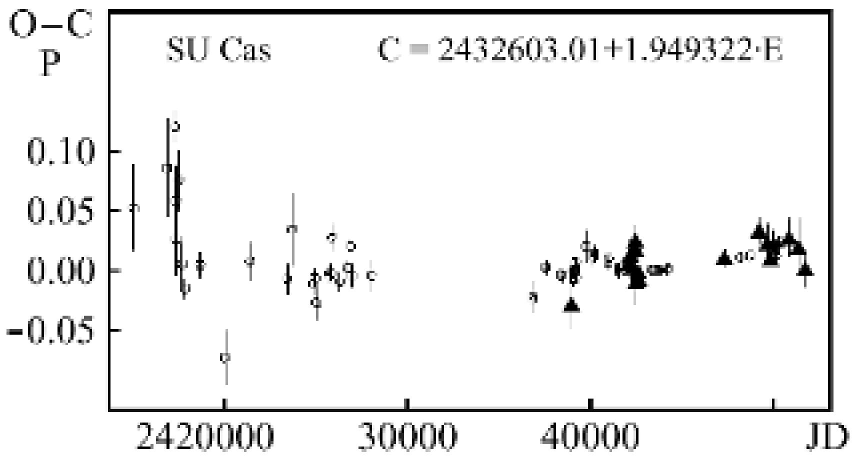
Star	Julian Date of Maximum	Error (days)	Number of obs.	Star	Julian Date of Maximum	Error (days)	Number of obs.
S Sge	2444346.84	.03	264		2442587.68	.03	477
cont.	2445411.36	.02	1202		2442592.19	.03	383
	2448127.18	.01	1180		2442632.10	.07	34
	2450298.15	.07	49		2442876.18	.06	49
	2450591.51	.04	277		2446459.85	.01	787
	2450641.78	.02	323		2446796.93	.02	187
	2450843.02	.06	144		2449254.23	.03	204
	2450951.91	.03	708		2450988.43	.01	646
	2451404.49	.04	106		2451303.49	.06	43
	2451438.19	.05	55				
				SV Vul	2440068.32	.15	106
W Sgr	2432407.60	.03	281		2440113.38	.52	29
	2437025.42	.14	78		2440114.36	.75	27
	2439395.27	.17	35		2440608.78	.26	278
	2439402.79	.26	55		2440880.88	.48	46
	2439744.31	.06	39		2441374.32	.13	302
	2442113.84	.04	89		2441960.11	.72	38
	2442258.15	.06	30		2442141.14	.23	80
	2442463.15	.05	53		2442184.59	.16	444
	2443161.91	.05	102		2442229.97	.40	33
	2448463.26	.04	220		2442410.06	.28	218
	2449177.20	.09	32		2442589.58	.45	34
	2450703.80	.04	357		2442636.14	.29	55
	2450756.84	.15	31		2442636.32	.27	59
	2450931.64	.03	507		2443400.42	.16	73
	2451972.13	.08	46		2443894.70	.22	67
					2443986.79	.21	99
T Vul	2432421.62	.01	430		2444660.11	.06	1142
	2438773.20	.08	32		2445201.63	.06	1415
	2441461.13	.04	171		2445246.70	.08	740
	2442051.01	.06	125		2446238.24	.15	118
	2442259.55	.04	44		2450015.02	.25	49
	2442290.49	.05	30		2451047.72	.13	548
	2442303.88	.04	34		2451453.13	.25	58
	2442308.35	.03	59		2451857.57	.23	82

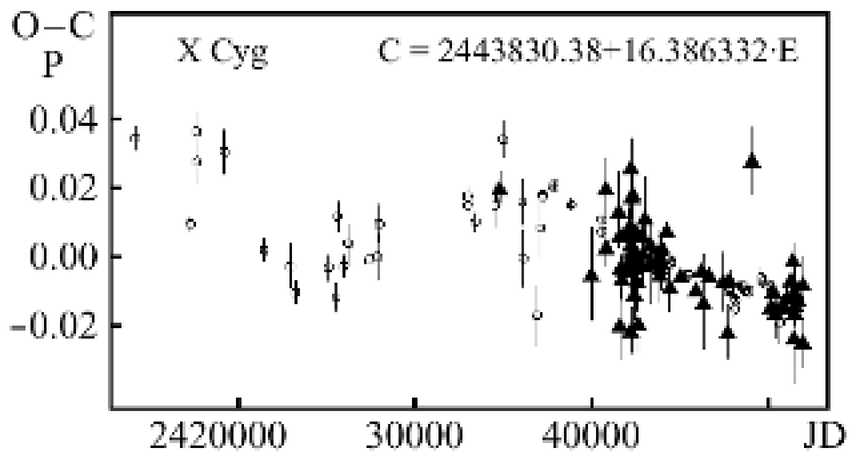


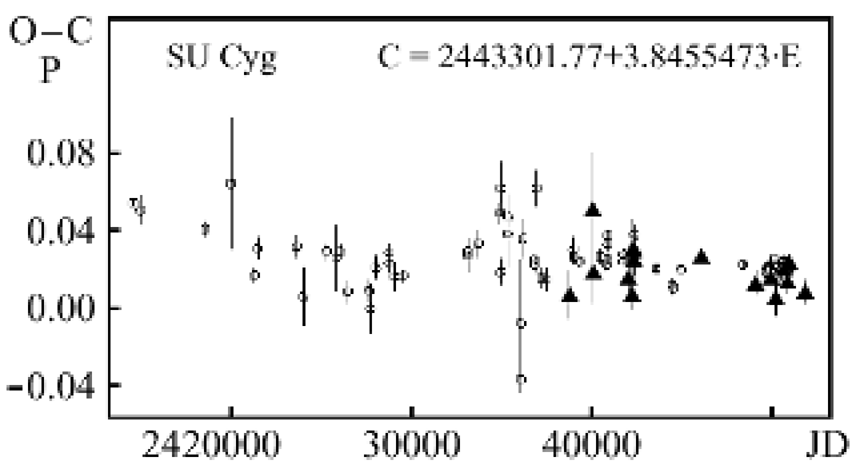
Figures 1–21. O–C diagrams of the Cepheid variables in this study (continued on following pages). See text for explanation of data.



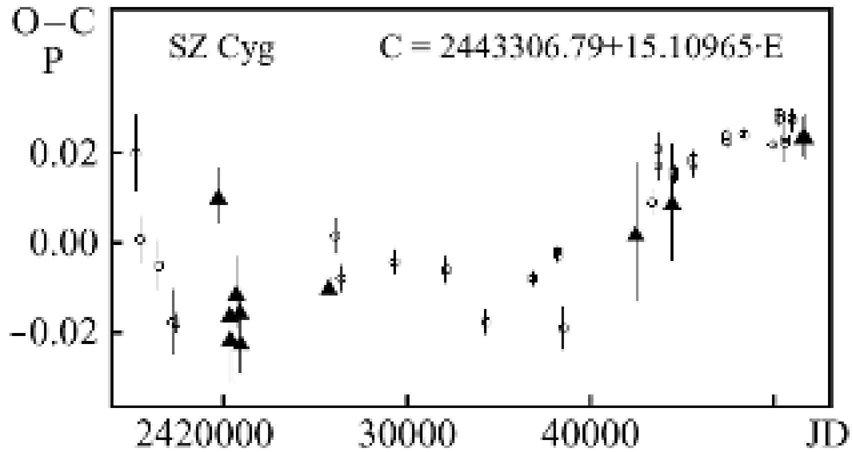
Figures 1–21, continued.

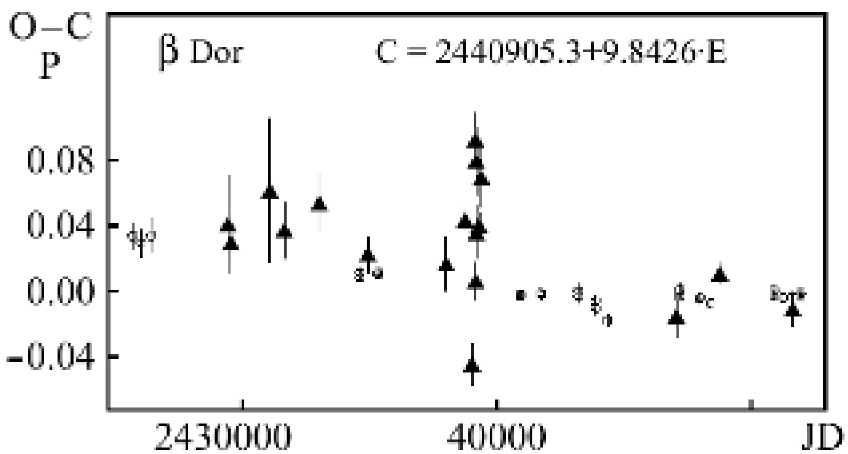


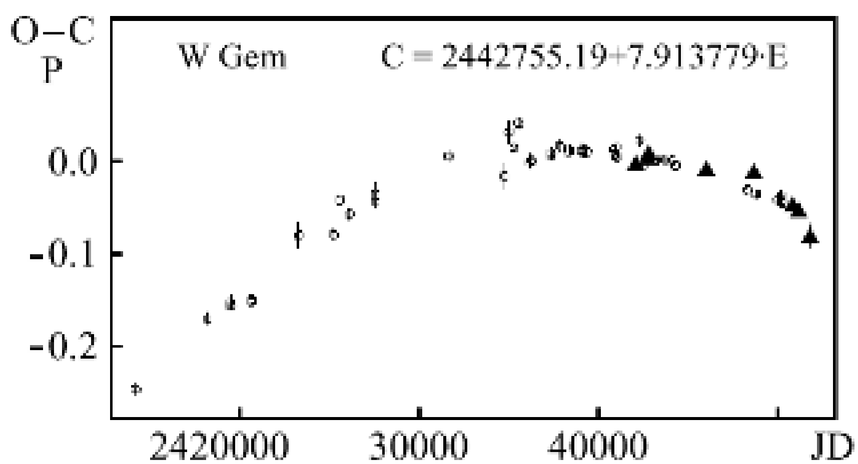




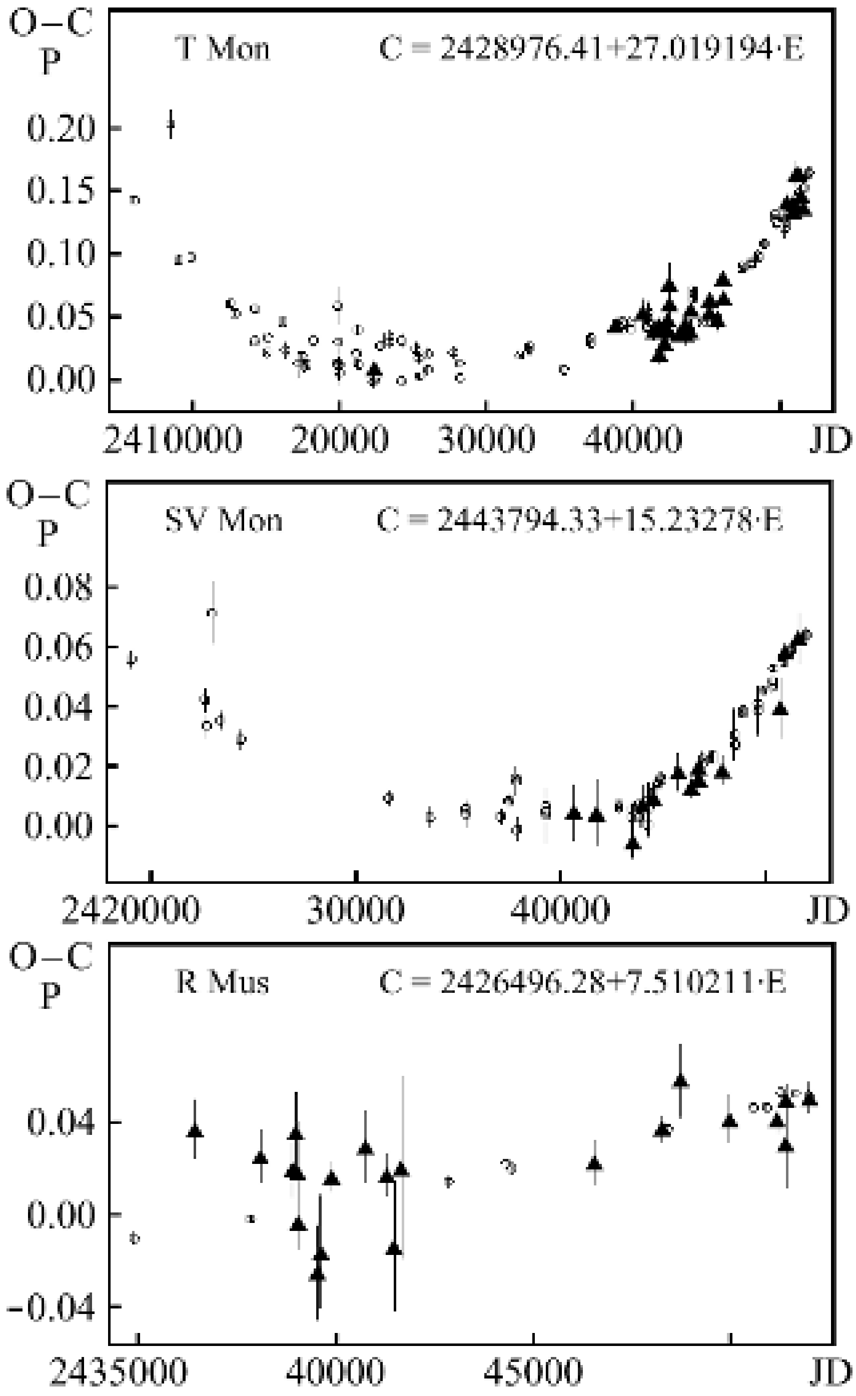
Figures 1–21, continued.



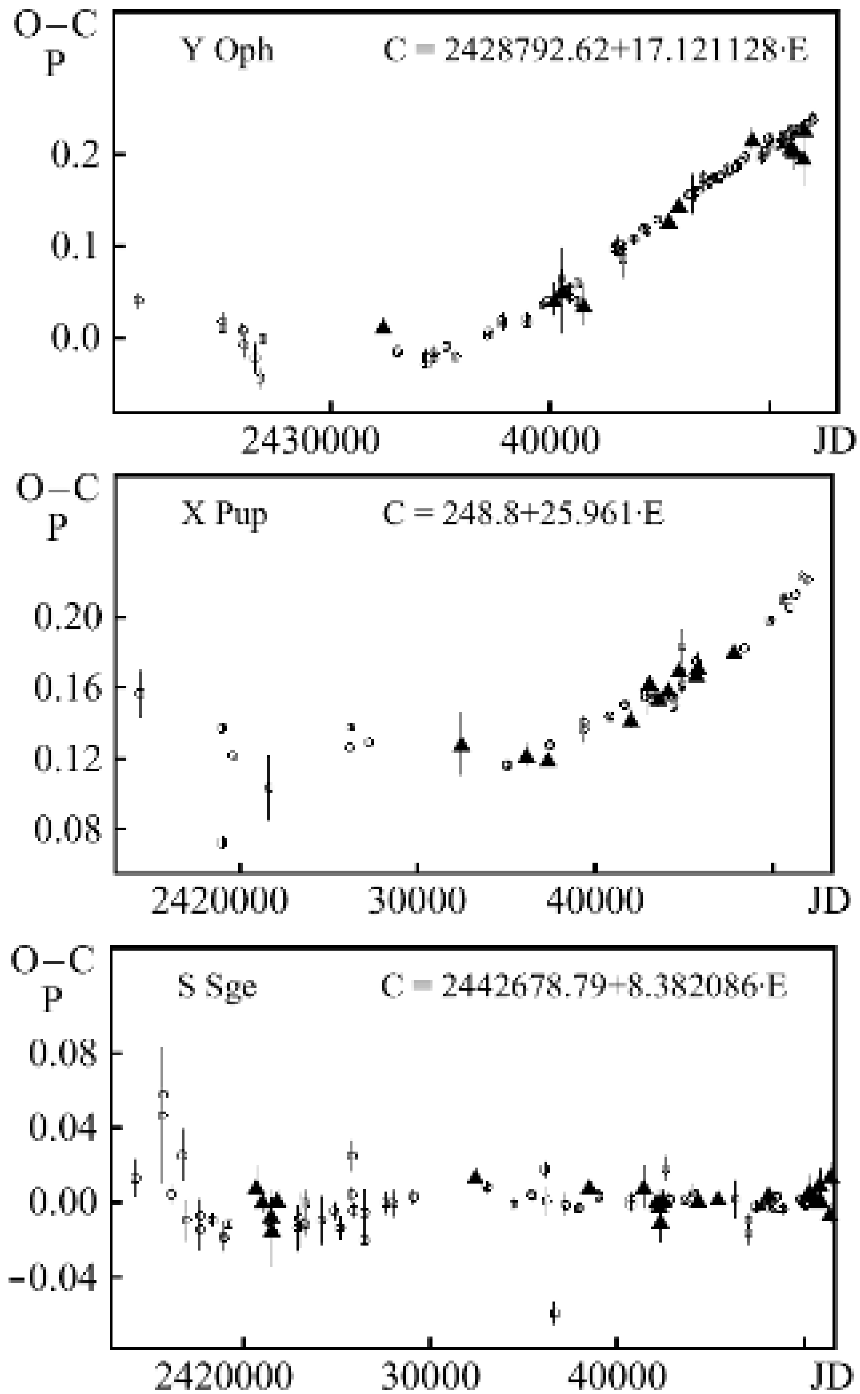




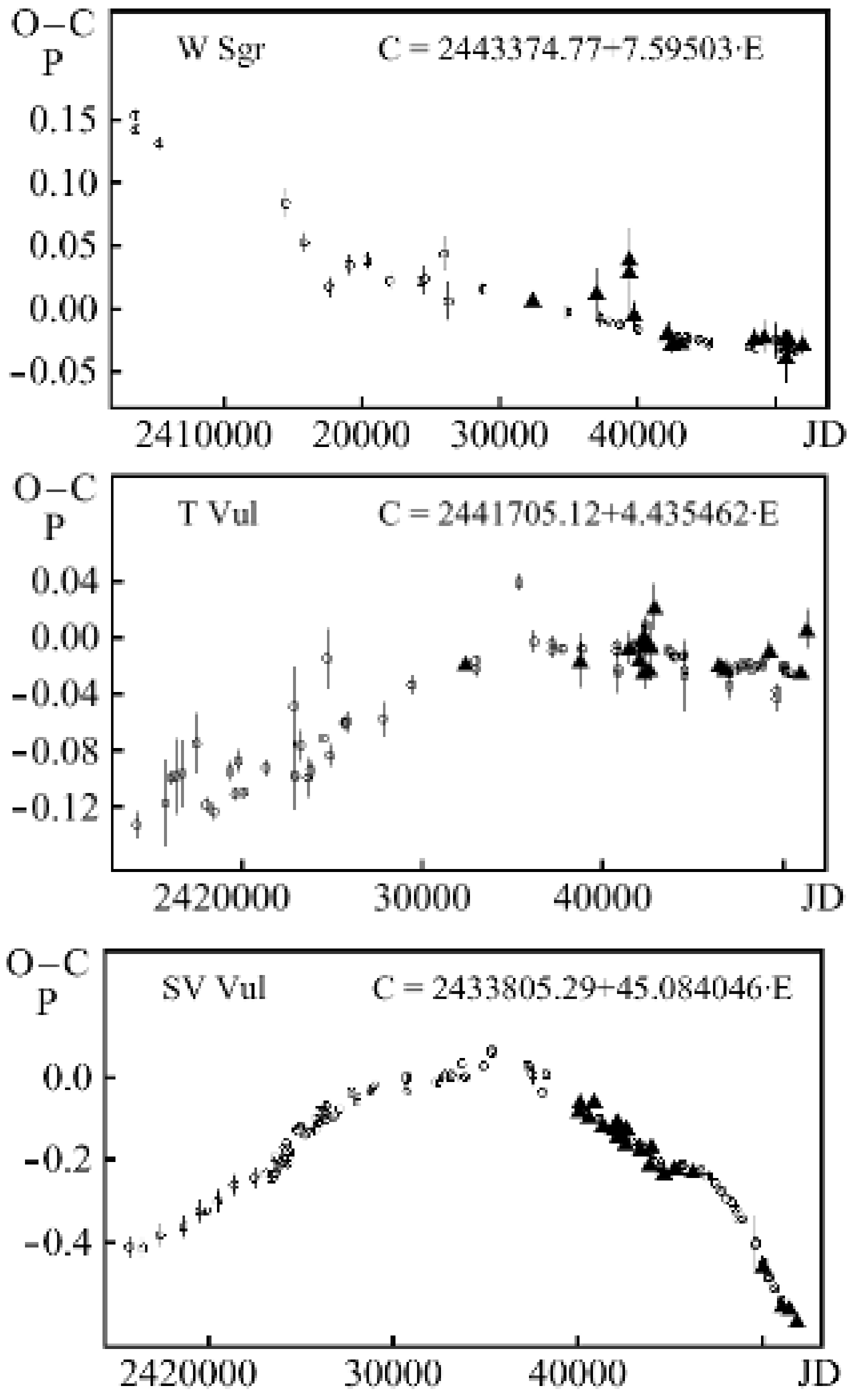
Figures 1–21, continued.



Figures 1–21, continued.



Figures 1–21, continued.



Figures 1–21, continued.