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NEW PHOTOELECTRIC MINIMA AND UPDATED EPHEMERIDES OF SELECTED ECLIPSING BINARIES

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We present 58 new minima times of 23 eclipsing close binaries obtained from July 1999 to March 2001 as a part of the program of their full light-curve coverages. The $UBVR$ photoelectric observations were taken at the Skalnaté Pleso (SP) and Stará Lesná (SL) observatories of the Astronomical Institute of the Slovak Academy of Sciences. In both cases the 0.6-m Cassegrain telescope equipped with a single-channel pulse-counting photoelectric photometer was used. For all observations a 10-second integration was used. Data reduction, the atmospheric extinction correction and transformation to the standard international UBV system were carried out in the usual way. We have calculated the times of minima separately for all filters using the Kwee and Van Woerden's method, parabola fit, sliding integration method, tracing paper and "center of mass" method which were described in detail by Ghedini (1982). The computer codes were kindly provided by Komžík (2000). To eliminate the influence of the photospheric activity on the minima times (e.g., for RT And and XY UMa), for computations of the primary and secondary minima we have used only observations in the phase intervals ± 0.02 and ± 0.04, respectively. The average times of the primary (I) and secondary (II) minima in different passbands and their probable errors are given in Table 1.

We have also collected all available minima times of these eclipsing binaries from literature and from compilations kindly provided by Kreiner (2000). The CCD, photoelectric and visual minima were weighted according to their average precision. Since the period changes in close binaries are rather often and pronounced, the presented ephemerides (Table 2) were obtained by fitting the data in the last section of the $O-C$ diagram which is approximately linear. The orbital periods of a large fraction of the presented binaries (AB And, BX And, SV Cam, VW Cep, EF Dra, SW Lac, XY UMa) are modulated by the presence of further component(s) in the system. Hence, the linear ephemerides of these systems are expected to be valid with a sufficient precision (0.01–0.02 in phases) only during few years. This is the case for multiple systems like VW Cep or EF Dra, where apparent changes of the orbital period has recently been quite large.

Detailed light-curve analysis and study of the period changes will be published elsewhere.

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Table 1: New times of primary (I) and secondary (II) minima. The standard errors are given in parentheses

System	JD_{hel} 2400000 +	Min.	Obs.	Fil.	System	JD_{hel} 2400000 +	Min.	Obs.	Fil.
AB And	51776.53314(5)	I	SL	B	SV Cam	51921.2796(9)	I	SP	V
	51776.53387(3)	I	SL	V		51924.5381(4)	II	SP	R
	51777.36296(3)	II	SL	B		51924.5388(3)	II	SP	V
	51777.36365(5)	II	SL	V		51997.4852(9)	II	SP	R
	51833.2869(1)	I	SL	V		51997.4898(9):	II	SP	V
	51833.28697(3)	I	SL	B	EG Cep	51718.44352(15)	I	SP	R
	51833.45306(5)	II	SL	V		51718.44389(5)	I	SP	V
	51833.45315(10)	II	SL	B		51718.44413(13)	I	SP	B
	51925.22047(6)	I	SL	B		51772.36150(8)	I	SL	B
	51925.22064(2)	I	SL	V		51772.36160(12)	I	SL	V
BX And	51800.5452(3)	I	SL	B	GW Cep	51968.3054(1)	II	SL	BV
	51800.5454(2)	I	SL	V	VW Cep	51707.4008(2)	I	SL	V
	51838.3734(1)	I	SL	B		51707.4013(4)	I	SL	B
	51838.3739(1)	I	SL	V		51716.4465(3)	II	SL	B
	51838.3743(1)	I	SL	U		51716.4478(2):	II	SL	V
RT And	51776.45476(4)	I	SL	V		51772.52501(6)	I	SL	V
	51776.45495(4)	I	SL	B		51772.52522(8)	I	SL	U
	51778.3411(2):	I	SP	R		51772.52561(8)	I	SL	B
	51778.3416(2)	I	SP	B		51777.5339(2)	I	SL	V
	51778.3417(1)	I	SP	V		51777.5346(2)	I	SL	B
SS Ari	51928.25849(5)	I	SL	V	YY CrB	51975.6053(1)	I	SL	V
	51928.25893(3)	I	SL	B		51975.6056(1)	I	SL	B
44i Boo	51704.4907(2)	I	SL	V	EF Dra	51968.5766(1)	I	SL	B
	51704.4909(2)	I	SL	B		51968.5772(1)	I	SL	V
	51705.4260(2)	II	SL	B	FU Dra	51925.67608(5)	I	SL	B
	51705.4270(2)	II	SL	V		51925.6756(1)	I	SL	V
	51556.6529(2)	I	SP	V		51927.6701(4)	II	SL	V
	51556.6530(3)	I	SP	R		51927.6710(1)	II	SL	B
	51556.6538(1)	I	SP	B		51952.5134(3)	II	SL	V
	51668.4679(2)	II	SL	V		51952.5140(1)	II	SL	B
	51668.4689(13):	II	SL	B		51952.6665(2)	I	SL	B
	51968.4253(1)	II	SL	V		51952.6679(1)	I	SL	V
	51968.4265(1):	II	SL	B	SW Lac	51389.51309(2)	I	SL	V
V523 Cas	51822.4264(2)	I	SP	V		51389.51313(2)	I	SL	B
	51822.4267(2)	I	SP	R		51389.51316(5)	I	SL	U
	51822.4269(1)	I	SP	B		51536.24001(13)	II	SP	B
AO Cam	51798.5673(2)	II	SL	V		51536.24003(8)	II	SP	R
	51798.5675(1)	II	SL	B		51536.24012(8)	II	SP	V
SV Cam	51435.54893(9)	I	SL	U		51772.4445(1)	I	SL	B
	51435.54893(3)	I	SL	B		51772.4448(1)	I	SL	V
	51435.54909(3)	I	SL	V		51860.32001(3)	I	SL	V
	51536.37178(5)	I	SP	V		51860.32028(8)	I	SL	B
	51536.37209(2)	I	SP	R	UV Lyn	51898.4814(1)	I	SL	B
	51536.37238(4)	I	SP	B		51898.4821(2)	I	SL	V
	51550.3096(3)	II	SL	B		51929.39972(5)	II	SL	V
	51550.3116(3)	II	SL	V		51929.4004(2)	II	SL	B
	51878.5746(4)	I	SP	V		51929.6066(1)	I	SL	V
	51878.5757(5)	I	SP	R		51929.6068(2)	I	SL	B
	51878.5762(4)	I	SP	B		51958.4490(2)	II	SL	V
	51921.2792(6)	I	SP	R		51958.4496(5)	II	SL	B
	51921.2793(4)	I	SP	B	U Peg	51778.4966(1)	II	SL	B

Table 1: (continued)

System	JD$_{\rm hel}$ 2400000 +	Min.	Obs.	Fil.	System	JD$_{\rm hel}$ 2400000 +	Min.	Obs.	Fil.
U Peg	51778.4970(1)	II	SL	V	EQ Tau	51930.2550(5):	II	SL	V
	51794.4230(4):	I	SL	B		51930.2565(1)	II	SL	B
	51794.4241(1)	I	SL	V	AW UMa	51536.5917(1)	I	SP	R
	51860.3852(1)	I	SL	B		51536.5922(1)	I	SP	B
	51860.3858(2)	I	SL	V		51536.5923(2)	I	SP	V
V432 Per	51911.2699(8):	I	SP	R		51928.5919(3):	II	SL	B
	51911.2714(7)	I	SP	B		51928.5933(1)	II	SL	V
	51911.2728(12)	I	SP	V	W UMa	51556.48346(10)	II	SL	B
AH Tau	51956.24554(6)	II	SL	V		51556.48373(4)	II	SL	V
	51956.2459(2)	II	SL	B		51597.52083(7)	II	SL	B
EQ Tau	51896.2932(1)	I	SL	B		51597.52084(8)	II	SL	V
	51896.29324(5)	I	SL	V	XY UMa	51919.5420(2)	I	SL	U
	51911.3122(2)	I	SL	V		51919.5421(2)	I	SL	B
	51911.31279(6)	I	SL	B		51919.54283(3)	I	SL	V

Table 2: New ephemerides of the selected eclipsing close binaries. The standard errors are given in parentheses, e.g., the entry 51534.2504(5) should be interpreted as 51534.2504 ± 0.0005. The reference gives last paper dedicated to the system or particularly to study of period change.

System	JD$_0$ 2400000 +	Period	Interval	Period change	Reference
AB And	51534.2504(5)	$0^{\rm d}.33189106(4)$	1981–2001	LT + ↗	Borkovits et al. (1996)
BX And	36528.8118(22)	0.61011285(11)	1981–2000	LT ?	Demircan et al. (1993)
RT And	32443.7967(5)	0.62892932(2)	1968–2000	↘	Pribulla et al. (2000a)
SS Ari	41947.151(5)	0.4059836(2)	1993–2001	↘	Demircan et al. (1993)
44i Boo	50945.4898(6)	0.26781916(7)	1988–2001	↗	Gherega et al. (1994)
V523 Cas	47000.1839(5)	0.23369229(4)	1987–2000	↗	Lister et al. (2000)
AO Cam	45745.6391(6)	0.32990473(7)	1980–2000	→	Rucinski et al. (2000)
SV Cam	33777.389(2)	0.59307318(8)	1979–2001	LT ?	Albayrak et al. (1999)
EG Cep	26929.3962(20)	0.54462278(5)	1976–2000	↗	Chochol et al. (1998)
GW Cep	47000.1436(12)	0.31882954(11)	1989–2001	↘	Pribulla et al. (2001b)
VW Cep	33898.424(23)	0.2783131(4)	1997–2000	LT + ↘	Pribulla et al. (2000b)
YY CrB	50955.8688(12)	0.37656421(9)	1998–2001	→	Rucinski et al. (2000)
EF Dra	51789.2125(12)	0.4240257(2)	1989–2001	LT + ↗ ?	Pribulla et al. (2001b)
FU Dra	50866.2768(5)	0.30671682(13)	1991–2001	→	Rucinski et al. (2000)
SW Lac	51056.2896(3)	0.32071510(9)	1993–2000	LT + ↗	Pribulla et al. (1999a)
UV Lyn	47000.4197(10)	0.41498460(15)	1988–2001	↗	Lu et al. (1999)
U Peg	33512.032(4)	0.37477742(10)	1985–2000	↘	Borkovits et al. (1996)
V432 Per	48601.3750(7)	0.3833120(2)	1991–2001	LT ?	Agerer (1992)
AH Tau	47000.2689(5)	0.33267164(7)	1975–2001	↘ ?	Liu et al. (1991)
EQ Tau	47000.3566(7)	0.34134666(10)	1984–2001	LT or ↘	Buckner et al. (1998)
AW UMa	38044.892(10)	0.4387259(3)	1994–2001	↘ + LT ?	Pribulla et al. (1999b)
W UMa	50554.7428(2)	0.33363551(3)	1984–2000	LT ?	Depasquale et al. (1999)
XY UMa	35216.398(5)	0.47899819(16)	1994–2001	LT + ↗	Pribulla et al. (2001a)

LT: light-time effect, ↗: period increase, ↘: period decrease, →: constant period

References:

Agerer, F., 1992, *IBVS*, No. 3797
Albayrak, B., Özeren, F.F., Ekmekci, F. et al., 1999, *RMxA&A*, **35**, 3
Borkovits, T., Hegedüs, T., 1996, *A&AS*, **120**, 63
Buckner, M., Nellermoe, B., Mutel, R., 1998, *IBVS*, No. 4559
Chochol, D., Pribulla, T., Rovithis-Livaniou, H. et al., 1998, *Contrib. Astron. Obs. Skalnaté Pleso*, **28**, 51
Demircan, O., Akalin, A., Derman, E., 1993, *A&AS*, **98**, 583
Demircan, O., Selam, S.O., 1993, *A&A*, **267**, 107
Depasquale, J.M., Bochanski, J.J., Guinan, E.F., 1999, *IBVS*, No. 4752
Ghedini, S., 1982, *Software for Photometric Astronomy*, Willmann-Bell Publ. Comp., Richmond
Gherega, O., Farkas, L., Horvath, A., 1994, *IBVS*, No. 4045
Komžík, R., 2000, private communication
Kreiner, J.M., 2000, private communication
Lister, T.A., McDermid, R.M., Hilditch, R.W., 2000, *MNRAS*, **317**, 111
Liu, Q.Y., Yang, Y.L., Zhang, Y.L., 1991, *Acta Astrophys. Sinica*, **11**, 44
Lu, W., Rucinski, S.M., 1999, *AJ*, **118**, 515
Pribulla, T., Chochol, D., Parimucha, Š., 1999a, *Contrib. Astron. Obs. Skalnaté Pleso*, **29**, 111
Pribulla, T., Chochol, D., Rovithis-Livaniou, H. et al., 1999b, *A&A*, **345**, 137
Pribulla, T., Chochol, D., Milano, L. et al., 2000a, *A&A*, **362**, 169
Pribulla, T., Chochol, D., Tremko, J. et al., 2000b, *Contrib. Astron. Obs. Skalnaté Pleso* **30**, 117
Pribulla, T., Chochol, D., Heckert, P.A. et al., 2001a, *A&A*, in press
Pribulla, T., Vaňko, M., Chochol, D. et al., 2001b, *Contrib. Astron. Obs. Skalnaté Pleso*, in press
Rucinski, S.M., Lu, W., Mochnacki, S.W., 2000, *AJ*, **120**, 1133