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NEW PHOTOELECTRIC AND CCD MINIMA AND UPDATED EPHEMERIDES OF SELECTED ECLIPSING BINARIES

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We present 90 new minima times of 35 eclipsing binaries obtained from March 2001 to November 2002 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 UBV system were carried out in the usual way. VRI CCD observations were obtained at the Roztoky Observatory ($\lambda = 21°28'54''$E, $\varphi = 49°33'57''$N). The 40cm Cassegrain telescope equipped with the SBIG ST-8 CCD camera and standard VRI filters was used. The exposure times for the V and RI passbands were 20 s and 10 s, respectively. The frames were reduced using standard procedure (bias and dark subtraction, flat field correction) and the brightness of the variable was determined by aperture photometry with respect to usually two close standard stars using the MuniPack package (`http://www.ian.cz/munipack/`). Since the field of view of the camera is $7'.9 \times 11'.9$ no extinction correction to the differential magnitudes has been applied.

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). The average times of the minima from all used filters are given in Table 1. Part of the new minima of 44i Boo can be found in Pribulla et al. (2001). For DU Boo we determined only one normal primary minimum from all observations obtained in spring 2002.

We have also collected all available minima times of these eclipsing binaries from literature and from compilations provided by Kreiner (2001). The CCD, photoelectric and visual minima were weighted according to their average precision. Since the period changes in close binaries are rather frequent and pronounced, the presented ephemerides (Table 2) were obtained by fitting the data in the last approximately linear section of the $(O-C)$ diagram. The orbital periods of some of the presented binaries (e.g., AB And, BX And, V523 Cas, SV Cam, VW Cep, EF Dra, SW Lac, XY UMa) are modulated by the presence

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.
RT And	52251.2951(1):	I	SP	RVR	SS Com	52403.5158(4)	I	RO	VRI
	52481.4838(1)	I	SL	BV		52404.3402(4)	I	RO	VI
AB And	52258.2736(2)	II	SL	BV		52404.5485(2)	I	RO	VI
	52484.4591(1)	I	SL	BV	YY CrB	52352.5466(2)	I	SL	UBV
BX And	52231.2850(1)	I	SL	BV	CG Cyg	52490.4190(1)	I	SL	BV
EP And	52200.3698(1):	II	SL	BV	V1191 Cyg	52413.4450(4)	I	RO	VRI
SS Ari	52528.5036(2)	II	SL	BV		52445.4067(2)	I	RO	VRI
V402 Aur	52224.467(2)	II	SL	UBV		52456.3748(1)	I	RO	RI
44i Boo	52363.5934(5):	I	SP	BVR		52465.4622(4)	I	SL	BV
	52364.5293(1)	II	SL	BV		52528.3033(4)	II	SL	BV
DU Boo	52380.2145(3)	II	SL	BV		52548.3544(3)	II	SL	BV
	52380.7202(2)	I	SL	BV	EF Dra	52031.3346(2)	I	SL	V
FI Boo	52043.4593(3)	II	SL	BV		52139.4607(1)	I	SL	BV
	52053.4095(2)	I	SL	B		52189.2824(2)	II	SL	BV
SV Cam	52195.2740(1)	I	SL	BV		52203.2757(1)	II	SL	BV
	52198.5365(2)	II	SL	BV		52252.2516(8)	I	SP	BVR
	52200.3178(3)	II	SP	BVR		52321.5799(1)	II	SL	BV
	52200.6124(3)	I	SP	BVR		52348.5043(2)	I	RO	VRI
	52282.4535(4)	I	SP	BR		52352.3203(1)	I	RO	RI
DN Cam	52247.5230(1)	II	SL	UBV		52352.5360(3)	II	RO	VR
	52568.4322(3)	II	SL	UBV		52401.5073(3)	I	SL	BV
FN Cam	52445.3947(3)	I	SL	UBV		52550.3423(2)	I	SL	BV
TX Cnc	52348.4185(3)	I	SL	BV	FU Dra	52464.4278(3)	II	SL	BV
	52352.4397(2)	II	SL	BV	SW Lac	52156.3371(2)	I	SL	UBV
WY Cnc	52339.4598(6)	II	SL	V		52191.4550(1)	II	SL	UV
	52342.3736(1)	I	SL	UBV		52505.4351(2)	II	SL	BV
	52352.3260(1)	I	SP	BVR	AM Leo	52397.3557(1)	I	SL	BV
CW Cas	52200.2777(1)	I	SL	BV	V714 Mon	52309.3076(2)	I	SL	BV
	52311.2418(1)	I	SL	BV		52311.3742(1)	I	SL	BV
	52527.4299(2)	I	SL	BV	V432 Per	52320.2634(2)	I	SL	UBV
V523 Cas	52504.4610(2)	II	SL	BV		52547.3745(3)	II	SL	UBV
	52504.5786(1)	I	SL	V		52547.5653(3)	I	SL	UBV
VW Cep	52139.3413(2)	I	SL	UBV		52585.3201(3)	II	SL	BV
	52182.3447(4)	II	SL	UBV	XY UMa	52251.4842(4)	I	SP	BVR
	52202.2363(1)	I	SP	BVR		52278.5530(10)	II	SL	BV
	52202.3801(2)	II	SP	BVR		52311.3600(3)	I	SP	BVR
	52202.5157(3)	I	SP	BVR		52311.6028(8)	II	SP	BVR
	52240.5074(6):	II	SP	UBVR		52322.3777(1)	I	SL	BV
	52452.4398(4)	I	SL	UBV		52322.6132(1)	II	SL	VB
	52453.4164(3)	II	SL	UBV		52351.3539(8)	II	RO	VRI
WZ Cep	52217.3841(3)	II	SL	BV		52351.5951(2)	I	RO	VRI
EG Cep	52444.4255(1)	I	SL	BV	AA UMa	52367.5846(3)	II	RO	RI
GW Cep	52185.2687(2)	I	SL	BV	AW UMa	52311.6006(6)	II	SL	UBV
	52185.4285(1)	II	SL	BV	ER Vul	52492.4670(2)	I	SL	V
EE Cet	52548.4392(3)	II	SL	UBV		52512.3626(4)	II	SL	BV

Table 2: New ephemerides of the observed eclipsing close binaries. The standard errors are given in parentheses, e.g., the entry 52137.5296(14) should be interpreted as 52137.5296±0.0014.

System	JD_0 2 400 000+	Period	Interval	Period change
RT And	52481.4848(3)	0.62892929(2)	1971 - 2002	↘
AB And	52484.4584(6)	0.33189189(12)	1994 - 2002	LT + ↗
BX And	52231.2862(7)	0.61011291(10)	1981 - 2002	LT ?
EP And	52137.5296(14)	0.40411058(15)	1982 - 2001	→
SS Ari	52528.7093(13)	0.40598385(19)	1981 - 2002	↘
V402 Aur	52224.7691(12)	0.6034992(3)	1991 - 2001	
44i Boo	52364.6634(7)	0.26781915(6)	1988 - 2002	LT + ↗
DU Boo	52380.720(2)	1.0558882(9)	1991 - 2002	
FI Boo	51718.3979(14)	0.3899978(4)	1991 - 2001	
CW Cas	52527.4311(8)	0.3188621(2)	1994 - 2002	↘
V523 Cas	52504.5730(7)	0.23369229(5)	1987 - 2002	LT
SV Cam	52282.4579(6)	0.59307301(9)	1979 - 2002	LT ?
DN Cam	52568.6830(6)	0.49830902(15)	1991 - 2002	
FN Cam	52445.3977(9)	0.6771318(5)	1991 - 2002	
TX Cnc	52352.6287(13)	0.38288247(9)	1977 - 2002	↗ ?
WY Cnc	52352.3270(7)	0.82936867(14)	1984 - 2002	↘
VW Cep	52506.4328(9)	0.27831149(17)	1995 - 2002	LT + ↘
WZ Cep	52217.5933(17)	0.41744491(12)	1982 - 2001	
EG Cep	52444.4282(6)	0.54462272(6)	1974 - 2002	↗
GW Cep	52185.5871(7)	0.31882957(12)	1991 - 2001	↘
EE Cet	52548.6291(10)	0.3799207(3)	1991 - 2002	
SS Com	52403.5127(19)	0.4128184(6)	1996 - 2002	↗
YY CrB	52352.5464(6)	0.3765642(3)	1991 - 2002	→
CG Cyg	52490.4173(5)	0.63114360(10)	1990 - 2002	LT ?
V1191 Cyg	52548.5110(16)	0.3133818(8)	1997 - 2002	↗
EF Dra	52550.3408(7)	0.42402593(9)	1989 - 2002	LT + ↗ ?
FU Dra	52464.5785(5)	0.30671687(11)	1991 - 2002	→
SW Lac	52505.5960(8)	0.32071417(16)	1994 - 2002	LT + ↗
AM Leo	52397.3557(13)	0.36579762(12)	1988 - 2002	LT ?
V714 Mon	52311.3756(9)	0.34450930(15)	1995 - 2002	→
V432 Per	52547.5658(7)	0.3833101(2)	1997 - 2002	LT ?
XY UMa	52351.5911(5)	0.47899511(4)	1931 - 2002	LT + ↗
AA UMa	52367.8160(14)	0.46812712(15)	1987 - 2002	↗
AW UMa	52311.8218(12)	0.4387261(2)	1995 - 2002	↘
ER Vul	52512.7111(11)	0.69809518(13)	1978 - 2002	→

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

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.

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