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PHOTOELECTRIC MINIMA OF ECLIPSING BINARIES

Introduction

Since 1963 photoelectric observations of eclipsing binaries were made at the Nürnberg Observatory/Germany. The photometer with 1P21 multiplier is mounted at a 34 cm Cassegrain-telescope. In 1965 a cooperation was arranged between the Nürnberg Observatory and a group of observers at the Ege University Observatory, Izmir/Turkey, where till August 1967 visual minima were derived. In the year 1968 a new 48 cm Cassegrain-telescope with photoelectric photometer (1P21) was mounted at the Ege University Observatory, which has very good climatic conditions. The complete instrument was financed by a NATO-Research Grant. This telescope is used by both observatories for the common program.

Minima of eclipsing binaries, observed at the Izmir- and Nürnberg-Observatory 1960-1967 were published in *Astron. Nachr.* 288.69 (1964), 289.191 (1966) and 291.111 (1968).

Observations

All minima listed here are photoelectric obtained during the period 1968/69. No filter were used, except for stars brighter than 7^m_{50} (Schott GG 11 = GG 495). In Nürnberg a Siemens-Kompensograph, in Izmir a Philips-recorder were used to record the measurements.

The table gives besides the heliocentric minima three different O-C's (see remarks at the end of table), the abbreviations of the names of the observers and the type of the instruments used (Izmir: 48 cm Cassegrain, Nürnberg: 34 cm Cassegrain).

Abbreviations of the Observers' Names

Al = A. Caliskan, Izmir	Ib = C. Ibanoglu, Izmir
Ba = H. Baumbach, Nürnberg	Ki = A. Kizilirmak, Izmir
Bi = A. Bickel, Nürnberg	Kt = M. Kurutac, Izmir
En = C. Endres, Nürnberg	Ly = H. Loy, Nürnberg
Gd = N. Güdür, Izmir	Me = M. Meler, Nürnberg
Gl = Ö. Gülmen, Izmir	Od = O. Demircan, Izmir
Gn = E. Gencer, Izmir	Pl = E. Pohl, Nürnberg
Gö = G. Görz, Nürnberg	Ro = B. Roth, Nürnberg
Gr = G. Grampp, Nürnberg	Rz = H. Renz, Nürnberg
Hd = K. Held, Nürnberg	Zk = Z. Cetinkaya, Izmir
Hö = D. Hölzl, Nürnberg	

Star	Min(helioc.)	O-C (I)	O-C (II)	O-C (III)	Observ.	Instr. cm
RT And	2440 115.4755	-0.0293	-0.0016		Gd	48
	439.375	-0.030	-0.002		G1/Od	"
XZ And	40 484.393	+0.072	-0.007		G1	"
AB And	40 433.4725	+0.0726	+0.0023		Ib	"
	474.2940	+0.0719	+0.0010		Ib	"
BX And	40 100.398	+0.042	+0.005		Gd/Ib	"
	103.448	+0.041	+0.005		Gd/Ib	"
	133.344	+0.042	+0.005		Gd/Ib	"
	496.363	+0.044	+0.005		Ki/Od	"
RY Aqr	40 476.324	-0.005	-0.009		Ib	"
KO Aql	40 435.4076	+0.0200	+0.0575		Al/Ib	"
KP Aql	40 098.471	+0.066	+0.031		Ib/Kt	"
OO Aql	40 068.4638	-0.0380	-0.0165	-0.0002	Ib/Kt	"
	366.454	-0.044	-0.021	0.000	Ib	"
V337 Aql	40 408.370	-0.025 =	-0.025		Gd/Od	"
V346 Aql	40 149.306	-0.024	-0.009		P1	34
	421.4738	-0.0222	-0.0072		Al/G1	48
V805 Aql	40 036.441	+0.014 =	+0.014		Ib/Kt	"
SX Aur	40 162.3358	+0.0172	+0.0141		Gd/Ib	"
	289.396	+0.019	+0.016		Gö/Me	34
	491.478	+0.018	+0.015		Ib	48
WW Aur	40 288.298	+0.004	-0.001		Bi/Rz	34
AR Aur	40 498.4683	+0.0186 =	+0.0186		G1	48
i Boo	39 948.363		+0.010	-0.003	Bi	34
	956.400		+0.013	0.000	Gö/Me	"
	959.349		+0.016	+0.003	Gö/En	"
	959.481		+0.014	+0.001	Gö/En	"
	968.453		+0.014	+0.001	Bi/Me	"
	977.292		+0.016	+0.002	Kt/P1	48
	40 316.346		+0.021	+0.007	P1/Gd/Ib	"
	319.296		+0.022	+0.008	P1/Kt/Ib	"
	331.346		+0.021	+0.006	Gd	"
363.484		+0.021	+0.006	Ba/Me	34	

Star	Min (helioc.)	O-C (I)	O-C (II)	O-C (III)	Observ.	Instr. cm
SV Cam	39 945.3718	-0.0198	+0.0016		Hö/Me	34
	977.3980	-0.0195	+0.0017		Kt/Pl	48
	40 092.4561	-0.0176	+0.0041		Gd/Ib	"
	127.4466	-0.0184	+0.0034		Ib	"
R CMa	39 935.307	+0.012	-0.001		Gö/Hö	34
RZ Cas	40 054.4168	-0.0353	-0.0068		Ki/Kt	48
	127.3272	-0.0353	-0.0068		Ib	"
TV Cas	40 056.4558	+0.0038 =	+0.0038		Gd/Kt	"
	105.396	+0.004 =	+0.004		Gd/Ib	"
	105.3977	+0.0053 =	+0.0053		Bi/Me	34
	203.2770	+0.0036 =	+0.0036		Hd/Pl	"
	493.293	+0.002 =	+0.002		G1	48
TW Cas	2440 104.432	-0.010	-0.011		Gd/Ib	48
	204.413	-0.012	-0.012		Bi	34
AB Cas	40 475.5216	+0.0763	+0.0108		G1	48
DO Cas	39 917.284	+0.047	0.000		Bi/Me	34
	40 051.475	+0.045	-0.003		Kt/Ib	48
	114.4687	+0.0498	+0.0005		Kt/Gd	"
	518.423	+0.055	+0.002		Gd	"
PV Cas	40 129.381		+0.061	+0.002	Ib	"
	227.4061		+0.0603	+0.0002	Ib/Kt	"
	416.456		+0.060	-0.001	Al/Ib	"
	479.475		+0.063	+0.001	Ib/Od	"
U Cep	40 086.4908	+0.1455	+0.0212		Gd/Ib	"
	101.4483	+0.1452	+0.0207		Bi/Hö	34
	136.3542	+0.1496	+0.0242		Gd	48
	141.335	+0.144	+0.019		Gd	"
VW Cep	39 987.4237	-0.0832	-0.007	-0.0003	Gd/Pl	"
	40 078.433	-0.084	-0.008	0.000	Gd/Ib	"
	137.435	-0.086	-0.009	0.000	Ib	"
	358.4148	-0.0916	-0.0128	-0.0017	Ib	"
	388.477	-0.088	-0.009	+0.003	Ib/Zk	"
	490.3378	-0.0919	-0.0121	+0.0005	Gd	"

Star	Min (helioc.)	O-C (I)	O-C (II)	O-C (III)	Observ.	Instr. cm
XX Cep	40 097.373	-0.090	-0.017		Ib/Ki	48
	139.442	-0.093	-0.020		Gd/Ib	"
	513.419	-0.090	-0.016		Ba/Gö	34
ZZ Cep	40 042.4714	0.0	= 0.0		Gd/Ib	48
EG Cep	40 050.4550		+0.0071		Gd	48
	201.316		+0.008		Bi/Me	34
	433.3246		+0.0087		Ib	48
	483.4284		+0.0075		Gl	"
U CrB	40 371.3752:	-0.0219:	-0.0246		Ib	"
Y Cyg	40 345.4774	-0.0051	+0.0086		Gd/Ib	"
	381.424:	-0.015:	-0.001:		Pl	34
	384.428	-0.007	+0.007		Ki/Zk	48
	423.379	-0.008	+0.006		Gd/Od	"
BR Cyg	40 377.4698	+0.0097=	0.0097		Gd/Ki	"
	437.4371:	+0.0117=	0.0117		Od	"
	501.398:	+0.010 =	+0.010:		Me/Ro	34
KR Cyg	40 420.4578	-0.0188	+0.0093		Al/Gl	48
MR Cyg	40 074.355	+0.002 =	+0.002		Gd/Ib	"
	364.480	0.000 =	0.000		Kt	"
V477 Cyg	39 983.4555	-0.0647	-0.0196	+0.0012	Kt	"
	40 091.4174	-0.0655	-0.0204	+0.0017	Kt/Gn	"
	382.4425	-0.0704	-0.0253	+0.0003	En/Gr	34
	422.3434:	-0.0687:	-0.0237:	+0.0024:	Gd/Od	48
V548 Cyg	40 109.474:	-0.054:	-0.021:		Bi/Hö	34
	185.295	-0.054	-0.021		Ib/Kt	48
	378.462	-0.050	-0.016		Ib	"
	434.421	-0.055	-0.021		Al/Od	"
V 836 Cyg	2440 057.444		-0.004		Gd	48
	406.369:		0.000:		Gl/Ki	"
Z Dra	40 346.3956	+0.0086	-0.0016		Ib	"
TW Dra	39 979.3515	-0.0084	-0.009	-0.0006	Pl	"
	40 080.3995	-0.0077	-0.0085	+0.0013	Gn/Kt	"
	473.352	-0.017	-0.018	-0.003	Me/Pl	34

Star	Min (helioc.)	O-C (I)	O-C (II)	O-C (III)	Observ.	Instr. cm
TZ Dra	40 394.353	-0.002	+0.001		Al/Gd	48
	419.4667	-0.0031	-0.0004		Hö/Ly	34
AI Dra	40 094.3910	+0.0174	+0.0060		Gd/Ib	48
	106.3783	+0.0165	+0.0052		Kt/Ib	"
	438.4491	+0.0160	+0.0046		Hö/Me	34
S Equ	40 411.387	+0.003	-0.004		Gd	48
YY Eri	40 201.4399	+0.0221	+0.0221		Ba/Bi	34
RX Her	40 037.4659	-0.0041	-0.0011		Gd/Ib	48
	110.3909	-0.0005	+0.0025		Gö/Me	34
	334.4895	-0.0021	+0.0010		Ib	48
TX Her	39 979.518	-0.013	-0.004		Gd	"
	40 008.3573	-0.0115	-0.0018		Kt/Gd	"
	389.4232	-0.0105	-0.0008		Gd/Gl	"
	426.5015	-0.0087	+0.0009		Hö/Ro	34
UX Her	40 022.4201		-0.0320	-0.0002	Gd/Kt	48
	039.4564		-0.0331	-0.0004	Ba/Me	34
	053.397		-0.032	0.000	Gd/Kt	48
	403.4372	-0.0309	-0.0335	-0.0001	Al/Ib	"
	431.3161	-0.0316	-0.0341	-0.0005	Ib	"
AK Her	39 980.419	+0.036	-0.011	+0.002	Gd/Kt	"
	981.4730	+0.0358	-0.0105	+0.0018	Kt/Gd	"
	40 368.429	+0.035	-0.014	0.000	Kt	"
	392.455	+0.034	-0.015	0.000	Ib	"
SW Lac	40 035.4224		-0.0028		Gd	"
	128.4540		-0.0023		Gn/Ib	"
	202.2197		-0.0040		Pl	34
	373.4866		-0.0062		Ib/Kt	48
	419.3502		-0.0067		Gd/Od	"
	497.2869		-0.0070		Gd	"
	515.246		-0.009		Pl	34
AR Lac	39 876.268	+0.041	-0.002		Me/Pl	"
CM Lac	40 048.386	-0.002	-0.002		Ib/Kt	48
	401.4195	-0.0010	-0.0010		Ib	"

Star	Min (helioc.)	O-C (I)	O-C (II)	O-C (III)	Observ.	Instr. cm
UV Leo	39 940.3390	-0.0058	+0.0064		Bi/Pl	34
	978.445	-0.006	+0.006		Kt/Pl	48
	40 291.3880	-0.0068	+0.0060		Ib/Kt	"
TZ Lyr	40 418.417	+0.031	+0.030		Al/Gl	"
FL Lyr	40 079.519	-0.002	+0.004		Ib/Kt	"
	395.355	+0.001	+0.003		Al/Gd	"
U Oph	40 075.404	-0.013	-0.003		Gn/Kt	48
V451 Oph	2440 410.4204	+0.0074	-0.0242		Ib	48
	477.405	-0.004	-0.036		Me	34
V566 Oph	40 047.358	+0.115	+0.002		Gd	48
	049.4057	+0.1140	+0.0016		Kt/Ib	"
	418.4931	+0.0957	+0.0024		Ba/Me	34
FT Ori	40 274.3917	+0.0163	-0.0163		Hö/Me	"
U Peg	40 096.4534	-0.0081	-0.0044		Kr	48
	205.328	-0.008	-0.004		En/Me	34
UX Peg	40 425.479	-0.056	0.000		Gl/Od	48
AT Peg	40 407.438	-0.021	-0.044		Ib	"
	438.383	-0.020	-0.044		Ib	"
DI Peg	40 424.4746	-0.0056	+0.0218		Gd/Gl	"
β Per	39 918.358	-0.006	+0.019		En/Gö	34
	40 285.368	-0.016	+0.013		Gö/Me	"
V505 Sgr	40 055.3991	-0.0264 =	-0.0264		Gd/Ib	48
	087.3367	-0.0264 =	-0.0264		Gd/Ib	"
RW Tau	40 160.3758	+0.0108	+0.0218		Gd/Ib	"
CD Tau	40 135.425	-0.051	-0.011		Gd	"
W UMa	39 940.4262	+0.0091	-0.0004		Bi	34
	992.4750	+0.0103	+0.0008		Kt	48
	40 293.416	+0.010	0.000		Gd/Ib	"
	322.4450	+0.0127	+0.0024		Ib/Kt	"
TX UMa	40 357.343		-0.056	+0.001	Gd	"

Star	Min (helioc.)	O-C (I)	O-C (II)	O-C (III)	Observ.	Instr. cm
W UMi	40 325.3284	-0.0058 =	-0.0058		Ib	48
AH Vir	40 349.4590	+0.0573	+0.0008		Gd/Ki	"
Z Vul	40 362.4366	+0.0089 =	+0.0089		Ib	"
	362.439	+0.011 =	+0.011		Ly/Rz	34
RS Vul	40 514.317	+0.001 =	+0.001		Bi/En	"
DR Vul	40 109.3523		+0.0403		Gd	48
	370.441		+0.031		Gd/Ki	"

Remarks concerning O-C

O-C (I): GCVS, Moscow 1958; O-C (II): SAC 39/40, Krakow 1967/68;
O-C (III): new elements, published in IBVS by Ibanoglu, Kurutac, Pohl:

OO Aql IBVS 391 (1969) Pohl
i Boo IBVS 209 (1967) Pohl
PV Cas IBVS 386 (1969) Pohl
VW Cep IBVS 369 (1969) Kurutac, Ibanoglu
V 477 Cyg IBVS 226 (1967) Pohl
TW Dra IBVS 443 (1970) Pohl
UX Her IBVS 369 (1969) Kurutac, Ibanoglu
AK Her IBVS 369 (1969) Kurutac, Ibanoglu
TX UMa IBVS 185 (1967) = SAC 41 (1970) Pohl

The (O-C)'s for secondary minima (especially for W UMa-stars) were calculated on the supposition that they are symmetric between primary minima. The sign = between O-C (I) and O-C (II) indicates, that the elements (I) and (II) are equal. The sign: means that the time of minimum is uncertain.

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