PHOTOELECTRIC PHOTOMETRY OF THE ECLIPSING BINARY V 505 MON

D. Chochol
Astronomical Institute, Slovak Academy of Sciences
059 60 Tatranská Lomnica, Czechoslovakia

G. A. Bakos
Department of Physics, University of Waterloo
Waterloo, Ontario, Canada N2L 3G1

C. Bartolini, A. Guarnieri
Department of Astronomy, Bologna University
40100 Bologna, Italy

A. Dapergolas
Halkys 59, Nea Ionia
Athens, Greece

L. Szabados
Konkoly Observatory of the Hungarian Academy of Sciences
1525 Budapest XII, Hungary

Received 14 September 1984

ABSTRACT. Photoelectric U, B, V observations of the eclipsing binary V 505 Mon, performed at the observatories in Skalnaté Pleso, Budapest, Bologna and Waterloo in the years 1972-1984 are presented. The following ephemeris has been derived, using all these data:

$$J.D.^{prim.min.} = 2441328.06 + 53.7675^{d}\ E\ .$$

Indications of ongoing mass transfer in a semidetached binary configuration are

presented. The possible causes of the observed short-term changes of brightness are discussed.

ФОТОЭЛЕКТРИЧЕСКАЯ ФОТОМЕТРИЯ ЗАТМЕННОЙ ПЕРЕМЕННОЙ V 505 ЕДИНОРОГА. В работе опубликованы фотоэлектрические U, B, V наблюдения затменной переменной V 505 Единорога, полученные на обсерваториях Скалнате Плесо, Будапешт, Болонья и Ватерлоо во время 1972-1984 гг. Все эти наблюдения использованы для выведения следующей эфемериды:

$$J.D.^{\text{гл.мин.}} = 2441328{,}06 + 53{,}7675\ E\ .$$

Приведены признаки переноса вещества в полуразделенной двойной системе. Дискутированы причины наблюденных кратковременных изменений блеска.

FOTOELEKTRICKÁ FOTOMETRIA ZÁKRYTOVEJ DVOJHVIEZDY V 505 MON. V práci sú publikované fotoelektrické U, B, V pozorovania zákrytovej dvojhviezdy V 505 Mon, získané v rokoch 1972-1984 na observatóriách Skalnaté Pleso, Budapešť, Bologna a Waterloo. Tieto údaje boli použité na odvodenie novej efemeridy:

$$J.D.^{\text{prim.min.}} = 2441328.06 + 53.7675^{d}\ E\ .$$

Pozorované náznaky prenosu hmoty v sústave vedú k domnienke, že ide o polodotykovú dvojhviezdu. V práci sú diskutované možné príčiny zistených krátkodobých zmien jasnosti.

1. INTRODUCTION

V 505 Mon (HD 48 914) is a relatively bright (V = 7.23, B-V = 0.01, U-B = -0.43) but until recently not very extensively studied Be star. Hoag and Smith (1959) classified the object as B5 Ib, Turner (1976) as B5 II, Chochol (1983) as B3 II-III. The light variations of V 505 Mon was discovered by Wachmann (1966). Chochol and Kučera (1981) proved, that V 505 Mon was an eclipsing binary with a period of 53.7805^{d}. The orbital period was confirmed spectroscopically by Stagni et al. (1982). According to them, V 505 Mon is a detached system with component masses of $m_1 = 50\ M_\odot$ and $m_2 = 27\ M_\odot$. De Gréve et al. (1983) found, however, that the spectral components were at variance with the other parameters in the HR diagram.

The purpose of this paper is to determine a new ephemeris of the eclipsing binary V 505 Mon, to discuss the asymmetries of the light curve and to search for the periodicity and cause of short-term changes in brightness, using the photometric material obtained at four different observatories during 1972-1984.

2. OBSERVATIONAL MATERIAL

The U, B, V photoelectric observations of V 505 Mon were performed with the 0.6 m telescopes of the observatories: Skalnaté Pleso, the Konkoly Observatory in Budapest, the University Observatory in Bologna and with 0.33 m te-

lescope of the University Observatory in Waterloo. The observations have been listed in Tab. 1, in which each entry represents the mean of 5-10 individual observations. The data were reduced to a standard system and are presented in terms of the differences V 505 Mon minus HD 48 956 (V = 8.15, B-V = 0.03, U-B = -0.23). On nights when only V observations were made, the data were reduced from the instrumental to the standard system using a statistically determined correction.

The program HEC 21 based on Stellingwerf's (1978) phase dispersion minimization method, given at our disposal by Dr. P. Harmanec from Ondřejov Observatory was used to determine the improved value of the period. The new ephemeris is

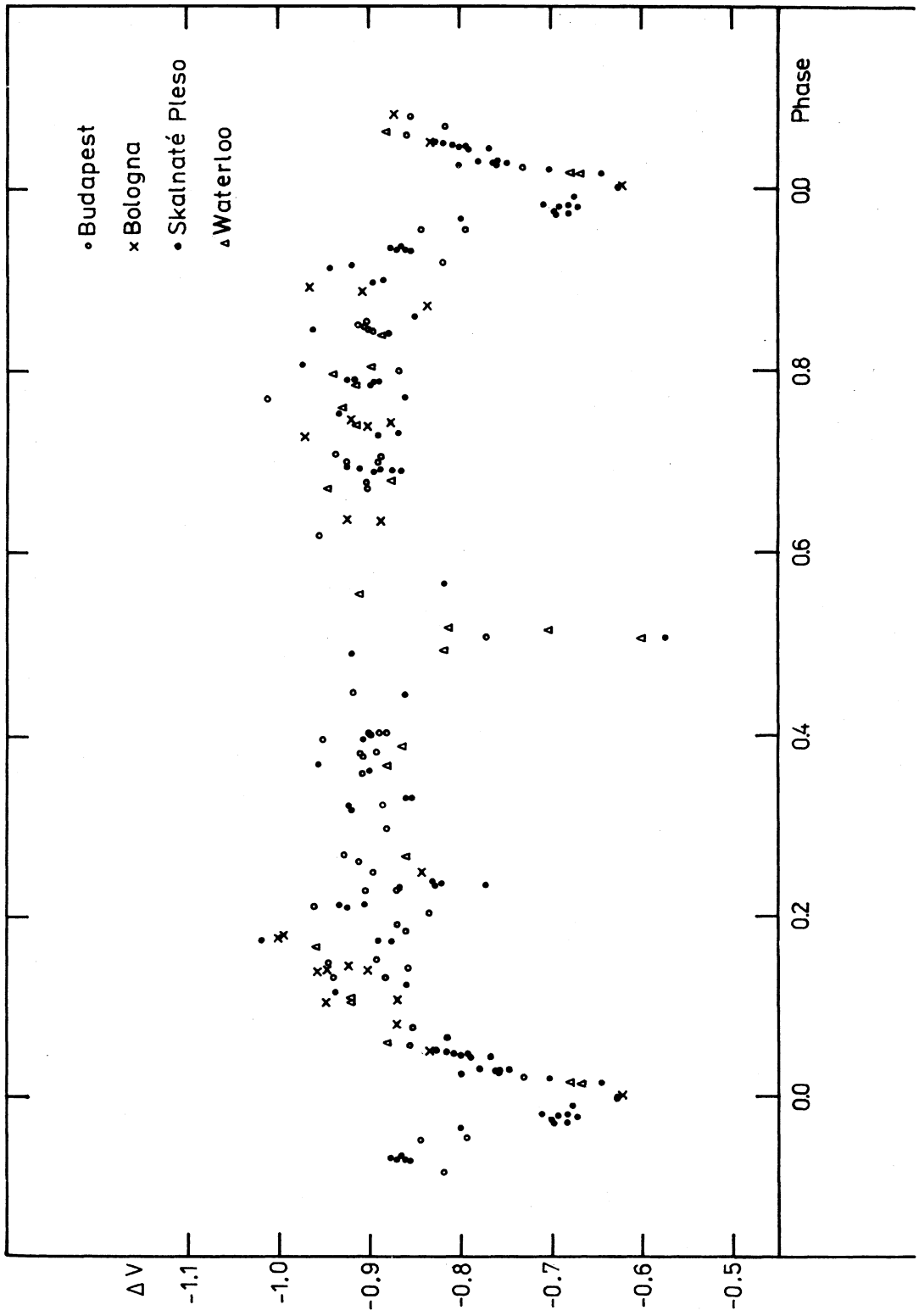
$$J.D.^{prim.min.} = 2441328.06 + 53.7675^{d}\ E\ . \qquad (1)$$

The photoelectric observations given in Table 1 are averages over 0.05 day and plotted as a function of orbital phase in Fig. 1.

As can be seen from Fig. 1, the long period changes of brightness, expressed by ephemeris (1) are apparently related to the eclipses of the components. The light curve, however, does not resemble light curves of detached eclipsing binaries, because of the presence of asymmetries. The remarkable features are brightening after the primary minimum, the decrease of brightness before the primary minimum and the large scatter of observations in the secondary minimum. The light curve displays also short-term changes in brightness with an amplitude of 0.15^{m}. Consequently, a search for shorter periods has been undertaken after the removal of the 53.7675^{d} period. The program HEC 21 indicated two possible periods 0.757065^{d} and 1.581002^{d}. However, the phase plots of the residual data with these periods are not very convincing, leaving thus doubts about the presence of a real short period.

3. DISCUSSION

Short-term brightness variations are frequently observed in Be stars. In some cases the period of variations was found and it is generally accepted that variations are associated with rotational or pulsational period of the star in question (Harmanec, 1983 a,b). The amplitude of short-term variations in V 505 Mon is one of the largest observed in Be stars (the amplitudes of the brightness variations are mostly less than 0.1^{m}). The study of physical nature of variations may have a fundamental significance for understanding of Be phenomenon. The study of the periodicity of short-term brightness variations of V 505 Mon using the presented material may be affected by the fact, that changes may have occured in the circumstellar envelope during the 12 years covered by observations. This could have an effect on the brightness of the object. The differences in the spectral classification of V 505 Mon indicate that this may be the case. It is interesting to note, that the brightening of the V magnitude of V 505 Mon out of the eclipses is accompanied by reddening of the B-V and blueing of the U-B indices. It indicates type 2 long term colour variations described by Harmanec (1983 a). In this case the object changes its photometric



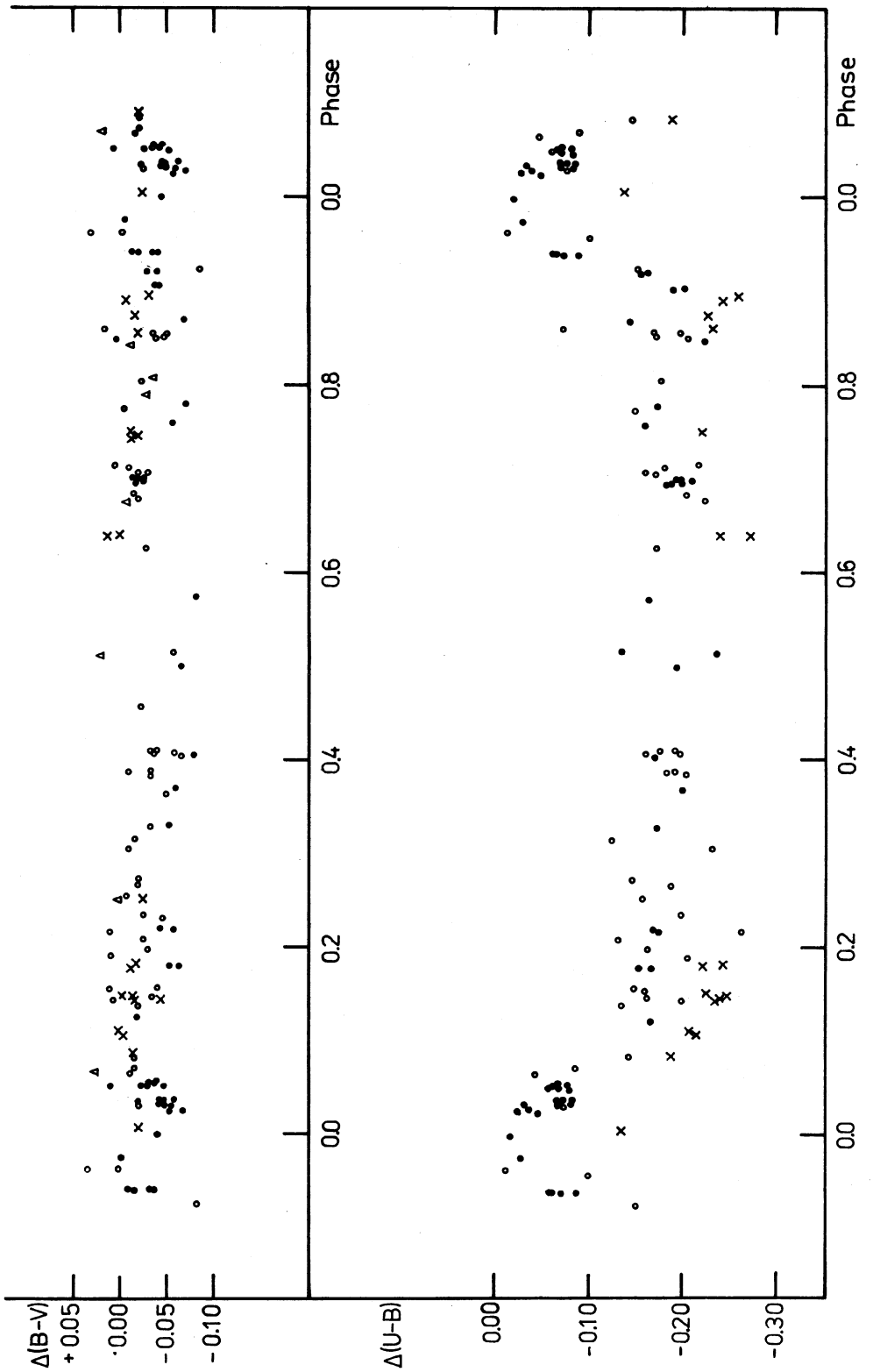


Fig. 1. U, B, V photometry of V 505 Mon.

Table 1

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
		Bologna			4278.45	0.8731	-0.830	-0.023	-0.227
2088.39	0.1411	-0.899	-0.051	-0.142	4279.27	0.8884	-0.907	-0.012	-0.243
.44	0.1420	-0.906	-0.052	-0.134	.45	0.8917	-0.948	-0.044	-0.260
2785.45	0.1054	-0.948	-0.009	-0.225	.46	0.8919	-0.991	-0.032	-0.266
.49	0.1062	-0.947	-0.014	-0.210	.47	0.8921	-0.958	-0.029	-0.257
2787.35	0.1407	-0.958	-0.020	-0.242	4285.41	0.0026	-0.623	-0.028	-0.138
.37	0.1411	-0.963	-0.020	-0.234	4534.56	0.6364	-0.905	0.000	-0.237
.40	0.1417	-0.955	-0.026	-0.241	.563	0.6365	-0.867	+0.013	-0.224
.48	0.1432	-0.960	-0.021	-0.242	.572	0.6366	-0.924	-0.006	-0.273
.55	0.1445	-0.939	-0.023	-0.242	4539.55	0.7292	-0.957		
.57	0.1448	-0.935	-0.018	-0.240	.58	0.7298	-0.983	+0.021	-0.309
.59	0.1452	-0.932	-0.021	-0.240	4540.56	0.7480	-0.911	-0.020	-0.222
.61	0.1456	-0.914	-0.032	-0.235	.57	0.7482	-0.928	-0.016	-0.219
.62	0.1458	-0.917	-0.025	-0.232	4558.49	0.0815	-0.861	-0.025	-0.188
2789.36	0.1781	-1.010	-0.018	-0.186	.50	0.0816	-0.880	-0.020	-0.191
.44	0.1796	-0.987	-0.029	-0.259	4567.52	0.2494	-0.852	-0.024	-0.232
.46	0.1800	-0.990	-0.031	-0.242	.53	0.2496	-0.826	-0.035	-0.209
.47	0.1802	-0.997	-0.024	-0.246	.54	0.2498	-0.852	-0.039	-0.242
.49	0.1805	-1.004	-0.017	-0.253					
2836.41	0.0532	-0.833					Budapest		
2839.38	0.1084	-0.871	-0.007	-0.210	1329.3851	0.0246	-0.731	-0.030	-0.073
4271.30	0.7401	-0.901	-0.020		.4309	0.0255	-0.731	-0.026	-0.081
.31	0.7403	-0.905	-0.019		1331.3493	0.0612	-0.871	-0.017	-0.030
.50	0.7439	-0.878	-0.024		.4583	0.0632	-0.844	-0.023	-0.075
4277.39	0.8534	-0.898	-0.024	-0.231	1332.3766	0.0803	-0.855	-0.024	-0.136
.41	0.8538	-0.909	-0.025	-0.234	.4989	0.0826	-0.854	-0.023	-0.155
4278.42	0.8726	-0.838	-0.015	-0.226	1340.3441	0.2285	-0.905	-0.053	
.44	0.8729	-0.839	-0.028	-0.211	1352.3411	0.4516	-0.917	-0.029	

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
1364.3722	0.6754	-0.902	-0.013	-0.235	1617.6112	0.3852	-0.874	-0.053	-0.186
.4149	0.6762	-0.903	-0.037	-0.184	1672.3923	0.4041	-0.868	-0.084	-0.169
1366.3377	0.7119	-0.935	0.000	-0.217	.3986	0.4042	-0.872	-0.095	-0.159
1389.3552	0.1400	-0.940	-0.001	-0.202	.4048	0.4043	-0.880	-0.090	-0.161
1392.3074	0.1949	-0.870	-0.038	-0.166	.4118	0.4045	-0.914	-0.046	-0.189
1393.3131	0.2136	-0.961	+0.004	-0.265	.4180	0.4046	-0.923	-0.043	-0.125
1394.3079	0.2321	-0.870	-0.032	-0.201	.4236	0.4047	-0.909	-0.077	-0.184
1395.3206	0.2510	-0.896	-0.014	-0.160	.4312	0.4048	-0.905	-0.049	-0.125
1396.3702	0.2705	-0.928	-0.026	-0.148	.4375	0.4049	-0.928	-0.030	-0.199
1399.3193	0.3253	-0.885	-0.040		.4437	0.4051	-0.919	-0.054	-0.186
1401.3124	0.3624	-0.909	-0.056		.4500	0.4052	-0.944	-0.016	-0.199
1402.3238	0.3812	-0.908	-0.041	-0.205	.4576	0.4053	-0.935	-0.025	-0.220
1403.3399	0.4001	-0.950	-0.073		.4645	0.4054	-0.853	-0.053	-0.230
1415.3290	0.6231	-0.955	-0.032	-0.173	.4858	0.4058	-0.871	-0.059	-0.193
1594.6084	0.9574	-0.885	-0.010	-0.083	.4913	0.4059	-0.896	-0.044	-0.170
.6147	0.9575	-0.850	-0.006	-0.114	.4979	0.4061	-0.901	-0.037	-0.207
.6223	0.9577	-0.794	-0.060	-0.099	.5027	0.4062	-0.890	-0.051	-0.229
.6278	0.9578	-0.844	-0.010	-0.099	.5083	0.4063	-0.905	-0.042	-0.216
.6322	0.9579	-0.826	-0.028	-0.117	.5135	0.4064	-0.906	-0.031	-0.212
1617.5340	0.3838	-0.930	0.000	-0.216	.5194	0.4065	-0.888	-0.043	-0.217
.5418	0.3840	-0.919	-0.017	-0.184	.5249	0.4066	-0.886	-0.052	-0.190
.5480	0.3841	-0.912	-0.030	-0.187	.5305	0.4067	-0.875	-0.052	-0.189
.5557	0.3842	-0.910	-0.011	-0.201	.5375	0.4068	-0.867	-0.059	-0.179
.5633	0.3838	-0.886	-0.023	-0.172	.5430	0.4069	-0.830	-0.086	-0.162
.5709	0.3845	-0.899	-0.023	-0.187	.5479	0.4070	-0.896	-0.021	-0.160
.5775	0.3846	-0.912	-0.021	-0.193	.5538	0.4071	-0.913	-0.021	-0.180
.5848	0.3848	-0.899	-0.036	-0.196	.5597	0.4072	-0.884	-0.035	-0.194
.6050	0.3851	-0.877	-0.065	-0.162	.5652	0.4073	-0.896	-0.013	-0.227

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
1672.5705	0.4074	-0.869	-0.059	-0.230	1742.2701	0.7037	-0.967	+0.029	-0.143
.5756	0.4075	-0.880	-0.059	-0.211	.2737	0.7038	-0.935	+0.002	-0.156
1696.3085	0.8489	-0.917	-0.024	-0.209	.2793	0.7039	-0.904	-0.038	-0.184
.3143	0.8490	-0.895	-0.058	-0.243	.2835	0.7040	-0.964	+0.002	-0.216
.3206	0.8491	-0.879	-0.060	-0.206	.2876	0.7041	-0.970	+0.023	-0.212
.3265	0.8492	-0.923	-0.027	-0.208	.2911	0.7041	-0.954	+0.010	-0.207
.3317	0.8493	-0.894	-0.033	-0.205	.2953	0.7042	-0.903	-0.040	-0.166
.3372	0.8494	-0.892	-0.045	-0.172	.2987	0.7043	-0.914	-0.050	-0.131
.3432	0.8496	-0.895	-0.053	-0.167	.3036	0.7043	-0.886	-0.048	-0.184
.3508	0.8497	-0.921	-0.028	-0.164	.3071	0.7044	-0.892	-0.033	-0.261
.3550	0.8498	-0.917	-0.062	-0.151	.3119	0.7045	-0.908	-0.021	-0.172
.3613	0.8499	-0.905	-0.056	-0.166	.3168	0.7046	-0.925	-0.017	-0.151
.3682	0.8500	-0.879	-0.054	-0.196	.3210	0.7047	-0.897	-0.049	-0.140
.3731	0.8501	-0.898	-0.059	-0.195	.3244	0.7047	-0.869	-0.021	-0.192
.4053	0.8507	-0.905	-0.029	-0.187	.3286	0.7048	-0.867	-0.040	-0.165
.4099	0.8508	-0.907	-0.041	-0.207	.3314	0.7049	-0.856	-0.049	-0.165
.4143	0.8509	-0.913	-0.031	-0.209	.3369	0.7050	-0.910	-0.038	-0.133
.4190	0.8510	-0.889	-0.044	-0.213	1957.6153	0.7088	-0.908	-0.032	-0.164
.4251	0.8511	-0.904	-0.053	-0.186	.6197	0.7089	-0.886	-0.021	-0.205
.4310	0.8512	-0.907	-0.054	-0.167	.6239	0.7090	-0.884	-0.032	-0.177
.4357	0.8513	-0.928	-0.040	-0.171	.6278	0.7091	-0.887	-0.014	-0.195
.4411	0.8514	-0.904	-0.066	-0.164	.6316	0.7091	-0.877	-0.024	-0.205
.4455	0.8515	-0.904	-0.056	-0.171	.6361	0.7092	-0.871	-0.041	-0.173
.4509	0.8516	-0.921	-0.041	-0.171	.6410	0.7093	-0.893	-0.011	-0.160
.4564	0.8517	-0.912	-0.060	-0.183	1962.6328	0.8022	-0.867	-0.027	-0.178
1742.2557	0.7035	-0.829	-0.139	-0.056	1965.5823	0.8570	-0.937	+0.067	-0.054
.2612	0.7036	-0.861	-0.078	-0.131	.5873	0.8571	-0.961	+0.016	-0.006
.2647	0.7036	-0.976	+0.015	-0.171	.5922	0.8572	-0.899	-0.010	-0.083

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
1965.5977	0.8573	-0.829	-0.029	-0.187
.6019	0.8574	-0.884	-0.032	-0.106
1980.5504	0.1354	-0.882	-0.031	-0.121
.5546	0.1355	-0.871	-0.035	-0.119
.5587	0.1356	-0.895	-0.011	-0.174
1981.5825	0.1546	-0.890	-0.030	-0.167
.5873	0.1547	-0.895	-0.067	-0.136
2108.3170	0.5117	-0.768	-0.066	-0.147
.3219	0.5118	-0.774	-0.063	-0.128
2465.3280	0.1516	-0.945	+0.003	-0.163
2467.2577	0.1875	-0.862	-0.001	-0.179
.2925	0.1881	-0.860	-0.003	-0.237
2468.2679	0.2063	-0.834	-0.032	-0.134
2471.3509	0.2636	-0.913	-0.028	-0.191
2473.4016	0.3017	-0.880	-0.015	-0.233
2767.5100	0.7717	-1.010	-0.008	-0.149
2816.3891	0.6808	-0.903	-0.019	-0.205
2829.3214	0.9214	-0.818	-0.089	-0.152
2831.3417	0.9589	-0.793	-0.006	-0.014
2837.2611	0.0690	-0.837	-0.004	-0.060
.3212	0.0701	-0.792	-0.041	-0.118
2841.3571	0.1452	-0.859	-0.042	-0.166
2850.3117	0.3117	-0.922	-0.022	-0.128
	Skalnaté Pleso			
3219.3527	0.1754	-1.053		
.3607	0.1755	-1.016		
.3685	0.1757	-1.028		
.3768	0.1758	-1.013		
3219.3851	0.1760	-1.008		
.3931	0.1761	-1.015		
.4044	0.1764	-1.016		
3436.6139	0.2161	-0.908		
.6288	0.2164	-0.917		
.6383	0.2166	-0.898		
3437.6404	0.2352	-0.869		
.6508	0.2354	-0.864		
3464.5152	0.7351	-0.882		
.5205	0.7352	-0.872		
.5246	0.7352	-0.853		
3467.4418	0.7895	-0.898		
.4487	0.7896	-0.894		
.4532	0.7897	-0.913		
.4577	0.7898	-0.903		
.4626	0.7899	-0.906		
.4672	0.7900	-0.911		
.4720	0.7901	-0.909		
.4774	0.7902	-0.894		
.4831	0.7903	-0.895		
.4887	0.7904	-0.890		
.4935	0.7905	-0.888		
.4983	0.7905	-0.888		
.5046	0.7907	-0.904		
.5095	0.7908	-0.891		
.5150	0.7909	-0.892		
.5198	0.7909	-0.899		
.5265	0.7911	-0.890		
.5317	0.7912	-0.882		

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	J.D. hel 2440000+	Phase	ΔV	J.D. hel 2440000+	Phase	ΔV
3467.5373	0.7913	-0.886	3468.5623	0.8103	-0.980	3545.4178	0.2397	-0.823
.5428	0.7914	-0.892	.6059	0.8111	-0.972	.4269	0.2399	-0.822
.5478	0.7915	-0.900	.6115	0.8113	-0.971	.4839	0.2410	-0.830
.5525	0.7916	-0.901	.6185	0.8114	-0.958	.4941	0.2412	-0.832
.5588	0.7917	-0.895	3470.6743	0.8496	-0.967	4249.4605	0.3339	-0.864
.5637	0.7918	-0.895	.6789	0.8497	-0.961	.4705	0.3341	-0.856
.5685	0.7919	-0.899	3477.4193	0.9751	-0.701	.4787	0.3343	-0.861
.5738	0.7920	-0.901	.4281	0.9752	-0.695	.4880	0.3345	-0.863
.5780	0.7920	-0.895	.4651	0.9759	-0.686	.4971	0.3346	-0.859
.5831	0.7921	-0.894	.4742	0.9761	-0.697	.5054	0.3348	-0.855
.5887	0.7922	-0.897	.4894	0.9764	-0.665	.5140	0.3349	-0.854
.6014	0.7925	-0.896	.5003	0.9766	-0.676	.5234	0.3351	-0.854
.6063	0.7926	-0.900	.5093	0.9767	-0.683	4251.4439	0.3708	-0.947
.6122	0.7927	-0.914	.5175	0.9769	-0.691	.4523	0.3710	-0.946
.6171	0.7928	-0.924	.5266	0.9771	-0.688	.4606	0.3711	-0.958
.6223	0.7929	-0.928	.5566	0.9776	-0.700	.4689	0.3713	-0.966
.6275	0.7930	-0.929	.5713	0.9779	-0.691	.4787	0.3715	-0.962
.6323	0.7930	-0.925	3485.6009	0.1272	-0.857	.4883	0.3717	-0.959
.6375	0.7931	-0.912	.6105	0.1274	-0.862	.4968	0.3718	-0.965
.6420	0.7932	-0.912	3545.2513	0.2366	-0.777	4255.5771	0.4477	-0.862
.6469	0.7933	-0.917	.2596	0.2368	-0.769	4284.3414	0.9827	-0.693
.6517	0.7934	-0.923	.2951	0.2375	-0.831	.3497	0.9828	-0.681
.6566	0.7935	-0.927	.3033	0.2376	-0.818	.3581	0.9830	-0.680
.6614	0.7936	-0.927	.3120	0.2378	-0.806	.3665	0.9831	-0.685
.6685	0.7937	-0.932	.3215	0.2380	-0.852	.3750	0.9833	-0.702
.6761	0.7939	-0.936	.3298	0.2381	-0.836	.3858	0.9835	-0.710
.6816	0.7940	-0.923	.3900	0.2392	-0.824	.3935	0.9837	-0.673
3468.5511	0.8101	-0.985	.4004	0.2394	-0.824	.4031	0.9838	-0.677
.5567	0.8102	-0.981	.4094	0.2396	-0.824	.4123	0.9840	-0.701

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
4284.4233	0.9842	-0.681			4591.3933	0.6934	-0.890	-0.010	-0.198
.4317	0.9844	-0.672			.4026	0.6936	-0.907	-0.009	-0.185
.4400	0.9845	-0.664			.4100	0.6937	-0.896	-0.028	-0.200
.4474	0.9847	-0.680			.4158	0.6938	-0.891	-0.042	-0.198
.4553	0.9848	-0.694			.4222	0.6940	-0.890	-0.041	-0.195
.4664	0.9850	-0.721			.4288	0.6941	-0.888	-0.026	-0.207
.4781	0.9852	-0.712			.4358	0.6942	-0.899	-0.011	-0.200
.4887	0.9854	-0.702			.4433	0.6943	-0.893	-0.002	-0.224
.4969	0.9856	-0.714			.4500	0.6945	-0.889	-0.008	-0.235
4285.3745	0.0019	-0.636			.4562	0.6946	-0.878	-0.027	-0.196
.3828	0.0021	-0.632			.4625	0.6947	-0.892	-0.010	-0.192
.3913	0.0022	-0.626			.4704	0.6949	-0.909	-0.007	-0.194
.4001	0.0024	-0.622			.4764	0.6950	-0.899	-0.044	-0.188
.4085	0.0025	-0.623			.4825	0.6951	-0.889	-0.045	-0.195
.4168	0.0027	-0.616			.4907	0.6952	-0.896	-0.018	-0.192
.4251	0.0028	-0.626			.4988	0.6954	-0.889	-0.041	-0.192
4552.5142	0.9703	-0.806	0.000	-0.021	.5070	0.6955	-0.883	-0.056	-0.194
.5273	0.9706	-0.788	-0.028	-0.040	.5140	0.6957	-0.898	-0.012	-0.224
.5404	0.9708	-0.803	-0.030	-0.028	.5203	0.6958	-0.890	-0.030	-0.206
4591.3191	0.6920	-0.877	+0.006	-0.189	.5273	0.6959	-0.875	-0.004	-0.211
.3299	0.6922	-0.833	-0.046	-0.175	.5336	0.6960	-0.894	-0.033	-0.185
.3379	0.6924	-0.891	-0.004	-0.171	.5408	0.6962	-0.911	-0.030	-0.180
.3447	0.6925	-0.868	-0.024	-0.193	.5481	0.6963	-0.901	-0.057	-0.179
.3518	0.6926	-0.863	-0.041	-0.192	.5549	0.6964	-0.890	-0.042	-0.186
.3585	0.6928	-0.870	-0.032	-0.188	.5616	0.6965	-0.914	-0.018	-0.196
.3664	0.6929	-0.864	-0.024	-0.183	.5686	0.6967	-0.916	-0.017	-0.198
.3735	0.6930	-0.876	-0.039	-0.186	.5770	0.6968	-0.918	-0.020	-0.204
.3803	0.6932	-0.876	-0.033	-0.185	.5890	0.6971	-0.933	-0.003	-0.200
.3870	0.6933	-0.876	-0.021	-0.203	.5954	0.6972	-0.936	-0.004	-0.207

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
4591.6028	0.6973	-0.916	-0.028	-0.205	4604.5410	0.9379	-0.885	-0.042	-0.061
.6097	0.6974	-0.923	-0.043	-0.207	.5622	0.9383	-0.884	-0.028	-0.086
.6167	0.6976	-0.934	-0.010	-0.220	.5787	0.9386	-0.865	-0.017	-0.063
.6977	0.6238	-0.928	-0.006	-0.211	.5960	0.9390	-0.869	-0.018	-0.063
4602.5133	0.9002	-0.893	-0.049	-0.188	4614.3120	0.1197	-0.935	-0.030	-0.168
.5279	0.9005	-0.896	-0.048	-0.190	.3256	0.1199	-0.937	-0.020	-0.166
.5429	0.9008	-0.902	-0.036	-0.192	4617.2800	0.1749	-0.878	-0.077	-0.144
.5578	0.9011	-0.896	-0.015	-0.217	.2897	0.1751	-0.876	-0.069	-0.164
.5714	0.9013	-0.890	-0.038	-0.206	.2997	0.1752	-0.885	-0.060	-0.164
.5863	0.9016	-0.876	-0.066	-0.204	,3097	0.1754	-0.885	-0.066	-0.172
.6035	0.9019	-0.883	-0.044	-0.188	.3174	0.1756	-0.908	-0.052	-0.163
4603.3419	0.9156	-0.948	-0.059	-0.162	4619.3552	0.2135	-0.918	-0.042	-0.179
.3577	0.9159	-0.940	-0.037	-0.168	.3632	0.2136	-0.934	-0.032	-0.194
.3820	0.9164	-0.945	-0.033	-0.160	.3714	0.2138	-0.911	-0.059	-0.180
.4711	0.9180	-0.918	-0.039	-0.153	.3788	0.2139	-0.923	-0.049	-0.175
.4865	0.9183	-0.923	-0.027	-0.156	.3892	0.2141	-0.945	-0.064	-0.158
.5021	0.9186	-0.923	-0.036	-0.153	.3958	0.2142	-0.933	-0.063	-0.171
.5207	0.9190	-0.921	-0.027	-0.162	.4023	0.2143	-0.933	-0.059	-0.184
4604.3470	0.9343	-0.846	-0.057	-0.089	.4080	0.2145	-0.966	-0.032	-0.153
.3643	0.9347	-0.850	-0.042	-0.090	.4135	0.2146	-0.915	-0.073	-0.176
.3816	0.9350	-0.850	-0.034	-0.086	.4184	0.2146	-0.921	-0.082	-0.187
.4022	0.9354	-0.863	-0.038	-0.082	.4233	0.2147	-0.935	-0.073	-0.166
.4157	0.9356	-0.865	-0.043	-0.073	4625.4046	0.3260	-0.923	-0.059	-0.173
.4325	0.9359	-0.853	-0.041	-0.068	.4204	0.3263	-0.924	-0.055	-0.173
.4463	0.9362	-0.858	-0.034	-0.069	4627.4073	0.3632	-0.899	-0.063	-0.178
.4671	0.9366	-0.877	-0.017	-0.067	.4164	0.3634	-0.906	-0.050	-0.177
.4854	0.9369	-0.864	-0.030	-0.065	.4231	0.3635	-0.904	-0.064	-0.171
.5043	0.9373	-0.873	-0.018	-0.059	.4313	0.3637	-0.900	-0.064	-0.171
.5232	0.9376	-0.865	-0.048	-0.050	.4379	0.3638	-0.901	-0.064	-0.173

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
4627.4455	0.3639	-0.896	-0.074	-0.163	4663.2419	0.0297	-0.771	-0.033	-0.034
4629.3528	0.3994	-0.897	-0.091	-0.179	.2492	0.0298	-0.807	-0.019	-0.034
.3595	0.3995	-0.909	-0.083	-0.170	.2562	0.0300	-0.813	-0.021	-0.027
.3657	0.3997	-0.917	-0.074	-0.172	.2619	0.0301	-0.809	-0.036	-0.041
.3721	0.3998	-0.914	-0.071	-0.172	4702.3070	0.7563	-0.920	-0.062	-0.160
.3778	0.3999	-0.896	-0.090	-0.173	.3123	0.7564	-0.943		
.3837	0.4000	-0.909	-0.085	-0.161	.3176	0.7565	-0.936	-0.061	-0.163
.3897	0.4001	-0.904	-0.101	-0.168	.3215	0.7565	-0.937	-0.055	-0.160
4634.3847	0.4930	-0.903	-0.070	-0.192	4703.2876	0.7745	-0.872	-0.079	-0.163
.3917	0.4931	-0.895	-0.072	-0.207	.2922	0.7746	-0.860	-0.077	-0.177
.3956	0.4932	-0.897	-0.070	-0.182	.2951	0.7746	-0.856	-0.062	-0.174
.4002	0.4933	-0.894	-0.072	-0.199	.3005	0.7747	-0.850	-0.074	-0.179
4635.3116	0.5102	-0.581	-0.052	-0.237	4985.2673	0.0189	-0.648	-0.057	-0.064
.3177	0.5103	-0.565	-0.067	-0.240	.2737	0.0190	-0.633	-0.072	-0.038
.3212	0.5104	-0.572	-0.069	-0.241	.2787	0.0191	-0.622	-0.067	-0.063
.3263	0.5105	-0.579			.2838	0.0192	-0.637	-0.069	-0.032
4638.4855	0.5693	-0.800	-0.104	-0.186	.2893	0.0193	-0.617	-0.073	-0.069
.4905	0.5694	-0.827	-0.060	-0.166	.3040	0.0196	-0.640	-0.055	-0.058
.4950	0.5694	-0.827	-0.090	-0.147	.3097	0.0197	-0.650	-0.064	-0.030
.4996	0.5695				.3150	0.0198	-0.655	-0.053	-0.035
4654.2955	0.8633	-0.870	-0.065	-0.139	.3207	0.0199	-0.653	-0.044	-0.053
.3040	0.8635	-0.852	-0.070	-0.148	.3262	0.0200	-0.648	-0.056	-0.063
.3122	0.8636	-0.845	-0.065	-0.156	.3374	0.0202	-0.640	-0.050	-0.053
.3207	0.8638	-0.845	-0.084	-0.136	.3394	0.0203	-0.664	-0.083	-0.033
.3271	0.8639	-0.842	-0.072	-0.153	.4107	0.0216	-0.647	-0.100	-0.025
4661.3537	0.9946	-0.678			.4150	0.0217	-0.651	-0.075	-0.012
.3587	0.9947	-0.659	-0.090	-0.037	.4194	0.0217	-0.659	-0.084	-0.035
.3717	0.9949	-0.675	-0.085	-0.002	.4236	0.0218	-0.686	-0.077	-0.022
.3758	0.9950	-0.686	-0.056	-0.017	.4328	0.0220	-0.669	-0.093	-0.036

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
4985.4431	0.0222	-0.660	-0.070	-0.044	5308.4833	0.0303	-0.765	-0.053	-0.062
.4490	0.0223	-0.658	-0.079	-0.038	.4904	0.0304	-0.768	-0.054	-0.075
.4558	0.0224	-0.686	-0.065	-0.022	.5016	0.0306	-0.767	-0.054	-0.080
.4609	0.0225	-0.683	-0.069	-0.029	.5098	0.0308	-0.759	-0.044	-0.080
.4663	0.0226	-0.692	-0.052	-0.033	.5182	0.0309	-0.765	-0.056	-0.053
.4772	0.0228	-0.689	-0.070	-0.022	.5295	0.0311	-0.771	-0.055	-0.067
.4819	0.0229	-0.679	-0.061	-0.025	.5361	0.0313	-0.757	-0.059	-0.080
.4868	0.0230	-0.694	-0.054	-0.019	.5429	0.0314	-0.758	-0.060	-0.074
.4917	0.0231	-0.689	-0.075	-0.022	.5508	0.0315	-0.745	-0.057	-0.083
.4961	0.0232	-0.687	-0.084	-0.024	.5571	0.0317	-0.718	-0.090	-0.090
.5043	0.0233	-0.678	-0.084	-0.027	.5707	0.0319	-0.729	-0.070	-0.086
.5118	0.0235	-0.691	-0.055	-0.031	.5774	0.0320	-0.748	-0.061	-0.086
.5179	0.0236	-0.711	-0.049	-0.014	.5848	0.0322	-0.762	-0.048	-0.088
.5232	0.0237	-0.727	-0.035	-0.032	.5924	0.0323	-0.767	-0.056	-0.084
.5284	0.0238	-0.714	-0.060	-0.003	.5994	0.0324	-0.768	-0.054	-0.082
.5396	0.0240	-0.710	-0.073	-0.003	.6057	0.0326	-0.768	-0.046	-0.086
.5456	0.0241	-0.709	-0.063	-0.018	.6155	0.0327	-0.751	-0.066	-0.071
.5528	0.0242	-0.693	-0.084	-0.044	.6217	0.0329	-0.749	-0.069	-0.063
.5585	0.0243	-0.717	-0.052	-0.055	.6277	0.0330	-0.754	-0.056	-0.079
.5632	0.0244	-0.693	-0.070	-0.068	.6342	0.0331	-0.765	-0.049	-0.083
.5718	0.0246	-0.689	-0.041	-0.066	.6404	0.0332	-0.771	-0.033	-0.076
.5768	0.0247	-0.689	-0.067	-0.051	.6584	0.0335	-0.772	-0.055	-0.066
.5814	0.0248	-0.719	-0.044	-0.063	.6649	0.0337	-0.789	-0.041	-0.058
.5858	0.0248	-0.701	-0.085	-0.063	.6729	0.0338	-0.784	-0.049	-0.056
5308.4426	0.0295	-0.750	-0.070	-0.070	.6801	0.0339	-0.789	-0.062	-0.067
.4510	0.0297	-0.757	-0.052	-0.085	.6884	0.0341	-0.771	-0.038	-0.095
.4579	0.0298	-0.759	-0.057	-0.066	5309.3959	0.0473	-0.755	-0.055	-0.053
.4647	0.0299	-0.758	-0.047	-0.075	.4018	0.0474	-0.760	-0.057	-0.051
.4738	0.0301	-0.764	-0.048	-0.069	.4080	0.0475	-0.759	-0.054	-0.071

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	Δ(B-V)	Δ(U-B)
5309.4149	0.0476	-0.765	-0.055	-0.058
.4214	0.0477	-0.775	-0.048	-0.051
.4298	0.0479	-0.786	-0.041	-0.057
.4361	0.0480	-0.791	-0.025	-0.067
.4424	0.0481	-0.814	+0.006	-0.058
.4487	0.0482	-0.774	-0.052	-0.070
.4539	0.0483	-0.770	-0.057	-0.071
.4604	0.0485	-0.820	-0.008	-0.054
.4688	0.0486	-0.807	-0.004	-0.060
.4766	0.0488	-0.779	+0.006	-0.085
.4841	0.0489	-0.781	-0.039	-0.066
.4910	0.0490	-0.795	+0.002	-0.070
.4989	0.0492	-0.780	+0.013	-0.100
.5060	0.0493	-0.815	0.000	-0.054
.5168	0.0495	-0.864	+0.015	-0.038
.5238	0.0496	-0.796	-0.053	-0.055
.5300	0.0498	-0.783	-0.028	-0.075
.5361	0.0499	-0.767	-0.050	-0.080
.5424	0.0500	-0.791	-0.033	-0.075
.5525	0.0502	-0.793	-0.056	-0.048
.5607	0.0503	-0.815	-0.011	-0.049
.5686	0.0505	-0.803	-0.029	-0.073
.5757	0.0506	-0.801	-0.053	-0.086
.5846	0.0508	-0.806	-0.048	-0.069
.5933	0.0509	-0.812	-0.022	-0.074
.5994	0.0510	-0.815	-0.045	-0.085
.6061	0.0512	-0.807	-0.045	-0.082
.6128	0.0513	-0.818	-0.048	-0.075
.6191	0.0514	-0.811	-0.051	-0.088
5309.6257	0.0515	-0.832	-0.034	-0.072
.6349	0.0517	-0.830	-0.032	-0.068
.6434	0.0519	-0.823	-0.033	-0.073
.6508	0.0520	-0.834	-0.037	-0.060
.6579	0.0521	-0.834	-0.061	-0.079
.6655	0.0523	-0.843	-0.030	-0.068
.6721	0.0524	-0.817	-0.043	-0.066
.6805	0.0526	-0.809	-0.035	-0.077
.6864	0.0527	-0.809	-0.049	-0.077
.6928	0.0528	-0.817	-0.075	-0.065
5782.3232	0.8430	-0.873	-0.007	-0.211
.3330	0.8432	-0.904	+0.016	-0.227
.3421	0.8434	-0.879	-0.004	-0.213
.3665	0.8438	-0.869	-0.019	-0.209
.3757	0.8440	-0.876	+0.010	-0.251
.3865	0.8442	-0.892	-0.002	-0.233

Waterloo

4590.7787	0.6820	-0.869		
.7898	0.6822	-0.887		
.8162	0.6827	-0.873		
4634.6603	0.4981	-0.820		
.6943	0.4988	-0.836		
.7130	0.4991	-0.799		
4635.6463	0.5165	-0.730		
.6754	0.5170	-0.695		
.6865	0.5172	-0.680		
4662.5877	0.0175	-0.645		
.6134	0.0180	-0.670		

Table 1 (continued)

J.D. hel 2440000+	Phase	ΔV	J.D. hel 2440000+	Phase	ΔV	Δ(B-V)
4662.6280	0.0183	-0.686	4701.5801	0.7427	-0.916	
.6481	0.0187	-0.680	.5912	0.7429	-0.925	
.6752	0.0192	-0.678	4702.5640	0.7610	-0.945	
4667.5623	0.1101	-0.930	.5758	0.7613	-0.930	
.5804	0.1104	-0.922	.5862	0.7614	-0.912	
.5984	0.1107	-0.915	.5932	0.7616	-0.930	
.6151	0.1110	-0.913	4704.5457	0.7979	-0.932	
.6429	0.1116	-0.930	.5575	0.7981	-0.945	
4670.6273	0.1671	-0.980	.5652	0.7983	-0.922	
.6398	0.1673	-0.983	.5714	0.7984	-0.947	
.6606	0.1677	-0.990	.5791	0.7985	-0.955	
4681.5820	0.3708	-0.880	4912.8985	0.6730	-0.947	-0.012
4682.5985	0.3897	-0.865	4921.8770	0.8399	-0.881	-0.018
4689.5888	0.5197	-0.808	.9041	0.8405	-0.891	-0.014
.6096	0.5201	-0.815	4933.9042	0.0636	-0.880	+0.018
.6214	0.5203	-0.822	4998.6694	0.2682	-0.860	-0.006
4691.6039	0.5572	-0.915	5011.6152	0.5090	-0.599	+0.014
.6268	0.5576	-0.908	5026.5774	0.7872	-0.914	-0.035
4701.5641	0.7424	-0.910	5027.5780	0.8058	-0.897	-0.041

luminosity class from dwarf to bright supergiant and back, maintaining however its photometric spectral subclass.

The photometric light curve given in Fig. 1 challenges the model of V 505 Mon as a detached system (Stagni et al., 1982), because it shows some indications of ongoing mass transfer in a semidetached binary configuration. The asymmetries described in previous section can be well explained by the existence of accretion disk surrounding the hot component, gaseous stream from cooler component and hot impact region on the accretion disk. The orbital period is long, so the presence of the disk in a semidetached system is anticipated. H_α emission detected by Chochol and Kučera (1981) and Stagni et al. (1982) may arise in the accretion disk. The observed short-term changes may be due to orbital motion of inhomogenities in accretion disk, as was proposed by Bath (1977). If this is the case, it is not necessary to expect strict periodicity.

The further spectroscopic study of the system is highly desirable.

ACKNOWLEDGEMENTS

The authors wish to express their thanks to Dr. P. Harmanec for valuable comments and suggestions and the staff members of the stellar department of the Skalnaté Pleso Observatory for practical help.

REFERENCES

Bath, G. T.: 1977, Monthly Notices Roy. Astron. Soc. 178, 203.
Chochol, D.: 1983, in Stellar Spectra and their interpretation, (Eds.: I. Hubený and B. Onderlička), Publ. Astron. Inst. Czechosl. Academy of Sci., No. 57, p. 30.
Chochol, D., Kučera, A.: 1981, Inform. Bull. Var. Stars, No. 1998.
De Gréve, J. P., Doom, C., Hellings, P., Packet, W., Stagni, R., Mammano, A.: 1983, Astrophys. Space Sci. 95, 215.
Harmanec, P.: 1983 a, in Advances in Photoelectric Photometry, Vol. 1,(Eds.: R. C. Wolpert, R. M. Genet), Fairborn Observatory, p. 42.
Harmanec, P.: 1983 b, in Rapid Variability of Early-type Stars, (Eds.: P. Harmanec and K. Pavlovski), Hvar Obs. Bull. 7, 55.
Hoag, A. A., Smith, E. P.: 1959, Publ. Astron. Soc. Pacific 71, 32.
Stagni, R., Margoni, R., Mammano, A.: 1982, Astrophys. Space Sci. 88, 115.
Stellingwerf, R. F.: 1978, Astrophys. J. 224, 953.
Turner, D. G.: 1976, Astrophys. J. 210, 65.
Wachmann, A. A.: 1966, Astron. Abhandl. Hamburger Sternw. 7, 341.