

UBV OBSERVATIONS OF THE ECLIPSING BINARY FW MONOCEROTIS

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Abstract. Photoelectric observations of FW Monocerotis in U , B , and V filters have been discussed. The depths of the primary minimum in UBV colours are 2^m63 , 2^m17 and 1^m76 , respectively. No variation in the period has been found and its revised value is $3^d8735868$.

1. Introduction

Variability of the system FW Monocerotis = BD-6°2376 was discovered by Chang in 1947. Yui (1947) estimated the light changes of this star on Harvard patrol plates taken over a period of more than forty-seven years. He found it to be a normal eclipsing system with a constant period of 3.8735833 days. The photographic light curve of FW Mon given by Yui (1947) shows a small reflection effect and the primary minimum is total. The shallow secondary minimum is slightly asymmetrical to primary minima. Photometric elements and absolute dimensions of the system are given. Chang (1947) has given the spectroscopic elements of the system. The spectral types of the brighter and fainter components have been reported as B5 and F2 respectively. Lucy and Sweeney (1971) have reanalysed the spectroscopic data given by Chang (1947). Lavrov and Lavrova (1986) have revised the photometric elements of FW Mon. Gimenez and Garcia (1990) have given the mass ratio and effective temperature of the primary component of FW Mon. Many visual times of minima have appeared in the BBSAG bulletins. Photoelectric observations of this system do not exist in the literature. The observations of sixteen nights taken during the period March 1973 to February 1981 are being reported here.

2. Observations

The star FW Mon was observed on the 104 cm Sampurnanand telescope of the Uttar Pradesh State Observatory in U , B and V filters using an EMI 6094S photomultiplier cooled to -20°C . The stars BD-6°2380 and BD-7°2279 were observed as comparison stars. We have chosen BD-7°2279 as our final comparison star. The magnitudes and colours of comparison and variable stars are listed in Table I. The differential standard magnitudes of the system in the sense comparison minus variable are listed in Table II. The standard errors of observations lie in the range 0^m01 to 0^m05 for U , B and V filters.

TABLE I
Particulars of comparison and variable stars

Name		V	$B - V$	$U - B$
FW Mon				
= BD $-6^{\circ}2376$	HD 65259	9^m95	0^m16	-0^m52
(Max)				
BD $-6^{\circ}2380$	HD 65326	9.48	0.18	-0.10
BD $-7^{\circ}2279$	HD 65347	9.57	0.55	-0.06

3. Light Curve and Period

The light curves in U , B and V filters are shown in Figures 1a, 1b and 1c. The phases at the beginning and end of primary eclipse are not covered, so only the duration of eclipse could be estimated. The total eclipse is visible only in V filter and its duration is 40 minutes. The depths of primary minima in U , B and V filters are 2^m63 , 2^m17 and 1^m76 . For calculating the depth of minimum, average value of the magnitudes between the phase intervals 0.14 to 0.34 and -0.003 to $+0.003$ were taken. This average value of magnitude at maximum phase is reported in Table I. Outside the eclipse light curve shows undulations which are more prominent in V and B than in U . If we consider the variations in magnitude near the phase 0.5 as due to secondary eclipse then the depth of secondary minimum will be around 0^m1 in B and V . Variation in magnitude near phase 0.5 in U filter is not prominent.

Ascending and descending branches of the primary minimum were covered only on one night, and this has been used for the determination of time of primary minimum by the method of Kwee and Van Woerden (1956). Average value of the time of primary minimum in U , B and V filters is $\text{JD}(\text{Hel}) 2443188.2740 \pm 0.0006$. Phases for Figures 1a, 1b and 1c, were computed using this as epoch.

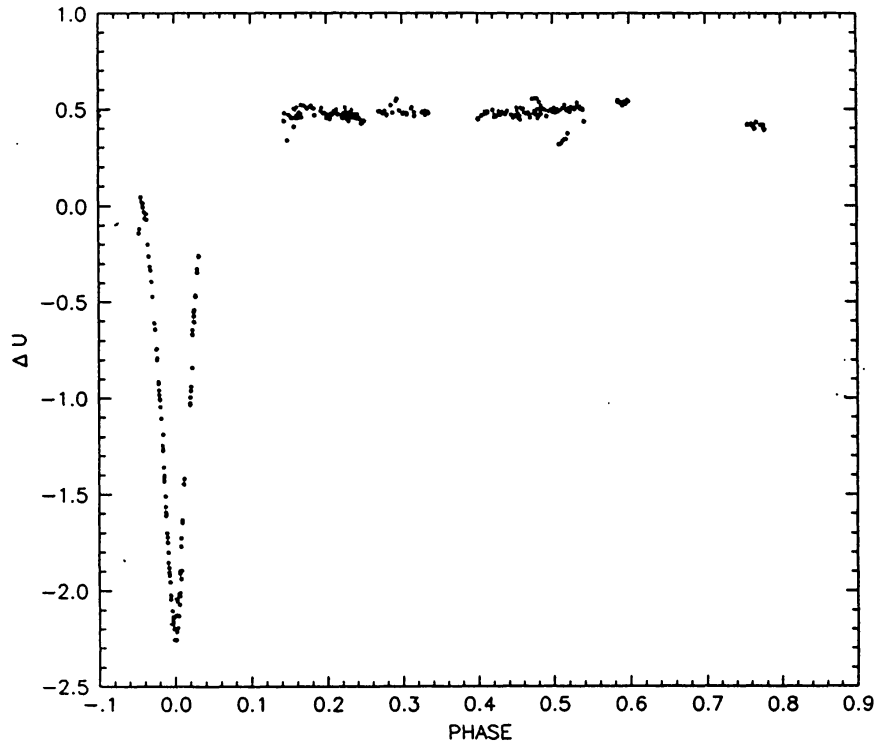
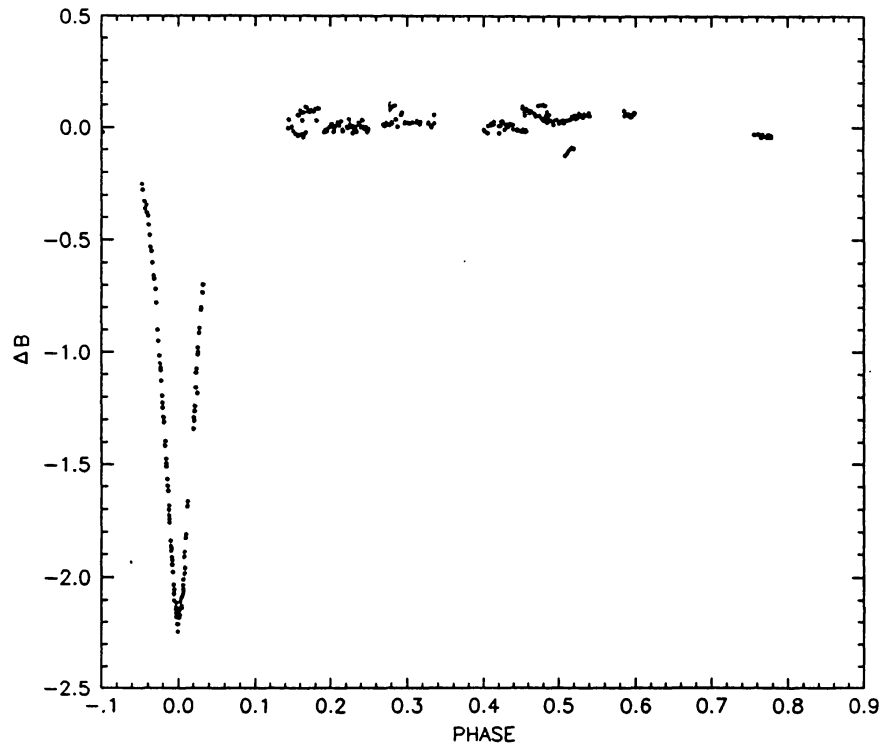
All the times of primary minima that were found in the literature have been listed in Table III, column 1. These times of minima have been analysed by the method of least squares to find a period for the system. Now an improved ephemeris can be given as:

$$\text{Primary Min.} = \text{JD}(\text{Hel}) 2427562.234 + 3^d 8735868 E \\ \pm 0.025 \quad \pm 4.9 \times 10^{-6}$$

The $O - C$ values obtained from the above ephemeris are listed in column 3 of Table III, with their respective sources in column 4. These values are plotted in Figure 2. The figure shows no variation in the period.

4. Discussion

The photographic amplitude of 1^m2 given by Yuin (1947) and quoted in the GCVS 1985 is much less than the visual amplitude of $1^m7 \pm 0.1$ found by Locher (1987).

Fig. 1a. *U* light curve of FW Mon.Fig. 1b. *B* light curve of FW Mon.

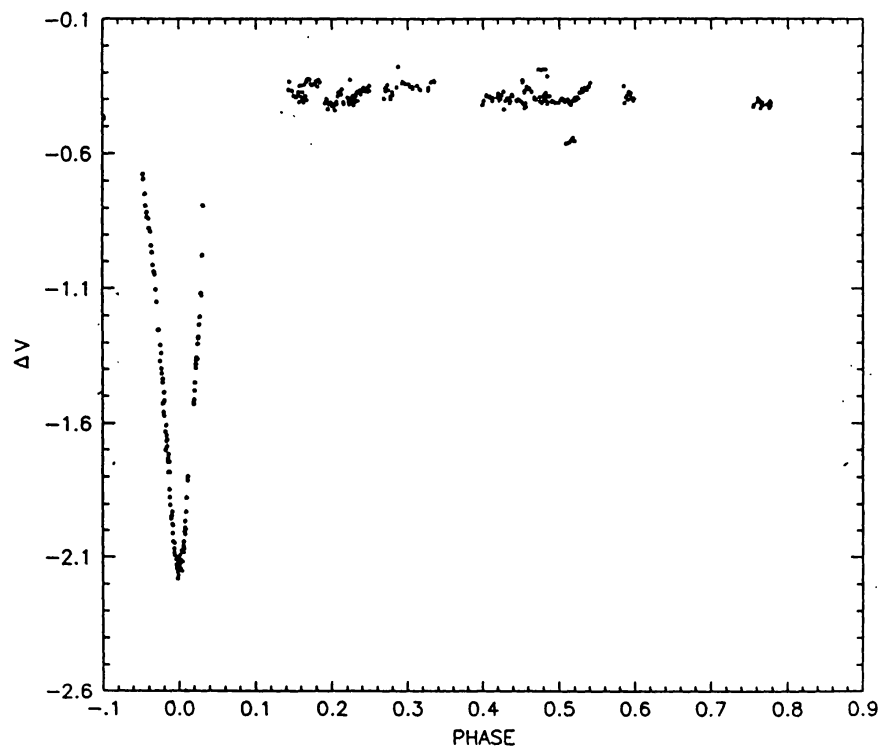
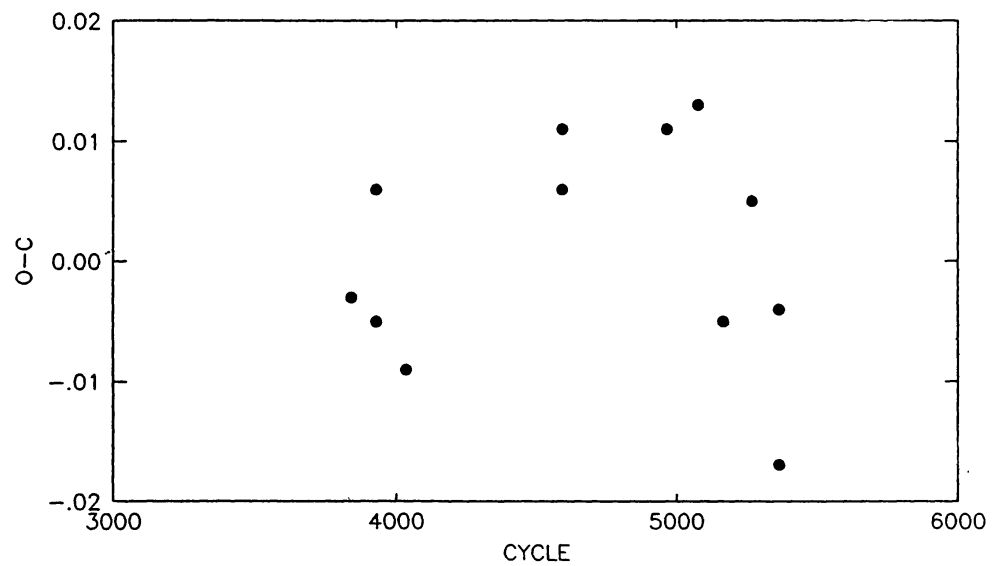


Fig. 1c. V light curve of FW Mon.

Fig. 2. ($O - C$) diagram for FW Mon.

It has been pointed out by Locher (1987) that the visual amplitude should be considerably less than the photographic amplitude, if the spectral type of B5+F2 for FW Mon is correct. Our observations show that the depth of minimum in U filter is more than in B and as expected least in V . The depth in V filter is 1^m76 which is about the same as observed by Locher (1987). The colour of the primary component was determined from the depth of the primary eclipse. Assuming that the eclipse is total, the colour of the secondary component can be found from the magnitude at zero phase. These colours are as under:

	$B - V$	$U - B$	V
Primary component	0^m08	-0^m58	10^m19
Secondary component	0^m58	-0^m06	11^m70

The secondary component is 1^m5 fainter than the primary component in V . The computed spectral types of the components are B3 and F0.

Acknowledgements

The first author is thankful to Mr. D.C. Paliwal for his help in computation of the period.

References

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 Yuin, C.: 1947, *Astrophys. J.* **106**, 303.

TABLE II
Standard differential magnitudes of FW Mon

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
1745.1759	0 ^m 509	1745.1764	0 ^m 085	1745.1767	-0 ^m 338
.1777	.493	.1775	.094	.1773	-.330
.1864	.477	.1867	.069	.1873	-.369
.1866	.455	.1880	.056	.1877	-.376
.1970	.508	.1977	.085	.1986	-.355
.2014	.501	.2007	.080	.1999	-.364
.2113	.505	.2118	.077	.2123	-.363
.2141	.483	.2133	.065	.2128	-.360
.2216	.484	.2225	.075	.2230	-.373
.2248	.476	.2243	.069	.2239	-.371
.2375	.485	.2382	.062	.2386	-.400
.2402	.473	.2396	.064	.2391	-.394
.2435	.476	.2443	.056	.2445	-.402
.2465	.458	.2458	.051	.2454	-.401
.2646	.479	.2653	.054	.2658	-.393
.2673	.494	.2668	.050	.2663	-.410
.2756	.471	.2761	.038	.2767	-.415
.2790	.480	.2782	.040	.2775	-.410
.2872	.454	.2879	.038	.2886	-.406
.2920	.463	.2899	.030	.2893	-.399
.3008	.484	.3016	.029	.3022	-.407
.3046	.474	.3035	.022	.3027	-.418
2787.2526	.554	2787.2526	.099	2787.2526	-.288
.2672	.559	.2672	.102	.2672	-.291
.2784	.557	.2784	.103	.2784	-.289
.2883	.538	.2883	.097	.2883	-.288
.2977	.519	.2977	.070	.2977	-.315
3125.3490	.416	3125.3480	-.031	3125.3474	-.428
.3495	.420	.3501	-.032	.3508	-.422
.3695	.416	.3688	-.027	.3682	-.411
.3698	.424	.3706	-.031	.3711	-.398
.3778	.408	.3773	-.033	.3767	-.405
.3782	.413	.3788	-.031	.3793	-.406
.3851	.397	.3846	-.045	.3842	-.434
.3854	.400	.3860	-.042	.3865	-.419
.3928	.429	.3921	-.031	.3915	-.411
.3935	.432	.3943	-.040	.3946	-.424
.4153	.415	.4147	-.045	.4141	-.420
.4159	.417	.4164	-.033	.4170	-.358
.4225	.416	.4219	-.038	.4214	-.417
.4228	.415	.4233	-.031	.4238	-.423
.4294	.402	.4289	-.043	.4286	-.433
.4297	.417	.43 1	-.042	.4306	-.409
.4352	.391	.4349	-.036	.4346	-.426
.4356	.395	.4360	-.044	.4364	-.414
3126.2844	-2.134	3126.2840	-2.131	3126.2835	-2.111
.2850	-2.161	.2856	-2.112	.2862	-2.145
.2879	-2.140	.2873	-2.143	.2868	-2.112
.2947	-2.132	.2942	-2.139	.2937	-2.117
.2949	-2.128	.2953	-2.146	.2957	-2.101
.3003	-2.125	.2998	-2.147	.2994	-2.125
.3011	-2.041	.3015	-2.142	.3020	-2.094
.3073	-2.048	.3067	-2.106	.3059	-2.112
.3076	-2.054	.3084	-2.093	.3089	-2.078
.3136	-2.016	.3122	-2.088	.3127	-2.118
.3140	-2.030	.3144	-2.083	.3149	-2.081
.3198	-1.911	.319	-2.034	.3190	-2.084
.3201	-1.899	.3205	-2.009	.3209	-2.044

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
3126.3261	-1 ^m 770	3126.3256	-1 ^m 912	3126.3250	-2 ^m 005
.3267	-1.727	.3273	-1.890	.3278	-1.966
.3333	-1.646	.3327	-1.827	.3324	-1.930
.3336	-1.634	.3342	-1.812	.3348	-1.877
.3412	-1.448	.3418	-1.688	.3424	-1.814
.3440	-1.420	.3435	-1.666	.3429	-1.800
.3857	-0.670	.3850	-1.093	.3835	-1.396
.3862	-.647	.3868	-1.076	.3845	-1.381
.3937	-.552	.3931	-1.183	.3874	-1.357
.3941	-.576	.3948	-0.981	.3926	-1.361
.4015	-.466	.4010	-.913	.3954	-1.280
.4019	-.473	.4025	-.892	.4004	-1.235
.4108	-.329	.4102	-.811	.4031	-1.205
.4112	-.347	.4117	-.801	.4097	-1.120
.4181	-.263	.4175	-.732	.4122	-1.127
.4184	-.259	.4189	-.697	.4165	-0.978
3184.2179	-.141	3184.2158	-.252	.4192	-.793
.2209	-.119	.2197	-.278	3184.2167	-.677
.2289	.045	.2278	-.329	.2202	-.695
.2320	.022	.2307	-.360	.2283	-.750
.2377	.014	.2365	-.345	.2313	-.793
.2383	-.007	.2394	-.380	.2371	-.818
.2446	-.031	.2461	-.393	.2389	-.836
.2479	-.065	.2493	-.433	.2455	-.841
.2538	-.040	.2554	-.479	.2487	-.877
.2570	-.070	.2580	-.531	.2546	-.890
.2623	-.199	.2636	-.549	.2577	-.941
.2663	-.262	.2677	-.599	.2631	-.967
.2731	-.314	.2758	-.656	.2671	-1.014
.2764	-.334	.2777	-.671	.2738	-1.039
.2816	-.392	.2834	-.717	.2771	-1.049
.2861	-.472	.2872	-.779	.2824	-1.105
.2951	-.610	.2935	-.900	.2867	-1.151
.2987	-.643	.2974	-.951	.2942	-1.255
.3058	-.744	.3040	-1.016	.2980	-1.253
.3102	-.798	.3085	-1.070	.3048	-1.370
.3112	-.789	.3126	-1.128	.3092	-1.398
.3177	-.925	.3192	-1.248	.3120	-1.417
.3209	-.984	.3229	-1.289	.3185	-1.527
.3249	-1.006	.3260	-1.310	.3223	-1.559
.3302	-1.106	.3312	-1.416	.3255	-1.572
.3362	-1.247	.3343	-1.396	.3309	-1.632
.3403	-1.188	.3390	-1.497	.3328	-1.701
.3466	-1.402	.3483	-1.619	.3350	-1.608
.3511	-1.509	.3527	-1.683	.3397	-1.662
.3552	-1.599	.3514	-1.702	.3476	-1.717
.3659	-1.854	.3643	-1.875	.3519	-1.746
.3708	-1.919	.3689	-1.926	.3543	-1.784
.3770	-2.043	.3783	-2.053	.3651	-1.930
3185.1437	0.490	3185.1398	-0.021	.3697	-1.982
.1480	.506	.1464	-.011	.3778	-2.049
.1560	.482	.1546	-.017	3185.1410	-0.415
.1571	.479	.1594	-.004	.1472	-.401
.1660	.483	.1672	.004	.1552	-.437
.1691	.478	.1677	.004	.1584	-.419
.1747	.455	.1734	.001	.1666	-.413
.1752	.461	.1764	.014	.1683	-.413
.1807	.473	.1827	.011	.1741	-.426
.1849	.472	.1833	.015	.1758	-.418

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
3185.1909	0 ^m .449	3185.1894	-0 ^m .020	3185.1817	-0 ^m .419
.1915	.460	.1929	-.006	.1842	-.428
.1969	.479	.1982	.003	.1900	-.441
.2005	.473	.1994	.005	.1923	-.421
.2066	.471	.2050	.012	.1976	-.410
.2074	.482	.2090	.022	.1987	-.419
.2107	.490	.2122	.020	.2058	-.389
.2168	.492	.2184	.017	.2083	-.375
.2203	.488	.2190	.007	.2116	-.385
.2247	.487	.2237	.025	.2178	-.380
.2251	.498	.2265	.025	.2195	-.376
.2565	.456	.2552	.001	.2241	-.383
.2572	.453	.2585	.002	.2259	-.365
.2625	.463	.2634	-.003	.2560	-.394
.2647	.454	.2637	-.003	.2580	-.398
.2701	.508	.2687	.034	.2632	-.403
.2744	.459	.2723	.007	.2642	-.420
.2805	.452	.2793	.002	.2693	-.328
.2810	.446	.2823	-.002	.2729	-.398
.2855	.460	.2866	-.025	.2799	-.406
.2881	.438	.2869	-.027	.2818	-.410
.2949	.461	.2933	-.004	.2861	-.412
.2952	.454	.2964	-.011	.2874	-.423
.3016	.466	.3041	-.012	.2943	-.409
.3097	.454	.3073	-.021	.2958	-.412
.3175	.469	.3159	.020	.3032	-.389
.3208	.474	.3194	.019	.3083	-.407
.3270	.450	.3253	.010	.3167	-.370
.3274	.455	.3291	-.002	.3201	-.368
.3346	.473	.3361	.030	.3260	-.384
.3381	.455	.3367	.032	.3283	-.376
.3431	.457	.3419	.005	.3354	-.361
.3440	.445	.3458	-.008	.3373	-.358
.3496	.449	.3508	-.001	.3425	-.369
.3522	.425	.3513	-.003	.3450	-.372
.3583	.437	.3567	.001	.3504	-.365
.3589	.426	.3609	-.021	.3516	-.361
.3657	.438	.3671	-.006	.3575	-.374
.3693	.439	.3677	-.011	.3599	-.365
3188.1813	-.741	3188.1807	-1.051	.3664	-.351
.1817	-.741	.1826	-1.081	.3685	-.369
.1907	-.913	.1914	-1.195	3188.1803	-1.310
.1936	-.958	.1929	-1.226	.1831	-1.340
.1987	-1.009	.1981	-1.290	.1918	-1.451
.1991	-1.047	.1997	-1.309	.1924	-1.438
.2117	-1.260	.2112	-1.475	.1975	-1.488
.2121	-1.272	.2126	-1.510	.2003	-1.517
.2165	-1.360	.2170	-1.568	.2103	-1.667
.2186	-1.412	.2180	-1.597	.2108	-1.646
.2192	-1.431	.2198	-1.619	.2130	-1.689
.2256	-1.564	.2262	-1.728	.2173	-1.733
.2276	-1.594	.2270	-1.743	.2177	-1.745
.2281	-1.611	.2287	-1.759	.2204	-1.784
.2323	-1.701	.2330	-1.839	.2264	-1.847
.2352	-1.722	.2345	-1.864	.2264	-1.875
.2356	-1.750	.2361	-1.885	.2291	-1.904
.2398	-1.801	.2404	-1.914	.2334	-1.948
.2425	-1.881	.2419	-1.946	.2341	-1.956
.2431	-1.906	.2437	-1.978	.2367	-1.945

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
3188.2477	-1 ^m 954	3188.2483	-2 ^m 032	3188.2409	-2 ^m 012
.2507	-2.021	.2499	-2.072	.2414	-1.978
.2513	-2.028	.2518	-2.102	.2443	-2.044
.2573	-2.103	.2579	-2.141	.2487	-2.071
.2603	-2.148	.2597	-2.159	.2493	-2.086
.2608	-2.173	.2614	-2.177	.2525	-2.095
.2660	-2.199	.2667	-2.209	.2584	-2.111
.2687	-2.193	.2682	-2.156	.2591	-2.130
.2691	-2.256	.2697	-2.243	.2619	-2.144
.2756	-2.254	.2766	-2.180	.2673	-2.157
.2795	-2.258	.2711	-2.209	.2676	-2.180
.2801	-2.214	.2807	-2.168	.2703	-2.167
.2863	-2.194	.2871	-2.130	.2770	-2.141
.2899	-2.129	.2892	-2.126	.2775	-2.129
.2904	-2.132	.2909	-2.135	.2810	-2.142
.2961	-2.071	.2966	-2.072	.2877	-2.151
.2984	-2.028	.2978	-2.052	.2883	-2.117
.2988	-2.010	.2991	-2.061	.2913	-2.117
.3033	-1.939	.3040	-1.985	.2970	-2.059
.3061	-1.896	.3066	-1.960	.2974	-2.066
.3502	-1.035	.3509	-1.340	.2996	-2.070
.3528	-1.028	.3523	-1.292	.3046	-1.991
.3531	-0.997	.3537	-1.305	.3051	-2.015
.3558	-.962	.3552	-1.263	.3073	-1.997
.3564	-.940	.3570	-1.240	.3511	-1.530
.3621	-.841	.3628	-1.158	.3518	-1.523
.3725	-.605	.3721	-1.010	.3541	-1.513
.3730	-.542	.3736	-1.000	.3547	-1.481
3189.1057	.471	3189.1074	-0.011	.3576	-1.452
.1105	.474	.1097	-.018	.3633	-1.366
.1327	.478	.1333	-.001	.3639	-1.381
.1357	.480	.1351	-.005	.3715	-1.305
.1439	.478	.1445	.004	.3738	-1.284
.1472	.489	.1464	.014	3189.1057	-0.412
.1545	.478	.1537	.003	.1094	-.419
.1550	.480	.1556	.003	.1339	-.404
.1620	.479	.1625	.007	.1345	-.411
.1645	.479	.1641	.004	.1451	-.402
.1691	.487	.1685	.002	.1458	-.396
.1697	.485	.1703	.002	.1529	-.402
.1759	.482	.1764	.004	.1562	-.388
.1787	.495	.1781	.005	.1631	-.401
.3166	.486	.3161	.012	.1635	-.393
.3233	.488	.3225	.011	.1679	-.385
.3237	.489	.3243	.006	.1709	-.393
.3328	.483	.3322	.019	.1769	-.381
.3391	.476	.3384	.013	.1774	-.374
.3481	.490	.3487	.010	.3156	-.399
.3584	.468	.3578	.022	.3220	-.360
.3587	.471	.3590	.016	.3248	-.371
3510.3385	.437	3510.3375	-.004	.3312	-.349
.3424	.479	.3420	.034	.3320	-.348
.3550	.336	.3558	.002	.3380	-.367
.3638	.470	.3644	-.018	.3491	-.400
.3745	.459	.3750	-.029	.3496	-.390
.3777	.453	.3783	-.028	.3573	-.374
.3874	.408	.3880	-.038	.3596	-.385
.3930	.454	.3922	-.033	3510.3370	-.366
.3999	.467	.4007	-.033	.3416	-.335

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
3510.4037	0 ^m 453	3510.4045	-0 ^m 031	3510.3562	-0 ^m 369
.4127	.455	.4121	-.027	.3647	-.388
.4162	.481	.4156	-.045	.3756	-.393
.4232	.474	.4240	-.029	.3789	-.392
.4274	.456	.4279	-.023	.3885	-.385
3515.2062	.446	3515.2046	-.010	.3913	-.410
.2070	.452	.2077	-.016	.4013	-.391
.2248	.464	.2242	-.025	.4050	-.405
.2253	.467	.2261	.007	.4115	-.394
.2416	.475	.2410	.018	.4151	-.413
.2421	.487	.2427	.010	.4250	-.389
.2542	.482	.2535	.014	.4285	-.403
.2550	.488	.2554	.026	3515.2032	-.421
.2813	.496	.2805	.007	.2085	-.407
.2819	.498	.2825	-.025	.2237	-.387
.2903	.460	.2895	.008	.2267	-.390
.2909	.472	.2916	.025	.2402	-.395
.2995	.463	.2988	.024	.2435	-.391
.3000	.466	.3006	.029	.2527	-.407
.3118	.489	.3111	-.009	.2562	-.395
.3122	.482	.3128	.015	.2798	-.394
.3205	.468	.3199	.010	.2830	-.379
.3210	.468	.3215	.014	.2889	-.405
.3299	.478	.3291	.001	.2962	-.400
.3304	.486	.3310	.010	.2981	-.389
.3397	.479	.3392	.017	.3020	-.388
.3401	.478	.3407	.017	.3105	-.373
.3471	.473	.3465	.013	.3133	-.438
.3546	.489	.3540	.013	.3193	-.408
.3549	.492	.3555	-.008	.3221	-.403
.3764	.472	.3757	-.013	.3284	-.397
.3770	.470	.3777	-.007	.3321	-.403
.3864	.468	.3858	-.012	.3386	-.398
.3870	.456	.3876	-.011	.3412	-.415
.3974	.469	.3967	-.014	.3460	-.407
.3980	.462	.3987	-.019	.3533	-.384
.4069	.463	.4063	-.009	.3561	-.389
.4074	.463	.4081	-.007	.3749	-.403
.4146	.462	.4141	-.019	.3784	-.408
.4152	.465	.4157	-.014	.3852	-.402
.4222	.466	.4216	-.011	.3878	-.405
.4225	.446	.4231	-.017	.3961	-.408
3534.1278	.520	3534.1288	.036	.3994	-.410
.1370	.481	.1364	.002	.4057	-.415
.1541	.543	.1551	.055	.4087	-.418
.1586	.553	.1598	.067	.4135	-.420
.1727	.493	.1720	.019	.4163	-.434
.1733	.491	.1738	.023	.4210	-.415
.1897	.476	.1905	.020	.4234	-.428
.1956	.483	.1963	.017	3534.1295	-.357
.2100	.479	.2092	.022	.1361	-.279
.2104	.472	.2111	.022	.1557	-.342
.2324	.504	.2330	.021	.1603	-.336
.2352	.510	.2347	.029	.1714	-.343
.2477	.484	.2482	.015	.1742	-.345
.2493	.465	.2500	.024	.1911	-.345
.2885	.482	.2891	.016	.1916	-.345
.2916	.486	.2909	.021	.1969	-.354
.3044	.490	.3034	.008	.2085	-.356

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
3534.3050	0 ^m 469	3534.3056	0 ^m 001	3534.2118	-0 ^m 363
.3179	.485	.3186	.018	.2335	-.351
.3207	.477	.3202	.055	.2340	-.351
3882.2543	.502	3882.2529	.054	.2477	-.365
.2601	.499	.2593	.055	.2504	-.367
.2665	.508	.2658	.075	.2898	-.368
.2749	.478	.2743	.031	.2902	-.358
.2816	.473	.2821	.066	.3028	-.339
.2902	.520	.2914	.090	.3060	-.337
.2990	.518	.2987	.089	.3193	-.336
.3052	.518	.3067	.070	.3197	-.333
.3148	.509	.3141	.069	3882.2523	-.373
.3199	.502	.3205	.077	.2585	-.350
.3335	.512	.3344	.071	.2652	-.349
.3414	.517	.3410	.082	.2737	-.374
.3463	.507	.3471	.030	.2826	-.347
.3546	.502	.3541	.085	.2920	-.337
.3586	.467	.3591	.083	.2981	-.326
3926.1109	.500	3926.1117	.032	.3075	-.326
.1177	.500	.1185	.044	.3135	-.345
.1237	.503	.1244	.054	.3208	-.349
.1367	.504	.1376	.047	.3258	-.345
.1434	.505	.1443	.056	.3350	-.344
.1504	.497	.1511	.031	.3404	-.333
.1564	.496	.1572	.029	.3477	-.353
.1620	.463	.1638	.012	.3536	-.328
.1744	.490	.1734	.033	.3595	-.337
.1847	.499	.1839	.036	3926.1131	-.390
.1934	.486	.1921	.019	.1190	-.384
.2002	.508	.1994	.024	.1249	-.378
.2073	.483	.2065	.031	.1384	-.390
.2140	.502	.2130	.032	.1449	-.389
.2184	.486	.2175	.020	.1516	-.410
.2230	.489	.2214	.032	.1578	-.406
.2349	.498	.2357	.032	.1672	-.412
.2419	.507	.2427	.034	.1719	-.414
.2499	.508	.2507	.035	.1828	-.414
.2530	.522	.2523	.037	.1911	-.415
.2596	.498	.2590	.050	.1988	-.404
.2648	.494	.2641	.042	.2059	-.399
.2701	.493	.2696	.051	.2119	-.405
.2741	.508	.2735	.055	.2165	-.402
.2794	.486	.2786	.040	.2203	-.410
.2848	.513	.2842	.054	.2363	-.402
.2901	.510	.2896	.046	.2431	-.416
.2962	.510	.2958	.065	.2515	-.421
.3030	.500	.3022	.054	.2519	-.415
.3091	.512	.3084	.058	.2584	-.408
.3156	.536	.3151	.046	.2635	-.401
.3220	.517	.3213	.062	.2690	-.407
.3285	.514	.3280	.055	.2732	-.395
.3330	.502	.3325	.055	.2780	-.403
.3391	.503	.3383	.059	.2838	-.393
.3444	.497	.3436	.066	.2891	-.397
.3492	.435	.3489	.051	.2950	-.376
4600.2281	.317	4600.2291	-.123	.3014	-.378
.2394	.321	.2402	-.113	.3077	-.362
.2472	.335	.2477	-.101	.3141	-.373
.2548	.342	.2556	-.093	.3205	-.358

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
4600.2626	0 ^m 344	4600.2632	-0 ^m 088	3926.3272	-0 ^m 365
.2719	.374	.2725	-.093	.3320	-.367
.4643.1362	.547	4643.1354	.076	.3380	-.355
.1367	.538	.1378	.054	.3429	-.355
.1489	.532	.1479	.058	.3487	-.341
.1497	.538	.1508	.062	4600.2299	-.563
.1596	.519	.1592	.053	.2408	-.561
.1600	.536	.1607	.061	.2482	-.559
.1689	.541	.1681	.058	.2561	-.551
.1696	.540	.1703	.048	.2636	-.543
.1768	.535	.1763	.058	.2732	-.555
.1771	.527	.1779	.059	4643.1348	-.352
.1818	.547	.1823	.059	.1386	-.414
.1846	.546	.1838	.068	.1472	-.393
.1897	.541	.1889	.066	.1516	-.388
4644.1799	.485	4644.1807	.019	.1578	-.403
.1834	.496	.1825	.011	.1611	-.374
.1923	.544	.1931	.009	.1673	-.383
.1958	.507	.1948	.061	.1709	-.378
.2022	.520	.2030	.044	.1759	-.397
.2045	.524	.2045	.037	.1782	-.398
.2113	.514	.2106	.021	.1827	-.406
.2115	.518	.2118	.025	.1835	-.398
.2221	.472	.2227	.014	.1884	-.398
.2242	.473	.2238	.010	4644.1813	-.476
.2251	.478	.2253	.027	.1820	-.475
.2327	.479	.2335	.021	.1936	-.431
.2355	.478	.2348	.019	.1943	-.441
.2422	.549	.2435	.006	.2036	-.382
.2449	.492	.2445	.016	.2041	-.391
.2506	.480	.2513	.009	.2100	-.423
.2537	.475	.2527	.012	.2126	-.415
.2589	.485	.2590	.029	.2230	-.442
.2650	.510	.2656	.040	.2233	-.433
.2673	.478	.2668	.029	.2255	-.417
.2725	.471	.2731	.037	.2340	-.434
.2751	.472	.2742	.026	.2345	-.411
.2810	.486	.2804	.020	.2438	-.441
.2813	.487	.2820	.011	.2442	-.431
.2881	.516	.2876	.007	.2517	-.456
.2885	.513	.2891	.020	.2521	-.465
.2923	.505	.2927	.014	.2577	-.453
.2948	.516	.2942	.001	.2662	-.439
.3010	.477	.3014	-.003	.2665	-.445
.3039	.469	.3034	-.008	.2735	-.430
.3096	.470	.3086	-.003	.2738	-.425
.3103	.471	.3111	-.005	.2796	-.423
.3179	.458	.3187	.022	.2823	-.430
.3221	.467	.3212	-.022	.2872	-.424
.3295	.472	.3298	-.026	.2892	-.445
.3341	.497	.3349	.005	.2932	-.450
.3373	.487	.3365	-.006	.2937	-.444
.3418	.501	.3410	.008	.3022	-.497
.3422	.500	.3430	-.010	.3027	-.489
.3487	.504	.3492	.005	.3076	-.482
.3505	.504	.3503	-.017	.3123	-.496
.3577	.493	.3583	-.022	.3200	-.497
.3603	.466	.3598	-.023	.3206	-.489
-	-	-	-	-.3265	-.498

TABLE II *Continued*

JD (Hel) 2440000 +	ΔU	JD (Hel) 2440000 +	ΔB	JD (Hel) 2440000 +	ΔV
-	-	-	-	4644.3353	-0 ^m 451
-	-	-	-	-.3360	-.462
-	-	-	-	-.3407	-.450
-	-	-	-	-.3434	-.430
-	-	-	-	-.3496	-.432
-	-	-	-	-.3500	-.457
-	-	-	-	-.3588	-.473
-	-	-	-	-.3593	-.463

TABLE III
Times of primary minima of FW Mon

JD (Hel) 2440000 +	cycle (E)	$O - C$	Reference
2448.425	3843	-0.003	BBSAG Bull. 21, 1975
2785.436	3930	0.006	ibid.26, 1976
2785.425	3930	-0.005	ibid.
3188.274	4034	-0.009	Present study
5357.503	4594	0.011	BBSAG Bull. 64, 1983
5357.498	4594	0.006	ibid.
6798.477	4966	0.011	ibid.82, 1987
7232.321	5078	0.013	ibid.88, 1988
7565.431	5164	-0.005	ibid. 91, 1989
7968.294	5268	0.005	ibid.94, 1990
8332.402	5362	-0.004	ibid.97, 1991
8332.389	5362	-0.017	ibid.