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UBV LIGHT VARIATION OF THE WR STAR HDE 311884

The double-lined spectroscopic binary HDE 311884=MR 42 (2000.0 RA:$12^h43^m50^s.6$, DEC:$-63^\circ5'.3$) (Roberts, 1962) is a southern WR star of spectral type WN6+O (Smith, 1968) probably associated with the open cluster Hogg 15 (Moffat, 1974). It is a very massive system with minimum masses around 40 $M_\odot$ for the WN6 component and 47 $M_\odot$ for the unevolved early-type O companion (Niemela et al., 1980). In that work it was strongly urged that MR 42 be observed photoelectrically, so it was included among others, in a photoelectric broad band observing program designed to detect or confirm light variations in WR systems.

The purpose of the present paper is to report differential observations of HDE 311884 taken at CTIO in an 11 day observing run showing a light variation.

In 1981 the differential observations were done between August 15 and August 26 with the 61 cm Lowell telescope at CTIO. A standard one-channel photometer was used together with conventional UBV filters and refrigerated photomultiplier RCA 1P21. Three stars were used as comparison stars. They were selected close in the sky to MR 42 (about 3') and also close in the colors from previous absolute UBV photoelectric photometry of stars near and in Hogg 15 (Feinstein and Marraco, 1971, Moffat, op. cit., Muzzio et al., 1976). The comparison stars C1, C2 and C4 were numbered identically with those beginning with H in the work of Feinstein and Marraco (op. cit.). Each daily observation cycle consisted of the sequence

C1 - C2 - C4 - WR - WR - C4 - C2 - C1.

Each observation of the cycle was made in the typical symmetrical pattern V-B-U-U-B-V together with the associated sky background. The interval of time required for observing the whole cycle was about 40 minutes.
A diaphragm of about 15" was used. The sky measures were made as close as possible to the stars and every time in the same place. The hour angle of the observations was about 4 hours west. The data reduction process has been made both including and not including the first and second order extinction coefficients. The results never differed more than $0^m.005$. After subtracting the sky background the star counts were converted into magnitudes. The magnitudes were interpolated to

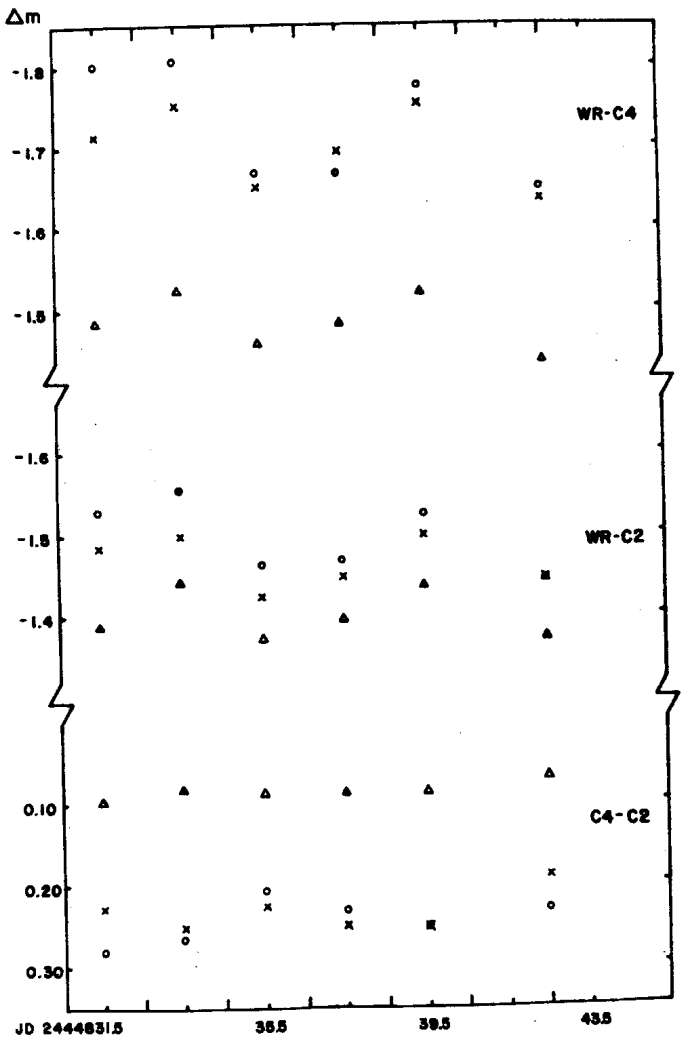

Figure 1

Differential observations of MR 42. Triangles, crosses and circles represent magnitude differences in V, B and U, respectively.

Table I

Differential Observations

JD (Hel.) 2440000+	Δv	Δb	Δu	Δb-Δv	Δu-Δb
WR-C4					
4831.5114	-1.484	-1.702	-1.790	-0.218	-0.088
4831.5152	-1.486	-1.723	-1.821	-0.237	-0.098
4833.5150	-1.525	-1.745	-1.811	-0.220	-0.065
4833.5190	-1.521	-1.755	-1.811	-0.235	-0.056
4834.9959	-1.458	-1.656	-1.679	-0.198	-0.023
4834.9997	-1.461	-1.641	-1.657	-0.180	-0.016
4837.4874	-1.481	-1.692	-1.680	-0.211	0.012
4837.4912	-1.491	-1.699	-1.659	-0.208	0.040
4839.4910	-1.513	-1.751	-1.778	-0.238	-0.027
4839.4945	-1.537	-1.763	-1.781	-0.226	-0.018
4842.4949	-1.459	-1.651	-1.673	-0.191	-0.023
4842.4989	-1.421	-1.629	-1.662	-0.208	-0.033
WR-C2					
4831.5114	-1.391	-1.473	-1.512	-0.082	-0.040
4831.5152	-1.394	-1.493	-1.542	-0.099	-0.050
4833.5150	-1.445	-1.494	-1.540	-0.048	-0.047
4833.5190	-1.446	-1.510	-1.568	-0.064	-0.058
4835.4959	-1.373	-1.427	-1.469	-0.055	-0.042
4835.4997	-1.379	-1.427	-1.459	-0.048	-0.032
4837.4874	-1.394	-1.443	-1.468	-0.049	-0.025
4837.4912	-1.409	-1.454	-1.464	-0.045	-0.010
4839.4910	-1.435	-1.499	-1.530	-0.064	-0.030
4839.4945	-1.447	-1.503	-1.521	-0.056	-0.018
4842.4949	-1.391	-1.460	-1.438	-0.069	0.021
4842.4989	-1.360	-1.438	-1.451	-0.077	-0.013
C4-C2					
4831.5075	0.095	0.227	0.276	0.133	0.049
4831.5179	0.093	0.228	0.279	0.135	0.051
4833.5109	0.086	0.258	0.301	0.172	0.042
4833.5216	0.073	0.241	0.228	0.168	-0.013
4835.4919	0.091	0.239	0.216	0.148	-0.024
4835.5027	0.079	0.208	0.196	0.129	-0.012
4837.4834	0.086	0.248	0.237	0.162	-0.011
4837.4938	0.085	0.247	0.223	0.162	-0.024
4839.4871	0.070	0.246	0.230	0.176	-0.016
4839.4970	0.095	0.264	0.276	0.168	0.012
4842.4908	0.067	0.196	0.263	0.129	0.067
4842.5014	0.066	0.187	0.195	0.121	0.008
C4-C1					
4831.5075	0.262	0.315	0.305	0.053	-0.010
4831.5179	0.277	0.339	0.387	0.062	0.048
4833.5109	0.124	0.218	0.266	0.093	0.048
4833.5216	0.197	0.250	0.225	0.053	-0.024
4835.4919	0.294	0.321	0.373	0.026	0.052
4835.5027	0.268	0.280	0.313	0.012	0.033
4837.4834	0.274	0.306	0.328	0.032	0.022
4837.4938	0.269	0.297	0.306	0.027	0.009
4839.4871	0.277	0.328	0.350	0.051	0.022
4839.4970	0.297	0.344	0.379	0.047	0.035
4842.4908	0.303	0.353	0.363	0.050	0.011
4842.5014	0.264	0.288	0.319	0.024	0.031

perform the following differences: WR-C4, WR-C2, C4-C2 and C4-C1. These values are listed in Table I. The daily mean values are displayed in Figure 1.

The differences C4-C2 show a dispersion typical of that folded in the light curves when observations of different days are grouped together in phase, though the dispersion in the U band is somewhat greater than expected, possibly due to the small number of the total star counts in that light (6000). On the contrary, the differences WR-C4 do establish a scatter that is three and two times greater than the normal dispersion in V, and B,U light, respectively. The differences WR-C2 are identical with the previous ones in the V band, while for B and U light are somewhat smaller, possibly due to the fact that comparison 2 is embedded in Hogg 15. The differences C4-C1 (not included in the figure) confirm the light variation of comparison 1 announced by Moffat (op. cit.) and Muzzio et al. (op. cit.).

It is concluded therefore, that MR 42 shows light variations with an amplitude about $0^m.1$ in UBV light. The trend of the photometric observations also suggests a possible orbital period of the system between 6 and 7 days which agrees with the value $6^d.34$ found from the velocity curves (Niemela et al., op. cit.). New photometric observations are needed to determine the shape of the light curve and to estimate the inclination of this very massive system.

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