B PHOTOMETRY OF ROMANO'S STAR IN M 33

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We present the light curve of Luminous Blue Variable candidate star GR 290 (Romano's star) in M 33 (Humphreys & Davidson 1994). The observational basis of this study is a sample of photographic plates of M 33 from the collection of the Bulgarian National Astronomical Observatory — Rozhen. All plates have been taken with the 2-m RCC $f/8$ Rozhen reflector.

We used 25 B-plates, 30×30 cm (103aO, IIaO and ORWO ZU 21 emulsions, GG 385 glass filter). The plates were taken from November, 1982 to October, 1990. Julian days of observations are presented in Table 1. The plate scale is 12.8 arcsec mm^{-1} and the area covered is $1° \times 1°$. The whole image of M 33 fits in each plate.

The measurements have been made with a MF-4 densitometer with a constant diaphragm in the Astronomical observatory of the Sofia University. At least four estimations of sky background for each star were obtained and then averaged value was used. The calibration curves have been constructed using the photoelectric sequence of Sandage & Johnson (1974). Then they have been fitted by the least squares with the most appropriated polynomials. For each plate standard deviations of measurements are presented in Table 1.

We present also CCD B-magnitude of Romano's star. Data were obtained on Special Astrophysical Observatory — SAO (Russia) with 1024×1024 CCD camera on 0.6-m Zeiss telescope (Vlasiuk 1997). The seeing during the observations was 2–3 arcsec. The scale was 0.84 arcsec/pixel, resulting in a field size of about 8 arcmin. Photometry of the program frame was carried out by PSF-fitting using IRAF/DAOPHOT. Transformation to the standard system is based on average photographic B-magnitudes of reference stars (A–L in Fig. 1) taken from the best five Rozhen B plates. Average magnitudes and root mean squares (r.m.s.) for these stars are given in Table 2.

The results of our photometry are given in Table 1. The light curve of Romano's star is presented in Fig. 2. Open circles represent original Romano's observations transferred to the Johnson B system (Romano 1978), photographic B-magnitudes from Rozhen 2-m RCC telescope are given with open diamonds, and the CCD B-magnitude from 0.6-m telescope — with open triangle. It is seen that Romano's star presents two broad maxima within a few years around 1970 and 1990. The derived mean cycle for the whole data set (Romano's + ours), using PDM method is about 6250 days.

Figure 1. CCD B image of the area around the Romano's star. North is up and East is to the left. Reference stars A–L from secondary photographic sequence are shown.

Figure 2. The long term B light curve of the Romano's star. Open circles represent original Romano's observations transferred to B-magnitudes, open diamonds — 2-m Rozhen observations, and open triangle — 0.6-m SAO observation.

Table 1: Photometry in B band of Romano's star in M 33

JD 244...	B	$\sigma(B)$	JD 244...	B	$\sigma(B)$	JD 244...	B	$\sigma(B)$	JD 244...	B	$\sigma(B)$
5286	17.16	0.15	5591	17.40	0.16	6707	17.46	0.16	8177	16.88	0.18
5295	17.25	0.15	5623	17.51	0.23	6707	17.51	0.16	8180	16.96	0.17
5296	17.19	0.23	5625	17.61	0.16	6708	17.30	0.07	8180	16.99	0.13
5297	17.24	0.25	5702	17.11	0.08	6708	17.52	0.10	8180	16.89	0.12
5588	17.35	0.23	5929	17.30	0.08	6709	17.49	0.08			
5588	17.34	0.26	5968	17.38	0.09	6738	17.45	0.11			
5590	17.55	0.20	6435	17.55	0.08	6738	17.32	0.17			

Table 2: Average B-magnitudes and r.m.s. of reference stars

St	$\langle B \rangle$	r.m.s.	St	$\langle B \rangle$	r.m.s.
A	15.49	0.18	F	17.33	0.06
B	15.79	0.07	G	17.86	0.03
C	16.48	0.13	H	16.33	0.16
D	16.35	0.10	K	17.10	0.19
E	17.22	0.13	L	17.91	0.07

References:

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