LIGHT VARIABILITY IN ε UMA

(Letter to the Editor)

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Abstract. First U, B, and V observations of ε UMa are presented. Light curves show light variations of varying amplitude. Colour indices also show small colour variations.

1. Introduction

No photoelectric photometry of ε UMa (= 77 ε UMa = BD + 56°1627 = HD 112185 = HR 4905, $V = 1^m.77$, $B - V = -0^m.02$, $U - B = +0^m.02$, AOp Cr) is available to us. The *Bright Star Catalogue* of Hoffleit and Jaschek (1982) classifies it as α CVn-type variable with an amplitude of $0^m.03$ having a period of $5^m.0887$, wherein it is also mentioned that SB is unresolved and binary nature is questioned. In this communication the U, B, and V photometry of ε UMa has been presented for the first time.

2. Observations

The star ε UMa was observed photoelectrically on the 38-cm reflector of the Uttar Pradesh State Observatory, using a cooled (−20 °C) 1P21 photomultiplier tube, U, B, and V filters of Johnson and Morgan system and d.c. technique. A total of four nights of observations were secured during the period 16 April, 1970 to 2 May, 1970. The stars γ UMa and β UMa were used as comparison star and check star, respectively. The particulars of the variable, the comparison and check stars are given in Table I.

The data were reduces to standard system from the observations of standard stars. The standard differential magnitudes, in the sense variable *minus* comparison and

TABLE I

Particulars of the variable comparison, and the check stars

Star	α_{1970}	δ_{1970}	m_v	Sp.
Variable: ε UMa (= BD + 56°1627 = HD 112185 = HR 4905)	$12^h52^m.7$	+56°07′.7	$1^m.77$	A0
Comparison: γ UMa (= BD + 54°1475 = HD 103287 = HR 4554)	11 52.2	+53 51.7	2.44	A0
Check: β UMa (= BD + 57°1302 = HD 095418 = HR 4295)	11 01.0	+56 32.8	2.37	A1

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standard differential colour indices are listed in Tables II and III, respectively, and are plotted in Figure 1. The average (graphical) errors of individual observations are $0^m.021$ (U), $0^m.014$ (B), and $0^m.014$ (V).

TABLE II

Standard U, B, and V magnitudes of ε UMa

UT	ΔU	UT	ΔB	UT	ΔV
		J.D. 2440693			
1934.7	$-0^m.228$	1934.1	$-0^m.332$	1933.6	$-0^m.409$
1957.7	−0.068	1956.6	−0.224	1957.1	−0.315
2018.1	−0.115	2016.9	−0.224	2017.5	−0.331
2040.0	−0.108	2038.7	−0.205	2039.3	−0.302
		J.D. 2440702			
1737.6	−0.511	1739.6	−0.591	1738.3	−0.631
1808.1	−0.318	1806.4	−0.385	1807.6	−0.442
1831.4	−0.314	1830.3	−0.385	1830.8	−0.432
1915.5	−0.427	1914.4	−0.542	1914.8	−0.565
		J.D. 2440707			
1750.1	−0.924	1749.1	−0.826	1949.6	−0.572
1802.2	−0.910	1803.3	−0.822	1802.7	−0.655
1815.1	−0.958	1816.3	−0.877	1815.6	−0.593
1907.5	−0.887	1909.0	−0.735	1908.3	−0.580
1926.5	−0.896	1927.8	−0.776	1927.2	−0.591
		J.D. 2440709			
1714.0	−0.531	1716.1	−0.370	1714.6	−0.468
1752.6	−0.458	1754.0	−0.346	1753.3	−0.367
1835.5	−0.450	1834.2	−0.354	1834.8	−0.355

3. Light Variability

The light and colour curves show light and colour variability on all the nights. The range of light variations is from $0^m.07$ to $0^m.21$ in ΔU, $0^m.07$ to $0^m.20$ in ΔB, and $0^m.05$ to $0^m.21$ in ΔV, while the range of colour variations is $0^m.04$ to $0^m.11$ in $\Delta(B-V)$ and $0^m.04$ to $0^m.08$ in $\Delta(U-B)$. These variations do not show a pattern. Thus, it is apparent that ε UMa is not an α CVn variable. Moreover, the maximum amplitude is of the order of $0^m.2$ which is higher than that is found in α CVn variables, for which it hardly exceeds $0^m.1$.

The colour indices nearly at the mid-points of these light curves have been calculated and are given in Table IV. Approximate spectral types of these nights have been assessed on comparing with the standard colour sequences given by Arp (1958). The spectral types on various nights range approximately from B9V to A3V. The average colour indices are $B-V=-0^m.01$ and $0^m.00$, which are in agreement with the colour

TABLE III

Standard colour indices of ε UMa

UT	$\Delta(U-B)$	$\Delta(B-V)$
	J.D. 2440693	
19 : 34	0.124	0.077
19 : 57	0.156	0.091
20 : 17	0.109	0.107
20 : 39	0.097	0.097
	J.D. 2440702	
17 : 40	0.080	0.040
18 : 06	0.067	0.057
18 : 30	0.110	0.008
19 : 14	0.115	0.023
	J.D. 2440707	
17 : 49	−0.098	−0.254
18 : 03	−0.088	−0.177
18 : 16	−0.081	−0.284
19 : 09	−0.152	−0.155
19 : 28	−0.120	−0.185
	J.D. 2440709	
17 : 16	−0.161	0.098
17 : 54	−0.112	0.021
18 : 34	−0.096	0.001

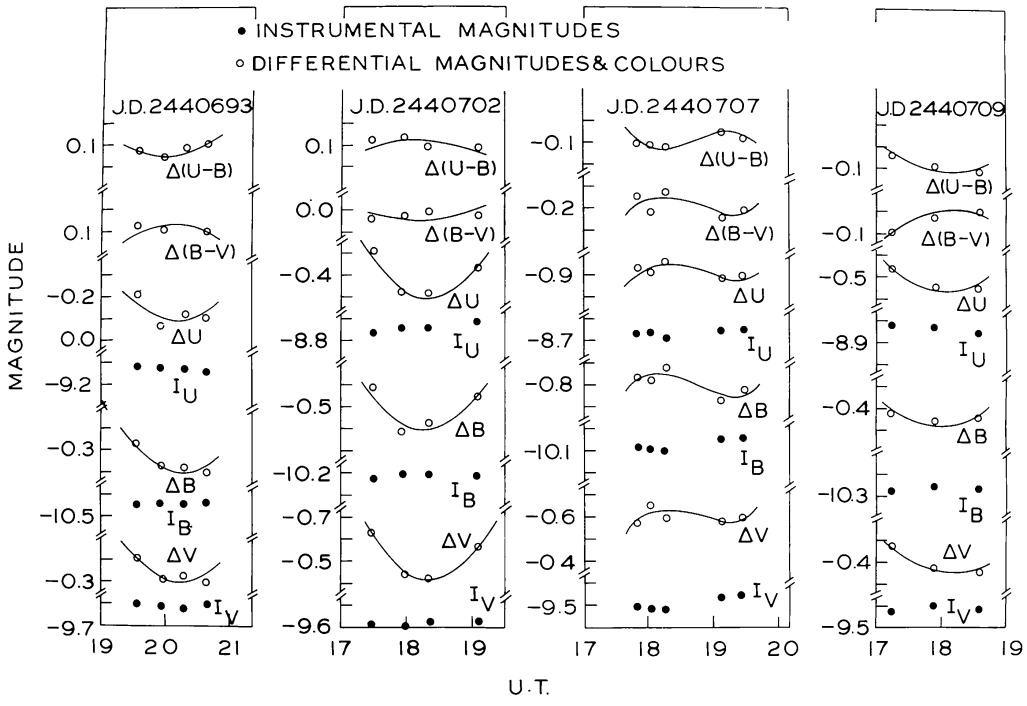

Fig. 1. Light and colour curves of ε UMa.

TABLE IV

Colour indices of ε UMa

J.D.	$B-V$	$U-B$	Sp. (approx.)
2440693	$0^m.10$	$0^m.13$	A3V
2440702	0.02	0.10	A1V
2440707	−0.21	−0.11	B9V (?)
2440709	0.05	−0.13	A1V
Mean	−0.010	−0.003	A0V

? = Not properly matching with the standard colour sequences.

indices $B-V = -0^m.02$ and $U-B = +0^m.02$ given by Hoffleit and Jaschek (1982), within error of observations. The observed colour indices show that the star belongs to A0V type.

4. Type of Variability

These variations do not fit-in an integrated light curve with the period given in the catalogue by Hoffleit and Jaschek (1982), thus it does not appear to be a α CVn variable. Moreover, there is no set type of variability, as we have stated above. Looking at the average U, B, and V amplitudes $0^m.13$, $0^m.13$, and $0^m.11$, spectral types, and V magnitude along with the period given in the catalogue of Hoffleit and Jaschek (1982), the star does not fin-in any type of known intrinsic variables. Average colour variations $B-V = 0^m.07$ and $U-B = 0^m.06$ are small. Detailed analysis of the star is not possible with the present observations. In future these may be looked into in terms of binary nature.

5. Summary

U, B, and V observations of ε UMa have been presented for the first time, which show that the light of star is variable. The type of variability does not appear to be intrinsic with the present observations, and the star does not appear to be a α CVn variable.

References

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