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FLARES AND MEAN PHOTOMETRY OF YZ CANIS MINORIS

Six flares of YZ Canis Minoris have been observed photoelectrically in the blue and ultraviolet at the 60-inch reflector of the Boyden Observatory during a short monitoring run of 9 hours accumulated over 6 nights. These runs have the distinction that they were preceded each night by an independent programme of multicolour photometry which supplied reliable determinations of zero points in the magnitude and colour equations. Mean magnitude and colours of YZ CMi in the standard Johnson UBVR system have been derived. The largest source of error in the results lies in the inexact knowledge of the form of the transformations from instrumental to standard system for peculiar red stars with emission line spectra, and the colour dependence at short wavelength of the atmospheric extinction.

The 60-inch was equipped with the Dunsink photometer with a magnetically-shielded E.M.I.9558 QA photomultiplier, cooled to 0°C by melting ice, having a sensitivity extending from the ultraviolet to the infrared. The following filters were used which remove the red leak and reproduce the standard system of Johnson et al. (Ref.1):

- U 1mm UG 2 + 2.5mm 80% Saturated  $\text{CuSO}_4$  soln. at 15°C.
- B 1mm BG 12 + 2 mm GG 13 + 1 mm BG 18.
- V 2mm GG 14 + 2mm BG 18.
- R 2mm RG 5.

The effective wavelength of the red filter-tube combination at about 7150 Å is 150 Å longward of Johnson's value, but it cuts off the H-alpha line.

Table 1 gives the Universal Time of the coverage of YZ CMi and the observed flares, together with the flares' approximate duration and magnitude range in blue. Light curves for the larger flares in blue and ultraviolet are presented in Fig.1, where the flare intensity ( $\Delta J$ ) is expressed in units of the normal intensity of the star ( $J_0$ ). Because of the very peculiar flare continuum and line emission and the strange veiling of the underlying late-type spectrum (Ref.2), conversion to the standard UBVR

FIG. 1.

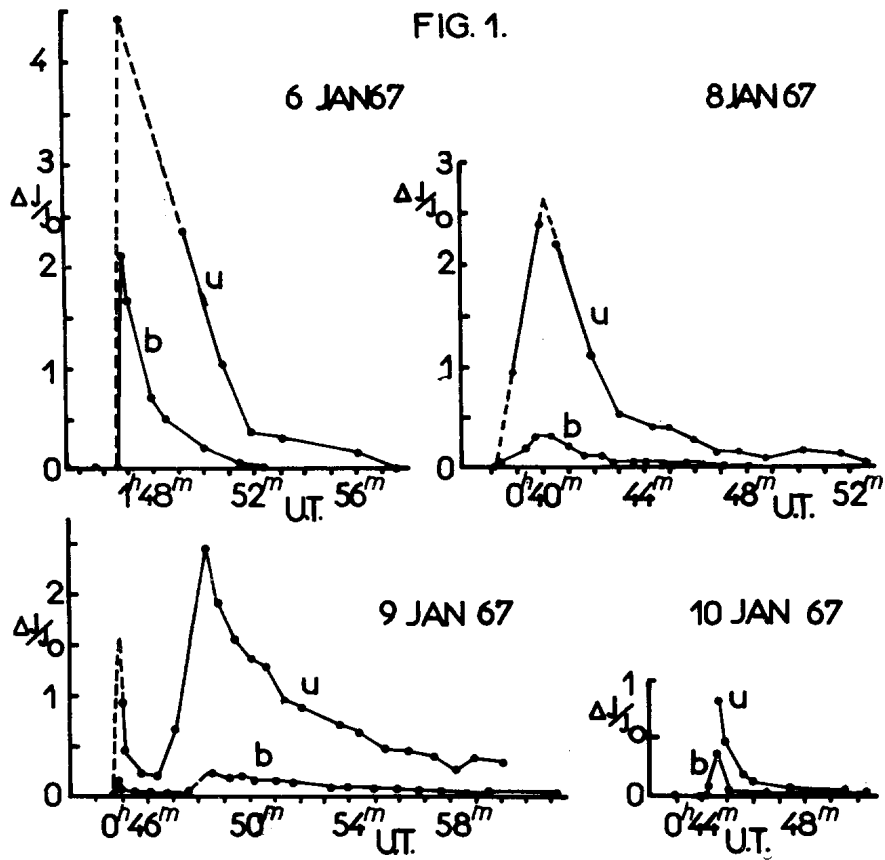


Table 1

1967	U.T.	Flares	Duration (mins)	Range (blue)
Jan 6	0 <sup>h</sup> 52 <sup>m</sup> - 2 <sup>h</sup> 06 <sup>m</sup>	1 <sup>h</sup> 46 <sup>m</sup> .8	6	1.23
7	1 22 - 2 11			
8	0 07 - 1 08	0 40.1	7	0.30
	1,15 - 2 01			
9	0 30 - 1 06	0 44.8	2	0.15
	1 15 - 2 09	0 48.3	11	0.23
	23 54 - 24 00			
10	0 00 - 2 01	0 44.6	2	0.38
16	0 21 - 2 07	0 43.3	4	0.07

system has not been attempted for the flares to avoid introducing false colour effects. In Fig.2, the uncorrected instrumental colour,  $u-b$ , of the flares alone are shown with a shift of the time-axis so that the moments of maximum blue light coincide. The effects of normal differential extinction during these flares are negligible. There is no evidence for a general trend in the  $u-b$  colour changes of the present flares during their development, such as reported by P. Chugainov in the colour index,  $B-V$ , where a reddening was observed immediately following flare maxime (Ref.3). The mean standard  $U-B$  of the total light from star-plus-flare during decline is estimated at  $0^m12$ .

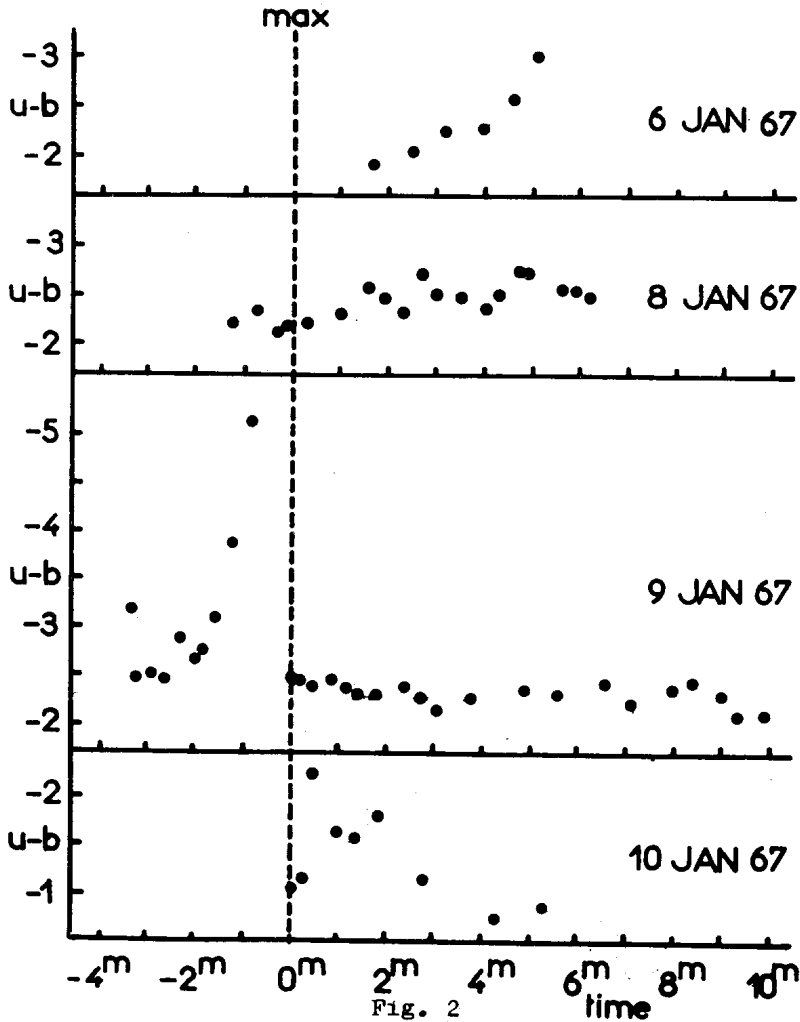


Fig. 2

Observations of YZ CMi in four colours, before and after flares, were obtained. These, together with similar observations of a nearby comparison star, were reduced with the main photometric programme. Nightly-determined colour equations and mean extinction coefficients, with second-order extinction terms in V and B-V only, were used.

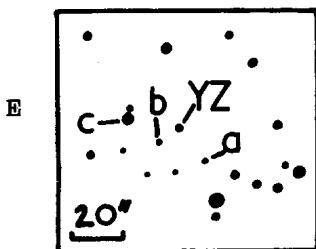
Table 2

YZ CMi	Star a	Star b	Star c
V $11^m.28 \pm .003$ (5)	$12^m.46 \pm .003$ (3)	$12^m.47$	$10^m.72$
V-R $1.90 \pm .025$ (10)	$0.77 \pm .015$ (4)	0.80	0.21
B-V $1.60 \pm .025$ (11)	$0.95 \pm .026$ (5)	1.13	0.51
U-B $0.91 \pm .106$ (10)	$0.67 \pm .054$ (5)	0.88	0.10

In Table 2, mean standard magnitudes and colours, standard deviations from the mean and the number of observations are given. No significant variations of YZ CMi in its quiet phase were detected, except possibly in U-B which shows a markedly higher standard deviation than that of the comparison star, and which is three times higher than the standard error of the photometric programme. Two further comparison stars were measured once, star c being useful for photographic and visual estimates of flare amplitudes (See Fig.3).

Fig.3

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REFERENCES

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- (3) P.F. Chugainov, Publ.Crimean Astroph.Obs. Vol.33, p.215 (1964).