

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1173

Konkoly Observatory
Budapest
1976 September 7

OPTICAL PHOTOMETRY OF THE X-RAY NOVA A0620-00

The very bright transient X-ray source A0620-00 (V616 Mon) was discovered by the Ariel-5 satellite on August 3, 1975 (Elvis et al. 1975). The X-ray flux increased rapidly reaching a brightness ~ 4 times that of Sco X-1 (Matilsky 1975).

The optical object corresponding to the X-ray source was identified by Boley and Wolfson (1975) from the X-ray position reported by the SAS-3 group (Matilsky 1975).

The present note gives results of photoelectric monitoring of the nova.

Initially observations were made with the 0.5 metre telescope at Sutherland using the Peoples' Photometer. Looking for short period variations, runs in B were made using 30 second integrations with a time resolution of 1-2 minutes.

Observations were made soon after the position of the optical object had been reported, but because of the star's proximity to the Sun at that time it was not possible to follow it for more than a few hours at a time.

A run of 1.7 hours was obtained on 22/23 August 1975, (JD 2442647.6), three other long runs were obtained in August and September.

Three standards were used: HD44700 which is about 3° from A0620-00 and at a greater zenith angle, HD44815 which is about 1° away, and E345 which is an E-region standard (Cousins and Stoy 1962) which is 50° away from the nova.

The light curves for the nova, together with the fluctuations of the standards used (to the same scale) are shown in Fig.1. The typical scatter of the points of the nova is ~ 0.02 magnitudes.

The graphs demonstrate that there were short period fluctuations in A0620-00 with variations of up to 0.15 magnitudes in one hour. Other observations around this time were made by Duerbeck and Walter (1976). They suspected irregular fluctuations in brightness but their measures were not suitable spaced to determine a time scale.

Two other runs were made during which the brightness of the star varied by less than 0.03 magnitudes in an hour. Sample data of intervals of ~ 0.02 days for all these runs are shown in Table 1.

Later observations were made with the 1 metre telescope at Sutherland using the St Andrews photometer. The magnitudes and colours from these observations together with those from the 0.5 metre telescope are shown in Table 1. The observations in UBV are in the Johnson system and those in RI are in the Cape-Kron system (Cousins 1974).

The adopted values for the standards used are:

HD44700 : V : 6.400, B-V : -0.145, U-B : -0.62, V-R : -0.06, V-I : -0.15

HD44815 : V : 8.292, B-V : -0.057, U-B : -0.25, V-R : -0.25, V-I : -0.06

E345 : V : 5.764, B-V : -0.067, V-R : -0.023, V-I : -0.052

The V values for these observations, together with the visual magnitude estimates (Bortle 1975/76, Locher 1975) and photometric V magnitudes (French 1975, Kirshner 1975, Lyutyj 1976) reported in IAU circulars are shown in Fig.2.

The average decline for the first two magnitudes was 0.017 ± 0.001 magnitudes per day.

A secondary maximum in the X-ray flux was reported which lasted for the month of February 1976 followed by a sharp decline beginning on February 31/March 1 (Kaluziński et al. 1976). Also a 7.8 day period in the X-ray flux has been reported (Matilsky 1976).

In the visible there was a corresponding increase in brightness in February which however was interrupted by at least two sharp deep minima. These minima would appear to have a depth of ~ 0.7 magnitudes and a width of ~ 6 days.

The time difference between these minima is 54.7 ± 0.3 days which would not conflict with 7 cycles of a 7.8 day period. But more data is required to confirm or deny this.

Acknowledgements:

We would like to thank Dr G. Wegner and Mr J.D. Laing for additional UBV observations and Dr M.W. Feast for many helpful discussions.

Table 1

B magnitudes and colours for A0620-00

J.D. hel	B	B-V	U-B	V-R _{KC}	V-I _{KC}
646.64	11.27				
.65	11.28				
.66	11.29				
647.60	11.28				
.63	11.36				
.66	11.39	0.17			
648.62	11.38	0.16		0.20	0.40
.64	11.36				
.65	11.33	0.17			
.66	11.34				
650.60	11.29				
.62	11.31				
.64	11.34	0.18		0.30	0.37
.66	11.37				
653.65	11.42	0.21	-0.76		
654.64	11.47	0.24	-0.77		
659.66	11.62	0.24	-0.77		
679.51	11.90				
.53	11.93				
.55	12.00				
.77	12.04				
681.50	11.98				
.52	12.00				
.54	12.05	0.24			
.56	12.07	0.24			
.58	12.10	0.23	-0.74	0.34	0.59
.60	12.11				
.62	12.12				
.63	12.09				
701.60	12.23	0.22	-0.71		
758.48	13.26	0.24		0.34	0.56
774.53	13.66	0.30			0.61
790.32	13.58	0.32			0.57
791.49	13.65	0.31			0.57
792.32	13.75	0.31		0.31	
.52	13.74	0.28	-0.67		
793.32	13.87	0.35			0.62
795.36	14.14	0.34			0.48
796.49	14.10	0.41			0.43
830.32	13.50	0.29	-0.60		
848.75	13.97	0.26	-0.68		
849.29	14.15	0.27	-0.69		
850.27	14.18	0.31	-0.68		
851.27	14.13	0.32	-0.63		
852.27	13.76	0.31	-0.52		

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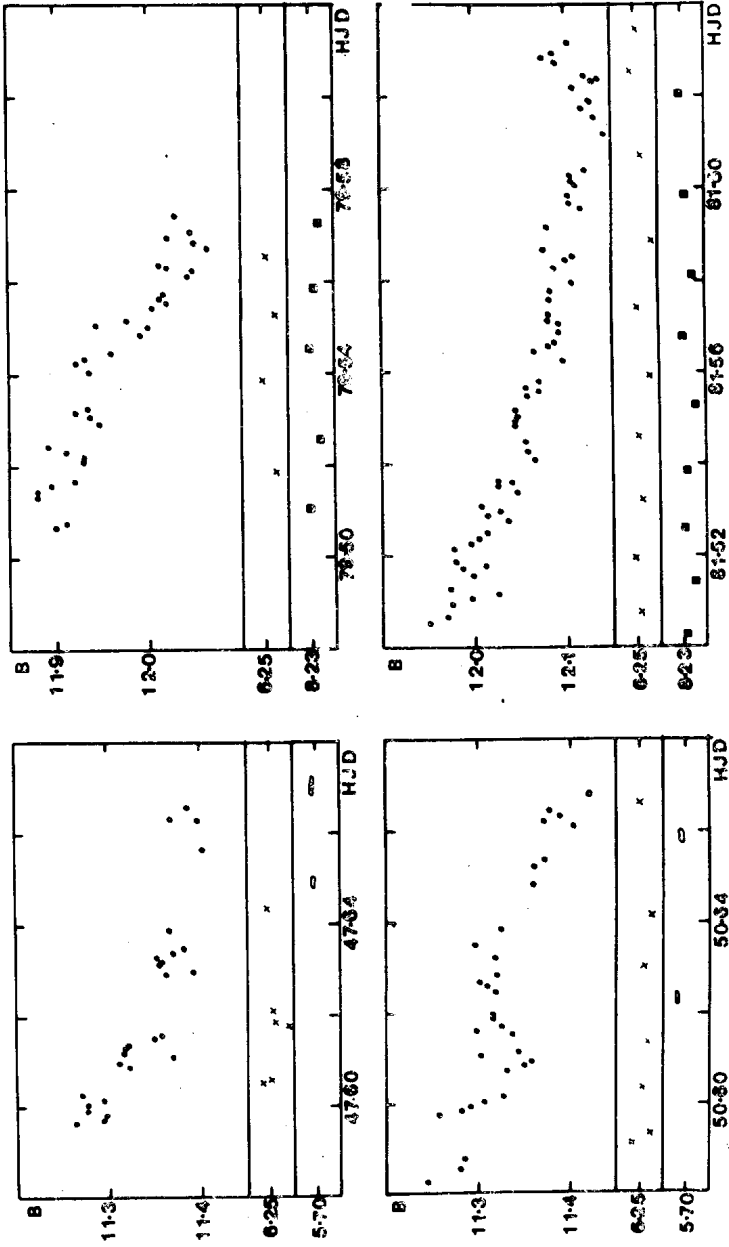


Fig.1. Fluctuations in B for A0620-00 against HJD (2441600+). The standards done at the same time are also shown. Symbols used: Circles: A0620-00; Crosses: HD44700; Open Ovals: E345; Squares: HD44815.

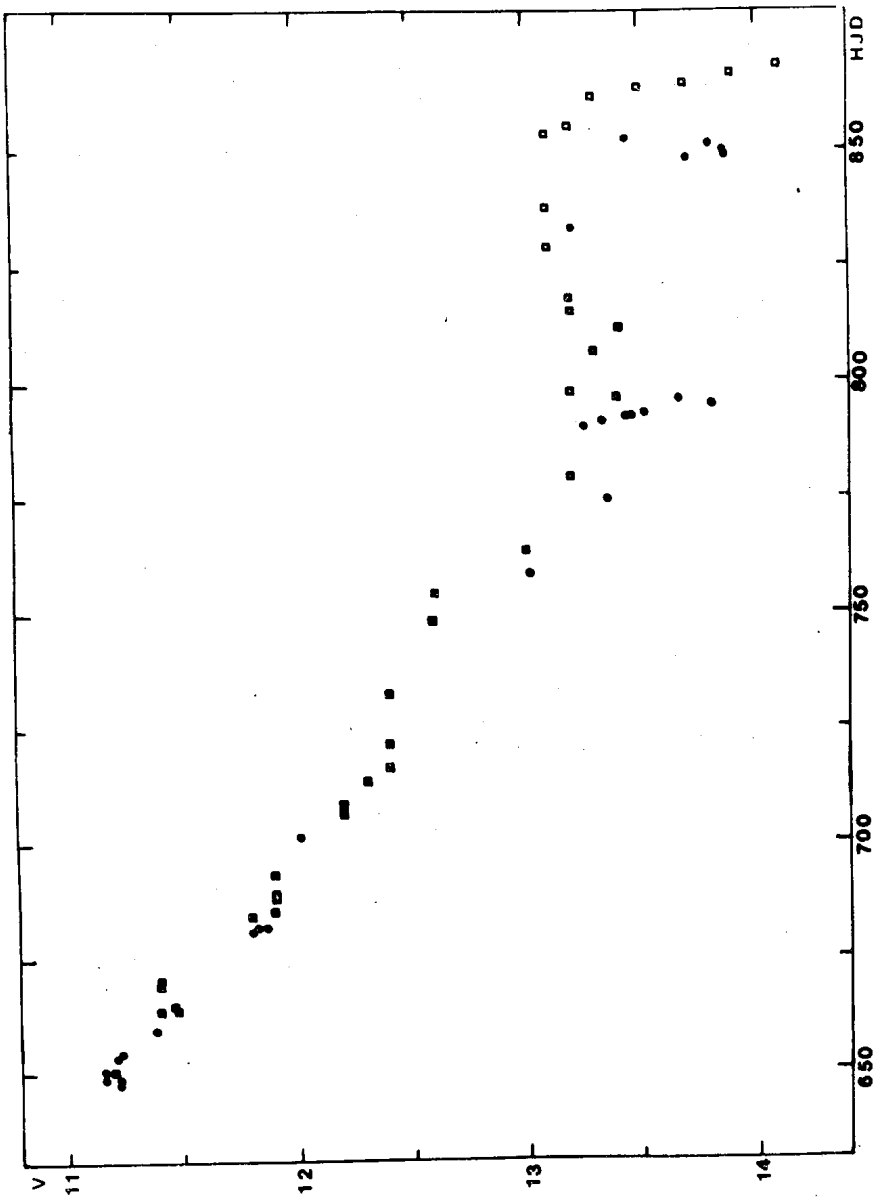


Fig. 2. Light curve in V for A0620-00 against HDJ (2441000+). Symbols used: Circles: S.A.A.O. observations at Sutherland; open Squares: magnitudes reported in IAU circulars.