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UBV PHOTOMETRY OF THE NOVA CYGNI 1975 ON SEPTEMBER 1975
A PHOTOELECTRIC LIGHTCURVE

Photoelectric observations of the Nova Cygni 1975 in the UBV-international system have been carried out at the Stephanion Observatory using the 30-inch Cassegrain reflector equipped with a dual channel photoelectric photometer. The photomultiplier used was an RCA 1P21 refrigerated with dry ice. The transformation of our instrumental ubv system to the international UBV system is given by the following equations:

$$V = v_o + 0.059(b-v)_o + 2.368 ,$$
$$B-V = 0.737 + 1.035(b-v)_o ,$$
$$U-B = -1.675 + 1.122(u-b)_o .$$

One or two differential measurements of the nova were done each clear night from September 22 up to September 30, 1975. The nearby star BD +47°3322 was selected as a comparison star, because of its resemblance in magnitude and colour as well with the nova at that stage. For the best accuracy of our measurements, provision was made for the evaluation of the second order extinction coefficient at the moment of each nova observation and for the best estimation of the magnitude and colour indices of the comparison star in use. To this purpose a second red comparison star was involved in the scheme of the observation. This star was BD +47°3321, an M star, visual companion of the star BD +47°3322. Finally, in order to deduce the magnitudes and the colour indices of these two comparison stars, two well known standard stars ε Cyg and α Del (Johnson et al. 1966) were measured more than twice each observational night.

The magnitudes and colour indices of the comparison stars, computed as the weighted means of the respective values which

have been derived from all the observations of these stars during the whole period, are given in Table I.

Table I

Star	V	s_V	B-V	s_{B-V}	U-B	s_{U-B}
BD +47°3322	6.456	0.009	+0.010	0.007	-0.381	0.007
BD +47°3321	7.306	0.006	+1.549	0.004	+1.095	0.009

From the small r.m.s. errors we may deduce that both stars show no variability, at least for that period when our observations of the Nova Cygni 1975 were made.

The magnitudes and colour indices of the Nova Cygni 1975 for the respective time of observation are given in Table II.

Table II

1975 September	U.T.	J.D. 2442600 +	V	B-V	U-B
	22.87	78.365	7.455	+0.096	-0.519
	22.91	78.409	7.413	+0.105	-0.482
	24.86	80.364	7.581	+0.080	-0.442
	24.93	80.425	7.581	+0.100	-0.457
	25.92	81.416	7.625	+0.064	-0.449
	27.86	83.362	7.785	+0.040	-0.446
	28.81	84.310	7.845	+0.036	-0.439
	28.95	84.449	7.854	+0.023	-0.382
	30.95	86.444	7.972	+0.005	-0.439

The r.m.s. errors for the V magnitude and the B-V, U-B colour indices are $s_V=\pm0.009$, $s_{B-V}=\pm0.007$ and $s_{U-B}=\pm0.007$.

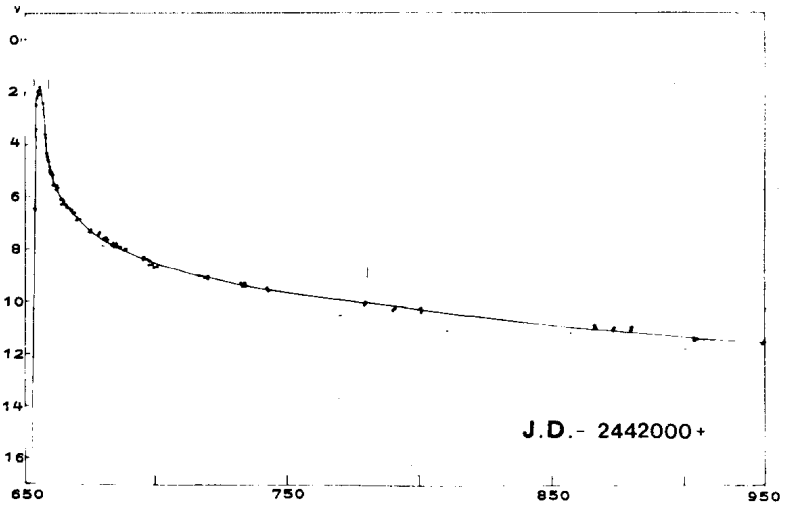
It is well known that small differences in the visual passband between two instrumental systems result into significant differences in the deduced V magnitude of a nova, due to the strong and broad emission lines (H_α, H_β and N_1, N_2 of [OIII], mainly). Therefore, in order to construct an homogeneous lightcurve, we have used the published V magnitudes by Margrave and Doolittle (1975), French (1975), Piirola (1975) and Williamon (1977) together with the V magnitudes of this work. All these observations show no systematic differences in overlapping time intervals, where the emission lines dominate in the spectrum of the Nova Cygni 1975. For the early phases of the nova outburst i.e. before the 4.00 U.T. of September no such selection need to be done, so we have used the published V-magnitudes of the Nova Cygni 1975 in the IAU Circulars Nos. 2826,2828,2832,2839.

By a least square fitting we find that the V lightcurve

of the Nova Cygni 1975 may be represented by the following equations

$$t \leq -1^d \qquad V = -6.104t - 4.463 \qquad (1)$$
$$-1^d < t < 3^d \qquad V = 1.83 \exp(0.29|t|) \qquad (2)$$
$$3^d < t < 125^d \qquad V = 2.954 + 3.392 \log t \qquad (3)$$
$$125^d < t < 280^d \qquad V = 0.603 + 4.499 \log t \qquad (4)$$

In these equations t is expressed in days and is measured from the time of the maximum brightness i.e. 31.00 U.T. of August, 1975 (JD 2442655.5). Equation (4) holds 1000 days after maximum. At that time the observed V magnitude of the nova is $14^m.14$ (Kleine et al. 1979) while the calculated V magnitude from this equation is 14.10 magnitude. If we assume that the equation (4) is valid until the end of the nova eruption, then the star will reach its prenova magnitude i.e. 21^m about 94 years after the time of maximum brightness.



The Figure displays the lightcurve of Nova Cygni 1975. The points represent the observed V magnitudes and the continuous lines the four equations.

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References:

Burkhead, M.S. : 1975, IAU Circ. No.2832

French, H., Margrave, T.E., Doolittle, J.H.: 1975,IAU Circ.No.2839
Johnson, H.L., Mitchell, R.I., Iriarte, B., Wisniewski, W.Z., : 1966, Lunar and Planetary Lab. Commun. 4, No. 63
Kozai, Y., Florkowski, D.R., Uckotter, D., Fernie, J.D., Piirola, V.: 1975, IAU Circ. No. 2834
Kleine, T., Kohoutek, L.: 1979, Astron.Astrophys., Vol. 76, 133
Martynov, D.Ya., Tempesti, P.: 1975, IAU Circ. No. 2826
Piirola, V.: 1975, IAU Circ. No. 2828
Williamon, R.M.: 1977, Publ.Astron.Soc.Pacific, Vol.89, 44