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LIGHT CURVE AND CHARACTERISTIC PHOTOMETRIC PARAMETERS OF NOVA CYGNI 1978 (V 1668 Cyg)

28 photoelectric V observations performed with the 40-cm refractor of the Teramo Observatory are given in Table I. BD +43°4012 with V=9.27 (checked with BD +43°4017) was utilized as comparison star. All the published photoelectric V and B observations together with some visual and photovisual measures which allow to secure the final rise and the epoch of the maximum are listed in Table II.

Table I

Teramo Observations

J.D.	V		J. D.	V	
2443771.300	7.87	± 0.01	2443806.292	10.37	± 0.01
772.300	7.82	± 0.01	807.250	10.46	± 0.03
774.344	8.03	0.01	810.243	10.54	0.01
775.292	8.17	0.01	811.253	10.52	0.01
776.333	8.18	0.00	813.253	10.75	0.01
777.451	8.38	0.00	823.253	11.10	0.01
778.319	8.40	0.00	829.215	11.19	0.03
779.302	8.53	0.01	832.271	11.24	0.02
781.310	8.61	0.00	833.233	11.24	0.02
788.278	9.28	0.01	835.208	11.20	0.01
789.278	9.26	0.01	837.226	11.32	0.00
793.332	9.77	0.01	838.217	11.35	0.00
804.292	10.19	0.01	843.215	11.41	0.02
805.278	10.27	0.01	849.265	11.47	0.02

The light curve drawn with the data of these two tables appears fairly well outlined up to 35 days after the maximum; thereafter the different series of observations diverge highly owing to the blowing up of the strong emissions in the spectrum of the nova. The same behaviour is of course shown by the B-V

Table II
Collected Magnitudes

J. D.	Magn.	B - V	Source
2443759.4	14		Andrews-Lloyd: IAU Circ. 3268
759.84	12		Di Cicco: IAU Circ. 3263
760.5	8.7 pg		Reginaldo: IAU Circ. 3276
761.0	9.0 v		Collins: IAU Circ. 3263
761.5	6.8 v		Morrison: IAU Circ. 3264
761.9	6.9 - 7.0 v		Reginaldo: IAU Circ. 3276
762.0	6.6 v		Hiraga: IAU Circ. 3267
762.57	6.4 v		Bretl: IAU Circ. 3263
762.63	6.3 v		Morgan: IAU Circ. 3263
762.66	6.6 v		Harless: IAU Circ. 3263
762.67	6.4 v		Barstow: IAU Circ. 3263
762.69	6.6 v		Mayer: IAU Circ. 3263
762.78	6.7 v		Collins:IAU Circ. 3263
763.55	6.0 pv		Lloyd: IAU Circ. 3268
763.66	6.17 V		Mattei: IAU Circ. 3303
763.66	6.2 v		Beckman: IAU Circ. 3264
764.29	6.4 v		Baroni-Cavagna: IAU Circ. 3264
764.34	6.35 V	+0.63	Baldinelli: IAU Circ. 3278
764.37	6.38 V	+0.68	Lindgren: IBVS 1543
764.45	6.34 V	+0.58	Duerbeck: Astron. Astrophys. 81,157
764.58	6.2 pv		Stelz: IAU Circ. 3268
764.63	6.33 V		Mattei: IAU Circ. 3303
764.66	6.4 v		Ashbrook: IAU Circ. 3267
764.75	6.32 V	+0.67	de Roux: IBVS 1519
765.41	6.17 V	+0.49	Duerbeck: Astron. Astrophys. 81,157
765.53	6.18 V	+0.50	Mallama: PASP 91,99
765.54	6.00 V		Stelz: IAU Circ. 3268
765.66	6.22 V		Mattei: IAU Circ. 3303
765.88	6.4 v		Morris: IAU Circ. 3267
766.35	6.66 V	+0.50	Baldinelli: IAU Circ. 3278
766.41	6.66 V	+0.50	Duerbeck:Astron. Astrophys. 81,157
767.47	6.92 V	+0.33	" " " " "
767.68	6.90 V	+0.36	Mallama: PASP 91,99
768.40	6.83 V	+0.35	Duerbeck: Astron. Astrophys. 81, 157
768.73	7.02 V	+0.36	de Roux: IBVS 1519
769.49	7.03 V	+0.30	Duerbeck: Astron. Astrophys. 81, 157
769.67	7.23 V		Mattei: IAU Circ. 3303
770.35	7.40 V	+0.29	Baldinelli: IAU Circ. 3278
770.43	7.45 V	+0.29	Duerbeck: Astron. Astrophys. 81, 157
770.64	7.67 V	+	Mattei: IAU Circ. 3303
770.83	7.71 V	+0.18	Margrave: IAU Circ. 3316
771.43	7.86 V	+0.18	Lindgren: IBVS 1543
771.49	7.69 V	+0.26	Duerbeck: Astron. Astrophys. 81, 157

Table II (cont.)

J. D.	Magn.	B - V	Source
2443771.72	7.74 V		Mattei: IAU Circ. 3303
771.80	7.79 V	+0.18	Margrave: IAU Circ. 3316
772.29	7.66 V	+0.29	Duerbeck: Astron. Astrophys. 81, 157
772.51	7.72 V	+0.24	Mallama: PASP 91,99
774.53	8.02 V	+0.34	deRoux: IBVS 1519
775.33	7.97 V	+0.29	Duerbeck: Astron. Astrophys. 81, 157
775.77	8.34 V	+0.18	Margrave: IAU Circ. 3316
776.29	7.98 V	+0.28	Duerbeck: Astron. Astrophys. 81, 157
776.81	8.17 V		Mattei: IAU Circ. 3303
777.29	8.12 V	+0.29	Duerbeck: Astron. Astrophys. 81; 157
777.52	8.29 V	+0.28	Mallama: PASP 91, 99
777.55	8.33 V	+0.25	deRoux: IBVS 1519
778.31	8.15 V	+0.30	Duerbeck: Astron. Astrophys. 81, 157
778.60	8.24 V	+0.27	Mallama: PASP 91, 99
778.70	8.30 V	+0.21	Margrave: IAU Circ. 3316
779.40	8.34 V	+0.30	Duerbeck: Astron. Astrophys. 81, 157
780.58	8.62 V	+0.31	Mallama: PASP 91, 99
780.69	8.68 V	+0.27	deRoux: IBVS 1519
781.80	8.68 V	+0.22	Margrave: IAU Circ. 3316
783.41	8.53 V	+0.28	Duerbeck: Astron. Astrophys. 81, 157
783.63	8.80 V		Mattei: IAU Circ. 3303
784.62	8.79 V		" " " "
785.64	8.87 V		" " " "
786.52	9.00 V	+0.21	deRoux: IBVS 1519
786.57	8.94 V	+0.22	Mallama: PASP 91,99
786.72	9.00 V		Mattei: IAU Circ. 3303
786.85	9.11 V	+0.22	Margrave: IAU Circ. 3296
787.76	9.32 V	+0.24	" " " "
788.76	9.37 V	+0.21	" " " "
789.32	9.06 V	+0.29	Hopp: IBVS 1633
790.26	9.08 V	+0.34	" " "
790.83	9.18 V	+0.23	Margrave: IAU Circ. 3296
791.53	9.30 V	+0.25	Mallama: PASP 91, 99
791.76	9.47 V	+0.19	Margrave: IAU Circ. 3296
792.44	9.32 V	+0.28	Duerbeck: Astron. Astrophys. 81, 157
792.70	9.71 V	+0.11	deRoux: IBVS 1519
793.27	9.15 V	+0.16	Hopp: IBVS 1633
793.36	9.47 V	+0.29	Duerbeck: Astron. Astrophys. 81, 157
794.26	9.62 V	+0.33	" " " " "
794.31	9.67 V	+0.40	Hopp: IBVS 1633
795.31	9.64 V	+0.20	" " "
795.72	9.81 V	+0.19	Margrave: IAU Circ. 3299
796.27	9.42 V	+0.33	Duerbeck: Astron. Astrophys. 81, 157
796.78	9.92 V	+0.19	Margrave: IAU Circ. 3299

Table II (cont.)

J. D.	Magn.	B – V	S o u r c e
2443797.25	9.70 V	+0.09	Bruch: IBVS 1567
798.20	9.81 V	+0.09	" " "
799.20	9.70 V	+0.04	" " "
799.76	9.90 V	+0.17	Margrave: IAU Circ. 3299
800.19	9.81 V	+0.04	Bruch: IBVS 1567
800.38	9.68 V	+0.22	Hopp: IBVS 1633
801.14	9.71 V	+0.05	Bruch: IBVS 1567
801.25	9.66 V	+0.21	Duerbeck: Astron. Astrophys. 81, 157
801.78	9.89 V	+0.14	Margrave: IAU Circ. 3299
802.53	9.95 V	+0.27	Mallama: PASP 91, 99
803.22	9.91 V	+0.06	Bruch: IBVS 1567
803.35	9.83 V	+0.22	Duerbeck: Astron. Astrophys. 81, 157
803.85	10.17 V	+0.12	Margrave: IAU Circ. 3299
804.44	9.80 V	-0.02	Bruch: IBVS 1567
805.30	9.95 V	+0.18	Duerbeck: Astron. Astrophys. 81, 157
807.31	9.90 V	+0.47	Hopp: IBVS 1633
808.34	10.10 V	+0.24	" " "
809.56	10.16 V	+0.20	Mallama: PASP 91, 99
814.21	10.44 V	+0.52	Hopp; IBVS 1633
814.37	10.35 V	+0.32	Duerbeck: Astron. Astrophys. 81, 157
815.23	10.36 V	+0.41	Hopp: IBVS 1633
818.26	10.41 V	+0.35	Duerbeck: Astron. Astrophys. 81, 157
825.21	10.54 V	+0.31	" " " " "
828.25	10.51 V	+0.29	Hopp: IBVS 1633
829.27	10.51 V	+0.41	" " "
832.26	10.61 V	+0.25	" " "
833.25	10.63 V	+0.24	" " "
847.25	10.90 V	+0.16	" " "
848.25	10.83 V	+0.31	" " "
849.37	10.97 V	+0.43	Duerbeck: Astron. Astrophys. 81, 157
850.19	10.99 V	+0.23	Hopp: IBVS 1633
862.24	10.93 V	+0.33	" " "

values after J.D. 43800 appear tremendously scattered, in accordance with the fact that the standard colours are meaningless for an emission object. A characteristic feature of this nova, already pointed out by other observers, is the complicated structure of the maximum: it appears to have been two maxima, at J.D. 2443763.7 and at J.D. 2443765.5; the first maximum time

relies largely on the photoelectric observation made by Mattei on J.D. 2443763.66: the reliability of this datum has been checked considering the good agreement of the remaining observations of Mattei with those of other observers, This structure of the maximum, which looks like a miniature version of the complicated structure of some slow novae such HR Del, is rather surprising in a fast nova such Nova Cyg 1978.

From the V light curve and the B-V colour displayed in Fig.1 the photometric values and the characteristic times of the dec-

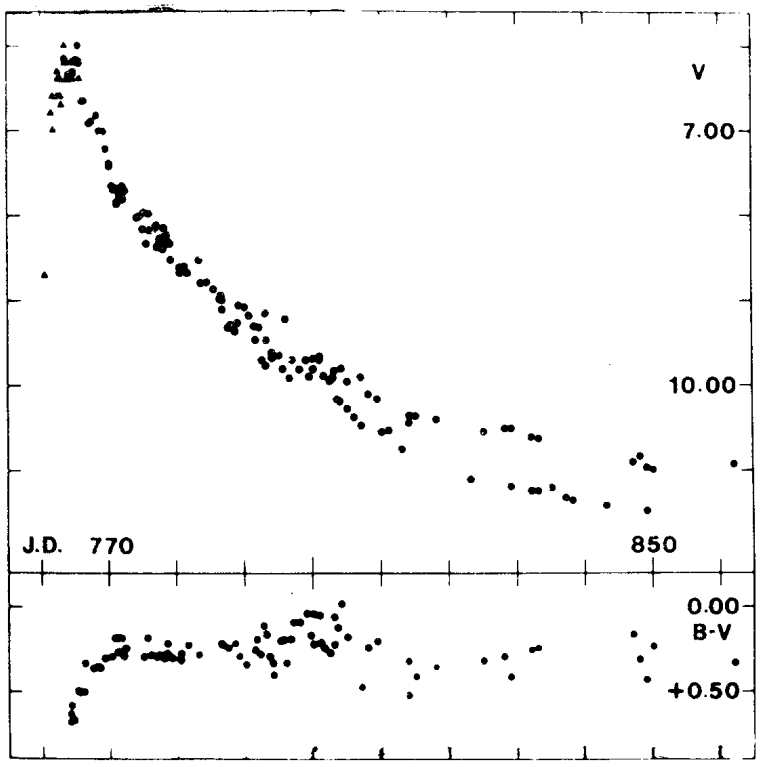

Fig. 1:

At the top: the V light curve ▲ : visual or photovisual observations,

● : photoelectric observations.

The lower branch after J.D. 3805 is formed by Teramo observations only; the upper branch is formed by the observations of Duerbeck and of Hopp.

At the bottom: the B-V curve (only photoelectric measures).

line are derived:

t_2= 12^d	t_3= 23^d	(V light)
t_2= 15^d	t_3= 30^d	(B light)
M_{Vmax}= 6.1	$(B-V)_{max}$=+0.68	

According to the standard criterion, V 1668 Cyg may be classified as a fast nova. It has not been possible to check the reliability of the highest observed photoelectric brightness (V=6.00; Stelz, 1978); therefore we have assumed for the magnitude at maximum the conservative value V=6.1.

By means of the well known relation of Schmidt as revised by Pfau (1976), $M_B=-10.67\pm0.30+1.80(\pm0.20)\ \log t_3$, the absolute magnitude at maximum $M_B=-8.0\pm0.6$ is derived. Assuming the Schmidt value +0.35 for the intrinsic B-V colour at maximum, the absolute V magnitude results

$$M_{Vmax}=-8.4\pm0.6 \quad \text{(from the rate of decline)}.$$

With this assumption, the observed B-V give the value +0.33 for the reddening of the nova. This result is in good agreement with the value $M_{Vmax}=-8.3$ found by Mallama and Skillman (1979) using the same criterion.

The method of the rate of decline $2/t_2$ as calibrated by Rosino (1964) confirms this result giving $V_o=-8.0$. The method of the light curve crossing point t=15 days (Buscombe and Vaucouleurs, 1955; Pfau, 1976) gives $V=-8.2\pm0.6$.

The absolute magnitude found by various observers with criteria independent from the rate of decline results much fainter: -7.5 ± 0.5 from the interstellar K I line (Slovak and Vogt, 1979); -6.8 ± 0.7 from the colour excess and the assumed reddening law (Duerbeck at al., 1980).

The disagreement between the results obtained using the rate-of-decline criterion and those obtained using other criteria appears confirmed and the doubt that the t_3-time is not so good luminosity indicator for all novae as hitherto assumed (Duebeck and Pollok, 1980) would appear therefore strengthened. We think, however, that the methods based on the interstellar absorption are of very little weight in this region of the sky where the absorption is so erratic.

A two hours monitoring on October 11, 1978, shows a maximum

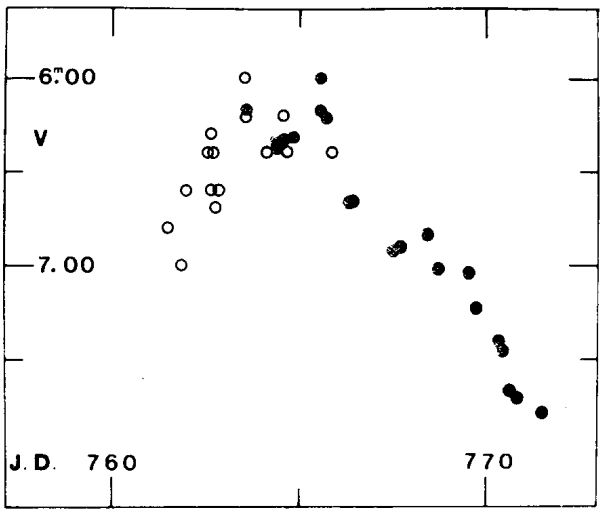

Fig. 2 :
The structure of the maximum : ○ visual or photovisual observations,
● photoelectric observations.

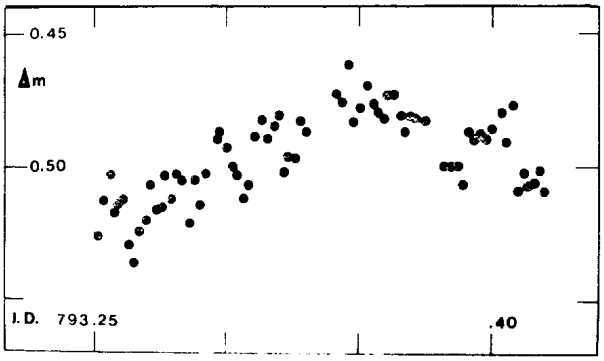

Fig. 3 : The short period light variation on October 11, 1978.

of the short period regular oscillation found in the nova light curve shortly after the maximum by Campolongo et al., (1980). The amplitude and the shape of the observed stretch agree with the amplitude and the period (respectively $0^{m}.15$ and $10^{h}.54$) found by the quoted authors. The statement of Mallama and Skillmann that a two-hour monitoring on September, 27, 1978, showed no short-time variation is not surprising: owing to the length of the cycle the monitoring may have fallen on an almost constant phase.

The presence of short-period regular oscillation in the very proximity of the maximum light was discovered for the first time in Nova Cyg 1975 (=V 1500 Cyg); the occurrence that the first monitoring of a nova thereafter expressly carried out has given a positive result seems to indicate that such a phenomenon is a rather general feature. Photoelectric monitoring for several hours during the first decline of the novae is therefore highly recommended.

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