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A PHOTOGRAPHIC LIGHT CURVE OF NOVA V1668 CYGNI
AND SOME OBSERVATIONS OF SS CYGNI

V1668 Cyg (Nova Cygni 1978) is a relatively faint, but well investigated nova. It was discovered on 1978 September 10.0 (UT) by Morrison (1978) and Collins (1978). Reginaldo (1978) published two pre-discovery magnitudes. At Hoher List Observatory, spectroscopic, photoelectric and photographic observations were carried out. In this note, we present a light curve based on the photographic observations of the field of V1668 Cyg between 1978 September 12.87 and 1979 October 24. As a by-product of this study, several outbursts of the nearby dwarf nova SS Cyg were also observed.

The series of photographic plates was obtained with the 30 cm f/5 four-lens astrograph. 70 plates are available, 12 of them were taken a few weeks before the brightening of the nova. All plates were measured with a Becker iris diaphragm photometer. Photographic magnitudes of the comparison stars and the sources from which they were taken are given in Table I. A critical review of m_{pg} of those stars which form the comparison sequence of SS Cyg was recently given by Lukas (1979). The magnitudes of the fainter stars were derived through comparison with a sequence in the open cluster IC 5146 (Walker 1959). An identification chart of the fainter stars is given in Fig. 1a,b, which is the reproduction of a POSS chart.

The photographic magnitudes of V1668 Cyg and SS Cyg are given in Table II. The plates were taken by the following observers: D = Duerbeck, H = Hopp, Hä = Hänel, K = Kiehl, Ka = Karimie, L = Lukas, Le = Lentés, S = Schumann, W = Witzigmann. On the plates taken before 1978 September 10, V1668 Cyg is not visible. One of the deepest plates is A3171, taken 18 days before outburst, which has a limiting magnitude m_{pg} of about 17^m, and does not show the image of the nova.

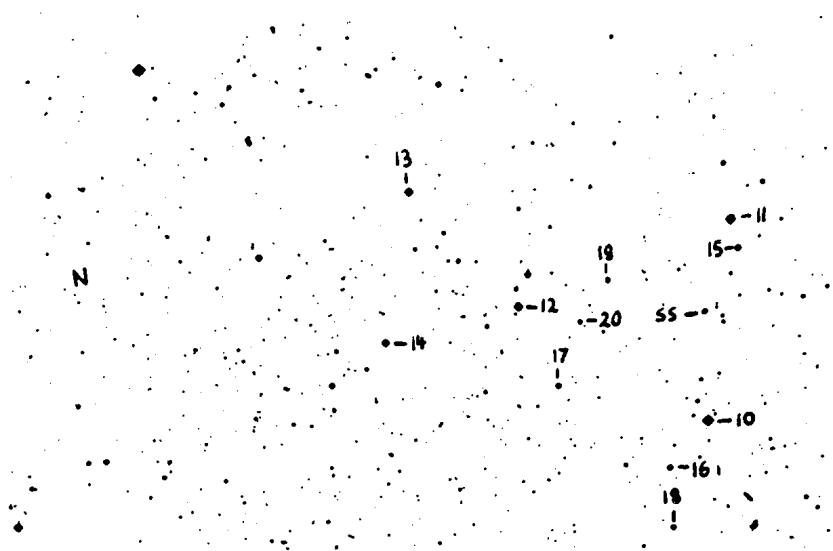


Fig. 1a. Field of Nova V1668 Cyg (=N) and SS Cyg (=SS); some of the fainter comparison stars are identified. North is to the left

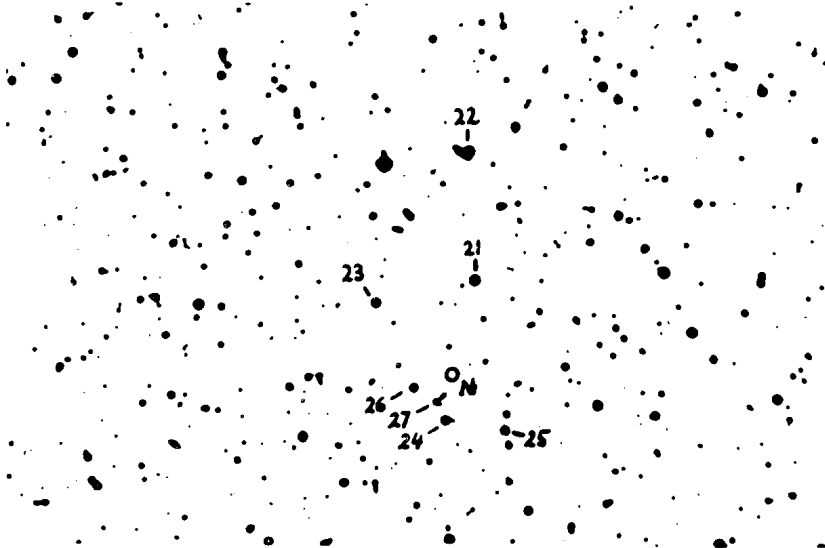


Fig. 1b. The field of Nova V1668 Cyg. The position of the nova (=N) is marked by a circle; some comparison stars are identified. North is to the left

Table I

List of comparison stars

No.	BD No.	m _{pg}	ref.	No.	BD No.	m _{pg}	ref.
1	+44° 3865	4.91	3,5	15	-	11.35	1,2,4,6,8
2	+44° 3889	6.39	4	16	-	12.04	6
3	+43° 4002	6.66	4	17	-	12.07	1,6,7
4	+42° 4204	6.86	2	18	-	12.28	1
5	+43° 4048	7.94	1,7	19	-	12.48	1,6,7
6	+42° 4197	8.74	1	20	-	12.91	1,6,7
7	+43° 4037	9.12	1	21	-	13.78	9
8	+43° 4030	9.18	1	22	-	13.93	9
9	+43° 4017	9.36	4	23	-	14.02	9
10	+42° 4190	9.76	1,4,6,7,8	24	-	14.58	9
11	+43° 4020	10.19	1,2,4,6,7,8	25	-	14.69	9
12	-	10.55	1,4,6,8	26	-	14.88	9
13	-	10.62	1,6,7	27	-	16.34	9
14	-	11.05	1,6,7,8				

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Table II
 Photographic observations of V1668 Cyg and SS Cyg

Plate No. A	Date JD 2440000+	Exposure (min)	Emulsion	Observer	V1668 Cyg	SS Cyg
3135	3718.414	10	ZU-2	H,K,W		8.91
3141	19.385	10	"	"		9.12
3145	19.531	10	"	"		9.47
3146	20.486	9	"	"		9.85
3147	23.483	10	"	"		11.11
3150	24.442	6	"	"		11.50
3151	25.451	10	"	"		11.67
3158	38.452	5	IIa-0	L		12.15
3161	40.450	9	"	"		12.57
3165	41.477	5	"	"		12.75
3169	42.478	7	"	"		12.30
3171	47.459	15	ZU-2	Ka		12.27
3172	64.373	5	"	D	6.82	12.45
3173	64.380	5	"	"	6.80	12.43
3174	64.399	5	"	"	6.53	12.37
3175	64.446	5	"	"	6.44	12.55
3176	64.536	13	"	"	6.48	12.47
3177	65.310	5	"	"	6.03	12.12
3178	65.332	6	"	"	6.06	12.04
3179	66.476	5	"	"	6.71	11.69
3180	66.483	5	"	"	6.85	11.86
3181	67.479	5	"	"	6.88	9.06
3182	67.483	5	"	"	7.04	8.82
3183	68.289	5	"	"	6.68	8.19
3184	68.293	5	"	"	6.51	8.07
3185	69.307	5	"	"	6.38	-
3186	69.342	8	"	"	6.37	8.16
3187	70.331	6	"	"	7.12	8.23
3188	70.337	8	"	"	7.03	8.40
3189	71.391	6	"	"	7.22	7.95
3190	71.397	8	"	"	7.46	8.15
3191	72.327	10	"	"	7.63	8.22
3192	72.336	13	"	"	7.39	7.94
3193	73.337	9	"	"	7.50	8.30
3194	73.351	10	"	"	7.67	8.51

Table II (cont.)

Plate No. A	Date JD 244000+	Exposure (min)	Emulsion	Observer	V1668 Cyg	SS Cyg
3195	3775.465	8	ZU-2	D	7.74	8.37
3196	75.471	10	"	Hä	7.56	8.14
3198	78.347	6	"	"	8.04	8.86
3199	83.434	10	"	D	8.30	11.07
3200	83.441	10	IIa-0	"	8.23	11.26
3201	85.333	15	"	Hä	8.17	11.67
3202	85.353	8	"	"	8.82	11.48
3204	88.430	23	"	S	9.17	12.22
3212	91.350	10	"	Hä	9.07	12.16
3213	92.343	10	"	"	9.77	12.32
3214	93.489	10	"	D	9.81	12.44
3215	94.382	10	"	"	9.65	12.49
3216	96.404	8	"	"	9.70	12.08
3217	3801.365	10	"	"	9.82	12.31
3218	03.382	10	"	"	10.02	12.33
3219	22.333	10	"	"	10.75	12.51
3220	25.396	10	"	"	10.68	12.40
3221	28.435	10	"	"	10.73	11.79
3222	49.237	10	"	"	11.26	12.42
3257	4040.463	20	"	"	14.64	12.57
3263	90.523	15	"	"	15.80	8.35
3272	4100.469	20	"	"	15.84	8.88
3285	28.394	20	"	"	15.55	12.38
3289	33.338	30	"	Le	15.80	12.38
3293	39.488	15	"	H	15.81	12.15
3297	40.343	30	103a-0	"	15.50	12.37
3305	42.411	30	"	"	15.86	12.11
3311	43.344	30	"	"	16.02	12.26
3320	46.481	30	"	"	15.96	12.46
3322	47.463	10	"	"	15.86	12.60
3330	70.381	20	IIa-0	D	16.29	8.98
3331	70.364	20	"	"	16.01	8.99
3332	71.301	10	"	"	16.20	8.99
3333	71.309	5	"	"	16.40	9.10
3334	71.318	13	"	"	16.07	9.39

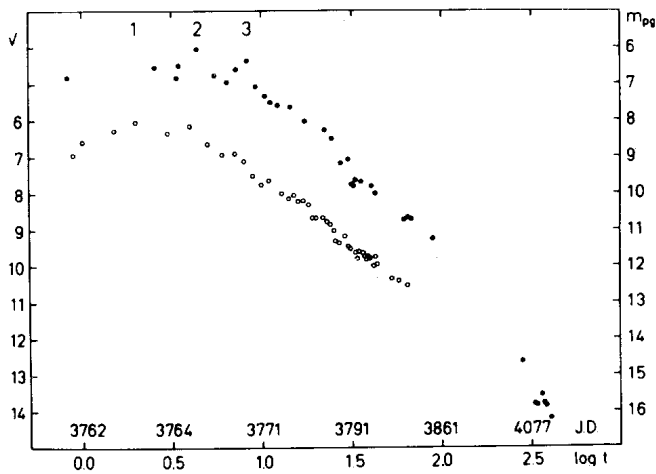


Fig.2. Photographic (upper) and photoelectric V (lower) light curves of V1668 Cyg. On the $\log t$ axis (number of days elapsed since JD 2 443 761.0), several Julian days are indicated. Three brightness maxima are labeled by numbers 1,2,3 (see text).

In Fig. 2, the photographic light curve and the photoelectric V light curve compiled by Duerbeck et al. (1980) are compared. The construction of a nova light curve from photoelectric data of different observers is somewhat problematic: UVB observations obtained with various instruments of different sensitivity functions exhibit systematic differences because of the influence of emission lines in the spectrum of the nova after maximum. Therefore, a series of photographic observations obtained with a single telescope is important to check the reality of some fluctuations in the light curve of V1668 Cyg which were reported in the paper by Duerbeck et al. (1980).

A logarithmic time scale is used in Fig. 2 in order to display the fluctuations in the early stages as well as the brightness decline in the late stages of the outburst. The time $t = 0$ was set to JD 2 443 761.0, as proposed by Gallagher et al. (1980). The maximum of the nova has a complicated structure, three brightness maxima occurred on JD 2 443 763, 765 and 769. They are present in the V light curve, yet more pronounced in the photographic light curve.

The photographic light curve supports the fact that the light curve of V1668 Cyg deviates markedly from those of the fast, intrinsically bright novae, like V1500 Cyg, Q Cyg, CP Lac etc. It is more like that of the somewhat slower,

intrinsically fainter nova LV Vul. The finding of Duerbeck et al. (1980) that V1668 Cyg is subluminoous for its fast evolution is thus confirmed and leads to the conclusion that the t_3 -time is not as good a luminosity indicator as hitherto assumed. A thorough discussion of the problem of nova luminosities is the subject of a forthcoming paper (Duerbeck 1980).

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