No. 10 (C82)

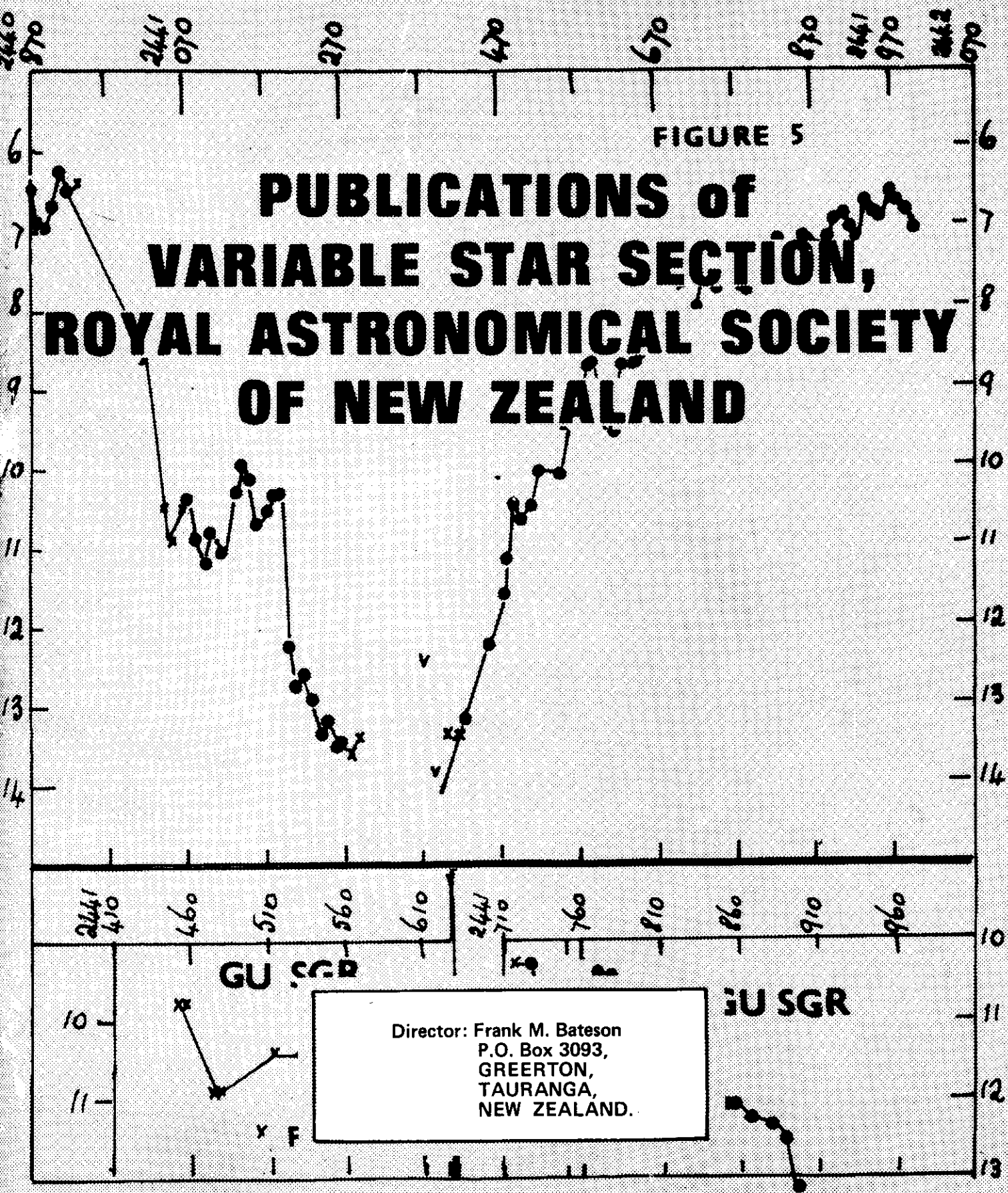

FIGURE 5

PUBLICATIONS of VARIABLE STAR SECTION, ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND

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THE LIGHT CURVE OF V348 SAGITTARII 1954 June 22 to 1981 OCTOBER 31.

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(1) Director, Variable Star Section, R.A.S.N.Z.
(2) Member, Variable Star Section, R.A.S.N.Z.

SUMMARY. A light curve, derived from 2,417 visual observations by members of the V.S.S., R.A.S.N.Z., is presented covering the interval 1954 June 22 to 1981 October 31. Data on twenty-one minima are tabulated and discussed. The mean decline time is nine days and the mean rise time 27 days. The minima and their duration have a random distribution.

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1. INTRODUCTION.

On the basis of its light variations and spectrum V348 Sgr is termed unique with a photographic range of 10.6 to 17.(1). Hoffleit (2) examined over 500 Harvard patrol plates. She found that between J.D. 2,417,500 and 2,425,000 the light curve appeared to confirm the previous classification of V348 Sgr as of the R CrB type. However, she found that earlier and later observations showed the star more often at minimum than at maximum with little resemblance to R CrB type variations. The observations from J.D. 2,425,000 to 2,429,500 suggested a semi-regular variation with cycles of 200 to 400 days.
Herbig (3) stated that V348 Sgr shows recurrent maxima with a mean spacing of about 200 days, at which times the star brightened from m_{pg}=17 to about magnitude 11. The rise seems usually to take 30-60 days with the subsequent decline being very much faster. Herbig also reported on the spectrum and the nebulous envelopes close to the star. He suggested that the general features of the light curve could be explained by the ejection of an opaque shell and its subsequent disolution..
V348 Sgr(4) was shown to have an infra=red excess and to be a hydrogen-deficent and carbon-rich object. It was considered to be closely related to the R CrB variables.

2. OBSERVATIONS.

At the suggestion of G. Herbig observations of V348 Sgr were commenced by A.F. Jones on 1954 June 22. Until 1969 May 23 he was the only observer, but after that date observations were contributed by other members of the Variable Star Section, Royal Astronomical Society of New Zealand. Table 1 shows the number of observations contributed by the observers.

TABLE 1.

TOTAL OBSERVATIONS CONTRIBUTED BY OBSERVERS.

CRAGG, T.A.	25	
JONES, A.F.	1,799	
JONES, M.V.	148	
MATCHETT, V.L.	37	
OVERBEEK, M.D.	145	
ROWE, G.	41	
TAYLOR, N.W.	45	
WILLIAMS, P.	119	
13 observers with) less than 15) obsservations each)	58	TOTAL 2,417

All observations were made visually. Charts and a sequence have been published (5).

3. LIGHT CURVE

The normal observing season is from mid-February to mid-November, although in some years observations did not commence until late March. The light curve, shown in Figures 1a to 1e, is arranged in calendar years so that the results for each observing season is shown separately. The threshold of most instruments used was around 14.0_v. As a result no information can be given on the star's behaviour below this limit. In some years V348 Sgr was always(e.g. 1965,Fig.1b), or mainly (e.g. 1959, Fig.1a) below this threshold.The light curve is from 10 day means.

4. RESULTS

Data on the declines of V348 Sgr are summarised in Table 2. Each decline has been given a number, which appears in the first column of the table. The second column gives the last observation at maximum prior to the decline with the J.D. in this column and the visual magnitude in the third column. The fourth column shows the J.D. when V348 Sgr reached 14.0_v on the decline. The fifth column gives the J.D. when the star reached 14.0_v on the rise and is followed in the next column by the time, in days, that V348 Sgr was fainter than 14.0_v. The seventh column shows the time, in days, that V348 Sgr took to fade from the magnitude in the third column to 14.0. The next three columns show the intervals, in days, between successuve dates when the variable reached 14.0 on the decline; between successive points at 14.0 on the rise, and the interval between 14.0 on the rise and the following 14.0 on the decline. The final column gives the rise time, in days. That corresponds to the time taken to increase from 14.0 to maximum at 11.7 to 12.3. When the star did not fully recover from a minimum no figure appears in the final column.

5. DISCUSSION.

For the purpose of this discussion maximum brightness of V348 Sgr falls between 11.6 and 12.3, whilst when it declines below 14.0 it is treated as a decline to minimum. The variable, during the intervals reported in this paper, spent about 45% of the time fainter than 14.0 and 55% brighter than this limit. The star did not always recover after a minimum to full maximum brightness but oscillated between 12.7 and 14.0 for long periods.

The decline times from maximum to 14.0 ranged from 2 to 41 days. Minimum No. 12 was unusual in having both a much slower decline and slower rise than normal.. Omitting minimum No. 12 and those for which the dates in Table 2 are uncertain, the mean decline time for 15 minima is 9 days.

In 9 cases the rise time from 14.0 to maximum can be reasonably well determined. They range from 8 to 50 days with a mean of 27 days. For most of the remaining rises the variable did not recover to maximum brightness.

The time that V348 Sgr remained fainter than 14.0 ranged widely from one minimum to another being from 14 to 670 days. The intervals between successive phases of the light curve appears to be entirely random. The decline rate showed no definite relationship with the time spent at minimum. There is an indication that the shorter the interval spent at minimum the steeper was the subsequent rise to maximum. This might be due to the variable at such times not falling far below 14.0 but no information can be offered on this point.

The light curve certainly, at times, shows many features common to variables of the R CrB type, e.g. steeper declines than rises; random distribution of minima and long intervals oscillating around maximum brightness. On the other hand the time spent at an intermediate magnitude is much longer than R CrB variables.

At times the variable shows an irregular variation, with amplitudes of from one magnitude to $0^m.2$. This amplitude is greatest when the star is between 13.0 and 14.0 and least when it is at maximum. No period could be found for these variations.

6. CONCLUSIONS

The light curve reveals so many features that are closely akin to those seen in R CrB stars that we conclude that this variable is related to that class. The variable spends 45% of the time at, or near, minimum brightness and 55% of the time at maximum or at an intermediate magnitude between 12.7 and 14.0. In that respect it differs from R CrB stars, but its steep falls; less rapid rises and the random distribution of minima resembles R CrB variables. There is no reason to doubt that the rapid falls and more leisurely rises would also operate in the lower part of the curve beyond the limit of the instruments used. We urge those members of the V.S.S., R.A.S.N.Z. equipped with instruments capable of reaching 15.0-16.0 magnitude to observe V348 Sgr more often.

ACKNOWLEDGEMENTS.

We have to thank G. Herbig for first directing the attention of A.F. Jones to V348 Sgr, and for supplying the original charts of the field. We are greatly indebted to all observers for their observations, especially to A.F. Jones for his excellent and long series of careful observations. Without his observations this paper could not have been written.

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TABLE 2.

DETAILS OF DECLINES OF V348 SGR.

No.	MAX. 24...	MAG. v	14.0D 24...	14.0R 24...	TIME (14.0 d	FALL TIME d	14.0D d	14.0R d	14.0R-14.0D d	RISE TIME d
1	34875	12.0	34981	35190	209	6	...	...	...	..
2	35527	13.2	35535?	35715	180	8?	554	525	345	..
3	36074	12.1	36077	36160	83	3	542	445	362	..
4	36510	11.7	36512	36850	338	2	435	690	352	..
5	37071	11.7	37078	37140	62	7	566	290	228	30
6	38588	12.2	38610?	39280?	670	22?	1532	2140	1470	..
7	39654	12.4	39656	39670	14	2	1046	390	376?	13
8	39753	12.5	39757	39800	43	4	101	130	87	..
9	39820	12.5	39840	40055	215?	20?	83	255	40?	35
10	40468	11.7	40478	40690	212	10	638	635	423	..
11	40723	12.7	40730	40814	84	7	252	124	40	26
12	41019	11.7	41060?	41480	420	41	330	666	246?	50
13	41558	12.4	41572?	41611	39?	14	512?	131	92?	27
14	41825	12.1	41838	42080?	242	13	266	469,	227	24?
15	42162	12.0	42180?	42560	380	18	342	480	100?	40
16	42656	11.6	42671?	42700	29?	15	491	140	111	17
17	42926	11.7	42938	42952	14	12	267	252	238	8
18	42966	11.8	42975.	43052	77?	9?	37?	100	23?	38
19	43480?	12.2?	43500?	43940?	440?	20?	525?	888?	448?	37?
20	43985	12.0	43991	44410?	419	6	491?	470?	51?	..
21	44512	12.7	44528	44735?	207?	16	537	325?	118?	..

NOTES TO TABLE 2.

No. 2. Was oscillating around 14.0 at end of 1955. First observation in 1956 was at 13.8. Uncertain whether a minimum occurred during interval when star could not be observed.

No. 3. Probably decreased again after 36.160 at end of 1957 observing season, as was rising when first seen in 1958.

No. 6. Probably there was a deep minimum between Nos. 5 & 6 when star unobservable.

No. 9.)Did not fully recover after minimum No. 10.Date of decline No. 9
No.11.)uncertain.

No. 12. Definitely a much slower decline and rise than normal.

No. 13. Some oscillations around 14.0 on the decline.

No. 15. Date of reaching 14.0 on decline uncertain. The partial recovery to 12.9 around 42.240=42,250 considered doubtful.

No. 19. Dates uncertain but V348 Sgr certainly faint for more than a year.

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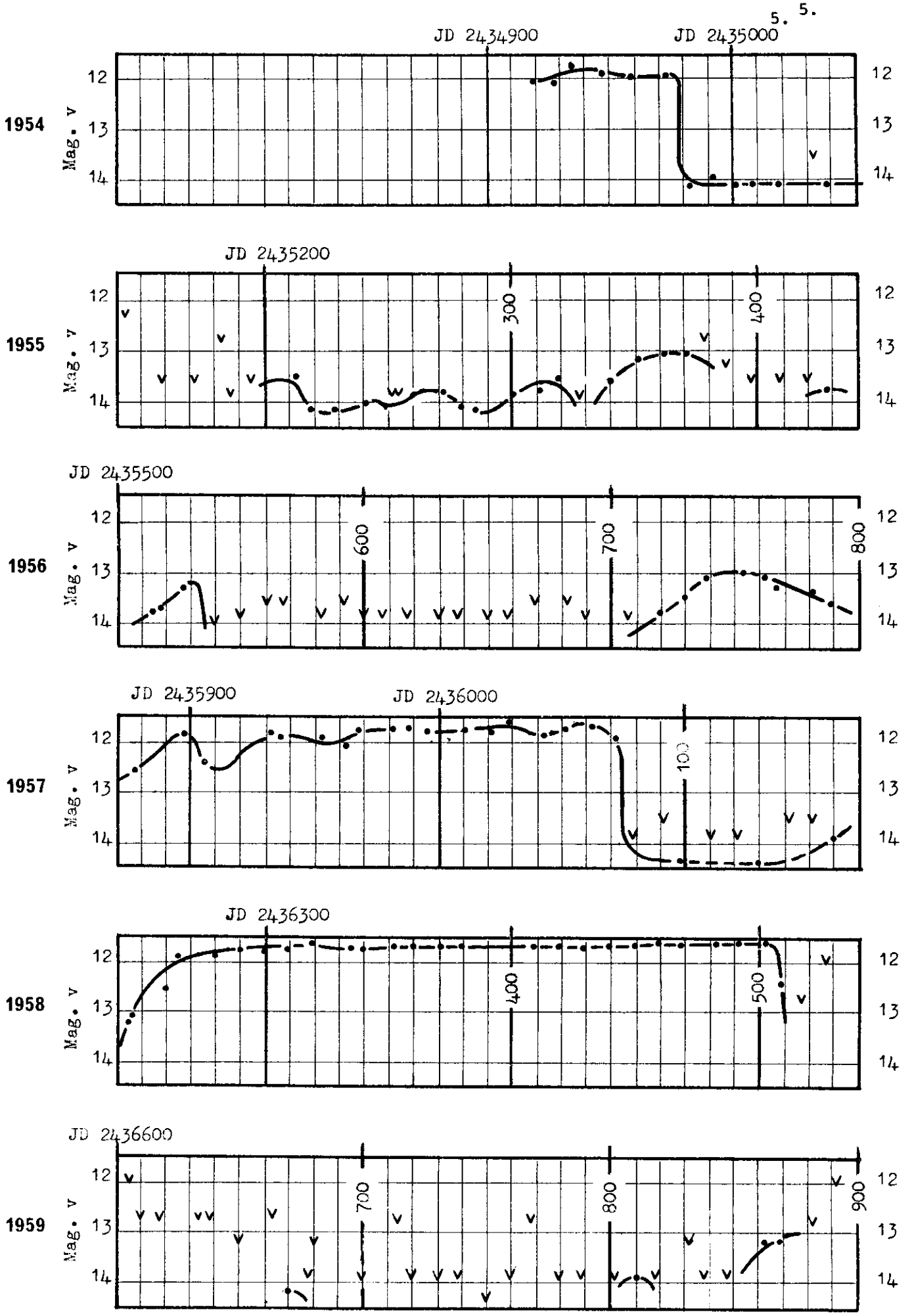

Fig. 1a 183423 V348 SAGITTARII – LIGHT CURVE – 1954 – 1959

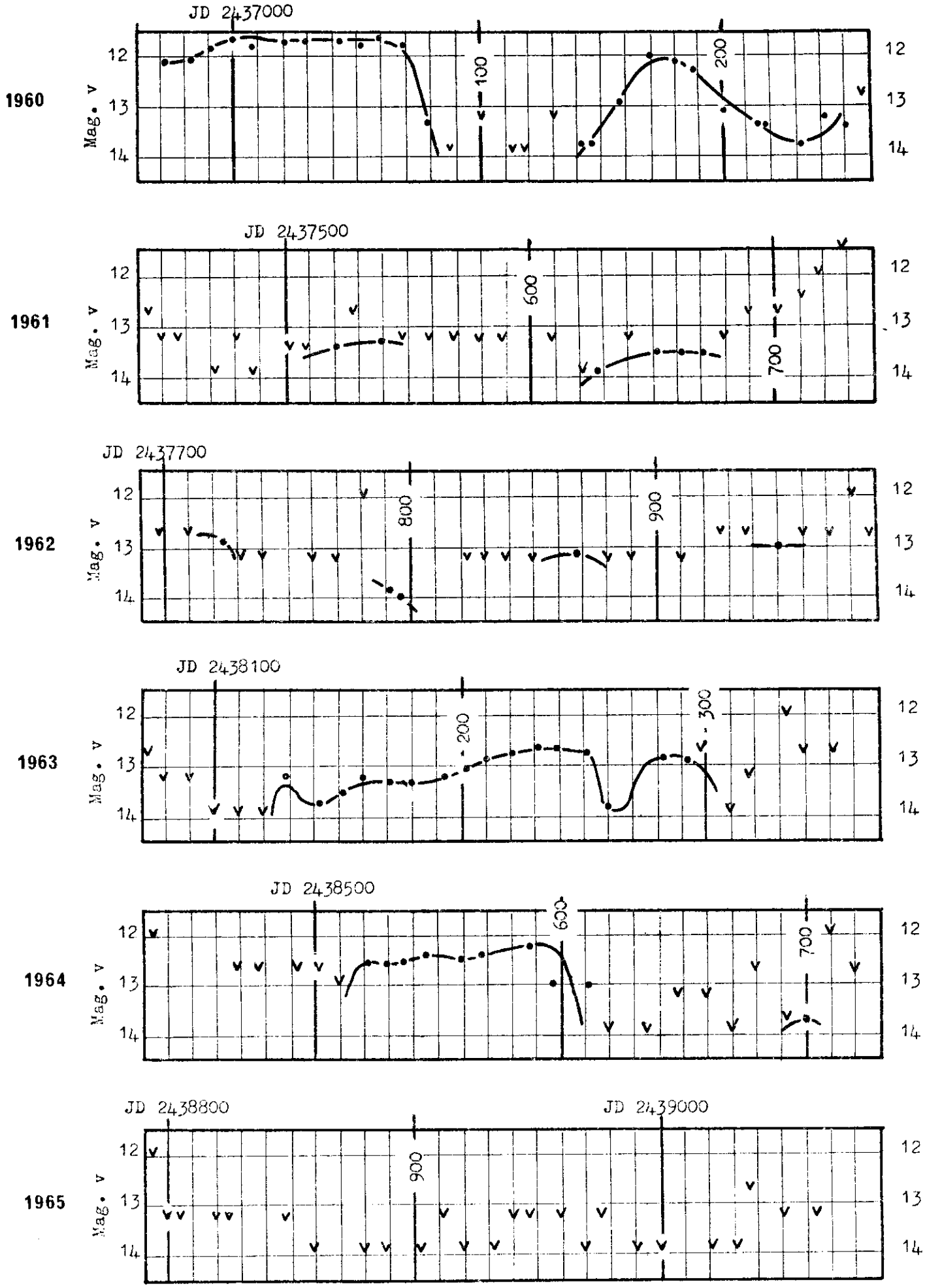

Fig. 1b 183423 – V348 SAGITTARII – LIGHT CURVE – 1960 – 1965

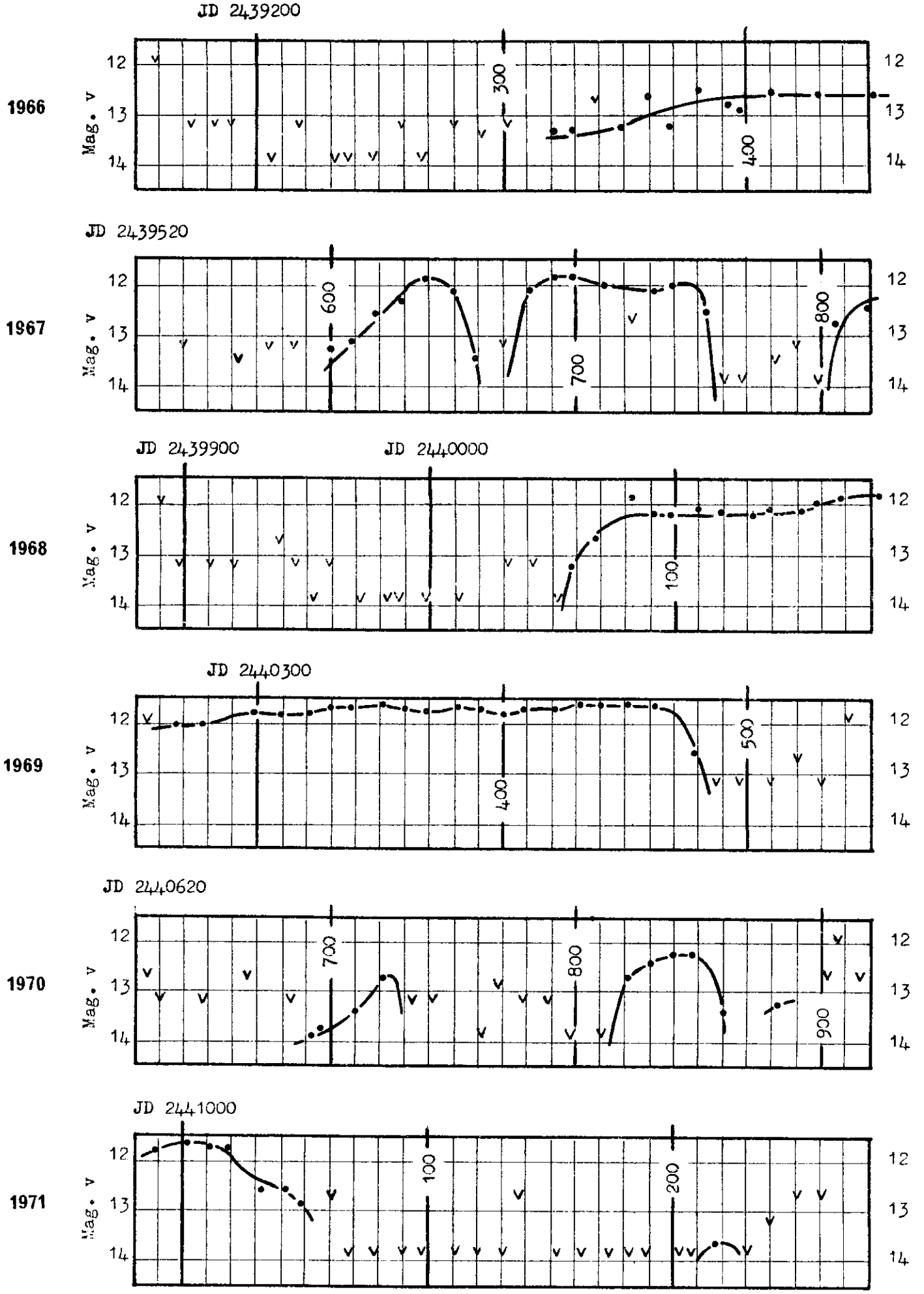

Fig. 1c 183423 V348 SAGITTARII – LIGHT CURVE – 1966 — 1971

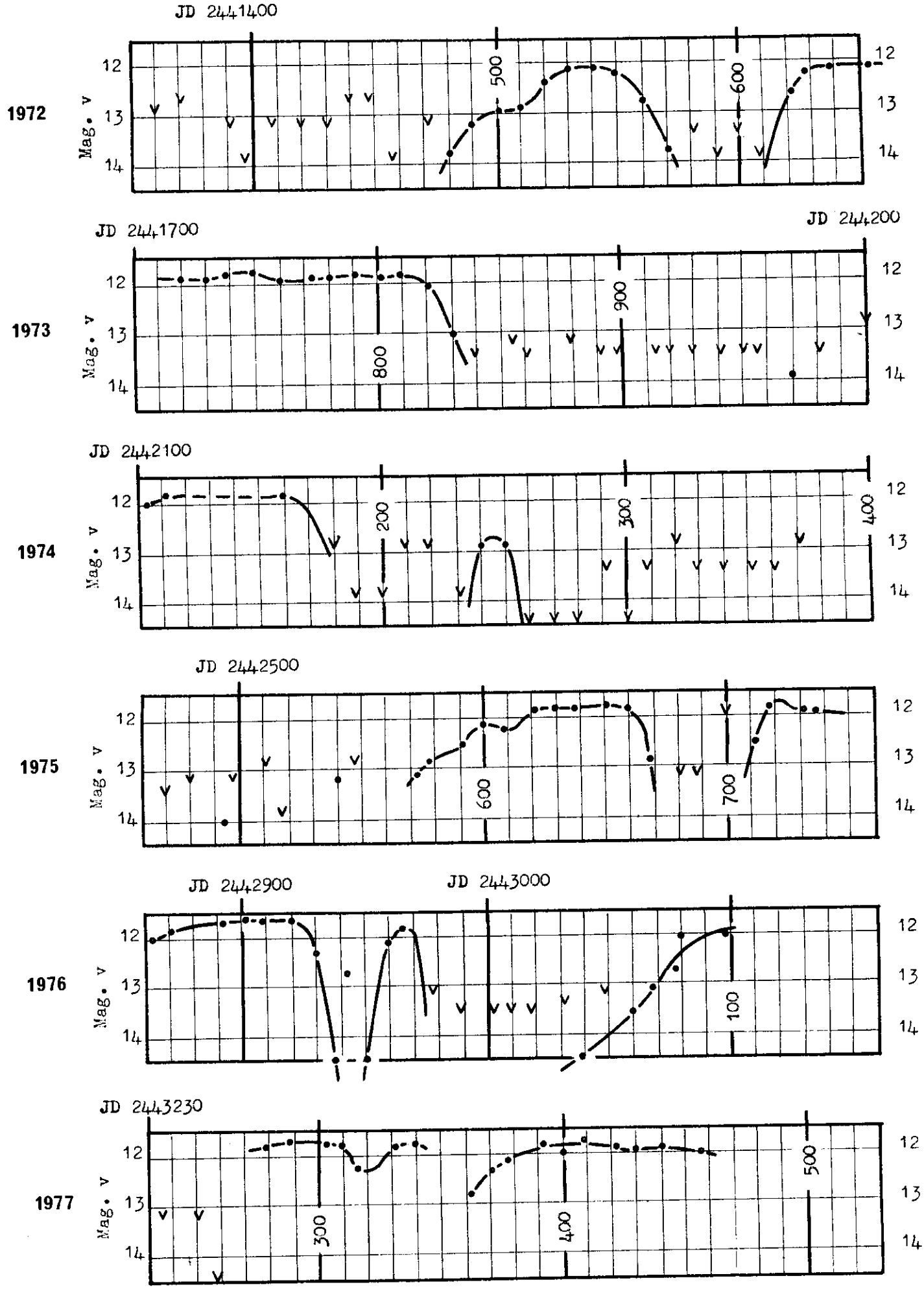

Fig. 1d 183423 V348 SAGITTARII – LIGHT CURVE – 1972 — 1977

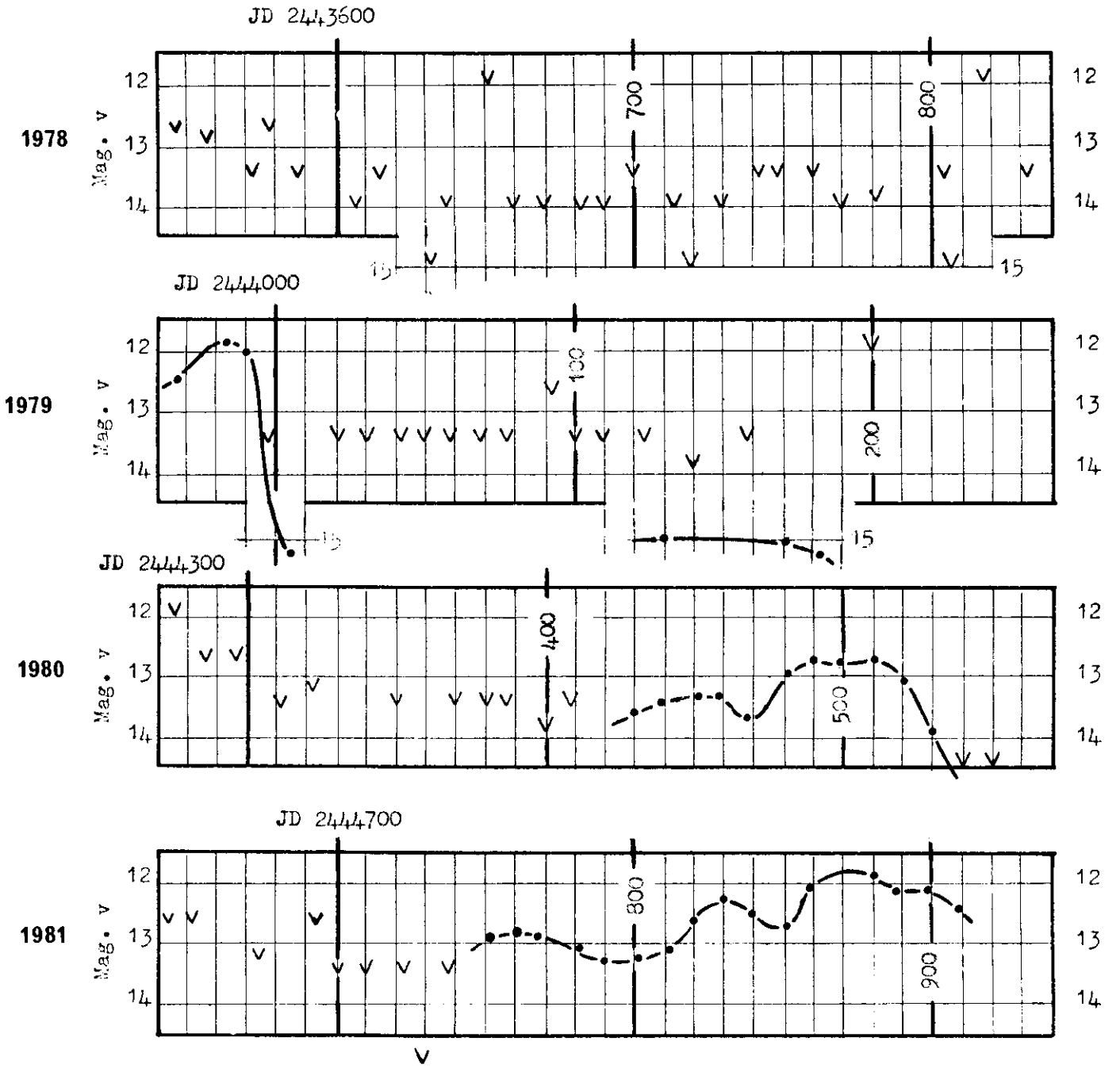

Fig. 1e 183423 V348 SAGITTARII – LIGHT CURVE – 1978 – 1981.

PHOTOELECTRIC PHOTOMETRY OF TY VELORUM AND SOME NEARBY STARS

Brian F. Marino & W.S.G. Walker

Auckland Observatory of the Auckland Astronomical Society

SUMMARY: Three colour UBV observations are presented for TY Velorum and some of the adjacent field stars.

.....

INTRODUCTION.

In a previous issue (1) Morel has presented a brief history of the star TY Vel. During 1981 June and July, at the request of the Section Director, we made a few three colour photoelectric measurements of this star and of some of the nearby field stars. These results are summarised here as it is not our intention to continue observations of these stars in the near future.

OBSERVATIONS.

The observations were made using the Griffiths/Freeth photon detection system on the Edith Winstone-Blackwell 50cm Cassegrain telescope at the Auckland Observatory. The system details have been described previously (2).

The reduced magnitudes are tabulated in Table 1. The star used for comparison is indicated for each object. The lettered stars refer to the chart published by Morel (1), except for stars 'p' and 'q' which are identified on the field sketch in Figure 1.

CONCLUSIONS.

We conclude that during the period of observation no significant variability was shown by stars 'a', 'b', or TY Vel. Some minor variability may be indicated by star 'q' but the variations found are of a similar order to the scatter we would expect at this magnitude level. Star 'p' shows variations which we consider real. The colours of this star are very similar to those found on SX Pav(4), an irregular low amplitude (approximately 0.5 magnitude) variable.

.....

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TABLE 1. Three colour UBV Observations.

Object	J.D. 2444000+	V	B-V	U-B	Comp	Notes
a	774.876	6.32	+1.43	+1.54	HD 78293	1.
b	774.881	7.91	+0.01	-0.15	a	2.
	776.880	7.91	0.00	-0.10	a	
TY Vel	774.883	11.84	+0.14	-0.16	a	
	776.872	11.93	+0.12	-0.19	a	
	777.824	11.87	+0.18	-0.18	a	
	786.772	11.90	+0.11	-0.16	a	
	797.802	11.92	+0.12	-0.16	a	
p	777.828	12.55	+1.41	+0.8:	a	3.
	786.774	12.73	+1.78	+1.0:	a	
	797.805	12.94	+1.75	+0.9:	a	
q	776.891	12.44	+1.50	+1.2:	a	3.
	777.826	12.34	+1.49	+0.7:	a	
	786.777	12.48	+1.41	+0.7:	a	
	797.807	12.53	+1.48	+1.8:	a	

Notes:
1. For HD 78293, V = 6.43, B-V = +0.26, U-B = +0.17 (Cousins and Stoy, 1963).
2. For 'a' deduced V = 6.32, B-V = +1.43, and U-B = +1.54.
3. U-B values of low weight due to small number of net U photons.

Data for TY Vel, from SPM4. [Not in 2MASS]
V = 11.86 (CCD)
B = 12.07

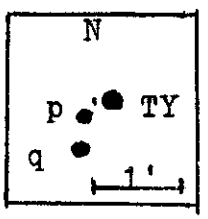

Figure 1. Field Sketch of TY Vel, 'p' and 'q'.

OUTBURSTS OF SOME SOUTHERN DWARF NOVAE---PAPER 3.

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SUMMARY: Outbursts are tabulated and discussed for the dwarf novae: V373 & V485 Cen; BR Lup; AB & IK Nor; V478 & MM Sco; FV & BF Ara; V551 & V1830 Sgr; BP CrA; DH & KX Aql; RZ Sge; KK Tel; TT & TU Ind; VZ Aqr. It is shown that visual monitoring only provides observations of the maximum phase of most of these stars because their maxima magnitudes are 13.0, or fainter. Observations of V591 Cen are also discussed although this star has been shown not to be a C.V.

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INTRODUCTION.

The results presented are derived from 7,073 visual observations by members of the Variable Star Section, R.A.S.N.Z. The interval during which each star was observed differs from one star to another. In general these stars do not attain a maximum brightness exceeding magnitude 13.o, whilst a number do not exceed 14.0 at maximum. This has meant that these stars have not been as closely monitored as might be desirable.
The observed outbursts for each star are listed separately and briefly discussed. The format for each table of outbursts is the same as in Paper 1 (1). In the discussions on individual stars where reference is made to the catalogued data these have been taken from the G.C.V.S. (2) and its supplements.
The observations themselves are given in Paper No. 4 included in this publication.

122045 V373 Cen.

(a) OBSERVATIONS. A total of 557 observations were made during the interval J.D. 2,442,810 to 2,445,120. The observing season is from December through August. This results in large gaps in the records. Even during the observing season V373 Cen has not always been consistently monitored.

(b) OUTBURSTS. The observed outbursts are listed in Table 1. The mean maximum magnitude is 13.81 with a spread from 13.4 to 14.3. This means that even the brightest maxima are about half a magnitude above the threshold of most instruments used. It is probable that many maxima have gone unobserved. In Table 1 the intervals in column 4 not enclosed in brackets are possibly, but not definitely, consecutive. The nine maxima concerned give a mean cycle of 53 days, with the individual intervals ranging from 23 to 78 days. It appears probable that the mean cycle is less than 53 days.
Maxima are either wide, with durations of 5 to 10 days, or narrow with durations of 1 to 3 days. Since only the maximum phase is observable nothing can be stated about the rate of rise or decline, or the form of the light curve. It is possible that some of the wide maxima are of the anomalous type.
Reference to the observations reproduced in Paper No. 4, published in this issue, will show that there are several positive observations which have not been included in Table 1 as outbursts. The reason for this is that the observers concerned queried their estimates as to whether they had identified the variable correctly. In Paper 4 such observations are followed by two question marks. Examples are estimates on 2,443,639 and 871. Some of these observations may be outbursts at the threshold limit but it seems unwise to include them in Table 1 in view of the doubts of the observers themselves.

TABLE 1.

OBSERVED OUTBURSTS OF V373 CENTAURI.

No.	J.D. MAX	MAX. m_v	INT. d	WIDTH. d	TYPE	No. Obs.
1	2,443,616	14.3	....	9	W	3
2	719	13.7	(103)	8	W	5
3	895?	14.4	(176)	1?	N	1
4	929	13.7	34	10	W	12
5	984	13.6	55	8	W	7
6	2,444,049	13.7	65	10	W	7
7	078?	13.6	29	3	N	2
8	342	13.4	(264)	10	W	13
9	409	13.7	67	?	?	3
10	480	13.6	71	1?	N	1
11	614	14.2	(134)	5?	W?	4
12	692	13.6	78	1	N	3
13	748	13.5	56	?	?	2
14	2,445,032	14.0	(284)	2?	?	2
15	055	14.2	23	?	?	1

.....

125132 V485 CENTAURI

(a) OBSERVATIONS. The observing season is December through August which leaves a large gap in the records. However, even during the observing season this star has not been well covered mainly owing to its faintness. The observations shown in Paper 4 in this issue cover the interval J.D. 2,443,604 to 2,445,161 and total 626 estimates. In the discussion that follows these have been combined with the 485 observations previously summarised (3).

(b) OUTBURSTS. It appears that an outburst must be defined as taking place when the star attains a maximum magnitude of 14.2 or brighter. There have been 44 positive observations of V485 Cen, of which 9 have been in the range 14.8 - 15.0. These might be regarded as faint peaks or fluctuations in minimum brightness. However I have disregarded them as outbursts. Reference to Paper 4, Table 2 shows that several positive observations are followed by two question marks indicating that the observer was uncertain of his identification of the variable. Since these were not supported by other positive observations they cannot be accepted as definite outbursts. In addition a positive observation of 12.9 on 2,442, 434 given in (3) cannot be accepted in view of the negative observations at the time. By disregarding these additional doubtful observations there are left 28 positive observations that can definitely be stated to be of outbursts. These are summarised in Table 2 below.
The seven outbursts in Table 2 (which includes those previously summarised) have a mean magnitude at maximum of 13.97, ranging from 13.6 to 14.2. These outbursts have a mean width at their peak of 3.4 days.
It is concluded that the observations do not support the catalogued range of 12.9 to 16.5ptg. The catalogued value for the mean cycle is 12: days. This seems to be unlikely, even allowing for the gaps in the present observations, unless there are many somewhat fainter maxima than magnitude 14.2.

TABLE 2.

OBSERVED OUTBURSTS OF V485 CENTAURI

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH d	TYPE	No. Obs.
1	2,441,452	14.0	....	3	N	5
2	773	14.0	321	6	W	4
3	2,442,248	13.6	475	5	W	6
4	871	14.0	623	4	N	3
5	2,443,934	14.2	1063	4	N	7
6	2,444,081	14.0	147	1	N	2
7	780	14.0	699	1	N	1

.....

123633 V591 CENTAURI.

(a) Observations. It has been shown (4) that this star is probably not a dwarf nova. Observations in Paper 4 include only two possible maxima and in both cases the observer questioned his identification. It is concluded that no outbursts were observed.

152940 BR LUPI.

(a) OBSERVATIONS. A total of 664 observations were made. Although these are from J.D. 2,441,563 to 2,445,138 there are many large gaps in the records as very few observations were made in some years. It was only from 1979 onwards that BR Lup has been reasonably well observed during the observing season of January through September.

(b) OUTBURSTS. Observed outbursts are listed in Table 3 on page 15. The mean maximum magnitude is 13.77 (13.3 to 14.4). With the exception of maxima Nos. 8 and 9, it is probable that no two maxima are consecutive. The catalogued mean cycle is about 24 days. It is probable that many maxima occur and have past unobserved since their maximum brightness would be below 14,0. However, the observations suggest that the mean cycle may be longer than 24 days although, because of the faintness of maxima, this cannot be stated with certainty.

154242 AB NORMAE

(a) OBSERVATIONS. A total of 400 observations have been made, mainly since 1979 January 20. There were two isolated observations in 1976 and the star was not well observed in 1978,

(b) OUTBURSTS. A very doubtful observation of 13.5 on 2,444,464 is the only possible outburst observed. This observation has been disregarded since the correct identification of the variable is uncertain. No confirming observation of AB Nor was obtained elsewhere (4).

161755 IK NORMAE

(a) OBSERVATIONS. IK Nor was observed at the published position (5) from 25 April, 1963 to October 14, 1963. After this there were 2 observations in 1964; 4 in 1972 and more numerous observations in 1973-75--all at the same position. An outburst was detected by B.M. Lewis, Carter Observatory, on 1974 May 9, advice of which was communicated to me some months later. This showed that the published position was in error, and the correction was then

published (6). After this a few observations were made in 1975 and 1976. Since April 30, 1978, IK Nor has been reasonably well observed.

(b0 OUTBURSTS. Table 4 lists the outbursts observed including that reported by B.M. Lewis. He placed the variable as slightly fainter than comparison star "z" which he considered about magnitude 12.5ptg. Subsequently Vogt (7) published a three colour sequence for IK Nor in which the V magnitude of "z" was 13.07 so Lewis's observation is assumed to be at about 13.5V. The detection of an outburst by B. Sumner enabled the Perth Observatory to obtain a confirming photo which showed that Lewis's position was correct. The catalogued range of IK Nor is given as 12.9 to 16.3ptg. It appears that maxima are about a magnitude fainter than 12.9. The mean cycle is stated to be 34 days. This cycle is probably much longer unless there are numerous maxima fainter than 14.0 which have passed unobserved.

TABLE 3.

OBSERVED OUTBURSTS OF BR LUPI.

No.	J.D. MAX.	MAX. m_v	INT d	WIDTH d	TYPE	No. Obs.
1	2,441,745	13.6	....	9	W	5
2	895	14.4?	150	?	N?	1
3	2,442,266	13.6	371	13	W	13
4	630	13.6	364	8	W	6
5	875	13.7	245	1?	N?	2
6	2,443,629	13.6	754	?	?	1
7	901	13.3	272	9?	W	5
8	2,444,000	13.9	99	?	?	1
9	039	13.9	39	?	W?	2
10	313	13.7	274	?	?	2
11	454	14.0	141	5+	W	3
12	730	13.7	276	4?	?	4
13	876	14.0	146	?	N	1
14	2,445,062	13.8	186	?	N	1

TABLE 4

OBSERVED OUTBURSTS OF IK NORMAE.

1	2,442,177	13.5?	....	?	?	Ptg. by B.M. Lewis
2	2,443,728	13.8	1551	1	N	2
3	2,444,682	13.7	954	1?	N?	2
4	2,444,780	13.8	98	1	N	1

TABLE 5

OBSERVED OUTBURSTS OF V478 SCORPII

1	2,443,340	13.9?	....	?	?	1
2	635	13.2?	295	9?	W	2
3	2,444,100	14.5?	465	1?	N	1
4	142?	13.7?	42	1?	N	1
5	431	14.2	289	?	?	2
6	767	14.3	336	?	?	2

171935 V478 SCORPII

(a) OBSERVATIONS. Between 2,443,339 and 2,444,902 only 195 observations were made.

(b) OUTBURSTS. Table 5 on page 15 lists the observed outbursts all of which depend on very few observations. A reported observation at 12.7 on 2,444,155 was rejected as I was satisfied that this was not a correct identification of the variable. Some other possible outbursts have also been disregarded as identification of V478 Sco was questioned by the observers. The limited observations means that nothing definite can be stated about the outbursts of V478 Sco. Maximum magnitude ranges from 13.2 to 14.5, but there is some doubt about the brighter estimate. The observations indicate that it is probable that maxima are more frequent than the observations indicate and that most maxima have a magnitude well below 14.0.

172342 MM SCORPII.

(a) OBSERVATIONS. A. Jones observed MM Sco from 2,436,635 to 2,439,287, with the main observing season March through October. There was then a gap in which MM Sco was not observed. Observations recommenced on 2,441,773. The number of observations in any one year has varied widely.

(b) OUTBURSTS. During the first interval of observations, when A. Jones was the only observer, 12 outbursts were recorded. Their mean magnitude was 13.6 and ranged from 13.3 to 14.1. It is possible that maxima 5 and 6 are the same outburst. The intervals between the observed outbursts ranged from 32 to 827 days, but it cannot be definitely stated that any two maxima were consecutive. Maximum No. 4 appears to have been a very long one persisting for 30 days. Little information can be derived from the remaining maxima recorded by A.Jones since they depend on only a few positive estimates.
In the second interval of observations only four outbursts were recorded, of which No. 14 was the only one well observed. The maximum brightness for No. 13, of 12.4, must be regarded with caution and it can well be that the observer made a mistake in his recording and that the real estimate was 13.4. It has been impossible to verify this. The outbursts are listed in Table 6 on page 17.
It appears that MM Sco has wide maxima at long intervals and that their maximum magnitude is about 13.2 to 13.5. It also has narrow maxima at shorter intervals with mean magnitudes half a magnitude or more fainter than the wide naxima. This raises the possibility that MM Sco may be a faint member of the SU UMa sub type, but no evidence can be produced to show whether the wide maxima are really supermaxima.

172562 FV ARAE

(a) Observations. A.F. Jones observed FV Ara from 2,437,098 to 2,438,255, after which there were no observations until 2,441,773 when several observers commenced to follow this star. Only a few observations were made in 1977 and 1978 so the records are rather broken.

(b) OUTBURSTS. Table 7, on page 17, lists the observed outbursts. During the first interval of observations by A.F. Jones seven maxima were recorded at from 13.5 to 14.0. Two earlier possible maxima of doubtful value are not listed as Jones queried his identification. Maxima Nos. 6, 7 and 8 might be the same outburst but if so it was a long one and there is no evidence to show whether they were the same outburst or not. In the second interval a further eight possible outbursts were recorded, of which two are not listed owing to doubts as to whether the variable had been correctly identified. With one exception the brightness at maximum was 13.7 - 14.0. The exception at 13.1 whilst a first class observation had its magnitude queried by the observer. The faintness of maxima has meant that no outburst has been well observed. It is clear that maxima are much fainter than the catalogued

magnitude of 12. Outbursts are probably much more frequent than the observations indicate.

TABLE 6

OBSERVED OUTBURSTS OF MM SCORPII.

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH d	TYPE	No. Obs.
1	2,436,673	13.5	....	8	W	3
2	2,437,082	13.9?	409	?	?	1 See note
3	909	13.3?	827	?	?	1
4	2,438,144	13.2	235	30	W	10
5	254	13.9	110	1	N	1
6	264	14.1	10	?	?	1
7	309	13.4	45	?	?	1
8	676	13.9	367	1	N	1
9	852	13.5	176	?	?	1
10	884	13.5	32	3	N	4
11	932	13.5	48	?	?	1
12	971	13.3	39	6	W	2
13	2,441,796	12.4??	....	?	?	1
14	2,444,011	13.3	....	8?	W	8
15	283	14.0	272	?	?	2
16	756	14.2	473	?	?	1

No.2. Recorded as (13.5 with a class 3 observations of 13.9?

TABLE 7.

OBSERVED OUTBURSTS OF FV ARAE.

1	2,437,113	13.8	....	?	?	1
2	229	13.5	116	?	?	2 See Note
3	457	13.7	228	?	?	1 Doubtful
4	671	13.5?	214	?	?	1
5	739	13.7?	68	?	?	2
6	2,438,116	13.9	377	?	?	1
7	124	14.0	8	?	?	2
8	137	13.8	13	6?	W	2
9	2,443,040	14.0	....	?	N?	1
10	2,444,381	13.0	....	1	N	1 See Note
11	515	13.1	134	3	N	2
12	547	13.7	32	?	?	1
13	637	13.7?	90	?	?	1
14	721	13.7?	84	?	N?	1
15	738	13.6	17	?	?	3

NOTES:

No. 2. Was also recorded at 12.9?? but this considered very doubtful by observer.

No. 10. Magnitude probably too bright as observation made in moonlight.

173047 BF ARAE

(a) OBSERVATIONS. These commenced on 2,443,991 and 119 estimates were made up to 2,444,897. The main observing season is April through October, with a few observations in February, March and November.

(b) OUTBURSTS. Four outbursts have been observed and are shown in Table 8. No worth while data can be summarised from such a small sample.

TABLE 8.

OB ERVED OUTBURSTS OF BF ARAE.

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH. d	TYPE.	No. OBS
1	2,444,054	13.4	....	4	N	6
2	129	13.0	75	6	W	5
3	459	13.9	330	?	?	1
4	794	13.2	335	?	?	3

175434 V551 SAGITTARII.

(a) OBSERVATIONS. The observing season is February through October. A total of 142 observations were made between 2,443,728 and 2,444,902.

(b) OUTBURSTS. Three outbursts were recorded as shown in Table 9. The magnitudes are approximate and have been estimated in the absence of reliable sequence magnitudes. Maxima No. 2 was probably earlier than shown as it appears that only the decline was seen. The outbursts are too few to enable any conclusions to be drawn from them.

TABLE 9.

OBSERVED OUTBURSTS OF V 551 SAGITTARII.

No.	J.D. MAX	MAX. m_v	INT. d	WIDTH d	TYPE	No. Obs.
1	2,443,806	13.4	....	4?	?	3
2	2,444,018?	14.5	212	?	?	3
3	485	13.6	467	2?	N?	2

183037 BP CORONAE AUSTRINAE

(a) OBSERVATIONS. This star has not been well observed. There were only 59 observations between 2,443,298 and 2,444,904.

(b) OUTBURSTS. Twelve outbursts are listed in Table 10. The maximum magnitude is from 13.8 to 14.4. Maxima Nos. 3 and 4 appear to be consecutive but none of the remaining maxima can be definitely stated to be successive. This is a Z Cam type variable and the catalogued mean cycle is 13.5 days. The observations cannot confirm this because they are not numerous enough but the mean cycle is obviously short and maximum brightness faint.

TABLE 10.

OBSERVED OUTBURSTS OF BP CORONAE AUSTRINAE.

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH	TYPE.	No. Obs.	
1	2,443,434	14.1	....	?	?	1	
2	991	14.3	557	4,	?	2	
3	2,444,013	14.2	22	?	?	1	
4	024	14.4	11	?	?	1	
5	078	13.9	54	?	?	1	
6	117	14.3	39	?	?	1	
7	456	13.9	339	5?	W?	4	
8	484	13.8	28	?	?	2	
9	707	14.3	223	?	?	1	
10	792?	-14.5	85	?	?	3	Decline only seen
11	831	-14.5	39	?	?	2	Decline only seen
12	904	14.2	73	?	?	2	Rise only seen.

180727 V1830 SAGITTARII.

(a) OBSERVATIONS. Between 2,443,998 and 2,445,176 a total of 198 observations were made . The crowded field makes it difficult to observe to as faint a limit as in most other fields.

(b) OUTBURSTS. Two outbursts have been observed, of which the first was confirmed by a photo at the Perth Observatory. In addition there may have been another outburst around 2,444,765. The observer (A.Jones) reported that he was uncertain of his two estimates at this time owing to the crowded field.

TABLE 11.

OBSERVED OUTBURSTS OF V1830 SAGITTARII.

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH. d	TYPE.	No. Obs.
1	2,444,465	12.0	....	?	?	2
2	791	11.5	326	?	?	2

192010 DH AQUILAE.

(a) OBSERVATIONS. Observing commenced on 2,444,355 and only 94 observations by two observers had been made up to 2,445,095.

(b) OUTBURSTS. One outburst at magnitude 13.8 was recorded on 2,444,455. This dpends on a single positive observation.

192914 KX AQUILAE

(a) OBSERVATIONS. A limited number of observations were made in 1959-60-61. A single observation was made in 1974 but from mid-1976 KX Aql has been observed with the estimates more numerous from 1979 onwards. The observing season is May through October with a few records in April and early November each year.

(b) OUTBURSTS. A single positive observation in the first interval of observations was rejected as the observer (A. Jones) considered it very doubtful. Table 12 lists possible outbursts, all of which depend on only one or two positive observations. I have rejected positive observations of 10.8 on 2,442,949 and of 11.2 on 2,443,648 as I doubt whether KX Aql reaches these magnitudes. It is probable that the observers concerned misidentified the variable. The catalogued range is 12.5 to 17:ptg and all the other positive observations are from magnitude 13.0 to 14.0. Nothing can be stated regarding the width of outbursts or their types owing to the limited positive observations. It is probable that the mean cycle is fairly short.

TABLE 12.

POSSIBLE OUTBURSTS OF KX AQUILAE.

No	J.D. MAX.	MAX. m_v	INT, d	No. Obs.
1	2,444,033	13.8?	....	1
2	076	13.9	43	1
3	113	13.8	37	1
4	377	14.0	(264)	2
5	400	14.0	23	1
6	466	13.0	66	1
7	483	13.0	17	3
8	711	13.8	(228)	1
9	754	13.8	43	1
10	874	13.5	120	1

195816 RZ SAGITTAE

(a) OBSERVATIONS. The main observing season is July through October with a few observations in May, June and November. Observations commenced on 2,442,987 and 294 estimates had been made up to 2,444,829.

(b) OUTBURSTS. Most of the ten outbursts shown in Table 13 are based on only a few observations. It is not possible to state definitely that any two outbursts were consecutive, but Nos. 5 and 6; 6 and 7; 8 and 9; 9 and 10 may be. The intervals in brackets in Table 13 are long and caused by the gap between observing seasons. The remaining outbursts give a mean cycle of 64 days. The sample is too small to enable any firm conclusions to be drawn but they do indicate that the mean cycle is probably shorter than the catalogued value of 260 days. Maximum magnitude ranges from 12.1 to 13.5. The best observed maxima are naturally the brightest and it can well be that only portion of the outbursts have been observed for the fainter outbursts. Probably the brighter maxima have a longer duration than the faint maxima.

202152 KK TELESCOPII

(a) OBSERVATIONS. Between 2,442,271 and 2,444,970 a total of 277 observations were made. Coverage was very poor in 1976-78 whilst in other years KK Tel has not been monitored as closely as desirable.

(b) OUTBURSTS. Four outbursts have been recorded with maximum magnitude of 13.2 to 14.0. Possibly many maxima occur just below 14.0 but the records are not sufficient to prove whether this is correct or not. Nor can any conclusions be arrived at concerning the mean cycle as the sample is too limited.

TABLE 13.

OBSERVED OUTBURSTS OF RZ SAGITTAE

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH d	TYPE	No. OBS.
1	2,443,003	13.1	....	?	?	1
2	375	12.5	(372)	2?	N?	4
3	685	12.3	(310)	?	?	1
4	811	12.1	126	4?	W?	4
52,444,070		12.2	(259)	9	W	19
6	140	13.3	70	1	N	2
7	175	13.0	35	?	?	1
8	427?	13.4	(252)	?	?	1
9	490	13.0	63	2?	N	2
10	516	13.5	26	?	?	1

TABLE 14.

OBSERVED OUTBURSTS OF KK TELESCOPII.

1	2,442,328	13.9	....	11	W	4
2	2,443,733	13.9	(1405)	1	N	2
3	2,444,371	13.2	(638)	4	N	4
4	455	14.0	84	1?	N	1

TABLE 15.

OBSERVED OUTBURSTS OF TT INDI

1	2,444,491	12.2	....	4+	W	5

TABLE 16.

OBSERVED OUTBURSTS OF TU INDI.

1	2,442,272	13.8	....	4+?	W?	4
2	297	14.1	25	?	?	2
3	307	14.0	10	?	?	2
4	330	14.2	23	?	?	1
5	341	14.1	11	?	?	1
6	361	14.1	20	?	N	1
7	395	14.1	34	?	N	1
8	494	14.1	(99)	?	?	1
9	520	13.9	26	?	?	1
10	2,443,405	12.5	....	?	?	1
11	427	13.0	22	2	N	2
12	2,444,523	13.6	....	?	?	3
13	708	13.9	(185)	?	?	1
14	877	13.9	(169)	?	?	1
15	932	13.9	55	?	N	1

202556 TT INDI

(a) OBSERVATIONS. Between 2,444,030 and 2,444,970 only 73 observations were made. TT Ind has been poorly observed and there are many gaps in the records.

(b) OUTBURSTS. Table 15 on page 21 gives details of the only outburst observed. The maximum magnitude of 12.2 is much brighter than the catalogued value of 14.0 ptg. TT Ind deserves much closer monitoring.

202645 TU INDI

(a) OBSERVATIONS. TU Ind is another star that has not been well followed. A total of 111 observations were made between 2,442,271 and 2,444,970. There were few observations in 1975 and 1977 with more in 1976; 1978 and 1979.

(b) OUTBURSTS. Despite the fragmentary nature of the observations fifteen outbursts were observed. These are shown on page 21 in Table 16. They appear to be of two types---faint with maximum magnitudes of 13.9 to 14.2 and brighter maxima of 12.5 to 13.6. Although most outbursts depend on very few observations it appears that the mean cycle is short. No two maxima can be definitely stated to be consecutive but the most probable examples give a mean cycle of 21.4 days. Possibly TU Ind is of the Z Cam sub type.

212503 VZ Aquarii.

(a) OBSERVATIONS. A.F. Jones observed VZ Aqr in 1959-61 and in 1972 after which there were no observations until 2,444,051 (1979 June 26). Since then the star has been well monitored during the observing season, May through November. The observations discussed here are up to 2,444,870.

(b) OUTBURSTS. Table 17 lists the 12 outbursts observed. These appear to fall into two types, i.e. wide maxima of from 12.7 to 13.2 and narrow maxima when the maximum brightness is usually , but not always, from 13.6 to 14.0 The wide maxima have a longer duration. VZ Aqr probably has a short mean cycle. It cannot be definitely stated that any two maxima are consecutive although it is probable that some are so. The mean cycle is probably shorter than 53.4 days, which is the mean from seven intervals ranging from 14 to 89 days.

TABLE 17.

OBSERVED OUTBURSTS OF VZ AQUARII.

No.	J.D. MAX.	MAX. m_v	INT. d	WIDTH d	TYPE	No. Obs.
1	2,437,465	13.2	....	11	W	3
2	2,441,493	13.9	....	1	N	1
3	551	13.1	58	2?	N	1
4	565	13.0	14	3	N	4
5	2,444,051	12.7	....	9	W	7
6	349	13.6	(298)	3	N	3
7	438	13.4	89	1	N	3
8	462	13.6	24	?	?	1
9	524	13.6	62	?	?	1
10	727	14.0?	(203)	1	N	1
11	765	12.7	38	5?	W?	4
12	854	13.1	89	6?	W	4

CONCLUSIONS.

The stars discussed in this paper are mainly those dwarf novae that have maxima at the threshold of most instruments used. At this limit it is easy for an observer to misidentify the variable especially if it lies in a crowded field or has a faint star close to it. All experienced observers have very clearly indicated in their records if they had doubts about the identification of the variable. I may have erred on the cautious side in disregarding such observations. The number of these faint maxima tabulated has largely been dependent on how often the observers with the largest instruments observed. For that reason and also because all that is seen is the maximum phase it has been impossible to provide details of the rates of rise and fall and only scanty data on maxima magnitudes and mean cycles.

A study of the results presented in this paper will show observers how they can make more useful contributions. If their instrumental threshold is say 12.5 it is quite useless observing the stars that have maxima of 13.5-14.0. However more monitoring of the brighter variables such as V1830 Sgr; RZ Sge; TT Ind and VZ Aqr is urgently required.

ACKNOWLEDGEMENTS

I wish to thank all observers for their observations without which this paper could not have been written.

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.....

OBSERVATIONS OF SOME SOUTHERN DWARF NOVAE---PAPER No. 4.

Frank M. Bateson

SUMMARY. Visual observations of the dwarf novae discussed in Paper 3 are listed.

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OBSERVATIONS.

The visual observations on the following pages have been made by members of the Variable Star Section, Royal Astronomical Society of New Zealand. The intervals during which the 20 stars were monitored differs from one star to another.

In presenting these results the symbol "(" is used for "Fainter than". A single question mark following a magnitude indicates that the observer reported a class 3 observation owing to some hindrance to observation such as clouds, moonlight, etc. When an observation is followed by two question marks it indicates that the observer was uncertain of the correct identification of the variable concerned.

Not all the observations made have been included. If there were two, or more, negative observations of a variable on the same night only the faintest appears. Many observations recorded a negative observation very much brighter than the possible maximum magnitude of some stars. An example is an observation of say (12.5 for a star that does not rise above magnitude 13.9. Such observations have been omitted from Table 2 which gives the J.D. of observation and the magnitude, be it negative or positive. Some of the earlier observations have also been omitted because they were mainly negative at fairly bright limits.

OBSERVERS

A total of 7,073 observations were made. The observers who contributed are shown in Table 1.

TABLE 1.

OBSERVERS"s TOTALS OF OBSERVATIONS.

BROWN, N.	845	MENZIES, B.	111
CRAGG, T.	70	McMILLAN, S.	76
FREETH, G.	340	MATCHETT, V.	412
HARRIES-HARRIS, E.	82	OVERBEEK, M	170
HULL, O.	662	PARKINSON, M.	32
HOVELL, S.	261	ROWE, G.	179
HERS, J.	26	SUMNER, B.	555
JONES, A.	1542	TREGASKIS, B.	42
JONES, M.	218	TAYLOR, N.	337
MARINO, B.	765	WILLIAMS, P.	247
19 Observers with less than 20 each			101

TOTAL 7,073

TABLE 2.

OBSERVATIONS OF SOUTHERN DWARF NOVAE.

V373 Cen 122045		V373 Cen 122045		V373 Cen 122045		V373 Cen 122045		V373 Cen 122045	
2442000+		2443000+		2443000+		2444000+		2444000+	
810.9	(13.5	920.95	(13.8	995.03	(14.4	103.79	(13.3	336.92	(14.0
812.9	(13.5	928.01	14.0	995.92	(14.0	104.90	(14.0	339.82	(13.6
818.9	(13.5	928.08	(14.3	996.04	(14.3	105.84	(14.0	340.09	13.8
819.9	(13.5	929.01	13.7	996.80	(13.6	112.80	(13.5	341.13	13.6
835.9	(13.5	929.93	13.7	997.27	(14.4	113.82	(13.6	341.82	13.6
872.9	(14.5	930.92	13.6	998.27	(14.4	222.28	(14.0	341.87	13.7
901.9	(14.5	932.08	13.5			224.30	(14.0	342.13	13.4
		933.10	13.6			227.29	15.4	342.91	(13.4
2443000+				2444000+					
339.93	(12.0	934.07	14.1	000.26	(14.4	230.26	(14.0	342.94	13.2
359.90	(14.3	935.09	14.2	009.90	(14.0	231.30	(14.0	343.95	13.4
522.15	(14.4	936.19	13.7	011.04	(14.4	233.27	(14.0	344.08	13.6
547.11	(14.0	937.11	13.7	012.08	(14.4	234.27	(14.3	344.80	13.6
548.01	(13.8	937.95	13.8	015.93	(14.0	236.29	(14.3	345.96	13.5
550.17	(13.4	938.06	14.2	018.98	(14.4	249.18	(14.0	346.99	13.6
566.96	(13.8	939.07	(14.3	019.79	(14.0	250.19	(13.4	347.89	13.7
572.91	(14.3	941.16	(14.0	021.92	(14.0	252.18	(14.0	348.86	(13.6
602.97	(14.3	943.29	(14.4	023.80	(13.7	255.25	15.4	349.90	13.8
603.82	(14.3	949.01	(14.3	024.01	(14.4	256.20	(14.0	350.90	(14.0
614.94	14.6?	951.04	(14.4	028.0	(16.0	257.31	(14.3	354.90	(13.8
615.90	14.3	951.92	(14.0	038.90	(14.0	258.23	(14.3	361.78	(13.5
623.90	14.5	953.16	(14.3	038.95	(14.4	261.17	(13.4	362.80	(13.3
631.90	(14.6	955.04	(14.4	041.88	(14.0	278.13	(14.0	366.80	(13.6
639.16	13.7??	956.13	(14.4	042.94	(14.3	279.95	13.9??	367.81	(13.6
642.91	(14.3	958.04	(14.0	043.86	(14.1	280.90	(13.3	368.79	13.8??
666.11	(14.4	960.0	(15.5	048.86	13.7	282.12	(14.0	369.10	(14.3
684.92	(14.6	960.01	(14.4	051.86	13.8	283.24	(14.0	369.92	(14.0
696.90	(14.6	962.12	(14.3	052.89	13.7	284.15	15.2	370.93	(13.9
718.89	13.7	963.10	(14.4	054.08	13.6	285.17	(14.3	371.06	15.3
719.91	13.7	966.09	(14.0	054.92	13.7	286.12	(14.3	372.82	(13.5
720.91	13.8	968.02	(14.4	056.91	13.8	286.96	(13.7	374.98	15.6
723.89	13.8	969.28	(14.4	058.90	13.8	288.96	(14.0	378.07	(14.3
726.90	14.0	970.35	(14.3	059.79	(13.6	292.01	(13.6	378.80	13.2??
745.98	(14.3	971.24	(14.4	066.85	(14.0	292.16	(14.0	379.81	(13.0
871.22	14.1??	978.85	(13.6	067.79	(13.9	293.20	(14.0	380.85	(13.3
878.19	(14.4	979.82	(14.0	068.99	(14.0	304.91	(13.6	382.93	(13.7
879.2	(16.0	980.81	(13.3	069.78	(13.5	304.94	(14.0	392.90	(14.0
881.17	(14.0	981.81	(13.4	071.96	(14.3	307.93	(13.4	395.80	(13.9
882.28	(14.4	981.89	14.0	073.78	(13.5	308.87	(13.3	396.92	(14.0
894.16	(14.0	982.88	(13.5	074.79	(13.5	310.86	(13.6	398.78	(13.9
895.15	14.4?	983.93	13.6	077.81	13.6	311.93	(14.0	400.80	(13.6
898.17	(14.4	984.14	14.1	079.90	(14.0	313.10	(14.0	402.80	(13.8
899.15	(14.0	985.91	13.8	080.80	13.8	314.89	(13.5	402.98	(14.0
900.12	(14.0	987.02	14.8	083.79	(13.6	319.06	(14.0	403.78	(13.6
903.20	(14.4	987.93	14.2	084.79	(13.6	320.12	(14.0	406.81	(13.4
904.15	(14.3	988.81	(13.6	090.81	(13.3	320.99	(14.0	407.77	14.0??
908.14	(14.4	990.07	14.8	095.90	(14.0	322.88	(13.2	407.90	(14.0
910.28	(14.4	991.04	(14.4	100.91	(14.0	332.83	(13.3	408.80	13.7??
913.30	(14.4	991.98	(14.4	101.81	(14.1	333.89	(14.0	409.85	13.7?

TABLE 2 (cont)

V373 Cen 122045		V373 Cen 122045		V373 Cen 122045		V373 Cen 122045		V591 Cen 123633	
2444000+		2444000+		2444000+		2445000+		2442000+	
421.79	(13.6	691.87	13.6	816.85	(13.6	078.91	(14.0	810.9	(14.0
424.80	(14.0	692.82	13.1	818.89	(14.0	080.92	(14.0	812.9	(14.0
426.89	(14.0	692.97	(13.4	820.80	(13.6	081.86	(14.0	819.9	(14.0
428.86	(13.4	694.83	(13.0	821.80	(13.6	082.86	(14.0	835.9	(14/0
433.82	(13.3	698.82	(13.5	842.82	(13.5	083.85	(14.0	839.9	(13.5
436.92	(14.0	699.09	(14.0	843.81	(13.6	083.94	(13.7	872.08	15.5
437.90	(14.0	699.81	(13.6	848.91	(13.7	084.81	13.6??	901.9	(13.5
442.95	(13.8	701.96	(14.0	959.10	(14.0	084.91	(14.0		
444.79	(13.3	702.82	(13.3	964.07	(14.0	085.81	13.3??		
449.78	(13.3	703.90	(13.6	965.15	(14.0	085.91	(14.0	2443000+	
450.81	(13.8	704.82	(13.5	966.07	(14.0	086.85	(14.0	198.02	(14.2
451.92	(13.8	710.81	(13.2	967.21	15.7	087.80	13.3??	226.84	(14.2
454.91	(14.0	712.84	(13.3	972.09	(14.0	087.88	(14.0	253.86	(14.4
455.83	(13.3	716.86	(13.3	975.16	(13.8	087.91	(14.0	255.84	(14.4
456.89	(14.0	717.92	(14.0	999.02	(13.6	089.80	(13.5	256.88	(14.4
459,82	(13.6	719.80	(13.6			090.82	(13.3	276.85	(14.4
460.86	(13.4	721.81	(13.6	2445000+		091.81	(13.3	278.82	(14.4
461.92	(13.6	722.90	(13.3	000.14	(14.0	092.81	(13.3	298.77	(14.2
462.89	(13.6	723.83	(13.3	001.15	(14.0	094.95	(13.3	304.90	(14.2
463.88	(13.6	724.86	(13.5	005.14	(14.0	099.79	(13.3	307.93	(14.4
464.89	(13.4	725.83	(13.6	007.16	(14.0	102.83	(14.0	308.77	(14.4
465.84	(13.4	726.91	(14.0	011.89	(13.6	104.82	(14.0	309.87	(14.4
467.85	(14.0	734.80	(13.6	013.91	(14.0	105.92	(13.4	316.81	(14.4
472.89	(13.4	747.82	13.5	017.90	(14.0	107.00	16.3	329.79	(14.4
479.86	(13.4	748.78	13.5	017.93	(13.7	107.80	(14.0	331.77	(14.4
479.89	13.6	750.79	(13.3	025.94	(14.0	111.79	(13.3	343.0	(15.6
480.88	(13.4	751.79	(13.4	032.18	14.0	112.90	(13.8	361.81	(14.4
481.88	(13.4	752.78	(13.6	034.18	13.9	113.92	(13.4	371.81	(14.4
482.87	(13.4	753.87	(13.4	041.89	(13.6	114.82	(14.0	546.06	14.2??
484.89	(13.7	754.84	(13.4	042.89	(14.0	115.90	(14.0	548.12	(14.4
609.28	(14.3	762.80	(13.6	044.93	(14.0	116.90	(14.0	579.87	(14.4
610.14	(14.3	763.93	(14.0	045.89	(14.0	117.79	(13.3	580.84	(14.4
611.25	(14.3	766.79	(13.6	046.91	(13.4	118.79	(13.5	582.87	(14.4
612.29	(14.3	778.92	(14.0	050.94	(14.0	119.78	(13.3	583.84	(14.2
614.25	14.2	779.91	(14.0	053.90	(14.3			586.12	(14.4
615.25	14.1	780.79	(13.6	055.01	14.2			587.93	(14.2
618.25	14.2	783.91	(14.0	055.19	(13.4			603.82	(14.4
619.30	14.2	784.86	(14.3	055.91	(14.0			604.83	(14.4
629.99	(13.4	786.91	(14.0	056.00	(14.0			610.83	(14.4
632.01	(13.4	793.92	(13.4	056.88	(14.0			614.31	14.2?
632.95	(13.3	797.78	(13.3	057.92	(14.0			628.88	(14.2
634.25	15.3	798.81	(13.4	062.19	(14.0			633.10	(14.2
636.18	(14.0	805.83	(14.0	070.81	(14.0			633.84	(14.2
657.93	(13.4	806.82	(14.0	071.82	(13.6			634.14	(14.2
665.01	(13.4	807.91	(14.0	073.92	(14.0			635.15	(14.8
668.99	(13.3	808.80	(13.4	074.86	(14.0			639.12	(14.4
672.93	(13.4	809.82	(14.0	075.85	(14.3			645.15	16.2
678.88	(13.0	811.80	(13.3	076.84	(14.0			652.00	(15.5
691.84	13.6	815.79	(13.5	077.82	(14.0			656.81	(14.2

TABLE 2 (cont)

V591 Cen 123633		V485 Cen 125132		V485 Cen 125132		V485 Cen 125132		V485 Cen 125132	
2443000+		2443000+		2443000+		2444000+		2444000+	
657.03	(14.0	604.13	(14.0	951.04	(14.0	080.83	14.0	340.83	(14.0
659.10	14.5??	614.20	(14.8	953.14	(14.8	081.81	14.3	343.86	(14.0
661.14	(14.4	627.02	(14.0	955.04	(14.0	083.89	(13.9	346.94	14.3??
721.91	(14.4	633.09	(14.0	956.12	(14.8	095.80	(13.9	347.96	(13.9
728.02	(14.4	634.06	(13.9	962.12	14.8	101.86	(13.9	348.86	(14.0
882.26	(14.4	635.06	(13.9	963.09	(14.0	105.84	(13.9	362.82	(14.0
908.21	(15.0	638.14	(14.8	966.09	(14.0	106.01	(13.9	367.90	(14.0
910.27	(14.8	639.12	(14.0	968.06	(13.9	106.82	(13.9	367.94	(14.8
913.33	(14.4	640.08	(13.9	969.27	(14.8	112.85	(13.9	370.93	(13.9
933.25	(14.8	645.16	(16.0	970.23	(14.8	222.13	(14.0	371.04	14.9
936.20	(14.4	655.08	(13.9	987.01	(14.8	222.31	(14.0	372.93	(14.8
936.22	(15.0	657.02	(14.0	990.05	(14.8	224.32	(14.0	375.01	16.0
937.13	(14.4	659.10	(14.0	991.03	(14.8	227.12	(14.0	375.83	(14.0
943.29	(14.4	661.14	(14.0	991.98	(14.8	227.32	(15.5	378.88	(14.0
951.04	(14.4	662.07	(14.0	994.98	14.8	228.12	(14.0	382.94	(13.9
953.14	(14.4	666.05	(13.9	996.05	(14.4	229.13	(14.0	392.92	(14.0
956.12	(14.4	690.04	(14.0	997.26	(14.8	230.08	(14.0	395.86	(14.0
960.0	16.1	698.02	(14.0	998.26	(14.8	230.32	(14.0	397.81	(14.0
960.83	(14.2	699.04	(14.0			231.32	(14.0	398.86	(13.9
963.10	(14.4	700.13	(13.9	2444000+		236.30	(14.0	404.83	(13.9
964.15	(15.0	717.97	(14.0	000.27	(14.8	250.22	(13.9	405.86	14.0??
966.09	(14.4	722.97	(14.0	011.04	(14.8	255.28	(15.6	405.88	(13.9
968.06	(14.4	728.02	(14.0	011.18	(15.0	257.31	(14.0	407.90	(13.9
969.27	(14.4	743.01	(14.0	012.09	(14.8	258.24	(14.0	408.92	(14.0
987.01	(14.4	745.97	(14.0	018.98	(14.0	260.14	(14.0	424.83	(14.0
990.06	(14.4	750.98	(14.0	019.16	(13.9	263.26	(15.6	425.83	(14.0
991.03	(14.4	871.23	(14.8	024.01	(14.8	264.17	(14.0	426.92	(14.0
991.93	(14.4	878.19	(13.9	028.0	(15.7	265.25	(15.6	428.87	(13.9
994.98	(14.4	879.21	16.2	038.96	(14.5	280.17	(14.0	430.92	(13.9
996.05	(14.4	882.26	(14.8	042.95	(14.0	283.25	15.0	432.96	(14.0
997.26	(14.4	895.16	(13.9	045.88	(14.8	284.19	(14.3	434.90	(13.9
998.26	(14.4	898.18	(14.5	046.92	(14.8	285.19	(14.0	435.80	(13.9
		899.15	(13.9	050.89	(14.8	286.20	(15.5	436.94	(13.9
2444000+		903.17	(13.9	051.91	(14.0	292.17	(14.0	437.88	(13.9
000.27	(14.4	904.16	(14.0	057.81	(14.0	293.20	(14.0	438.96	(13.9
011.04	(14.8	910.26	(14.8	058.91	(14.0	306.99	(13.9	450.87	(13.9
012.09	(14.8	913.33	(14.0	066.79	(14.8	307.89	(13.9	453.90	(13.9
023.81	(14.0	927.12	(14.0	067.82	(14.8	313.14	(14.0	460.22	(13.9
024.01	(14.8	928.14	(14.0	068.84	(14.0	313.92	(14.0	460.90	(14.0
028.0	15.8	932.10	14.4	069.00	(13.9	319.07	(14.0	461.85	(13.9
038.96	(14.4	933.10	14.3	069.94	(14.0	320.14	(14.0	465.86	(13.9
042.95	(14.4	933.24	14.3	070.92	(14.0	320.94	(14.0	467.89	(13.9
069.00	(14.4	934.06	14.2	071.81	(14.0	325.18	(14.0	484.91	(13.9
077.98	(14.4	935.10	14.4	073.80	(14.0	333.91	(14.0	609.29	(14.0
348.96	(13.6	936.19	15.0	074.84	(14.0	335.05	(14.0	610.27	(14.0
372.94	(14.4	936.20	14.8	075.85	(14.0	336.08	(14.0	611.27	(14.0
374.98	(16.2	937.13	(14.8	076.81	(14.0	337.06	(15.3	612.30	(14.0
432.97	(14.4	939.09	(14.0	077.98	(14.4	337.90	(14.0	614.27	(13.9
454.88	(14.2	941.16	(13.9	079.90	(13.9	338.06	(14.0	615.26	(14.0
459.88	(14.2	943.29	(13.9	079.96	(14.0	340.07	(14.0	618.26	(14.0
460.87	(13.5							622.14	(14.0
753.88	(14.2								
763.94	(14.2								
778.93	(14.4								
779.85	(14.4								
784.85	(14.4								

YABLE 2 (cont)

V485 Cen 125132		V485 Cen 125132		V485 Cen 125132		BR Lup 132940		BR Lup 152940	
2444000+		2444000+		2445000+		2441000+		2441000+	
634.31	(15.3	993.15	(14.0	128.3	(13.9	563.95	(13.9	841.95	(13.2
636.23	(14.0	994.14	(14.0	129.4	(13.9	570.91	(14.4	843.93	(13.2
646.22	(15.3	997.20	(14.8	132.91	(13.9	571.89	(14.4	845.96	(13.2
666.98	(13.9	998.15	(14.0	133.4	(13.9	572.89	(13.7	853.93	(13.7
671.20	(13.9	999.02	(13.9	134.2	(13.9	577.91	(13.7	854.93	(13.7
674.91	(13.9			134.86	(13.9	584.88	(13.7	856.91	(14.4
693.92	(13.9	2445000+		136.2	(13.9	585.87	(13.6	857.92	(14.7
699.10	(14.0	000.15	(14.0	138.3	(14.8	587.88	(13.6	858.89	(14.7
699.91	(13.9	001.15	(14.0	138.94	(14.8	591.90	(13.7	863.96	(13.7
		002.51	(13.9						
702.93	(13.9			139.3	(14.0	594.88	(13.7	864.89	(14.4
703.93	(13.9	022.34	(14.8	139.90	(13.9	596.89	(13.7	873.91	(14.7
705.95	(14.0	032.04	(14.8	140.04	15.0	597.89	(15	874.95	(14.7
717.96	(14.0	042.98	(14.0	140.3	(14.0	598.88	(13.2	875.91	(14.7
723.93	(13.9	042.98	14.5??	140.81	(13.9	605.88	(13.2	883.95	(13.7
724.96	(14.8	044.94	(14.0	141.2	(14.0	717.17	(14.4	892.04	(13.7
725.91	(14.8	045.89	(14.0	142.3	(14.0	723.23	(14.4	893.93	(13.7
727.87	(14.8	053.97	(14.0	143.3	(14.0	738.16	(13.7	894.91	14.4
729.94	(13.9	055.02	(14.0	143.89	(13.9	745.25	13.7	898.94	(13.7
734.17	(13.9	056.00	(14.0	144.3	(13.9	747.26	13.6	899.95	(13.7
747.82	(14.0	056.88	(14.0	147.00	(14.0	748.26	13.6	900.97	(13.7
751.88	(13.9	058.07	(13.9	148.4	(13.9	751.27	14.6	901.91	(13.2
753.88	(14.0	060.04	(13.9	149.3	(14.0	754.25	14.4	906.93	(14.7
763.94	(14.0	061.10	(13.9	160.2	(14.8	773.05	(13.2	912.96	(13.7
764.88	(14.0	070.83	(14.0	160.88	(13.9	774.05	(13.2	913.93	(13.7
776.78	(14.8	071.83	(14.0	161.21	(13.9	778.02	(13.2	914.89	(13.6
777.89	(13.9	075.86	(14.0			779.04	(13.2	915.93	(13.7
778.89	(14.0	078.93	(13.9			779.96	(13.6	918.91	(13.6
779.82	(13.9	081.87	(13.9			781.08	(13.7	919.95	(13.7
779.85	(14.0	082.92	(14.0			781.94	(13.2	920.90	(13.6
779.86	14.0	083.85	(13.9			787.25	(14.7	921.89	(14.4
780.83	(13.9	084.81	(13.5			793.91	(13.6	922.90	(13.7
784.02	(13.9	084.91	13.9??			795.95	(13.6	923.92	(13.7
784.90	(14.8	086.93	(13.9			796.98	(14.4	925.90	(14.7
786.92	(14.0	087.91	(13.9			800.00	(13.5	926.95	(13.7
788.79	(14.8	091.87	(13.9			802.95	(14.4	928.90	(13.7
789.94	(14.0	092.87	(13.9			804.88	(13.6	929.91	(13.7
791.81	(14.8	104.82	(13.9			805.94	(14.4	940.89	(13.7
792.77	(14.0	107.0	(16.2			807.07	(13.7	941.90	(13.7
793.80	(14.0	109.4	(13.9			807.94	(14.7	944.88	(13.6
805.84	(14.0	109.88	(14.8			811.03	(13.7	945.89	(13.7
806.81	(14.0	110.3	(13.9			811.99	(13.7	946.89	(13.7
807.92	(13.9	112.28	(14.0			812.92	(13.7	949.88	(13.6
808.80	(14.0	113.25	(13.9			826.02	(13.7	950.90	(13.7
809.82	(14.0	113.87	(13.9			828.02	(14.4	951.88	(13.6
818.82	(14.0	114.82	(13.9			829.01	(14.4	953.89	(13.6
825.79	(13.9	116.23	(13.9			830.96	(14.4	954.88	(13.6
839.93	(13.9	117.4	(13.9			831.89	(13.6	969.88	(13.7
842.80	(13.9	118.87	(13.9			832.89	(13.6		
964.11	(14.0	119.23	(13.9			833.98	(14.4		
990.17	(14.8	120.3	(13.9			835.00	(14.4		

TABLE 2 (cont)

BR Lup 152940		BR Lup 152940		BR Lup 152940		BR Lup 152940		BR Lup 152940	
2442000+		2442000+		2442000+		2444000+		2444000+	
155.96	(13.7	473.28	(13.6	875.02	13.7	000.28	13.9	375.13	(15.6
179.90	(13.6	494.23	(14.4	876.02	13.7	011.05	(14.7	377.14	(13.8
185.95	(13.6	503.98	(14.4	901.9	(13.0	012.10	(14.7	378.10	(13.8
186.88	(13.6	508.98	(13.6	978.01	(13.2	018.24	(15.6	398.06	(14.4
187.92	(13.6	511.98	(13.6	979.92	(13.2	024.02	(14.4	426.98	(13.8
188.87	(13.6	520.24	(14.4	990.92	(13.7	038.98	13.9	435.12	(14.4
189.89	(13.6	525.95	(14.4	991.90	(13.7	040.94	(13.8	454.07	14.1
191.88	(13.6	542.04	(13.6	994.95	(13.2	041.99	(13.7	455.11	14.0
192.90	(13.6	546.96	(13.6			042.96	14.4	459.05	14.4
193.99	(13.6	547.93	(13.6	2443000+		050.0	(16.0	461.04	(14.4
235.88	(14.7	575.93	(13.6	011.90	(13.6	054.11	(14.4	462.04	(14.4
241.92	(14.7	579.97	(13.6	018.90	(13.6	056.99	(13.7	465.0	(16.0
242.92	(14.7	599.07	(13.6	225.06	(13.6	068.99	(13.8	466.05	(13.8
243.88	(14.7	604.98	(14.4	257.04	(13.6	071.98	(13.8	480.02	(13.8
244.88	(14.7	605.96	(13.6	270.96	(13.5	075.07	(14.4	485.00	(14.7
245.89	(14.7	606.96	(14.4	275.06	(13.5	077.02	(13.8	486.01	(13.8
246.89	(14.7	609.07	(14.7	284.02	(13.5	078.05	(14.4	486.98	(14.7
247.89	(14.7	612.93	(13.2	285.0	(14.0	096.04	(13.9	488.9	15.5
248.89	(14.7	614.91	(13.6	329.0	(14.7	098.03	(13.7	489.93	(13.2
249.90	(14.7	618.91	(14.7	362.0	16.3	105.00	(13.8	491.04	(13.8
250.88	(14.7	620.93	(14.7	369.95	(13.7	108.02	(13.8	492.86	(13.7
264.89	14.2	621.90	(14.7	387.90	(13.7	109.9	(15.6	493.82	(13.8
265.88	13.9	622.95	(14.7	629.1	13.6	113.02	(14.4	495.04	(13.8
267.88	13.9	625.02	(14.7	729.11	(13.8	116.03	(13.2	497.89	(14.1
268.88	14.2	626.05	(14.4	746.10	(14.4	124.98	(13.7	508.98	(13.8
269.89	13.7	629.95	13.7	751.01	(14.4	127.98	(14.4	511.87	(13.8
270.88	13.7	630.93	13.7	901.31	13.3	131.98	(13.7	512.86	(13.7
271.89	13.6	630.95	13.6	902.28	13.6	134.99	(13.7	531.85	(13.6
272.90	14.4	634.01	13.6	903.25	13.7	139.98	(13.7	610.34	(13.8
273.89	14.4	634.98	(13.6	903.26	13.8	255.31	(14.7	612.32	(13.8
274.89	14.5	636.89	14.0	910.31	14.2	257.32	(13.8	614.32	(13.8
275.90	14.7	636.92	(13.2	928.17	(13.8	258.32	(13.8	615.32	(14.7
276.88	14.7	637.89	14.1	933.24	(14.7	263.31	(13.2	618.32	(14.0
277.89	14.9	640.91	(13.6	936.22	(14.7	264.33	(13.8	619.33	(13.8
278.88	(14.7	641.88	(14.7	937.17	(13.8	265.31	(15.6	620.14	(13.4
279.88	(14.7	642.91	(13.6	941.17	(13.6	283.28	(15.6	621.33	(13.8
294.88	(14.7	648.88	(14.7	956.18	(14.7	284.26	(14.0	634.33	(14.7
296.89	(14.7	649.89	(14.7	957.33	(14.7	285.26	(14.4	636.29	(14.7
297.89	(14.4	651.91	(13.6	960.23	(14.4	286.27	(15.6	646.29	(14.7
299.90	(13.7	656.93	(13.7	963.10	(13.7	292.24	(14.0	647.6	(13.2
302.88	(13.6	810.9	(13.5	966.12	(14.4	293.30	(14.0	671.28	(14.0
303.88	(13.6	819.9	(13.5	969.34	(14.7	313.21	13.7	674.27	(13.8
304.89	(13.7	835.9	(13.5	970.23	(15.6	313.38	13.7	678.28	(13.8
305.95	(13.2	840.9	(13.5	984.15	(13.7	321.28	(14.0	680.4	(13.2
306.88	(13.7	841.05	(13.7	987.03	(13.7	327.10	(15.6	694.0	(13.6
315.92	(13.8	848.05	(13.7	990.12	(14.4	340.10	(14.0	698.36	(13.7
323.88	(13.6	853.03	(13.2	991.07	(14.4	341.14	(14.0	699.19	(14.0
327.88	(13.6	864.01	(13.7	991.12	(15.6	354.40	(14.4	703.17	(14.0
329.88	(13.6	865.04	(13.7	995.09	(14.4	355.41	(14.4	707.24	(14.4
434.23	(14.4	868.02	(13.7	996.05	(13.7	369.13	(13.8	708.24	(14.0
438.25	(14.4	872.9	(13.5	997.29	(14.7	371.08	(15.6	722.28	(13.8
452.26	(14.4	873.04	(13.7	998,33	(14.4	374.20	(14.7	723.55	(13.7
				999.28	(14.4			725.92	(13.7

TABLE 2 (cont)

BR Lup 152940		BR Lup 152940		BR Lup 152940		AB Nor 154242		AB Nor 154242	
2444000+		2444000+		2445000+		2442000+		2444000+	
727.15	(14.0	821.31	(13.7	000.17	(13.2	840.9	(14.5	041.00	(13.7
730.10	13.7	821.81	(13.7	002.53	(13.7	872.9	(14.5	041.83	(13.7
731.12	13.7	823.29	(13.6	004.58	(13.6			042.96	(14.2
732.30	(13.7	824.28	(13.6	007.17	(13.2	2443000+		044.02	(14.2
733.15	13.9	825.30	(13.4	021.08	(13.2	605.06	(13.7	049.9	(16.0
733.58	(13.6	828.81	(13.3	022.54	(13.6	720.95	(13.7	054.09	(13.7
734.25	14.3	833.79	(13.7	024.57	(13.6	722.99	(13.7	056.99	(13.7
735.31	(13.6	837.85	(13.6	028.27	(15.0	725.84	(13.7	059.79	(13.7
739.56	(13.6	842.24	(13.6	028.55	(13.7	726.84	(13.7	067.79	(13.7
748.79	(13.7	843.23	(13.7	048.57	(13.7	729.12	(14.0	070.00	(13.7
752.81	(13.7	843.84	(13.7	050.21	(13.7	746.10	(14.5	071.98	(13.7
753.96	(13.7	844.84	(13.7	055.03	(14.4	751.01	(14.3	073.79	(13.7
756.09	(14.7	844.84	13.6??	056.01	(13.8	753.85	(13.7	075.08	(14.5
758.23	(13.7	844.86	(13.7	056.17	(14.4	754.81	(13.7	077.03	(13.7
759.33	(13.6	845.24	(13.7	060.41	(13.7	755.89	(13.7	078.05	(14.4
763.30	(13.7	845.86	(13.6	062.20	13.8?	770.86	(13.7	080.79	(13.7
764.80	(13.2	847.24	(13.7	063.21	(13.7	788.82	(13.5	083.79	(13.7
766.80	(13.4	848.22	(13.7	064.55	(13.7	790.86	(13.5	084.80	(13.7
774.78	(13.2	849.24	(13.6	065.58	(13.6	894.14	(13.7	098.03	(13.7
775.81	(13.2	850.27	(13.6	075.44	(13.7	903.28	(13.7	100.07	(13.7
776.81	(13.8	852.22	(13.6	075.90	(13.8	910.30	(13.7	101.84	(13.7
777.85	(13.2	854.25	(13.6	076.57	(13.6	926.18	(14.0	103.84	(13.7
779.25	(13.7	863.87	(13.2	077.28	(13.6	956.18	(14.0	105.00	(13.7
780.28	(13.7	864.84	(13.2	078.33	(13.6	964.24	(15.0	105.84	(13.7
780.91	(13.8	865.82	(13.7	079.31	(13.6	966.13	(13.7	108.05	(13.7
783.19	(13.7	867.24	(13.2	080.93	(13.6	968.16	(13.7	109.9	(15.5
784.34	(13.7	868.82	(13.6	083.14	(15.6	969.35	(14.5	113.06	(14.2
785.35	(13.7	870.84	(13.2	086.97	(13.8	970.24	(15.0	113.82	(13.7
786.94	(13.8	872.84	(13.2	089.27	(13.6	984.15	(13.7	124.98	(13.7
788.25	(13.7	873.88	(13.2	094.21	(13.7	984.94	(13.7	127.98	(14.2
788.76	(13.7	875.86	14 0?	104.10	(13.8	987.03	(13.7	128.83	(13.7
789.77	(13.8	876.84	(13.2	107.26	(13.6	990.12	(13.7	132.9	(16.0
791.25	(13.7	876.88	(13.8	109.07	(13.8	991.07	(14.5	134.99	(13.7
791.82	(14.4	877.81	(13.8	110.06	(13.8	991.13	(15.0	135.85	(13.7
792.23	(13.7	878.84	(13.2	111.24	(13.6	992.92	(13.7	136.85	(13.7
792.78	(13.8	883.24	(13.6	112.12	(14.7	995.10	(14.2	138.87	(13.7
793.32	(13.7	884.82	(13.7	113.29	(13.6	996.05	(13.7	139.82	(13.7
793.76	(13.8	885.83	(13.7	118.31	(13.6	997.28	(14.4	141.84	(13.7
796.85	(13.2	892.82	(13.7	121.28	(13.8	998.32	(13.7	142.83	(13.7
797.80	(13.7	895.86	(13.8	129.81	(13.6	999.28	(13.7	143.84	(13.7
804.21	(13.6	896.85	(13.8	130.80	(13.6	2444000+		255.32	(15.2
805.20	(13.6	897.82	(13.7	133.03	(13.8	000.28	(14.5	257.33	(13.7
806.23	(13.6	972.14	(13.2	134.25	(13.6	011.05	(14.5	258.34	(13.7
806.85	(13.8	976.13	(13.2	134.80	(13.4	011.08	(15.0	263.31	(15.2
807.82	(13.6	993.17	(13.2	136.4	(13.8	012.10	(14.5	265.31	(15.2
808.84	(13.8	998.15	(13.2	137.26	(13.6	013.84	(13.7	279.18	(13.7
809.83	(13.8	999.17	(13.7	138.3	(13.8	015.83	(13.7	283.30	(15.5
811.85	(13.2			138.86	(13.5	017.87	(14.0	284.27	(14.2
813.25	(13.6					018.26	(15.0	285.27	(14.2
813.81	(13.2					019.90	(13.7	286.28	(15.5
816.23	(13.6					024.02	(14.5	292.25	(1422
818.83	(13.7					028.10	(13.7	293.30	(14.2
819.34	(13.6					038.98	(14.3	294.13	(13.7

AB Nor 154242		AB Nor 154242		AB Nor 154242		IK Nor 161755-		IK Nor 161755	
2444000+		2444000+		2444000+		2443000+		2444000+	
302.12	(13.7	468.81	(13.7	796.86	(13.7	629.1	(16.0	000.00	(14.5
308.17	(13.7	472.90	(13.7	806.85	(13.7	633.22	(13.8	011.10	(14.5
311.20	(13.7	475.88	(13.7	808.85	(13.7	639.19	(14.6	012.10	(14.5
312.13	(13.7	477.90	(13.7	809.84	(13.7	723.17	(14.5	018.30	(15.0
313.21	(13.7	478.88	(13.7	810.94	(13.7	728.15	13.9	024.02	(14.5
320.14	(13.7	479.88	(13.7	818.87	(13.7	729.10	13.8	038.02	(13.6
321.28	(14.2	480.89	(13.7	820.81	(13.7	732.10	(13.6	038.98	(14.5
325.14	(13.7	481.85	(13.7	821.81	(13.7	743.08	(13.6	040.96	(13.6
327.10	(15.5	485.00	(15.3	825.81	(13.7	746.08	(14.5	042.04	(13.6
340.12	(14.0	486.01	(13.7	833.79	(13.7	748.14	(14.5	042.96	(13.6
341.14	(14.2	486.99	(15.3	837.85	(13.6	751.04	(14.5	044.02	(14.0
341.95	(13.7	487.83	(13.7	842.82	(13.7	756.08	(13.6	050.0	(15.7
348.97	(13.7	489.87	(13.7	843.84	(13.7	758.00	(13.6	054.10	(14.5
354.24	(14.2	491.04	(13.7	844.84	(13.7	780.10	(13.6	068.97	(13.6
355.07	(13.7	492.85	(13.7	845.83	(13.7	786.04	(13.6	071.96	(13.6
355.31	(14.2	493.82	(13.7	864.84	(13.7	787.06	(14.0	075.19	(13.6
369.09	(13.7	495.04	(13.7	865.82	(13.7	788.07	(13.6	076.97	(13.6
369.13	(14.2	497.89	(13.7	869.9	(15.5	805.03	(13.6	078.06	(14.5
371.05	(15.5	510.85	(13.7	875.86	(13.7	806.06	(13.6	079.96	(13.6
371.09	(15.5	511.87	(13.7	876.88	(13.7	809.02	(13.6	081.96	(13.6
375.14	(15.5	512.86	(13.7	877.83	(13.7	810.03	(14.0	098.00	(13.6
378.10	(13.7	531.87	(13.7	878.84	(13.7	817.01	(13.6	100.03	(13.6
398.07	(14.2	618.32	(14.0	884.82	(13.7	818.02	(13.6	105.01	(14.5
404.84	(13.7	619.33	(14.0	885.83	(13.7	882.32	(13.6	108.01	(13.6
409.86	(13.7	646.30	(14.5	892.82	(13.7	903.27	(14.5	110.0	16.0
421.80	(13.7	657.21	(13.7	895.87	(13.7	910.29	(14.5	112.98	(14.5
423.86	(13.7	671.29	(14.0	896.85	(13.7	913.31	(14.5	116.02	(13.6
424.81	(14.2	674.27	(13.7	897.82	(13.7	933.26	(14.5	124.98	(13.6
425.81	(13.7	678.28	(13.7			936.23	(14.5	131.97	(13.6
426.98	(14.2	694.01	(13.7			937.32	(14.5	143.01	(13.6
435.13	(14.2	699.19	(14.1			941.17	(13.6	157.99	(13.6
437.02	(13.7	703.18	(14.0			943.31	(14.5	158.99	(13.6
437.80	(13.7	706.22	(13.7			953.15	(13.6	164.02	(13.6
444.80	(13.7	707.24	(14.2			955.09	(13.6	168.01	(13.6
450.81	(13.7	708.24	(14.0			956.19	(14.5	169.01	(13.6
454.07	(14.0	727.15	(14.0			957.23	(14.5	170.01	(13.6
454.81	(13.7	730.10	(14.0			960.22	(14.5	257.33	(14.0
455.94	(13.7	734.12	(14.0			963.11	(14.5	258.33	(14.0
456.79	(13.7	747.84	(14.0			966.13	(13.6	263.33	(15.5
459.05	(14.0	753.97	(13.7			969.30	(14.5	264.34	(14.0
459.83	(13.7	776.81	(13.7			970.30	(14.5	265.32	(15.5
461.04	(14.0	779.07	(13.7			974.40	(13.6	283.32	(15.5
462.04	(14.0	779.80	(13.7			984.16	(14.5	284.29	(14.0
463.95	(13.0	780.92	(13.7			987.04	(14.0	285.28	(14.0
464.99	13.5??	784.91	(13.7			990.12	(13.6	286.29	(15.6
465.79	(13.2	786.95	(13.7			991.13	(14.5	292.26	(14.0
465.90	(13.7	788.87	(13.7			995.09	(14.5	293.31	(14.0
465.93	(13.7	789.77	(13.7			997.28	(14.5	313.23	(14.0
466.05	(13.7	791.82	(13.7			999.38	(14.0	321.28	(14.0
466.88	(13.7	792.78	(13.8					337.11	(15.2
467.86	(13.7	793.76	(13.7					338.13	(14.0
								340.13	(14.0
								341.17	(14.0

TABLE 2 (cont)

IK Nor 161755		IK Nor 161755		IK Nor 161755		V478 Sco 171935		V478 Sco 171935	
2444000+		2444000+		2444000+		2443000+		2444000+	
349.18	(13.6	706.23	(14.0	879.96	(13.6	339.91	13.9?	069.91	(13.4
354.24	(14.0	707.22	(13.6	896.86	(13.6	357.83	(14.0	075.21	(13.7
355.28	(14.0	708.25	(14.0	897.87	(13.6	359.93	(14.0	076.97	(13.4
369.15	(14.0	710.32	(13.6	901.93	(13.6	391.95	(13.2	078.01	(14.0
371.11	(15.5	727.19	(14.0			395.89	(14.0	082.20	(13.7
374.18	(14.0	730.13	(14.0	2445000+		593.11	(13.5	097.98	(13.5
375.13	(15.5	731.13	(13.6	048.57	(13.6	635.18	13.2?	100.1	14.5
377.13	(14.0	733.15	(14.0	055.06	(13.6	644.1	13.7	100.93	(13.4
378.09	(14.0	733.68	(13.6	056.02	(13.6	645.11	(13.2	105.04	(13.5
379.13	(13.6	734.14	(14.1	056.27	(15.0	700.00	(13.5	110.09	(13.8
398.08	(14.0	753.99	(13.6	060.51	(13.6	700.99	(13.5	112.03	(14.5
426.99	(14.0	756.10	(15.0	075.45	(13.6	702.93	(13.5	113.0	(14.0
428.18	(14.0	779.09	(13.6	076.64	(13.6	712.89	(13.5	128.0	(14.0
435.13	(14.0	779.81	(13.5	082.98	(13.6	717.94	(13.5	135.01	(14.0
454.01	(14.0	779.85	(13.1	083.17	(15.0	719.92	(13.5	139.87	(14.0
455.11	(14.0	779.86	13.8	086.98	(13.6	723.91	(13.4	141.86	13.7?
459.06	(14.0	780.30	(13.6	110.09	(13.8	728.89	(13.4	142.84	(14.0
461.05	(14.0	780.93	(13.6	112.15	(15.0	729.91	(13.4	159.03	(13.6
462.03	(14.0	783.24	(13.6	121.27	(13.6	730.92	(13.4	162.0	(15.5
465.03	(14.0	784.93	(13.6	136.95	(13.6	744.91	(13.4	165.00	(13.7
466.06	(14.0	786.78	(13.6	141.04	(13.6	746.89	(13.4	166.9	(15.7
468.13	(14.0	788.26	(13.6	142.4	(13.6	748.92	(13.4	272.11	(13.2
480.01	(13.6	788.79	(13.6			754.87	(13.5	283.33	(15.0
485.03	(15.5	789.78	(13.6			768.93	(13.4	284.35	(14.0
486.04	(14.0	791.82	(14.5			787.0	(15.7	285.35	(14.0
487.00	(15.5	792.77	(13.6			933.29	(14.0	286.36	(15.5
488.95	(13.6	793.80	(13.6			956.25	(14.0	292.32	(14.0
491.03	(13.6	806.88	(13.6			964.15	(13.4	293.35	(14.0
492.87	(13.6	808.86	(13.6			970.14	14.2??	313.28	(14.0
494.07	(14.0	809.84	(13.6			970.33	(14.0	321.31	(14.0
495.05	(14.0	817.94	(13.6			982.04	(13.4	346.06	16.2
508.98	(13.6	818.88	(13.6			983.10	(13.4	354.38	(14.0
512.87	(13.6	820.81	(13.6			984.17	(14.0	355.38	(14.0
610.33	(13.6	821.82	(13.6			988.02	(13.4	371.14	15.0
614.33	(14.0	825.79	(13.6			990.13	(14.0	374.01	(13.4
615.33	(14.5	833.79	(13.6			991.20	(14.0	375.16	15.0
618.33	(14.0	837.85	(13.6			995.11	(14.0	392.97	(14.0
619.34	(14.0	839.95	(13.6			996.32	(14.0	396.93	(14.5
621.34	(13.6	845.25	(13.6			997.31	(14.0	426.91	(13.4
634.34	(15.0	845.82	(13.6			999.34	(14.0	427.93	(13.4
636.30	(15.0	847.28	(13.6			2444000+		430.92	14.2
646.31	(15.0	848.23	(13.6			000.29	(14.0	438.05	15.2
671.30	(14.0	849.25	(13.6			009.95	(13.4	438.88	(13.4
674.29	(13.6	849.97	(13.6			011.08	(14.0	441.99	(14.5
678.29	(14.0	850.28	(13.6			012.10	(14.0	453.92	(14.0
681.34	14.1	852.23	(13.6			018.14	(14.5	454.89	(13.4
682.38	13.7	864.94	(13.6			019.19	(14.0	456.0	(16.0
691.14	(14.0	871.93	(13.6			024.11	(14.0	458.92	(14.5
699.20	(14.0	875.95	(13.6			044.01	(14.0	461.07	(14.0
703.20	(14.0	876.92	(13.6			049.0	(16.1	462.06	15.8
705.21	(14.0	877.85	(13.6			049.91	(13.4	463.00	(14.0

TABLE 2 (cont)

V478 Sco 171935		V478 Sco 171935		MM Sco 172342		MM Sco 172342		MM Sco 172342	
2444000+		2444000+		2436000+		2437000+		2437000+	
466.07	(14.5	871.92	(14.5	786.01	(13.5	214.87	(13.0	531.11	(13.0
470.00	(14.5	875.92	(13.5	788.93	(13.5	217.90	(13.5	539.87	(13.0
470.92	(14.5	876.90	15.6	791.00	(13.5	218.93	(13.5	540.86	(13.5
482.91	(13.4	877.90	(13.5	802.94	(13.5	228.88	(13.5	548.94	(13.0
483.94	(13.5	878.91	(14.5	803.98	(13.5	230.97	(13.0	554.91	(13.0
485.92	(13.5	879.93	(14.5	806.86	(13.5	249.92	(13.0	556.99	(13.0
487.01	(14.5	901.93	(14.5	809.93	(13.5	256.91	(13.0	557.93	(13.0
487.04	15.0	902.92	(15.1	810.89	(13.5	348.17	(13.0	569.87	(13.0
489.97	(14.5			814.94	(13.5	377.16	(13.0	574.93	(13.0
490.01	15.7			817.93	(13.5	384.20	(13.5	575.93	(13.0
490.95	(14.5	MM Sco		830.89	(13.0	387.22	(13.5	579.94	(13.0
492.96	(14.5	172342		842.94	(13.0	388.21	(13.5	580.91	(13.0
493.89	(14.5			844.95	(13.0	402.21	(13.5	586.90	(13.0
495.08	(14.0	2436000+		845.89	(13.5	405.02	(13.0	589.93	(13.0
497.95	(14.5	635.16	(12.5	846.95	(13.5	409.22	(13.0	606.89	(13.0
498.93	(14.5	642.22	(13.0	863.90	(13.0	410.20	(13.5	613.91	(13.0
500.91	(14.5	646.22	(13.5	873.93	(13.0	429.25	(13.0	615.90	(13.0
510.93	15.8	649.16	(13.5			437.27	(13.0	616.91	(13.0
512.93	(14.5	650.18	(13.5	2437000+		438.98	(13.5	696.15	(13.0
520.96	15.0	661.21	(13.5	032.21	(13.5	439.94	(13.5	701.15	(13.0
527.91	(14.5	665.21	14.3	059.99	(13.0	441.26	(13.5	705.12	(13.0
527.93	15.7	671.02	14.0	069.92	(13.0	442.24	(13.5	727.13	(13.0
539.93	(14.5	673.24	13.5	078.00	(13.5	446.25	(13.0	740.17	(13.5
546.92	(14.0	685.90	(13.0	079.98	(13.5	455.96	(13.5	759.22	(13.0
670.2	(15.5	688.00	(13.0	081.95	(13.5	456.94	(13.0	762.15	(13.5
703.29	(14.0	697.27	(13.5	098.92	(13.0	459.97	(13.0	763.20	(13.0
707.26	(14.0	699.24	(13.5	101.96	(13.5	461.01	(13.5	771.24	(13.0
708.29	(14.0	703.23	(13.5	111.97	(13.0	461.94	(13.0	790.23	(13.0
730.20	(14.0	708.26	(13.5	112.96	(13.5	462.98	(13.0	794.98	(13.0
732.07	(14.5	715.95	(13.5	113.93	(13.5	463.97	(13.0	814.23	(13.0
749.96	(13.5	720.99	(13.5	116.99	(13.5	464.99	(13.0	821.97	(13.0
766.97	14.3	722.95	(13.5	120.87	(13.0	465.96	(13.0	823.24	(13.0
767.99	14.5	723.92	(13.5	128.91	(13.5	467.94	(13.0	829.20	(13.0
779.90	(13.5	726.27	(13.5	129.91	(13.5	468.95	(13.0	831.22	(13.0
781.90	(13.5	729.00	(13.5	131.92	(13.0	469.99	(13.5	838.97	(13.0
784.09	(13.5	730.98	(13.5	132.80	(13.5	471.94	(13.0	840.00	(13.0
784.92	(13.5	733.23	(13.5	133.93	(13.5	474.21	(13.5	846.98	(13.0
787.92	(14.5	735.15	(13.5	134.85	(13.5	476.25	(13.0	847.95	(13.0
792.00	(14.5	736.25	(13.5	137.93	(13.5	478.93	(13.0	852.95	(13.0
794.96	(14.5	737.22	(13.5	139.96	(13.5	479.93	(13.0	853.94	(13.0
795.05	(14.5	746.04	(13.5	143.97	(13.5	480.91	(13.0	864.80	(13.0
808.95	(14.5	747.95	(13.5	145.87	(13.5	482.90	(13.5	867.95	(13.0
809.86	(14.0	750.95	(13.5	158.94	(13.0	487.82	(13.5	869.95	(13.0
812.01	(13.5	755.99	(13.5	159.95	(13.0	488.90	(13.0	875.82	(13.0
814.94	(13.5	758.96	(13.5	166.00	(13.5	491.94	(13.5	876.95	(13.0
815.92	15.0	764.23	(13.0	167.97	(13.5	502.20	(13.0	882.86	(13.0
830.03	(14.0	767.23	(13.0	172.98	(13.0	512.95	(13.0	883.97	(13.0
832.93	(14.5	770.78	(13.5	173.99	(13.5	521.94	(13.0	884.94	(13.0
833.90	(14.5	777.91	(13.5	187.95	(13.5	523.99	(13.0	901.96	(13.0
836.92	(14.5	781.94	(13.0	198.93	(13.5	525.95	(13.5	906.00	(13.0
843.92	(14.5	784.98	(13.5	204.93	(13.0	527.89	(13.0	906.93	(13.0
864.92	(14.0					528.95	(13.5	908.94	13.3?
867.0	(15.1							913.98	(13.0
								930.95	(13.0
								932.92	(13.0

TABLE 2 (cont)

MM Sco 172342		MM Sco 172342		MM Sco 172342		MM Sco 172342		MM Sco 172342	
2438000+		2438000+		2439000+		2441000+		2442000+	
087.19	(13.5	494.21	(13.5	003.96	(13.5	895.94	(13.4	206.92	(13.6
095.16	(13.5	525.23	(13.0	021.93	(13.5	899.95	(13.4	207.93	(13.6
111.20	(13.5	527.22	(13.0	029.90	(13.5	905.9	(14.0	210.9	(13.8
122.24	(13.5	536.24	(13.0	032.96	(13.5	906.9	(13.0	212.95	(13.6
124.19	(13.5	568.22	(13.0	054.89	(13.5	912.97	(13.4	213.98	(13.6
136.99	(13.5	608.97	(13.5	159.16	(13.0	913.94	(13.4	218.95	(14.0
140.26	(13.5	613.95	(13.0	205.21	(13.5	914.9	(14.0	219.90	(14.0
144.20	13.2	636.92	(13.5	287.85	(13.5	919.95	(13.4	220.9	(13.5
145.93	13.8	640.90	(13.5			921.96	(13.6	222.94	(13.6
148.94	14.0	648.93	(13.5			922.91	(13.6	237.92	(13.6
149.98	14.0	664.93	(13.5	2441000+		923.93	(13.4	240.96	(13.6
155.24	13.4	665.91	(13.5	782.04	(12.9	926.9	(13.5	246.9	(13.5
156.24	13.4	666.86	(13.5	796.12	12.4??	928.91	(13.6	254.9	(13.5
163.91	13.4	669.96	(13.0	79698	(12.9	929.92	(13.4	261.9	(13.0
167.24	13.4	674.90	(13.0	800.9	(15.0	936.9	(14.5	264.89	(13.6
170.98	13.9	675.89	13.9	807.9	(15.0	940.9	(13.5	265.91	(13.4
174.23	13.8	678.92	(13.5	808.0	(13.5	941.91	(13.6	266.90	(13.5
176.97	(13.5	694.89	(13.5	811.03	(13.4	943.9	(14.0	268.9	(13.5
178.98	(13.5	696.88	(13.5	815.9	(15.0	944.9	(13.5	273.9	(14.0
181.24	(13.5	699.88	(13.5	821.9	(13.5	950.9	(13.5	274.90	(14.0
182.21	(13.5	702.88	(13.5	823.9	(14.0	953.88	(13.4	277.93	(13.4
191.92	(13.0	794.17	(13.5	824.9	(13.5	955.90	(13.6	279.95	(13.6
192.95	(13.5	800.16	(13.5	826.02	(13.6	956.90	(13.4	280.90	(14.0
193.96	(13.5	804.17	(13.5	828.04	(14.3			283.9	(13.5
196.98	(13.5	819.18	(13.5	829.06	(14.3	2442000+		294.92	(13.4
202.01	(13.5	826.18	(13.5	830.97	(14.3	080.90	(13.0	295.90	(13.5
204.95	(13.5	851.97	13.5	832.0	(14.5	081.90	(14.0	296.93	(13.4
207.98	(13.5	855.20	(13.5	833.98	(14.3	088.9	(13.5	297.93	(13.6
212.24	(13.5	880.94	(13.5	835.00	(14.3	095.9	(14.0	299.92	(14.0
219.92	(13.5	883.97	13.5	836.00	(14.5	096.9	(13.5	301.90	(13.5
221.94	(13.5	885.23	13.7	837.00	(13.5	097.90	(14.0	306.96	(13.4
222.95	(13.5	886.21	13.7	840.00	(14.5	098.9	(13.5	307.94	(13.4
230.95	(13.5	887.20	13.9	842.92	(13.4	099.9	(13.5	309.93	(13.4
232.92	(13.5	890.26	(13.5	843.00	(14.5	102.25	(13.6	310.91	(13.0
236.93	(13.5	892.22	(13.5	844.9	(14.0	131.9	(14.5	315.91	(13.4
251.90	(13.5	900.92	(13.0	845.9	(13.0	133.9	(14.5	327.90	(13.6
252.92	(13.5	906.96	(13.5	851.9	(14.0	134.9	(15.0	511.20	(13.5
253.94	13.9	909.17	(13.5	853.94	(13.6	137.09	(13.6	512.15	(13.5
254.90	(13.5	916.22	(13.5	854.94	(13.4	164.19	(14.5	520.21	(13.5
255.95	(13.5	931.95	13.5	856.95	(13.6	166.08	(15.0	535.2	(13.5
		936.97	(13.5						
259.97	(13.5			857.93	(13.6	167.15	(15.0	536.2	(13.5
263.90	14.1?	941.92	(13.5	858.90	(13.5	168.11	(15.0	547.10	(13.5
282.91	(13.5	970.95	13.3	859.89	(13.5	173.95	(13.5	554.12	(13.5
284.84	(13.5	976.99	13.5	863.9	(14.5	180.08	(13.6	564.10	(14.0
289.98	(13.5	993.99	(13.5	864.90	(13.5	180.96	(15.0	572.0	(14.0
293.83	(13.0	996.91	(13.5	871.9	(14.5	182.01	(13.6	573.0	(14.0
308.85	13.4?			872.9	(13.5	182.88	(14.5	574.0	(14.0
312.95	(13.5			873.91	(13.4	184.05	(14.5	575.10	13.4
316.87	(13.0			877.9	(13.0	187.99	(13.4	605.09	(13.5
317.90	(13.5			883.96	(13.6	191.02	(14.5	606.17	(13.5
417.15	(13.0			892.05	(13.4	195.78	(13.0	607.01	(13.5
433.16	(13.0			893.94	(13.6	197.00	(13.5	609.08	(13.5
						198.01	(14.0	614.94	(14.0

TABLE 2 (cont)

MM Sco 172342		MM Sco 172342		MM Sco 172342		MM Sco 172342		MM Sco 172342	
2442000+		2443000+		2444000+		2444000+		2444000+	
618.93	(13.5	012.0	(13.4	082.19	(13.6	435.15	(14.0	708.25	(13.9
620.89	(13.5	033.94	(13.4	084.10	(14.2	436.83	(13.5	723.25	(13.5
621.91	(13.5	036.93	(13.4	096.04	(13.9	437.80	(13.6	730.21	(13.9
622.96	(13.5	039.93	(13.4	098.00	(13.9	450.84	(13.5	734.26	(14.6
625.03	(13.5	040.92	(13.4	105.01	(14.2	454.11	(14.0	749.91	(13.4
626.06	(13.5	271.03	(13.5	106.07	(13.9	455.13	(14.0	751.90	(13.4
629.99	(13.5	275.06	(13.5	108.07	(13.9	456.0	(15.5	752.94	(13.4
630.95	(13.6	285.27	(13.5	112.02	(14.2	456.81	(13.4	756.14	14.2
634.03	(13.5	369.96	(13.4	113.02	(13.9	458.06	(13.9	767.90	(13.4
636.92	(13.5	420.0	(13.5	117.09	(13.9	459.07	(14.0	776.86	(13.4
				127.99	(13.9				
637.92	(13.5	426.0	(13.5			459.83	(13.5	777.90	(13.5
640.92	(13.5	429.0	(13.5	129.00	(13.9	460.84	(13.5	778.92	(13.5
641.89	(13.5	430.0	(13.5	130.03	(13.9	462.08	(14.0	779.89	(13.5
642.91	(13.5	638.21	(14.2	131.97	(13.9	462.84	(13.5	780.82	(13.4
645.97	(13.5	728.10	(14.2	133.07	(13.9	465.05	(14.0	783.27	(13.9
648.89	(13.5	751.07	(14.2	135.01	(13.9	465.80	(13.4	784.93	(13.5
649.90	(13.4	903.33	(13.9	143.03	(13.9	467.89	(13.5	786.82	(13.9
651.92	(13.4	913.33	(14.2	159.02	(13.9	469.02	(13.5	788.85	(13.5
653.95	(13.4	936.31	(14.6	164.02	(13.9	480.02	(13.5	789.78	(13.9
656.94	(13.4	956.22	(13.5	168.04	(13.9	485.06	(15.1	791.26	(13.9
711.94	(13.4	964.29	(14.6	170.02	(13.9	486.03	(13.5	791.83	(14.0
810.0	(13.5	970.28	(14.3	263.35	(14.6	487.04	(15.1	793.81	(14.0
812.0	(13.5	971.10	(13.9	265.33	(14.6	490.01	(15.3	797.16	(13.4
819.0	(13.5	991.21	(13.9	283.33	14.0	491.05	(14.0	806.84	(13.5
820.0	(13.5	991.40	(14.6	284.34	(14.0	494.09	(14.0	809.86	(13.9
840.0	(13.5	995.16	(13.5	285.34	(14.0	495.06	(14.0	818.85	(14.2
855.0	(13.5	996.33	(14.6	286.31	14.9	496.81	(13.4	820.82	(13.4
861.0	(13.5	997.31	(14.6	292.33	(14.0	497.90	(13.9	821.33	(13.9
868.0	(13.5	999.30	(14.6	313.28	(14.0	510.95	(15.7	821.82	(13.4
869.0	(13.5			321.31	(14.0	511.95	(13.5	823.31	(13.5
870.0	(13.5	2444000+		327.13	(14.6	512.94	(13.5	825.79	(13.5
872.0	(13.5	011.10	13.3	341.22	(14.0	515.97	(13.5	828.82	(13.2
873.0	(13.5	012.11	13.6	349.24	(13.5	523.04	(13.5	837.86	(13.7
876.0	(13.5	012.15	13.4	354.25	(14.0	525.92	(13.9	842.84	(13.4
877.0	(13.5	013.11	13.4	355.29	(14.0	527.94	(15.1	843.85	(13.4
880.0	(13.5	013.20	13.5	369.16	(13.9	530.90	(13.5	845.25	(13.4
883.0	(13.5	018.13	14.1	370.19	(14.6	531.87	(13.6	845.87	(13.9
892.0	(13.5	019.2	13.6	371.13	(15.1	537.86	(13.2	847.29	(13.9
901.0	(13.5	019.18	14.2?	374.20	(14.0	538.86	(13.4	848.24	(13.9
915.9	(13.5	024.09	(13.9	375.15	(15.1	542.86	(13.9	850.28	(13.0
942.9	(13.2	044.01	(14.2	381.88	(13.5	546.86	(13.9	854.27	(13.0
961.0	(13.5	054.11	(14.2	384.91	(13.5	553.87	(13.4	864.90	(14.6
984.08	(13.4	055.05	(13.9	386.90	(13.0	646.33	(14.6	865.83	(13.9
985.0	(13.5	056.99	(13.5	398.08	(14.0	667.11	(13.4	868.82	(13.6
993.01	(13.4	058.35	(13.9	405.10	(14.0	670.2	(15.5	869.96	(13.5
		060.34	(13.9	406.95	(13.5	674.31	(13.5	870.91	(13.6
		067.96	(13.5	407.81	(13.5	678.34	(13.5	872.87	(13.4
		068.96	(13.9	408.82	(13.4	682.39	(13.6	874.04	(14.6
		072.00	(14.2	409.86	(13.6	694.04	(13.5	875.95	(13.5
		075.07	(14.2	421.80	(13.5	699.31	(13.9	876.91	(14.6
		078.00	(14.2	424.82	(13.5	703.26	(13.9	877.90	(13.5
		079.97	(13.9	428.19	(14.0	707.25	(13.9	878.90	(13.5
								880.93	(13.4

TABLE 2 (cont)

MM Sco
172342

2444000+
883.26 (13.5
886.82 (13.5
887.89 (13.1
892.84 (13.5
894.95 (13.5
896.88 (13.5
897.88 (14.0
898.94 (13.6
905.95 (13.5
906.86 (13.5

908.95 (13.5

FV Ara
172562

2437000+
098.93 (13.2
099.90 (13.5
112.96 (13.5

113.94 13.8?
128.92 (13.5
129.91 (13.2
131.97 (13.5
132.95 (13.5
133.94 (13.5
139.97 (13.5
167.99 (13.5
172.98 (13.5
173.99 (13.5

198.98 (13.5
201.93 (13.5
214.89 (13.5
217.97 (13.5
218.93 (13.5
224.97 (13.5
228.97 12.9??
230.97 13.5
249.94 (13.5
250.90 (13.5

256.94 (13.5
350.16 (13.2
372.18 (13.5
378.20 (13.5
386.20 (13.5
439.90 (13.2
441.26 (13.2
455.97 (13.2
456.95 13.7
459.97 (13.8
461.01 (13.2
461.94(13.8
463.97 (13.5

FV Ara
172562

2437000+
464.98 (13.8
468.96 (13.2
469.99 (13.8
471.96 (13.5
476.26 (13.8
482.89 (13.8
491.95 (13.8
502.25 (13.5
521.95 (13.5
525.95 (13.5

527.89 (13.5
539.87 (13.5
554.95 (13.5
575.89 (13.2
580.91 (13.5
603.90 (13.2
613.96 (13.5
614.94 (13.5
616.91 (13.5

671.11 13.5?
705.13 (13.2
727.13 (13.5
739.17 13.7
740.14 14.0
759.22 (13.5
761.20 (13.5
762.15 (13.5
763.22 (13.5
772.23 14.0?

790.23 (13.5
794.99 (13.5
823.24 (13.5
828.21 (13.2
830.20 (13.5
838.98 (13.5
840.00 (13.5
846.98 (13.5
852.92 (13.5
864.80 (13.2

867.95 (13.5
869.97 (13.5
875.82 (13.5
876.96 (13.5
882.96 (13.5
883.98 (13.2
884.94 (13.5
901.96 (13.5
906.00 (13.2
908.94 (13.5
930.95 (13.5
958.90 (13.5

FV Ara
172562

2438000+
087.19 (13.5
095.16 14.0??
116.20 13.9?
122.24 (14.0
124.20 14.0?
125.23 14.1?
136.99 13.8?
142.95 13.8?
144.20 (13.5
149.99 (13.5

163.93 (13.5
167.23 (13.5
170.99 (13.5
176.95 (13.5
182.21 (13.5
191.93 (13.5
192.95 (13.5
202.02 (13.5
222.95 (13.5

255.95 (13.5

2441000+
774.07 (13.3
779.05 (13.3
781.05 (13.3
782.05 (13.3
796.99 (13.3
800.00 (14.0
807.20 (14.5

808.10 (14.0
811.04 (13.8
813.07 (13.3
815.15 (14.0
820.00 (13.0
823.0 (13.5
824.0 (14.0
826.03 (14.0
828.0 (14.0
829.02 (13.8

832.00 (14.5
833.96 (13.8
835.0 (14.0
836.1 (14.0
837.0 (13.5
840.0 (13.5
841.0 (13.5
841.97 (13.3
843.1 (13.8
843.93 (13.8
845.97 (13.3
849.97 (13.4

FV Ara
172562

2441000+
851.0 (14.0
853.95 (13.8
854.94 (13.8
856.96 (13.8
859.89 (13.8
863.9 (14.5
873.92 (13.8
874.96 (13.3
875.91 (13.3
894.01 (14.0

895.95 (13.8
899.96 (13.8
900.98 (14.0
901.95 (14.0
912.98 (13.8
913.95 (13.8
919.96 (13.8
921.97 (13.8
922.92 (13.8

923.93 (13.8
926.9 (13.5
928.93 (13.8
929.92 (14.0
936.9 (13.5
940.91 (14.0
941.91 (13.8
944.9 (13.5
953.88 (14.0
955.90 (14.0

956.91 (13.3

2442000+
088.2 (13.5
096.2 (13.5
097.1 (13.5
098.1 (13.5
099.1 (13.5
102.26 (13.8
104.0 (13.5

105.0 (14.5
106.0 (13.5
125.0 (13.5
127.0 (13.0
129.0 (14.0
131.0 (14.5
133.0 (14.5
134.0 (15.0
137.10 (13.3
167.09 (15.0
168.18 (14.5
173.95 (13.5
180.09 (14.0

FV Ara
172562

2442000+
182.01 (13.8
182.88 (14.0
184.06 (14.0
195.78 (13.0
197.9 (13.5
198.9 (14.5
206.92 (14.0
207.93 (13.8
210.9 (13.5
212.96 (13.8

213.98 (13.8
218.9 (14.0
219.96 (13.3
222.9 (13.5
246.9 (13.5
254.9 (13.5
255.92 (14.0
257.94 (14.0
264.90 (13.8

265.92 (13.8
268.9 (14.0
274.9 (14.5
277.93 (13.8
279.95 (13.8
280.9 (13.5
283.9 (13.5
286.92 (14.0
289.0 (13.0
290.91 (14.0

294.93 (14.0
296.93 (13.8
297.93 (13.8
299.93 (13.8
307.95 (13.8
309.93 (14.0
310.9 (13.5
315.93 (14.0
327.90 (14.0
329.90 (14.0

331.90 (14.0
511.2 (13.5
520.2 (13.5
535.2 (13.5
536.2 (13.5
542.05 (14.0
543.04 (13.8
554.0 (13.5
563.94 (13.8
572.0 (13.5
573.0 (13.5
574.0 (13.5
575.93 (13.5

TABLE 2 (cont)

FV Ara 172562		FV Ara 172562		FV Ara 172562		FV Ara 172562		FV Ara 172562	
2442000+		2443000+		2444000+		2444000+		2444000+	
607.02	(13.8	012.90	(14.0	286.37	(15.5	444.80	(13.0	614.14	(13.3
614.95	(13.8	019.94	(13.3	292.31	(14.0	449.79	(13.0	615.14	(13.3
618.93	(13.5	032.91	(14.0	293.34	(14.0	450.85	(13.3	620.15	(13.3
620.93	(13.5	033.95	(14.0	313.27	(14.0	453.91	(14.0	637.15	(13.3
621.95	(13.5	034.95	(13.3	314.00	(13.3	454.84	(13.3	637.15	13.7?
622.96	(13.5	039.94	14.0	320.03	(13.3	455.84	(13.3	651.18	(13.3
625.03	(13.5	040.92	(14.0	321.30	(14.0	456.82	(13.3	657.24	(13.4
626.07	(13.5	042.90	(14.0	333.92	(13.0	457.92	(13.3	667.20	(13.3
629.99	(13.5	044.94	(14.0	337.14	(14.7	458.87	(13.3	696.20	(13.3
630.96	(13.8	045.92	(14.0	337.99	(13.3	459.83	(13.3	699.31	(14.0
634.03	(13.5	225.01	(14.0	341.23	(14.0	460.90	(14.0	701.21	(13.3
635.04	(13.3	257.04	(13.3	341.97	(13.3	462.05	(14.0	703.33	(14.0
636.95	(14.0	420.0	(13.5	343.94	(13.3	462.88	(13.8	703.93	(13.0
637.93	(13.5	732.25	(14.3	351.98	(13.3	464.09	(13.3	708.26	(14.0
640.92	(13.8	734.30	(13.8	354.35	(14.0	465.03	(14.0	711.20	(13.3
641.90	(13.8	746.17	(14.3	355.32	(14.0	465.94	(13.3	717.93	(13.4
642.92	(13.5	748.19	(14.3	367.96	(13.5	468.95	(13.3	719.22	(13.3
648.89	(13.5	751.08	(14.3	369.19	(14.0	469.96	(13.8	720.87	(13.3
649.93	(14.0	756.09	(13.9	369.92	(13.5	477.14	(13.3	720.87	13.7?
651.93	(14.0	758.19	(13.9	371.21	(15.5	482.81	(13.4	723.88	(13.3
653.95	(14.0	806.08	(13.9	372.94	(13.5	484.81	(13.5	725.90	(13.3
656.95	(14.0	809.04	(14.3	376.98	(13.3	485.90	(14.0	726.88	(13.3
810.2	(13.5	903.31	(14.2	378.88	(13.3	487.93	(13.3	729.95	(14.0
812.2	(13.5	936.27	(15.0	379.87	(13.6	488.95	(13.3	734.17	(14.0
819.1	(13.5	964.22	(14.5	380.86	13.0?	489.93	(13.3	734.81	(13.0
820.1	(13.5	970.34	(13.5	381.87	(13.3	495.83	(13.3	738.25	13.6
835.0	(13.5	991.16	(15.0	382.95	(13.3	496.95	(13.8	739.25	13.6
840.0	(13.5	995.17	(13.5	386.89	(13.0	497.85	(13.3	741.23	13.6
855.0	(13.5	996.35	(13.5	393.97	(13.3	499.91	(13.3	747.81	(13.3
860.0	(13.5	997.30	(13.5	398.78	(13.0	510.90	(13.3	747.83	(13.8
861.0	(13.5			399.92	(14.0	511.85	(13.3	748.89	(13.3
868.0	(13.5	2444000+		400.80	(13.0	512.85	(13.3	749.93	(13.3
869.0	(13.5	018.35	(15.5	402.81	(13.3	513.85	(13.3	751.93	(13.3
870.0	(13.5	042.06	(13.7	404.79	(13.6	514.88	13.1?	752.94	(13.3
872.0	(13.5	054.20	(13.8	405.88	(13.3	515.97	(12.5	754.98	(13.3
873.0	(13.5	069.01	(13.8	406.94	(13.3	516.94	(13.3	764.94	(13.8
876.0	(13.5	075.25	(13.8	407.80	(13.4	517.90	13.7	766.81	(13.0
883.0	(13.5	078.04	(13.6	408.93	(14.0	518.89	(13.8	767.26	(13.3
892.0	(13.5	082.18	(13.5	409.94	(13.3	523.94	(13.3	777.87	(13.3
901.0	(13.5	098.01	(13.7	411.94	(13.3	525.94	(14.0	778.80	(13.3
915.0	(13.5	105.01	(13.7	421.79	(13.0	526.96	(13.8	779.80	(13.5
961.0	(13.5	113.06	(13.8	424.81	(14.2	529.98	(13.3	780.81	(13.0
985.0	(13.5	159.01	(13.9	425.84	(13.3	532.86	(13.3	783.93	(14.0
990.96	(14.0	165.02	(13.9	426.94	(14.0	537.85	(13.5	784.85	(13.3
993.02	(13.8	168.06	(13.8	432.95	(14.0	538.87	(13.3	785.92	(13.3
994.96	(14.0	169.02	(13.0	433.89	(14.0	539.87	(13.3	786.82	(14.0
		170.02	(13.8	434.90	(14.0	541.89	(13.3	788.26	(13.3
		202.86	(13.3	435.80	(13.3	542.93	(14.0	788.85	(14.0
		203.86	(13.3	436.92	(13.3	545.90	(14.0	789.78	(14.0
		265.33	(15.0	437.79	(13.4	546.88	13.7?	791.83	(14.1
		283.35	(15.5	438.95	(14.0	554.91	(13.8	793.94	(13.8
		285.32	(14.0	439.89	(13.3	566.85	(13.0	796.84	(13.3
								797.80	(13.3
								798.84	(13.2

TABLE 2 (cont)

FV Ara 172562		FV Ara 172562		BF Ara 173047		BF Ara 173047		V551 Sgr 175434	
2444000+		2444000+		2444000+		2444000+		2444000+	
804.80	(13.3	903.87	(13.3	164.03	(13.8	779.88	(14.1	011.12	(15.0
805.86	(13.3	905.96	(13.4	168.03	(13.8	784.93	(14.1	018.19	14.5
806.83	(13.5	906.98	(13.4	169.03	(13.8	786.82	(14.1	018.38	14.5
807.92	(13.8	907.95	(13.4	265.35	(15.0	788.84	(14.1	019.15	(13.8
809.87	(14.0	908.96	(13.4	283.37	(15.0	789.78	(14.1	019.19	14.5
811.81	(13.3	931.94	(13.3	284.32	(14.2	791.83	13.6	024.12	(14.2
813.81	(13.3			285.31	(14.2	792.77	13.8	041.06	(14.5
815.81	(13.6			286.35	15.5	793.81	13.2	043.04	(13.6
816.86	(13.4			292.30	(14.2	809.87	(14.1	054.15	(14.2
818.87	(13.4			293.33	(14.2	818.85	(14.2	060.31	(13.8
820.81	(13.7	BF Ara		313.25	(14.0	825.79	(13.4	069.07	(13.8
821.96	(14.0	173047		321.29	(14.2	862.0	(14.1	071.97	(13.6
825.88	(13.3			337.16	(14.6	864.94	(14.1	075.20	(13.8
828.81	(13.0	2443000+		341.21	(14.1	865.84	(13.4	077.00	(13.8
836.82	(13.3	991.19	15.4	354.35	(14.1	877.91	(13.4	078.04	(14.2
837.84	(13.5	995.17	(14.4	355.32	(14.1	878.88	(13.4	081.96	(13.8
838.98	(13.8	996.34	(14.5	369.20	(14.1	892.84	(13.4	084.03	(13.5
842.83	(13.4	997.30	(14.5	371.23	(15.5	897.88	(14.1	094.96	(13.6
843.82	(13.3	998.32	(13.8	454.08	(14.1			097.99	(13.6
844.84	(13.6	999.25	(14.2	459.09	13.9			104.96	(13.6
845.82	(13.5	2444000+		461.06	(14.1	V551 Sgr		108.07	(14.0
846.82	(13.3	011.11	(14.2	462.06	(14.1	175434		110.12	(13.9
847.84	(13.3	018.31	(15.4	465.04	(14.1			112.00	(14.5
848.82	(13.3	024.10	(14.2	486.07	(14.1	2443000+		114.05	(14.2
849.92	(14.0	030.32	(14.2	487.01	(15.5	728.12	(14.0	124.99	(13.7
851.97	(13.3	042.07	(13.6	489.84	(13.4	732.21	(14.0	131.98	(13.6
852.87	(13.3	044.01	(14.2	492.88	(14.1	733.30	(14.0	135.02	(13.6
853.81	(13.0	054.14	13.7	493.95	(14.1	746.09	(14.0	143.02	(13.7
854.84	(13.2	054.14	13.1	494.13	(14.1	748.17	(14.0	158.00	(13.6
864.94	(14.0	054.14	13.4	495.07	(14.1	751.03	(14.0	164.02	(13.6
		054.20	(13.6						
865.84	(13.3			496.83	(13.4	758.20	(13.5	165.01	(13.8
867.84	(13.3	055.06	14.1	497.90	(14.1	786.04	(14.0	168.0	(16.0
868.85	(13.3	057.21	14.6	525.93	(13.4	805.06	13.7	169.02	(13.8
870.92	(13.4	058.34	14.3	531.91	(13.4	806.05	13.4	170.02	(13.8
871.95	(13.3	060.33	(14.1	554.89	(13.4	809.02	14.3	191.9	(15.0
872.87	(13.4	068.97	(14.1	667.16	(13.4	936.36	(15.5	283.35	(15.0
873.89	(13.3	078.05	(13.8	678.33	(14.1	964.31	(15.5	285.36	(14.2
875.96	(13.8	078.13	14.6	681.35	(14.1	970.27	(15.5	286.35	(15.6
876.96	(13.3	079.97	(14.2	694.04	(13.4	970.28	(15.0	292.34	(14.2
877.91	(13.3	098.02	(13.8	699.29	(14.1	991.24	(15.0	293.35	(14.2
878.82	(13.4	105.02	(14.4	703.24	(14.1	995.18	(14.4	313.30	(14.0
879.95	(13.8	110.01	(13.8	706.23	(14.1	996.35	(14.5	321.32	(14.2
880.90	(13.0	113.00	(14.0	707.25	(14.1	997.30	(14.5	341.23	(14.0
882.95	(13.4	117.14	(14.0	708.25	(14.1	998.32	(14.5	354.27	(14.2
886.86	(13.3	129.01	13.0	719.22	(13.0			355.12	(13.0
892.96	(13.4	130.02	13.2	725.98	(13.4			355.30	(14.2
894.96	(13.4	131.09	(13.5	727.22	(14.1			369.18	(14.0
895.86	(13.3	131.97	13.6	730.19	(14.1			371.16	(15.5
896.95	(13.8	133.06	13.1	731.13	(13.4			377.15	(14.0
897.89	(14.0	135.01	14.0	733.16	(14.1			378.12	(14.0
898.88	(13.4	143.02	(13.7	734.15	(14.1			379.14	(14.0
		159.00	(13.7	756.15	14.8			405.10	(14.0
								424.83	(14.0

TABLE 2 (cont)

V551 Sgr 175434		V1830 Sgr 180727		V1830 Sgr 180727		V1830 Sgr 180727		V1830 Sgr 180727	
2444000+		2443000+		2444000+		2444000+		2445000+	
427.04	(14.0	998.29	(14.4	756.18	(15.0	869.94	(14.0	138.95	(12.0
428.20	(14.0			761.25	(12.0	870.85	(12.0	140.30	(12.0
435.16	(14.0	2444000+		764.93	(12.0	872.87	(12.5	141.94	(12.5
436.84	(13.6	019.20	(14.4	765.25	12.8??	873.90	(12.0	143.05	(13.0
439.81	(13.6	024.15	(14.4	765.85	(12.0	876.85	(12.0	146.29	(12.0
450.85	(13.6	030.32	(14.4	766.24	(12.0	877.87	(12.0	146.94	(12.0
454.12	(14.0	054.16	(14.4	767.24	13.0??	878.84	(12.0	148.19	(15.6
455.12	(14.2	078.04	(14.4	770.25	(12.0	884.85	(12.0	148.91	(12.5
455.95	(13.6	114.05	(14.4	775.81	(12.0	885.86	(12.0	151.81	(12.0
456.0	15.4	128.01	(14.4	777.86	(12.0	886.88	(12.0	159.82	(12.0
456.88	(13.6	129.02	(14.4	779.85	(12.0	894.86	(13.0	161.92	(12.0
458.88	(13.6	130.03	(14.4	784.85	(12.0	895.87	(12.0	163.90	(12.0
459.12	(14.0	131.97	(14.0	785.92	(12.0	903.87	(12.0	165.84	(13.4
459.84	(13.6	133.07	(14.4	786.87	(12.0	907.87	(12.0	166.85	(12.0
461.09	(14.0	135.02	(14.4	789.82	(12.0	908.87	(12.0	167.97	(12.0
462.08	(14.2	354.29	(14.4	.83	(14.4	909.88	(12.0	171.32	(12.0
464.10	(14.4	355.30	(14.4	791.84	11.5	910.87	(12.0	172.05	(13.0
465.07	(14.2	369.22	(14.4	793.81	11.3			173.81	(13.5
466.12	(14.0	371.20	(15.6	794.80	12.7?	2445000+		174.90	(14.4
468.14	(14.0	378.13	(14.4	797.89	(12.0	001.17	(12.0	175.81	(13.5
469.02	(13.6	379.14	(14.4	804.79	(12.0	007.17	(12.0	176.80	(13.5
485.08	13.6	428.24	(14.4	805.85	(12.0	014.17	(12.0		
486.05	(13.8	435.19	(14.4	806.79	(12.0	016.17	(12.0		
487.05	14.4	454.17	(14.0	807.91	(12.0	037.22	(12.0	BP CrA	
491.05	(14.0	455.15	(14.4	810.04	(13.0	050.19	(12.0	183037	
494.09	(14.0	459.13	(14.0	811.81	(12.0	054.13	(12.5		
495.11	(14.0	462.13	(14.4	813.81	(12.0	055.23	(12.0	2443000+	
522.0	15.0	462.94	(12.0	816.94	(12.0	056.06	(13.5	298.97	(14.6
523.04	(14.0	465.12	12.0	817.85	(12.0	062.22	(12.0	309.89	(14.4
541.87	(14.0	466.12	12.8	820.81	(12.0	064.23	(12.0	423.0	(14.4
670.2	(15.5	468.14	(13.5	821.91	(12.0	065.23	(12.0	434.0	14.1
671.34	(14.0	482.96	(12.0	822.80	(12.0	067.24	(13.0	803.99	(14.5
674.32	(14.0	485.10	(15.6	825.82	(12.0	076.23	(12.0	805.06	(14.5
678.35	(14.0	487.06	(15.6	833.83	(12.0	082.21	(12.0	809.10	(14.4
681.34	(14.0	494.10	(14.0	835.85	(12.0	084.26	(12.0	810.96	(13.7
682.38	(14.0	495.11	(14.0	836.81	(12.0	086.19	(12.0	964.39	15.2
699.30	(14.1	523.05	(14.4	837.92	(12.0	095.23	(12.0	970.38	(14.6
703.26	(14.1	678.36	(13.5	841.83	(12.0	104.91	(12.0	991.39	14.3
705.30	(14.0	681.36	(14.0	843.83	(12.0	106.05	(13.0	995.18	14.5
707.25	(14.2	682.39	(14.0	844.86	(12.0	107.09	(13.0	997.28	(14.6
708.28	(14.1	699.32	(14.0	845.87	(12.0	109.08	(13.0	2444000+	
727.39	(14.0	703.28	(14.0	846.84	(12.0	112.23	(15.6	013.2	14.2
730.21	(14.0	707.26	(14.0	847.85	(12.0	113.06	(13.0	018.37	(15.0
733.16	(14.0	708.30	(14.0	848.82	(12.0	114.39	(12.0	024.14	14.4
734.27	(14.7	730.23	(13.7	849.84	(12.0	117.20	(12.0	054.22	(14.5
756.16	(15.2	733.17	(13.7	851.85	(12.0	119.23	(12.0	078.11	13.9
809.92	(14.0	741.24	(12.0	852.86	(12.0	120.02	(13.0	117.16	14.3
864.9	(14.2	747.86	(12.0	853.82	(12.0	122.21	(12.0	149.95	(13.5
865.83	(13.6	748.89	(12.0	854.84	(12.0	123.61	(12.0	165.06	(13.7
864.96	(14.4	749.93	(12.0	857.84	(12.0	130.84	(12.0	176.9	14.9
876.9	(15.5	751.94	(12.0	863.88	(12.0	134.87	(12.0	197.9	(14.4
878.85	(13.6	752.94	(12.0	867.85	(12.0	135.91	(12.0	454.03	14.1
902.9	(15.0	754.98	(12.0	868.85	(12.0	137.05	(13.0	454.98	14.0

TABLE 2 (cont)

BP CrA 183037		DH Aql 192010		DH Aql 192010		KX Aql 192914		KX Aql 192914	
2444000+		2444000+		2444000+		2442000+		2444000+	
455.89	13.9	355.37	(14.0	847.85	(12.7	168.16	(13.5	064.99	(12.8
458.95	14.2	369.23	(14.0	848.82	(12.7	949.09	10.8??	067.05	(13.0
461.99	(13.7	371.32	(15.0	849.84	(12.7	978.96	(13.0	067.94	(14.0
463.93	(14.5	428.22	(14.0	852.86	(12.7	980.85	(13.3	068.93	(14.0
467.89	(14.5	435.17	(14.0	853.82	(12.7			069.96	(13.0
473.01	15.1	455.14	13.8	854.84	(12.7	2443000+		071.07	(14.5
478.87	(14.5	459.12	(14.2	863.88	(12.7	029.92	(14.0	072.25	(14.0
479.89	(14.5	462.09	(14.2	867.86	(12.7	030.89	(14.0	073.00	(14.0
480.90	(13.7	485.13	(15.5	868.85	(12.7	032.97	(14.0	073.94	(14.0
481.90	(14.5	487.12	(15.5	870.85	(12.7	033.95	(14.0	075.11	(14.0
482.90	14.0	494.11	(14.0	873.87	(12.7	035.02	(12.8	075.92	(13.0
483.89	13.8	495.13	(14.0	876.85	(12.7	040.02	(12.8	076.06	(12.8
511.0	15.5	523.07	(14.2	877.87	(12.7	049.91	(14.0	076.06	13.9?
538.96	(13.1	703.38	(14.0	878.84	(12.7	079.91	(14.0	076.92	(13.3
707.1	14.3	708.34	(14.0	885.86	(12.7	278.15	(12.8	076.92	(14.0
722.95	(13.1	719.23	(11.6	903.88	(12.7	285.30	(14.0	077.93	(14.0
738.01	14.8	726.26	(12.7	907.86	(12.7	396.90	(14.0	078.91	(14.0
749.92	(13.7	727.22	(12.7	908.88	(12.7	429.0	(12.8	079.90	(14.0
750.07	(13.1	728.25	(12.7	909.86	(12.7	648.20	11.2	081.08	(14.0
787.95	(14.5	729.25	(12.7			789.85	(13.2	082.14	(14.0
792.02	14.5	730.28	(14.0	2445000+		793.87	(13.6	083.05	(14.0
794.98	15.2	736.26	(14.0	050.17	(12.7	797.86	(12.8	084.10	(14.0
795.04	15.0	738.25	(12.7	053.22	(12.7	798.85	(13.2	085.14	(14.0
833.95	14.5	739.25	(12.7	054.20	(12.7	803.84	(13.2	087.15	(14.0
836.93	14.8	753.25	(12.7	055.22	(12.7	804.86	(13.0	087.90	(13.5
843.98	14.8	754.25	(12.7	056.21	(12.7	809.05	(14.0	091.92	(12.8
864.94	14.8	756.25	(12.7	060.23	(12.7	811.87	(12.6	095.91	(14.0
867.95	(13.1	765.24	(12.7	062.21	(12.7	812.84	(13.5	096.88	(14.0
870.0	(13.7	766.25	(12.7	065.23	(12.7			098.93	(14.0
871.93	(14.4	767.25	(12.7	067.24	(12.7	2444000+		099.98	(14.0
875.94	(13.1	770.25	(12.7	078.23	(12.7	025.31	(12.2	100.91	(14.0
879.95	14.8	777.88	(12.7	081.20	(12.7	027.21	(13.3	101.83	(13.5
901.95	14.6	785.93	(12.7	082.20	(12.7	028.23	(12.8	103.85	(13.4
904.01	14.2	789.97	(12.7	083.21	(12.7	029.34	(14.0	104.89	(14.0
		805.86	(12.7	084.21	(12.7	030.32	(14.0	105.85	(13.5
		806.87	(12.7	085.20	(12.7	031.24	(13.3	106.90	(13.3
		807.91	(12.7	086.20	(12.7	032.37	(14.0	108.89	(14.0
		811.82	(12.7	087.18	(12.7	033.24	13.8?	110.89	(14.0
		813.81	(12.7	090.22	(12.7	034.22	(12.8	111.91	(14.0
		816.94	(12.7	091.23	(12.7	041.04	(13.5	112.93	13.8
		817.85	(12.7	093.20	(12.7	042.00	(13.0	113.83	(14.0
		820.82	(12.7	094.20	(12.7	048.99	(13.5	117.89	(13.5
		821.91	(12.7	095.23	(12.7	053.12	(13.4	122.96	(13.8
		825.81	(12.7			054.18	(14.0	124.81	(13.4
		833.82	(12.7			055.01	(14.0	126.91	(13.3
		835.86	(12.7			056.97	(13.5	129.09	(12.8
		836.82	(12.7			057.19	(14.0	129.97	(14.0
		837.92	(13.7			058.33	(14.0	131.85	(12.8
		843.85	(12.7			058.96	(13.0	133.92	(14.0
		844.86	(12.7			060.34	(14.0	134.89	(13.3
		845.88	(12.7			060.96	(13.0	135.89	(13.3
		846.85	(12.7			061.98	(12.8	136.93	(14.0

TABLE 2 (cont)

KX Aql
192914

2444000+

137.91	(13.3
138.83	(13.6
139.83	(14.0
140.92	(13.2
141.85	(13.4
142.90	(14.0
143.85	(14.0
145.85	(13.2
150.81	(12.4
152.81	(12.8
154.91	(14.0
156.86	(12.8
157.85	(12.8
159.91	(14.0
161.88	(13.3
162.95	(12.8
164.05	(12.8
164.89	(14.0
165.94	(12.8
167.85	(13.2
168.84	(13.2
169.91	(14.0
170.83	(13.4
171.84	(13.0
173.83	(13.0
174.84	(13.0
183.84	(12.4
184.83	(12.6
351.24	(13.3
352.24	(13.3
370.23	(13.8
375.22	(13.5
376.30	(13.5
377.24	14.0?
379.24	14.3?
386.24	(13.8
397.04	(13.5
400.23	14.0?
405.13	(13.0
412.22	(13.3
429.96	(14.0
430.93	(13.3
432.97	(13.3
434.92	(12.8
436.93	(13.3
438.09	(14.0
438.94	(13.8
439.90	(12.8
451.91	(14.0
455.85	(13.2
456.91	(13.2
457.94	(13.0

KX Aql
192914

2444000+

458.88	(13.3
459.89	(14.0
461.03	(13.0
461.94	(13.3
464.91	(13.3
465.80	(12.5
465.84	13.0
468.95	(13.3
469.89	(14.0
479.95	(14.0
481.83	(12.8
482.83	13.0
482.93	13.8
484.81	13.0??
484.82	(13.4
485.97	(14.0
487.01	(14.0
487.94	(13.3
488.96	(13.3
489.95	(14.0
490.93	(14.0
493.34	(14.2
493.89	(14.0
495.92	(13.3
496.94	(14.0
497.96	(14.0
498.93	(14.0
499.92	(12.8
500.90	(14.0
502.31	(13.5
505.0	(14.0
506.36	(13.9
510.88	(13.5
512.0	(16.0
512.92	(14.0
514.88	(12.8
515.99	(12.8
516.97	(12.8
517.92	(14.0
522.96	(14.0
525.93	(12.6
526.98	(12.6
527.90	(14.0
538.88	(12.6
539.92	(14.0
544.32	(13.5
545.25	(14.2
546.92	(14.0
604.15	(14.0
698.21	(13.3
701.22	(12.8
704.20	(13.3

KX Aql
192914

2444000+

711.24	13.8
712.23	(13.3
727.22	(13.8
728.25	(13.3
729.25	(13.3
736.25	(13.3
738.26	(13.3
739.25	(13.3
753.25	(13.3
754.25	13.8?
756.25	(13.3
784.96	(13.5
789.97	(13.3
792.02	(14.0
795.04	(14.5
807.94	(13.5
815.94	(14.5
816.86	(13.2
817.96	(13.3
818.83	(13.2
819.90	(13.2
820.82	(12.9
821.94	(13.5
828.83	(12.6
829.84	(12.4
830.83	(12.4
832.95	(14.0
833.94	(14.0
835.91	(14.0
836.94	(14.5
837.86	(14.0
841.83	(13.3
842.83	(13.2
843.93	(14.5
844.84	(13.4
845.88	(13.3
846.85	(13.3
847.85	(13.3
848.83	(13.3
849.95	(14.0
852.86	(13.3
853.80	(13.0
858.80	(12.4
864.96	(14.0
865.82	(13.0
867.85	(13.3
868.85	(12.8
870.00	(12.8
870.91	(13.0
871.94	(14.0
872.86	(12.8
873.90	13.5?

KX Aql
192914

2444000+

875.93	(14.0
876.94	(14.0
877.87	(12.8
878.95	(14.0
879.86	(14.0
880.87	(13.0
885.83	(12.4
886.82	(12.6
887.83	(12.4
893.00	(12.6
894.88	(13.0
895.86	(12.8
896.88	(14.0
898.84	(12.7
901.95	(14.0
906.01	(12.8

2445000+

054.21	(12.8
063.22	(12.8
065.23	(13.3
081.21	(13.3
083.23	(12.8

RZ Sge
195816

2442000+

987.02	(12.9
987.97	(14.4
989.04	(14.4
991.95	(12.9
999.94	(13.4

2443000+

002.93	13.1
005.98	(14.4
008.93	(14.4
010.00	(14.4
012.95	(14.4
024.92	(14.4
029.91	(13.4
030.88	(14.4
032.97	(14.4
033.95	(14.4
037.90	(14.4
040.95	(13.4
049.90	(14.4
079.91	(13.4
339.02	(13.4
340.95	(13.4

RZ Sge
195816

2443000+

342.92	(13.4
353.00	(13.4
358.92	(13.4
360.05	(14.4
363.90	(13.4
366.99	(14.4
370.95	(14.4
374.91	12.5
375.91	13.2
376.01	13.5
376.90	(13.4
376.94	14.0
377.99	(14.4
380.91	(13.4
394.91	(14.4
395.99	(13.4
408.92	(13.4
422.92	(13.4
426.93	(12.5
428.90	(13.4
429.89	(13.4
430.93	(12.9
432.93	(12.5
433.90	(13.4
434.92	(13.4
436.90	(13.4
438.94	(12.5
439.94	(12.5
440.94	(12.5
442.92	(13.4
443.90	(13.4
444.90	(13.4
458.91	(13.4
615.20	(12.9
629.21	(12.9
684.97	12.3
689.98	(12.9
696.05	(13.4
696.95	(13.4
699.98	(12.9
701.00	(13.4
702.94	(13.4
712.91	(12.9
717.96	(12.9
724.06	(13.4
729.91	(12.5
730.89	(13.4
740.89	(13.4
745.00	(13.4
746.88	(12.9
753.90	(13.4
755.87	(13.4

TABLE 2 (cont)

RZ Sge 195816		RZ Sge 195816		RZ Sge 195816		RZ Sge 195816		KK Tel 202152	
2443000+		2444000+		2444000+		2444000+		2442000+	
756.83	(13.4	072.25	12.6	141.85	(13.2	492.94	(14.4	306.91	(14.0
760.96	(13.4	073.00	12.5	141.90	(13.5	493.88	(14.4	307.89	(13.9
770.85	(13.4	073.94	13.1	142.95	(13.4	496.96	(13.4	327.91	14.0
777.83	(13.2	074.94	13.2	143.81	(12.9	497.96	(14.4	329.93	13.9
778.95	(13.4	075.00	13.1	145.85	(13.0	498.92	(14.4	336.90	13.9
783.85	(13.4	075.11	13.5	150.81	(12.4	500.90	(14.4	338.91	14.5
784.85	(12.9	075.6	12.7	152.81	(12.4	510.88	(13.4	339.90	(14.0
786.93	(13.4	076.07	12.9?	154.91	(13.4	512.92	(14.4	340.91	(14.0
788.81	(13.4	076.92	13.6	156.96	(13.4	516.00	13.5	354.91	(14.3
789.84	(12.9	076.92	13.2	159.91	(13.4	516.98	(11.6	355.91	(14.0
790.86	(12.9	077.0	13.5	161.84	(13.0	527.90	(14.4	356.91	(14.0
791.85	(12.7	077.93	13.3	164.89	(13.4	539.92	(14.4	360.92	(14.0
793.85	(12.5	077.99	(13.4	167.85	(12.9	545.90	(13.4	361.93	(14.0
796.83	(12.5	078.12	13.6	168.83	(12.9	546.91	(14.4	362.92	(14.0
797.82	(12.5	078.91	13.4	169.91	(13.4	723.23	(12.9	363.90	(14.0
798.82	(13.2	078.99	(13.4	170.83	(13.2	779.96	(12.9	372.92	(14.0
800.89	(13.4	079.14	13.8	171.84	(13.0	784.08	(13.0	383.92	(14.0
802.85	(12.9	081.97	(13.4	173.83	(12.9	784.96	(13.4	384.91	(13.8
803.83	(13.2	082.14	(15.3	174.83	13.0	792.01	(13.4	389.92	(13.8
804.86	(12.7	083.06	(14.4	180.84	(12.9	794.95	(12.9	390.92	(14.0
810.83	12.1	084.10	(15.0	183.84	(12.4	795.03	(14.4	392.92	(14.0
811.87	12.1	085.14	(14.7	184.83	(12.5	807.92	(13.4	394.91	(14.0
812.83	12.4	087.15	(14.3	349.23	(12.5	813.01	(13.0	395.92	(14.0
814.85	12.7	089.96	(12.9	351.24	(12.9	815.95	(14.4	494.25	(14.0
816.84	(12.5	091.94	(12.5	370.23	(12.9	818.89	(13.4	520.29	(14.0
819.85	(12.2	095.91	(13.4	375.22	(12.9	819.89	(12.9	607.04	(13.8
820.84	(12.5	098.92	(14.4	376.29	(12.9	820.82	(12.6	630.98	(13.9
821.85	(12.5	099.99	(13.4	379.24	(12.9	821.94	(13.4	634.96	(13.9
2444000+		100.89	(12.9	386.24	(12.9	828.84	(12.6	636.99	(13.9
		101.83	(12.9	397.04	(13.4	829.83	(11.6	649.94	(13.9
027.25	(12.9	103.85	(13.4	426.94	13.4			653.98	(13.9
028.24	(13.4	104.94	(13.4	429.94	(13.4			656.95	(13.9
030.24	(12.5	105.85	(13.5	431.03	(14.4	KK Tel		710.97	(13.9
031.24	(12.5	106.90	(12.9	432.98	(12.9	202152		714.94	(13.9
033.25	(12.9	108.89	(13.4	438.04	(14.4			727.93	(13.8
053.11	(13.4	110.89	(13.4	451.92	(13.4	2442000+		736.91	(13.9
054.04	(13.4	111.91	(13.4	455.11	(12.5	271.96	(14.0	745.91	(13.9
055.01	(13.4	112.93	(12.9	455.86	(12.9	272.89	(14.0	995.01	(13.9
057.22	(14.7	113.83	(13.5	456.91	(12.9	273.92	(14.0		
057.97	(12.9	117.89	(12.9	459.89	(13.4	274.91	(14.0	2443000+	
058.96	(12.9	122.92	(12.5	461.03	(12.9	275.93	(14.0	046.96	(13.9
060.04	(14.0	124.81	(13.4	463.04	(13.4	276.92	(14.0	099.91	(13.8
060.96	(12.5	126.91	(12.9	469.99	(14.4	277.94	(14.0	404.97	(13.9
067.05	(13.0	129.97	(13.4	472.94	(14.4	278.90	(14.0	419.0	(13.5
067.94	(13.4	133.91	(12.9	479.90	(14.4	279.92	(14.0	425.9	(13.5
068.93	(12.9	134.90	(12.9	482.82	(12.8	294.90	(13.9	426.9	(13.5
069.96	12.7	136.96	(13.4	483.96	(12.9	297.92	(14.0	428.9	(13.5
069.97	12.7	138.83	(13.6	484.90	(13.5	299.91	(14.0	430.9	(13.5
070.92	12.2	139.83	13.4	487.01	(13.4	302.92	(14.0	669.19	(14.3
071.07	12.5	139.86	13.2	489.95	13.0	303.90	(14.0	732.28	(14.3
		140.91	(12.9	490.93	14.0	304.92	(14.0	733.32	13.9

TABLE 2 (cont)

KK Tel 202152		KK Tel 202152		KK Tel 202152		KK Tel 202152		TT Ind 202556	
2443000+		2444000+		2444000+		2444000+		2444000+	
734.31	14.3	198.86	(14.0	487.14	(15.6	896.95	(13.8	500.08	(13.5
735.34	(14.3	200.89	(14.0	487.84	(13.8	904.91	(13.8	523.08	(14.6
748.21	(14.3	202.87	(14.0	489.0	(15.5	906.10	(13.8	575.06	(13.5
751.24	(14.3	203.86	(13.8	494.08	(13.8	911.95	(13.8	577.07	(15.1
788.07	(14.3	208.88	(13.0	495.10	(14.2	916.01	(13.9	585.04	(14.6
805.12	(14.0	215.89	(13.5	496.96	(13.8	929.90	(13.8	708.35	(14.2
806.09	(14.3	227.91	(13.9	515.98	(13.8	931.88	(13.8	727.37	(14.0
964.38	(14.3	292.37	(14.0	517.00	(13.8	933.92	(13.5	730.32	(14.0
969.38	(14.3	302.13	(13.0	518.91	(13.8	934.88	(13.8	734.30	(14.6
991.39	(14.3	308.17	(13.0	523.09	(14.7	941.90	(13.8	756.21	(15.1
996.35	(14.3	313.36	(14.0	525.95	(13.8	942.91	(13.8	789.84	(13.5
997.31	(14.3	320.22	(14.3	526.98	(13.8	953.91	(13.8	791.88	(13.5
999.35	(13.8	321.33	(14.0	545.92	(13.9	955.97	(13.8	793.82	(13.5
		354.32	(14.3	549.93	(13.8	958.89	(13.8	825.88	(13.5
2444000+		355.34	(14.3	553.0	(13.8	965.89	(13.8	871.98	(13.5
005.22	(13.8	368.00	(13.8	554.0	(13.8	970.90	(13.8	874.15	(13.5
012.17	(13.8	369.25	(14.2	554.91	(13.8			876.96	(13.5
018.23	(15.5	369.31	(14.0	566.96	(13.5			877.92	(13.5
021.15	(13.8	371.26	13.2	568.98	(13.8			881.12	(12.0
024.16	(13.0	372.22	13.2	582.98	(13.8	TT Ind		882.06	(15.1
028.15	(13.8	372.99	(13.9	708.35	(14.2	202556		896.91	(13.5
030.17	(13.8	374.23	13.9	727.38	(13.8			904.92	(13.5
042.14	(13.8	375.17	13.8	730.32	(14.1	2444000+		906.08	(13.5
054.16	(13.8	377.16	(13.8	734.31	(14.7	030.39	(14.5	906.87	(12.5
060.32	(13.8	399.1	(16.0	784.97	(13.8	032.38	(14.5	911.95	(13.5
061.24	(13.8	405.12	(13.8	789.85	(13.8	048.29	(14.5	926.02	(13.5
075.24	(13.8	428.20	(14.2	791.89	(13.8	054.17	(14.5	927.08	(13.5
078.10	(13.8	432.00	(13.8	793.83	(13.8	078.08	(14.0	929.90	(13.5
082.31	(13.8	435.14	(14.2	796.23	(13.8	086.36	(14.5	931.89	(13.5
106.02	(13.8	437.13	(13.9	796.85	(13.0	113.04	(14.2	933.92	(13.5
114.14	(13.8	438.94	(13.8	807.95	(13.8	128.01	(14.0	934.88	(13.5
117.15	(14.3	444.14	(13.8	817.04	(13.8	354.31	(14.0	937.05	(13.5
134.89	(14.0	445.15	(13.8	821.96	(13.8	355.33	(14.0	941.90	(13.5
142.88	(14.0	453.81	(13.0	828.19	(13.8	369.24	(14.2	942.91	(13.5
145.21	(13.8	454.15	(14.2	839.93	(13.8	371.27	(15.4	944.87	(13.5
159.10	(13.8	454.91	(13.8	844.84	(13.8	428.21	(14.0	953.91	(13.5
164.03	(13.8	455.12	(14.0	845.85	(13.8	435.14	(14.0	955.97	(13.5
165.05	(13.8	455.17	14.0	849.92	(13.8	454.13	(14.0	958.89	(13.5
167.13	(13.8	456.92	(13.8	854.06	(13.8	455.16	(14.0	965.89	(13.5
		457.06	(13.8						
167.84	(14.0			863.1	(14.0	459.11	(14.0	968.91	(13.5
169.02	(13.8	458.07	(13.8	864.83	(13.0	462.11	(14.0	970.90	(13.5
170.03	(13.8	459.11	(14.2	865.91	(13.8	465.08	(14.0		
173.87	(14.0	459.90	(13.8	870.04	(13.8	466.09	(14.0		
186.04	(13.8	460.99	(13.8	871.98	(13.8	485.14	(15.4		
186.89	(14.0	462.11	(14.2	874.17	(13.8	487.13	(15.4		
188.02	(13.8	464.11	(13.8	875.93	(13.8	491.06	12.2		
188.88	(14.0	466.09	(14.2	876.95	(13.8	492.06	12.4		
189.90	(14.0	469.04	(13.8	877.92	(13.8	493.07	12.4		
191.88	(14.0	482.83	(13.8	878.89	(13.8	494.08	12.5		
193.90	(14.0	485.15	(15.1	879.97	(13.8	495.09	12.6		
197.90	(13.9	485.91	(13.8	882.08	(15.1	498.08	(13.0		

TABLE 2 (cont)

TU Ind 202645

2442000+
271.98 13.8
272.94 13.8
273.91 13.8
274.91 14.5
275.92 (14.3
276.90 (14.3
277.93 (14.3
278.90 (13.8
279.91 (13.8
296.91 14.1

297.92 14.3
299.92 (13.8
302.92 (13.8
303.90 (13.8
304.92 (13.8
306.91 14.1
307.89 14.0
327.91 (13.8
329.93 14.2
336.94 (13.0
338.92 (14.3

339.90 (14.3
340.90 14.1
354.91 (14.3
355.91 (14.3
356.91 (14.3
360.92 14.1
361.93 (14.3
362.92 (14.3
363.90 (14.3
372.92 (14.3

383.92 (13.8
384.91 (13.8
389.92 (13.8
390.92 (13.8
392.92 (13.8
394.91 14.1
395.92 (13.8
397.91 (13.8
473.27 (13.8
494.26 14.1

520.29 13.9
607.05 (13.5
636.99 (13.5
649.94 (13.5
653.98 (13.5
656.98 (13.5
710.98 (13.5
711.94 (13.5
727.93 (13.0
736.92 (13.5

TU Ind 202645

2442000+
745.91 (13.5

2443000+
040.96 (13.5
099.92 (13.0
404.98 12.5
419.9 (13.0
425.9 (13.0
426.9 13.0
428.9 13.5

430.9 (13.5

2444000+
354.33 (14.3
355.35 (14.3
369.26 (13.8
371.30 (15.5
462.12 (14.2
466.10 (14.2
485.18 (15.5
487.16 (15.5

492.08 (13.8
494.08 (13.8
495.10 (14.2
523.13 13.6
524.12 13.6
525.12 13.7
708.36 13.9
710.38 (13.8
730.33 (13.8
789.85 (13.8

790.11 (13.0
791.88 (13.8
793.83 (13.5
796.19 (13.8
797.17 (13.8
825.88 (13.5
871.99 (13.8
876.96 13.9
896.91 (13.8
904.92 (13.8

906.08 (13.8
906.88 (13.8
926.02 (13.8
929.90 (13.8
930.88 (13.5
931.89 13.9
932.86 (13.5
933.92 (13.8
934.89 (13.8
937.05 (13.8

TU Ind 202645

2444000+
941.90 (13.8
942.91 (13.8
944.87 (13.8
953.91 (13.8
958.89 (13.8
965.90 (13.8
970.90 (13.5

VZ Aqr 212503

2441000+
488.27 (12.9
490.27 (12.2
492.25 (13.2
493.27 13.9
494.27 (12.9
495.27 (12.9
500.94 (12.9

501.98 (12.9
504.17 (13.1
506.21 (13.1
513.21 (13.1
515.96 (13.5
516.26 (12.9
517.26 (13.1
518.26 (13.1
521.23 (13.1
522.25 (13.1

528.95 (12.9
530.96 (12.9
531.98 (13.5
534.20 (13.1
535.95 (13.1
536.94 (13.1
544.94 (13.1
545.96 (13.1
548.20 (13.5
550.84 13.1

551.93 (12.9
556.05 (12.9
557.95 (12.9
563.94 (13.1
564.94 13.0
566.89 13.6
566.95 13.9
567.86 14.1
569.93 (13.1
570.92 (13.1

VZ Aqr 212503

2441000+
571.94 (13.1
573.94 (13.5
583.84 (13.5
584.86 (13.5
586.85 (13.1
587.95 (13.1
594.92 (13.1
605.88 (12.9
615.90 (12.9
617.95 (13.1

618.93 (12.9
619.93 (13.1
628.92 (13.1

2444000+
051.24 13.3
054.20 12.7
057.22 12.8
058.33 12.9
059.24 13.1
060.24 13.5

060.32 13.4
061.20 (13.5
062.24 (13.5
063.25 (12.9
069.95 (13.1
071.09 (12.9
072.26 (15.3
073.21 (14.5
074.24 (13.1
075.12 14.8

076.09 (13.1
077.25 (13.1
078.12 (14.0
079.15 (15.0
080.24 (13.1
081.08 (14.0
082.14 (14.0
084.11 14.8
085.15 15.0
086.35 (15.3

087.15 (14.0
088.25 (13.1
095.84 (12.9
097.89 (12.9
100.88 (12.0
101.89 (12.9
104.93 (13.1
105.93 (13.1
106.90 (13.1
112.93 (13.1

VZ Aqr 212503

2444000+
122.96 (13.1
125.82 (13.1
126.90 (13.1
129.93 (13.1
134.90 (13.1
135.89 (13.1
138.91 (13.1
140.91 (13.1
141.89 (13.1
142.86 (13.1

145.94 (12.9
155.86 (13.1
156.86 (13.1
161.88 (13.1
162.92 (12.9
167.99 (13.1
168.97 (13.1
171.86 (13.1
172.93 (13.1
183.91 (12.9
187.92 (13.1

188.89 (13.1
189.93 (13.1
197.90 (12.9
198.90 (13.1
200.89 (13.1
201.88 (13.1
349.22 13.6
351.23 13.6
352.24 13.5
370.24 (13.1

375.22 (13.1
377.24 (13.1
379.25 (13.1
386.25 (13.1
387.25 (13.1
400.24 (13.1
402.24 (13.1
404.25 (13.1
411.26 (13.1
412.23 (13.1

417.26 (13.1
428.24 (13.1
432.97 (13.1
434.92 (12.9
436.25 (13.1
436.93 (13.1
437.94 13.4
438.85 13.5
438.92 13.6
439.91 (12.9

TABLE 2 (cont)

VZ Aqr 212503		VZ Aqr 212503	
2444000+		2444000+	
440.25	(13.1	741.25	(13.1
444.25	(13.1	753.25	(13.1
445.26	(13.1	754.27	(13.1
446.25	(13.1	756.25	(13.1
453.90	(13.1	765.25	12.9
456.93	(12.9	766.25	12.7
457.94	(13.1	767.25	12.9
458.87	(13.1	770.21	13.1
461.94	13.6	786.25	(13.1
464.91	(13.1	787.26	(13.1
468.95	(13.1	788.25	(13.1
469.95	(13.1	789.97	(12.9
482.93	(13.1	790.10	(13.2
487.94	(13.1	792.24	(13.1
488.90	(13.1	796.28	(12.9
489.94	(13.1	797.17	(13.5
495.91	(13.1	798.25	(13.1
496.91	(13.1	799.25	(13.1
497.85	(13.1	800.25	(13.1
499.92	(13.1	807.92	(12.9
510.91	(13.1	814.25	(13.1
511.85	(13.1	817.05	(13.5
512.86	(13.1	817.96	(13.4
513.85	(13.1	821.91	(13.4
514.88	(13.1	828.20	(13.0
517.92	(13.1	835.86	(12.9
518.91	(12.9	836.92	(13.4
523.95	13.6	843.84	(13.4
538.89	(12.9	844.86	(13.4
539.87	(13.1	845.88	(13.1
541.87	(13.1	846.85	(12.9
542.90	(13.1	847.85	(13.1
544.93	(13.1	848.83	(12.9
546.89	(13.1	849.85	13.6
552.90	(13.1	851.85	(12.9
569.90	(13.1	852.86	(13.1
571.90	(13.1	853.82	13.1
698.21	(12.9	854.85	13.1
701.22	(12.9	855.86	13.2
703.20	(12.9	863.88	(13.1
		867.86	(13.1
704.19	(13.4		
711.21	(13.1	868.86	(13.1
712.23	(13.4	870.85	(13.1
726.25	(13.1		
727.24	14.0?		
728.25	(13.1		
729.25	(13.1		
736.25	(13.1		
738.26	(13.1		
739.25	(13.1		

PHOTOELECTRIC PHOTOMETRY OF V532 CENTAURI AND SOME NEARBY STARS

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Auckland Observatory of the Auckland Astronomical Society.

SUMMARY: Three colour UBV observations are presented of V532 Centauri and some of the nearby field stars.

...

INTRODUCTION.

In IAU Circ. 3586 (1) it was suggested that V532 Cen was a cataclysmic variable identical with the X-ray source 3A-1431-409. Following correspondence with the Director of the Section we made several three colour measures of V532 Cen and several of the nearby field stars, during 1981 May to July. These observations are presented here as it is not our intention to continue to observe these stars.

OBSERVATIONS.

The observations were made using the Griffiths/Freeth photon detection system on the Edith Winstone-Blackwell 50cm Cassegrain telescope at the Auckland Observatory. The system details have been described by Freeth (2).

The reduced magnitudes are given in Table 1. The star used for comparison is indicated for each object. Star 'B' was used as the primary comparison. The three colour values V= 9.90, B-V = +0.40, U-B = +0.01, were deduced from observations of the known standard stars HD 126981, HD 127294, and HD 126386 (3).

Figure 1 is a field sketch of the region near V532 Cen and identifies the various stars observed.

CONCLUSIONS.

We conclude that none of the stars observed show colours expected of a cataclysmic variable. No V magnitude variation greater than 0.3 was observed on any star during the observing interval. Both V532 Cen and star 'C' show sufficient change to suggest they may be small amplitude variables.

REFERENCES

(1) 1981. IAU Circ. 3586.
(2) Freeth, R.V. 1982. "A Microbased Stellar Photometry System". Proc. Second N.Z. Symp. Photoelectric Photometry. In Press.
(3) Cousins, A.W.J. & Stoy, R.H. 1963. Roy Obs Bull No. 64.

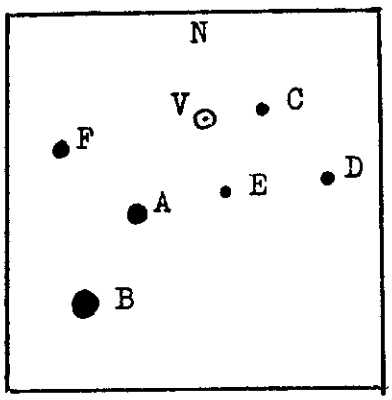

Figure 1. Field Sketch Showing the Position of V 532 Cen and the Brighter Nearby Stars.

TABLE 1. Three colour UBV Observations.

Object	J.D. 2444000+	V	B-V	U-B	Comp	Notes
A	727.906	10.47	+1.42	+1.55	B	
= Co2	727.926	10.42	+1.48	+2.12	B	
−40° 2811	746.973	10.46	+1.42	+1.63	B	
	746.994	10.43	+1.42	+1.55	HD 126981	
	760.982	10.47	+1.40	+1.57	B	
	776.911	10.46	+1.44	+1.64	B	
	789.860	10.45	+1.46	+1.80	B	
	797.906	10.44	+1.45	+1.57	B	
	802.865	10.50	+1.35	-	B	
		Mean 10.45	1.43			
HZ 128086 = Co2 −40° 8215 B	746.992	9.90	+0.40	+0.01	HD 126981	
C	746.987	12.45	+1.23	+1.56	B	
	776.920	12.43	+1.39	+1.61	B	
	789.858	12.24	+1.22	+1.95	B	
	797.904	12.36	+1.13	+1.21	B	
	802.859	12.38	+1.39	-	B	
D	746.983	12.33	+0.42	-0.08	B	
	776.922	12.35	+0.42	-0.02	B	
E	746.979	13.70	+0.47	-0.2:	B	1.
	776.918	13.53	+0.49	+0.6:	B	
F	746.975	11.23	+1.28	+0.9:	B	1.
= Co2 −40° 8815	776.913	11.19	+1.22	+1.8:	B	
V 532 Cen	727.901	13.61	+0.98	+0.1:	B	1.
	746.990	13.74	+1.12	-0.6:	B	
	760.976	13.64	+0.75	+0.3:	B	
	776.907	13.69	+1.07	-0.1:	B	
	786.794	13.53	+0.80	+0.3:	B	
	789.854	13.62	+1.03	+0.6:	B	
	797.901	13.83	+0.40	+0.4:	B	
	802.861	13.80	+0.94	-	B	

Notes: 1. U-B values of low weight due to small number of net U photons.

PHOTOELECTRIC PHOTOMETRY OF NOVA CORONAE AUSTRINAE-1981

W.S.G. Walker and Brian F. Marino
Auckland Observatory of the Auckland Astronomical Society.

SUMMARY: 17 sets of three colour UBV observations of Nova Coronae Austrinae 1981 obtained at Auckland Observatory are presented.

...

INTRODUCTION

This nova, discovered by Honda, was observed on 17 occasions during the period 1981 April 24 to July 20, using the Edith Winstone Blackwell 50cm reflector at the Auckland Observatory. Observations were made in the UBV colour system using standard filters and an EMI 9502 photomultiplier tube. The observing techniques and reduction methods are as previously described (1).

OBSERVATIONS

Except where noted each observation comprises 2 groups of UBV measures, each comprising 3 sets of 10 second integrations in each colour. Observations were made using a 31 arc second aperture, in the sequence sky, comparison, variable, variable, check, comparison, sky. The main comparison star was that near AM CrA marked '84' on chart No. 378 (2). Star '77' was used as a check star. Three colour values for these were determined from standard stars HD 170040 and HD 169942 (3), yielding the values:-

HD 172125=C-37°12770 Star 84	V = 8.41	B-V = +0.54	U-B = +0.12
HD 172003=C-37°12765 Star 77	7.69	+1.57	+1.83

The observations are shown in Table 1 and Figure 1.

We have determined the internal accuracy of the observations to be within the following limits:

1. At Magnitude V = 10.39, V ±0.013; B-V ± 0.018; U-B ±0.008
2. At magnitude V = 14.15 V ±0.18; B-V ±0.25; U-B ±0.10

DISCUSSION

The rate of decline is similar in the V and B passbands, but is rather less in the U band. There is a general slowing of the decline during the period JD 2444750 to 2444780, and there is a slight indication that the decline was slowing as the observing period concluded.
On some nights the nova was brighter than the preceding night, indicating short term brightenings. No attempt was made, however, to monitor the nova over a full night to search for periodic variations.

CONCLUSIONS

Compared to other novae measured in Auckland during the past decade the intensities in both B and U bands were very strong compared to the V. This produced the unusual colours B-V and U-B in Table 1. D. Buckley (4) has confirmed that the nova had a very strong emission spectra.

ACKNOWLEDGEMENTS

We wish to thank G. Herdman, P. Kilbey and I. Maxwell for assistance with the observations and the reductions; the Auckland Astronomical Society and the Carter Observatory for grants towards the computing facilities used in the reductions; and the Auckland Observatory Trustees and the University of Auckland for use of the telescope and photoelectric equipment.

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(3) Cousins, A.W.J. & Stoy, R.H. 1963. Roy Obs Bull No. 64.
(4) Buckley, D. 1981. Private communication.

TABLE 1. Three colour UBV Observations.

J.D. 2444000+	V	B-V	U-B	Notes
719.0428	10.39	-0.65	-0.87	
727.1084	10.90	-0.72	-0.95	1 set
747.0187	12.08	-0.63	-1.36	
747.9309	12.13	-0.62	-1.34	
748.9520	12.34	-0.80	-1.37	
749.9378	12.28	-0.67	-1.40	
752.9244	12.47	-0.75	-1.41	
753.9443	12.19	-0.71	-1.35	
754.9274	12.50	-0.75	-1.46	1 set
761.0025	12.66	-0.73	-1.57	
766.9347	12.96	-0.88	-1.69	
776.9362	13.29	-0.80	-1.88	
777.9407	13.27	-0.70	-1.98	
780.8603	13.66	-0.97	-1.92	conditions poor
789.8378	13.84	-0.72	-2.16	
797.9434	13.68	-0.30	-2.22	
805.8270	14.15	-0.57	-2.14	

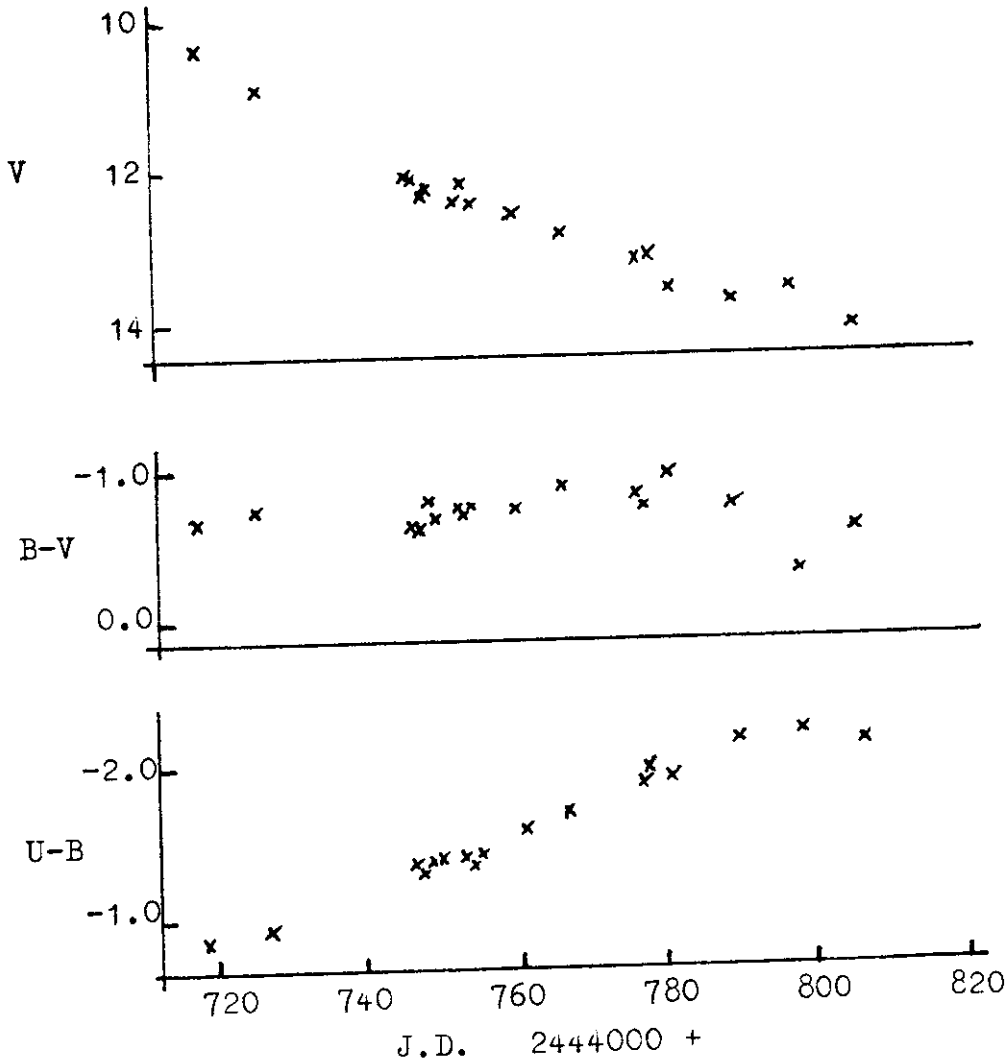

FIGURE 1. Observations of Nova Coronae Austrinae 1981.

VISUAL OBSERVATIONS OF THE IRREGULAR VARIABLE RX LEPORIS

Frank M. Bateson and C.W. Venimore
Variable Star Section, Royal Astronomical Society of N.Z.

SUMMARY: A light curve from 194 visual observations of RX Lep is presented. It is shown that the variable is a typical red irregular variable.

...

INTRODUCTION

RX Lep is catalogued (1) as of type Lb, spectral class gM6, and with a visual range of 5.0 to 7.0. This star is BD $-12^{\circ}1092$=HD 33664 =GC6358=SVS 100456= Zi 357. It was under the last designation that Oravec (2) publisheda light curve for 1948 to 1955. His paper gives many references to RX Lep as a variable, or suspected variable.

CHART & SEQUENCE

Chart B3 (3) has been used with a sequence of V magnitudes.

OBSERVATIONS

RX Lep has been observed from J.D. 2,444,184 to 2,445,086. The main observing season is October through April. Seventeen observers have contributed estimates Those contributing more than 10 observations were: G. Herdman (17); P. Kilbey (41); A. Leslie (60); L. Turle (31) with 13 other observers contributing 45 observations.

DISCUSSION

Ten day means have been plotted in the light curve that appears in Figure 1. In this a cross denotes a mean from a single observation; a dot a mean from 2 to 4 observations and an open circle a mean from 5 or more observations. Although the interval covered is fairly short the light curve is published in the hopes of encouraging those with limited instrumental means to persist with their observations..

There is some scatter in the observations due to the redness of the variable. The amplitude and form of the light curve varies as can be expected for a star of this type. Three well defined minima were recorded at:

J.D. 2,444,291	6.30
626	6.61
937	6.66

Maxima have occurred when the variable was unobservable, with the exception of that on 2,444,220, which depends on a single observation. RX Lep has intervals when its amplitude is small. One such interval commenced on 2,445,000. The same low amplitude variations are apparent in Oravec's light curve. The times of minima tend to be well defined when the amplitude is larger and during such intervals minima have an approximate period of about 323 days. This rough periodicity disappears when the amplitude is small.

The mean range, during the period of observations, was 5.35 to 6.66 with extremes of 4.8 to 7.0.

CONCLUSIONS

RX Lep is a typical red irregular variable which has, at times, a rough periodicity of about 323 days with a mean visual range of 5.35 to 6.66. This tendency to an approximate periodicity disappears for intervals when the light curve is dominated by low amplitude variations.

ACKNOWLEDGEMENTS

We wish to thank all observers for their observations.

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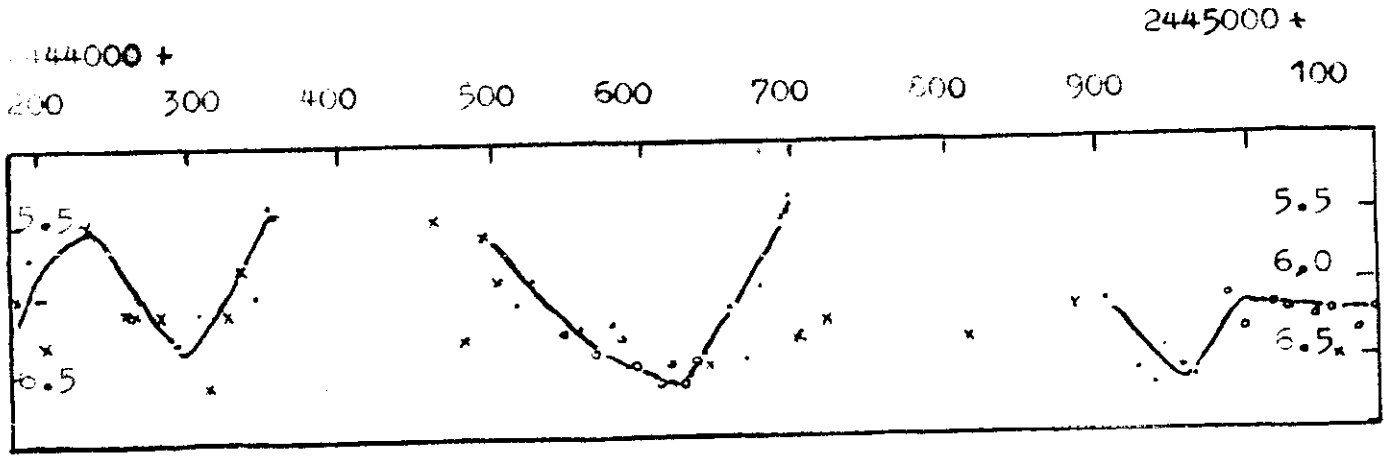

Figure 1 : Light Curve of RX LEPORIS.

PHOTOELECTRIC OBSERVATIONS OF THE 1981 SUPERNOVA IN NGC 1316

W.S.G. Walker and Brian F. Marino
Auckland Observatory of the Auckland Astronomical Society

SUMMARY: 9 sets of three colour UBV observations of the 1981 Supernova in NGC 1316 obtained at Auckland Observatory are presented.

...

INTRODUCTION

This supernova was observed on 9 occasions during the period March 11 to April 8,1981, after which time low altitude and increasing moonlight made observations impossible.
The telescope used was the 50cm Edith Winstone Blackwell reflector at the Auckland Observatory. Observations were made in the UBV colour system using an EMI 9502 photomultiplier tube andstandard filters. The observing techniques and reduction methods are as previously described (1).

OBSERVATIONS

Each observation comprises 4 groups of UBV measures, each comprising 3 sets of 10 second integrations in each colour. The observing sequence was sky, comparison, variable, variable, sky, variable, variable, comparison, sky. A nearby star was used as the main comparison, for which the values V=7.15, B-V = +0.15, U-B = +0.11 were deduced from HD 21635 and HD 21574 (2). A 31 arc second aperture was used, and sky measures were taken clear of the galaxy. The observations are given in Table 1 and in Figure 1. The time given is the mean of the four groups of measures.

We have determined the internal accuracy of the observations to be within the following limits:

1. At magnitude 12.27 V.	V	± 0.03	B-V ± 0.08	U-B ± 0.16
2. At magnitude 13.06 V		± 0.06	± 0.15	± 0.30

DISCUSSION

Our observations cover such a limited range that conclusions are dangerous. They show that the supernova was brightening initially and becoming slightly bluer. Peak brightness appears to have occurred near JD 2444681 and to have been associated with an abrupt change in the B-V colour curve, which reddens consistently from that point on as the supernova declined. The faintness of the object in U makes the U-B colours of limited value only.

ACKNOWLEDGEMENTS

We are especially indebted to F.M. Bateson for telephoned advice of discovery of this supernova which allowed the early observations to be obtained.
We wish to thank Gordon Herdman for assistance with the observations and reductions, the Carter Observatory and the Auckland Astronomical Society for providing funds to purchase the computer used in the reductions, the University of Auckland and the Trustees of the Observatory for the use of the telescope and associated equipment.

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TABLE 1. Three colour UBV Observations.

J.D. 2444000+	V	B-V	U-B	Notes
674.8593	12.51	+0.30	-0.26	
676.8538	12.40	+0.23	-0.25	
677.8559	12.37	+0.18	-0.21	
683.8845	12.27	+0.35	+0.19	2 groups only
691.8282	12.64	+0.77	+0.01	
692.8291	12.62	+0.84	+0.26	
698.8164	13.03	+0.93	-0.13	
699.8150	13.05	+1.18	+0.10	
702.8268	13.06	+1.14	+0.40	

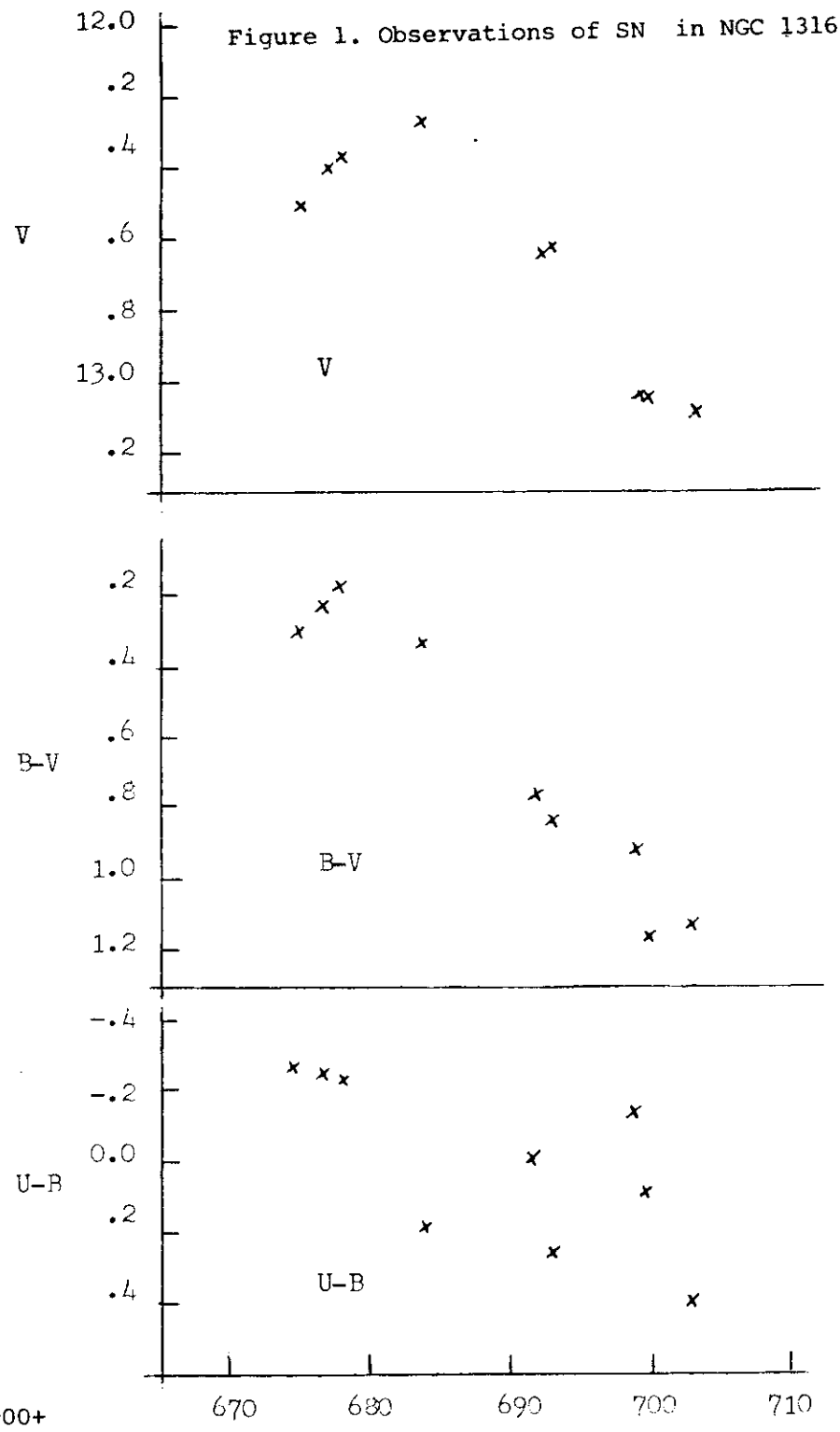

Figure 1. Observations of SN in NGC 1316

PHOTOELECTRIC PHOTOMETRY OF NOVA RR PICTORIA, CSV 6467 AND SOME NEARBY STARS.

Brian F. Marino and W.S.G. Walker
Auckland Observatory of the Auckland Astronomical Society

SUMMARY: Three colour UBV and unfilitered white light monitoring observations are presented for the nova RR Pictoris, CSV 6467, and some of the nearby field stars.

...

INTRODUCTION

Visual observations of RR Pic have appeared in many earlier Circulars of the Variable Star Section, and most recently have been summarised (1) for the interval JD 2440950 to 2443090.
The system has been observed photoelectrically by several observers (2),(3),(4). The magnitude is found to vary by a few tenths on a time scale of minutes. Observations over a few hours show repetitive fluctuations typical of orbital variations satisfying the ephemeris HJD (max) = 2438815.379 + 0.1450255 days. Vogt has discussed in detail a model which satisfies the observed photometric behavior and which is consistent with UV photometry carried out with the OAO-2 satellite.

OBSERVATIONS

We present here photoelectric UBV sets and unfiltered white light monitoring observations made at the Auckland Observatory between 1971 and 1976. Also presented are observations of CSV 6467 (=NSV 03043) and some of the nearby visual comparison stars which are shown on charts 269 and 270 (5).

The equipment used was the 50cm Edith Winstone-Blackwell telescope with the Mark 1 photometer using an EMI 9502 phototube and the original Clive Rowe current to frequency converter, for all observations up to JD 2441850. Thereafter the Griffiths/ prototype photon detection system was used with the same phototube and mechanical photometer section.

The main comparison for the observations was the star marked '83' for which the values V = 8.16, B-V = +1.13, and U-B = +1.08 have been deduced from the standards HD 46730, HD 46792 and HD 48189 (6). Star 'A', identified in Fig. 1, was used as a check star. The mean UBV values for this from 13 sets of observations are V = 10.21, B-V = +0.64, and U-B = +0.12.

Table 1 lists the reduced three colour observations for RR Pic. Column 6 gives the cycle and phase position from the ephemeris of Vogt above. Table 2 lists the results for CSV 6467 and the field stars.

For the white monitoring, sky and comparison star measurements were taken at frequent intervals during each observing session to allow reduction to net white intensity. The reduced white light-curves are plotted in Fig.2 to 4. A time derived from the data in Figure 2 has been used by Vogt in his period analysis of the system. No attempt has been made to determine a time of maximum light from the data in Figures 3 or 4.

CONCLUSIONS

The observations of RR Pic are generally consistent with those obtained by Vogt. CSV 6467 shows variations and colour of a magnitude and colour indicative of a small amplitude red variable star. Stars 'A', "68' and '89' show no significant variations of magnitude or colour during the interval of the observations.
We do not intend to make further observations of any of these stars in the future.

ACKNOWLEDGEMENTS

Assistance with the observations was provided by J and L. Beuning, D. Fisher, S. Clements, G. Freeth, D. Paterson, G. O'Connor and M. Stoker.

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(6) Cousins, A.W.J. & Stoy, R.H. 1963. Roy Obs Bull No. 64.

TABLE 1. Three colour UBV Observations of RR Pic

J.D. 2440000+	V	B-V	U-B	Air Mass X	Cycle phase	Notes
1019.003	12.14	-0.01	-0.91	1.42	15194.72	
1036.870	12.06	-0.09	-0.92	1.19	15317.92	
1066.924	12.16	-0.06	-0.99	1.70	15525.15	
1069.904	12.33	-0.23	-0.97	1.63	15545.71	
1714.044	11.88	-0.03	-1.02	1.24	19987.26	
1714.053	11.98	-0.04	-0.92	1.27	19987.31	
1715.886	12.20	-0.12	-0.96	1.12	19999.97	
1722.902	12.31	-0.09	-0.92	1.11	20048.35	
1729.923	12.38	-0.15	-0.99	1.12	20096.76	
1736.866	12.30	-0.14	-0.99	1.11	20144.64	
1740.962	12.25	-0.12	-0.92	1.22	20172.88	
1771.866	12.09	-0.13	-0.94	1.20	20385.98	
1776.977	12.19	-0.07	-0.96	1.68	20421.21	
1778.977	12.07	-0.14	-0.93	1.72	20435.01	
1808.894	12.18	-0.13	-0.89	1.71	20641.30	
1828.775	12.17	-0.03	-0.93	1.38	20778.38	
2408.886	12.26	-0.01	-0.98	1.29	24778.44	
2409.881	12.29	-0.01	-0.98	1.29	24785.31	
2414.889	12.23	-0.11	-0.93	1.24	24819.83	
2422.016	12.11	-0.11	-0.94	1.12	24868.98	
2500.023	12.36	-0.08	-1.02	1.87	25406.86	

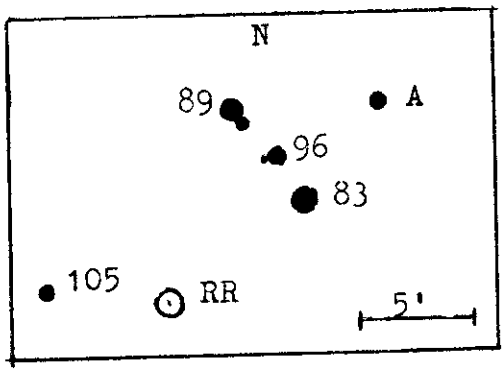


FIGURE 1. Identification of star 'A' near RR Pictoris.

TABLE 2. Three colour UBV Observations of stars near RR Pic

J.D. 2440000+	V	B-V	U-B	Air Mass X	Notes
Star: CSV 6467					
1019.010	8.88	+1.65	+1.95	1.45	
1036.875	9.45	1.60	1.65	1.19	
1066.930	9.02	1.68	1.95	1.74	
1069.915	9.06	1.68	1.91	1.20	
1715.893	9.01	1.63	1.82	1.12	
1722.909	9.04	1.67	2.00	1.11	
1729.929	8.99	1.66	1.75	1.13	
1740.970	9.08	1.66	1.97	1.24	
1771.870	9.10	1.66	1.86	1.21	
1776.974	9.09	1.66	2.00	1.66	
1778.970	9.07	1.65	1.89	1.67	
1808.899	9.04	1.61	2.01	1.75	
1828.780	9.03	1.66	-	1.40	
Star: 'A' on field sketch, Figure 1.					
1019.012	10.20	+0.64	+0.17	1.46	Mean V = 10.21
1066.928	10.21	0.64	0.13	1.73	
1069.913	10.22	0.67	0.08	1.68	B-V = +0.64
1069.927	10.21	0.61	0.10	1.78	
1715.884	10.18	0.65	0.11	1.12	U-B = +0.12
1722.907	10.22	0.63	0.11	1.11	
1729.930	10.18	0.66	0.06	1.13	
1736.871	10.23	0.63	0.11	1.11	
1740.967	10.22	0.65	0.10	1.24	
1771.872	10.19	0.63	0.16	1.21	
2408.893	10.20	0.64	0.13	1.27	
2500.027	10.21	0.63	0.12	1.91	
2936.8	10.22	0.64	0.18	1.54	
Star: '68' on chart 269					
1715.875	6.57	+0.11	+0.01	1.13	
2936.8	6.62	0.09	0.11	1.54	
Star: '89' on chart 270					
1036.874	8.83	+0.89	+0.57	1.19	
1715.882	8.81	0.88	0.57	1.12	
2936.8	8.85	0.90	0.59	1.54	
'83'	8.16	+1.13	+1.08		

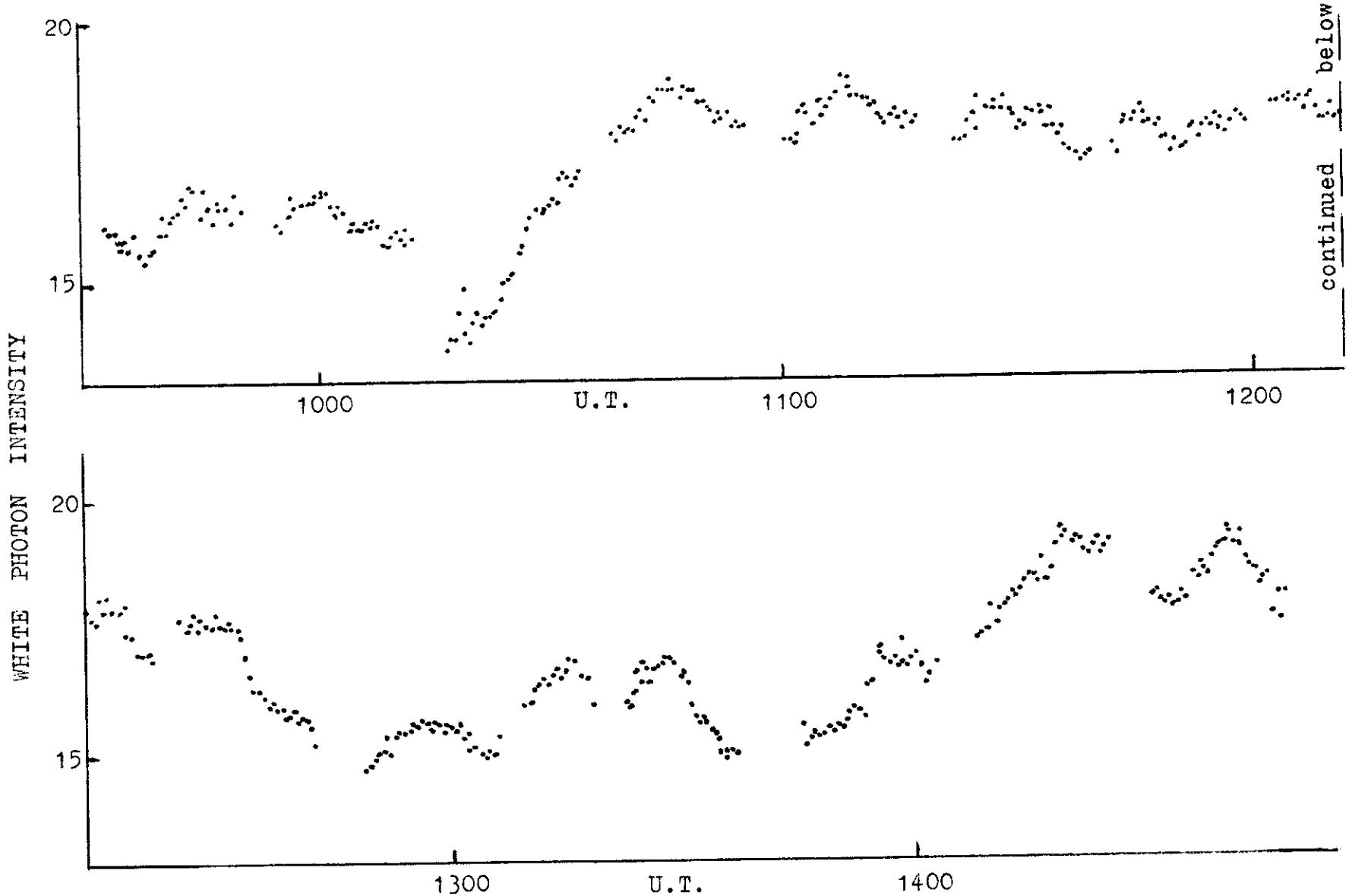


FIGURE 2. White light monitoring of RR Pictoris, 1974 December 27 U.T.

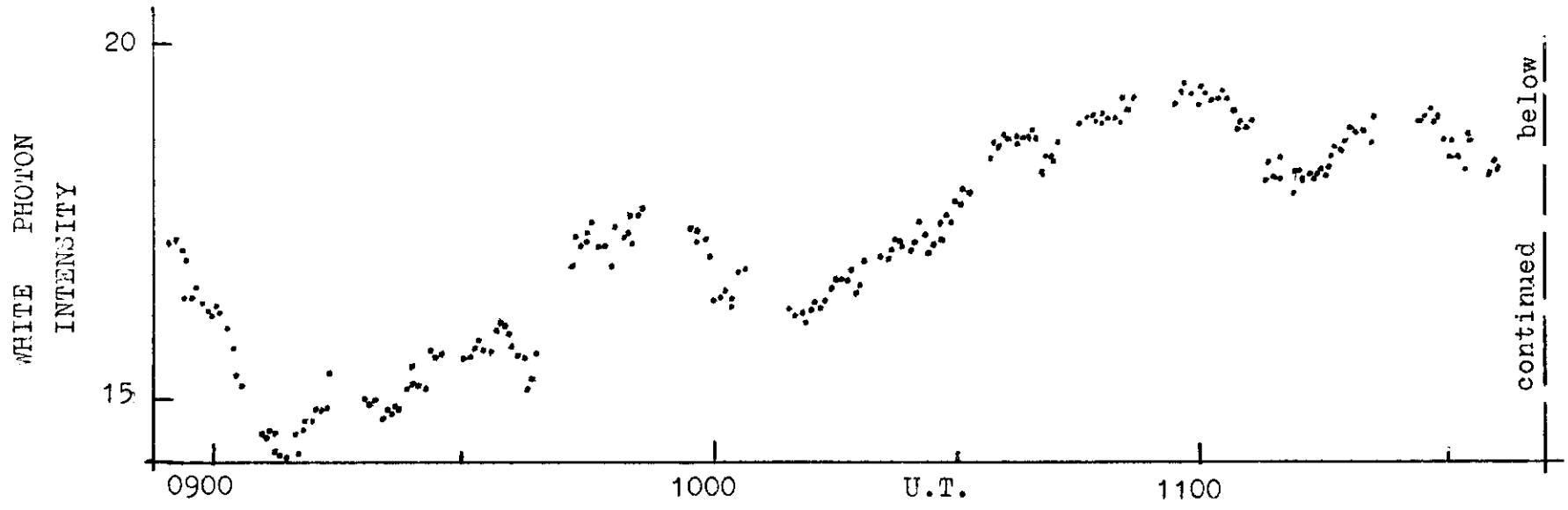
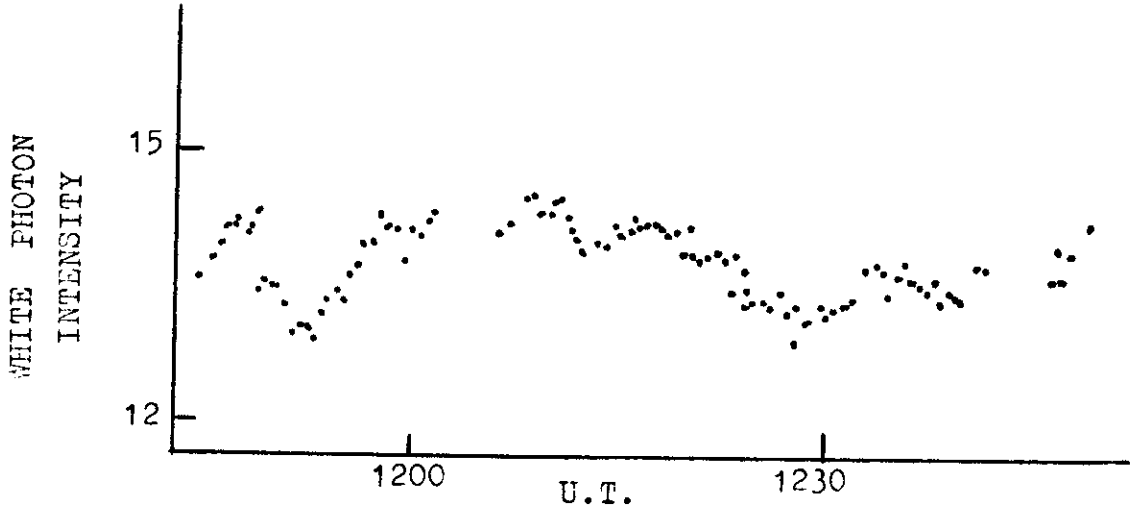


FIGURE 4. White light monitoring of RR Pictoris, 1975 February 3 U.T.



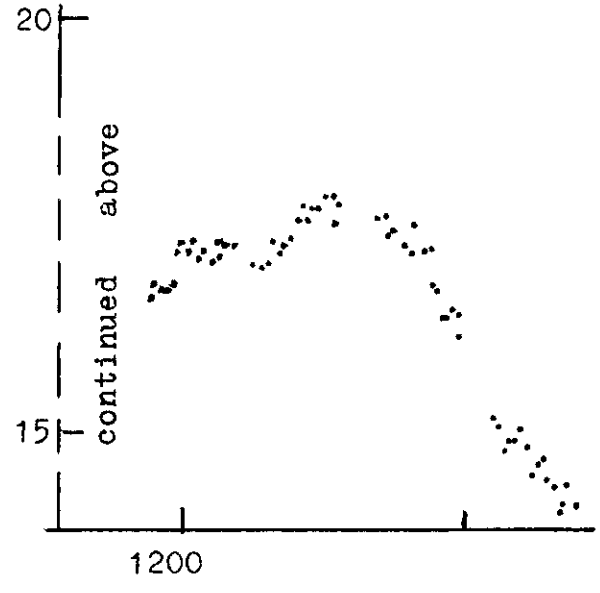


FIGURE 3. White light monitoring of RR Pictoris, 1975 January 2 U.T.

THREE COLOUR PHOTOMETRY OF THE STAR AM CORONAE AUSTRINAE

Brian F. Marino and W.S.G. Walker
Auckland Observatory of the Auckland Astronomical Society

SUMMARY: Three colour UBV observations of the semi-regular variable star AM CrA obtained at the Auckland Observatory during 1981 are presented.

...

INTRODUCTION

During 1981 we made three colour measurements of the nova Coronae Austrinae 1981. These results appear on page 48 of this publication. The nearby 8th magnitude semi-regular star AM CrA was also measured on the same evenings using the same equipment. These measurements have been reduced using the same standard and comparison stars, and the methods previously described for the nova.

OBSERVATIONS

The reduced observations for AM CrA are listed in Table 1 below. These data were obtained with the assistance of G. Herdman, P. Lockwood and I. Maxwell of the Auckland Astronomical Society.

TABLE 1. Three colour observations of AM CrA.

J.D. 2444000+	V	B-V	U-B
719.0430	8.13	+1.94	+1.49
727.1066	8.02	+1.97	+1.50
747.0154	8.17	+1.99	+1.48
747.9338	8.17	+2.05	+1.29
749.9356	8.22	+2.01	+1.44
752.9278	8.27	+2.03	+1.42
753.9421	8.26	+2.02	+1.35
760.9999	8.39	+2.00	+1.40
766.9325	8.48	+2.00	+1.38
776.9308	8.63	+2.00	+1.38
777.9385	8.64	+1.98	+1.34
780.8579	8.68	+2.00	+1.35
789.8439	8.77	+1.96	+1.23
797.9497	8.76	+1.95	+1.29
803.8305	8.74	+1.94	+1.32

REVISED PERIOD FOR V384 CARINAE

Colin W. Venimore
Variable Star Section, R.A.S.N.Z.

SUMMARY: Visual observations of V384 Car are presented as a light curve from ten day means for the interval JD 2,444,000 to 2,444,900. A revised semi-regular period is determined, although it is shown that this varies within wide limits. The amplitude is more confined.

...

INTRODUCTION

This star was first suspected of variability by the writer in 1971 and observations to JD 2,444,000 were published (1)under the title, "A Variable in the Field of RW Carinae". The star is now designated as V384 Car. That paper showed the star's position on a tracing from chart 73 (2). Comparison stars from that chart have been used in all observations.

OBSERVATIONS

The light curve is shown in Figure 1 and covers the interval JD 2,444,000 (1978 May 6) to 2,444,900 (1981 October 22). Most of the observations have been made by Venimore with a few from other members of the Variable Star Section. In Figure 1 crosses represent means in which there was only one observation; dots indicate two to three observations and open circles more than three observations in a ten day mean. The light curve continues that previously published (1).

DISCUSSION

Table 1 lists the observed maxima and minima. These give a mean period of 349 days, with maxima 342.5 days and minima 355.5 days. The intervals between successive maxima range from 253 to 442 days; minima from 301 to 427 days. As minima are better defined than maxima, O-C residuals have been calculated from the following epoch, which seems to give the best fit for the observations.

EPOCH (Minimum) JD 2,442,198 $\pm$ 355.5 days
Minimum to Maximum : Mean 207 days (Extremes 108 to 256 days)
Maximum to Minimum: Mean 136 days (Extremes 91 to 232 days)
Maximum Magnitude: Mean 10.0 (Range 9.9 - 10.25)
Minimum Magnitude: Mean 11.2 (Range 11.0 - 11.6)

The above epoch gives mean O-C residuals of $\pm$ 20.8 days, with the difference between observed and calculated varying widely. That is typical for a semi-regular variable. Mean minima period (355.5 days) is almost identical with mean maxima period (355.8 days) previously calculated (1).

When the light curve is plotted on a larger scale, there is some suggestion of a stand-still on the ascending branch. Recent minima appear to be brighter than those first observed. However, as observations are still dominated by those fromone observer, it is not possible to be dogmatic about detail. Closer analysis of V384 Car must await the attention of more observers - and, in view of the small amplitude, preferably experienced observers.

ACKNOWLEDGEMENTS
My thanks to other observers. Especial thanks to Frank M. Bateson for his

advice and interest in the preparation of this paper.

REFERENCES

(1) Venimore, C.W. 1979. Publ. 7 (C79), V.S.S., R.A.S.N.Z.
(2) Bateson, F.M., Jones, A.F. & Stranson, I. 1966. "CHARTS FOR SOUTHERN VARIABLES", Series 3. Published by F.M. Bateson, Tauranga, N.Z.

TABLE 1.

OBSERVED MAXIMA AND MINIMA OF V384 CARINAE.

MAXIMA			MINIMA			
J.D.	MAG_v	INT_d	J.D.	MAG_v	INT_d	O-C
2,441,328	10.1	...	2,441,445	11.6	...	-42.0
685	10.0	357	840	11.4	395	- 2.5
2,442,057	9.9	372	2,442,198	11.6	358	± 0°0
453	9.9	396	545	11.0	347	- 8.5
801	10.1	348	900	11.5	355	- 9.0
2,443,100?	9.9?	299	2,443,268	11.0	368	+ 3.5
463	10.1	363	695?	11.2	427	+75.0
905	10.0	442	996	11.1	301	+20.5
2,444,220	10.1	315	2,444,337	11.1	341	+ 6.0
500	10.25	280	645	11.1	308	-41.5
753	10.0	253				

O-C Residuals calculated on Epoch Minimum 2,442,198 ± 355.5d.

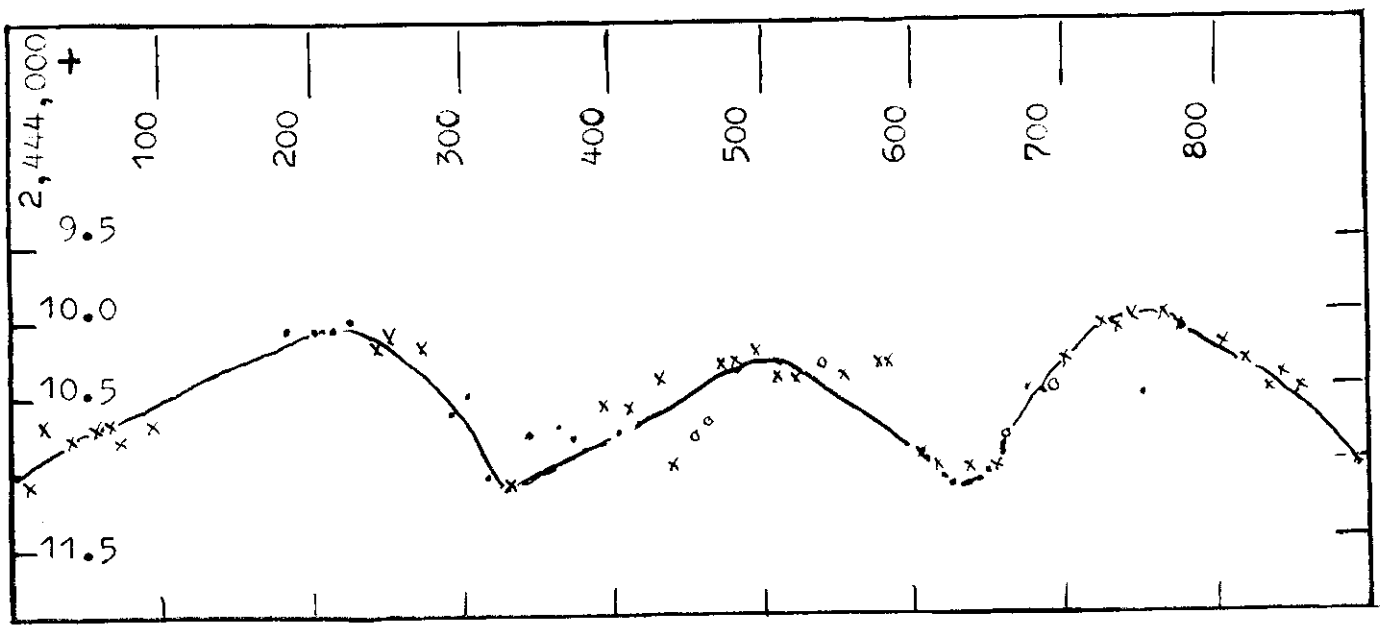


Figure 1: Light Curve of V384 Carinae.

VISUAL OBSERVATIONS OF CSV 6467 = NSV 03043 --1970 to 1982.

Frank M. Bateson and Colin W. Venimore
Variable Star Section, R.A.S.N.Z.

SUMMARY: Visual observations of CSV 6467 are presented in a Table of ten day means and in light curves for the intervals in which the star was well observed. It is shown that this star is an irregular low amplitude variable.

...

INTRODUCTION

CSV 6467 (NSV 03043) is shown on charts 269 and 270 (1) for RR Pic. It is catalogued as a suspected semi-regular variable with a range of 10.5 - 11.5p, spectral class M3 (2).

OBSERVATIONS

Visual observations commenced on JD 2,440,901 and for some years the records were fragmentary, but in more recent years the star has been well observed. The majority of the observations were made by three observers, i.e. G. Herdman (61); B. Menzies (93) and D. Overbeek (239), whilst 14 other observers with less than 20 observations each contributed 98 estimates making the total available for discussion 491. The observations were made using the sequence stars shown on the charts for RR Pic.
Table 1 lists the observations in ten day means. Figure 1 shows the light curve for those intervals when the star was well observed. In this figure crosses represent single observations; dots means from 2 to 4 observations and open circles means from 5, or more, estimates. The fragmentary nature of the earlier observations makes the reproduction of a light curve useless.

DISCUSSION

The amplitude varies from one interval to another but the mean range is 8.95 to 9.82 with extremes of 8.0 to 12.3. In particular CSV 6467 appears to have been much fainter than normal from JD 2,442,063 to 2,442,128. The observations at that time came from a single observer and were scattered in time so that this apparent deep minimum cannot be confirmed.

No reliable semi-regular period can be determined and the star appears to be a typical red, irregular variable of low amplitude.

ACKNOWLEDGEMENTS

The observers are thanked for their observations.

REFERENCES

(1) Bateson, F.M., Jones, A.F. & Stranson, I. 1971. CHARTS FOR SOUTHERN VARIABLES, Series 7. Published by F.M. Bateson, Tauranga, N.Z.
(2) Kholopov, P.N. (Editor). 1982. New Catalogue of Suspected Variable Stars. Nauka, Moscow.

TABLE 1.

TEN DAY MEANS OF CSV 6467 PICTORIS.

MEAN J.D.	MEAN MAG	No. OBS
2440900		
001.9	9.2	1
043.9	9.3	1
069.9	9.0	1
2441000		
008.9	11.3	1
028.9	8.8	1
039.0	9.5	1
045.0	10.3	1
058.0	9.1	1
065.9	9.65	2
094.4	9.45	2
290.9	9.3	1
308.9	8.7	1
321.9	9.5	1
335.9	9.2	1
358.9	9.3	1
421.9	9.6	1
660.9	11.0	1
673.9	9.1	1
687.9	9.2	1
766.9	9.25	2
778.8	9.35	2
794.9	9.35	2
802.8	9.1	1
821.9	9.6	1
2442000		
001.9	9.1	1
030.9	9.4	1
047.9	9.4	1
058.9	9.3	1
063.3	11.8	1
079.3	11.9	1
088.3	11.4	1
093.3	12.0	3
105.6	10.7	2
129.3	10.3	1
136.1	9.5	2
148.9	9.6	1
157.6	9.5	3
166.3	9.5	1
178.2	9.15	2
182.1	9.57	4
194.9	9.33	3
207.7	9.3	2
212.2	9.6	2
222.2	9.5	1

MEAN J.D.	MEAN MAG	No OBS
2442000		
367.4	9.1	2
398.3	9.1	1
404.2	9.15	4
415.7	9.13	7
424.2	9.17	4
434.6	9.3	1
446.7	9.27	3
450.4	9.1	1
470.3	9.4	1
482.1	9.05	2
495.2	9.37	3
504.6	9.15	2
514.9	9.27	3
521.5	9.33	3
537.6	9.37	4
545.3	9.32	6
564.3	9.44	5
599.9	9.1	1
633.2	9.15	2
661.6	9.1	1
685.6	8.8	1
700.0	9.1	1
736.4	9.3	1
749.6	9.05	2
754.9	8.95	2
774.5	9.12	4
787.3	9.5	1
795.2	9.03	3
801.3	9.3	1
813.3	9.3	1
826.3	9.37	4
834.0	9.03	3
845.8	9.1	2
858.6	9.2	2
896.6	9.53	3
904.2	9.57	3
915.6	9.6	2
920.8	9.6	1
936.2	9.5	4
946.5	9.5	3
955.2	9.6	2
968.6	9.1	1
989.6	9.1.	1
994.1	9.4	2
2443000		
008.6	9.1	1
014.6	9.4	2
021.6	9.2	1

MEAN J.D.	MEAN MAG	No. OBS
2443000		
039.1	9.35	2
097.1	9.43	3
108.3	9.03	3
112.8	9.0	2
124.3	9.0	2
133.5	9.2	6
143.8	9.16	5
160.3	9.5	1
171.9	9.5	1
275.8	9.6	1
303.8	9.6	1
482.1	9.8	1
499.0	9.4	1
509.9	9.4	1
510.9	9.2	1
521.0	8.9	1
539.0	9.1	1
567.9	9.1	1
597.9	9.1	1
628.9	9.3	1
634.5	9.37	7
644.3	9.46	3
653.4	9.25	2
660.9	9.1	1
750.2	9.8	1
810.1	9.55	2
842.1	9.4	1
866.3	9.82	10
874.8	9.24	7
885.6	9.15	2
895.6	9.29	9
906.3	9.28	7
915.9	9.4	1
924.4	9.2	2
930.7	9.2	3
956.7	9.0	3
2444000		
015.9	9.45	2
225.4	9.45	2
237.1	9.5	1
248.9	9.36	3
264.2	9.13	3
271.0	9.0	1
284.5	9.15	2
293.9	9.6	2
305.9	9.38	5
319.9	9.6	1
322.9	9.6	1

MEAN J.D.	MEAN MAG	No. OBS
2444000		
333.3	9.55	2
344.9	9.3	3
353.8	9.63	3
367.8	9.4	2
398.3	9.65	2
407.8	9.7	1
525.9	9.2	1
538.0	9.6	1
546.9	9.45	2
553.4	9.55	2
566.9	9.4	2
584.0	9.36	5
595.4	9.65	4
605.5	9.53	6
615.1	9.32	4
627.9	9.5	3
634.2	9.38	5
646.6	9.27	4
651.9	9.55	2
662.9	9.36	3
674.5	9.42	4
683.6	9.30	2
695.7	9.43	12
703.2	9.54	5
715.8	9.6	3
724.1	9.55	9
733.4	9.3	3
747.2	9.4	5
755.2	9.5	4
762.7	9.48	5
776.8	9.58	4
789.7	9.3	1
821.6	9.2	1
848.6	9.0	1
853.6	9.0	1
872.1	8.95	2
885.5	8.96	3
898.9	9.1	1
905.9	9.2	1
910.4	9.0	1
924.6	9.2	2
936.5	9.08	5
942.8	9.18	4
954.5	9.16	5
965.0	9.07	4
974.1	9.15	6
985.1	9.18	6
995.0	9.24	8

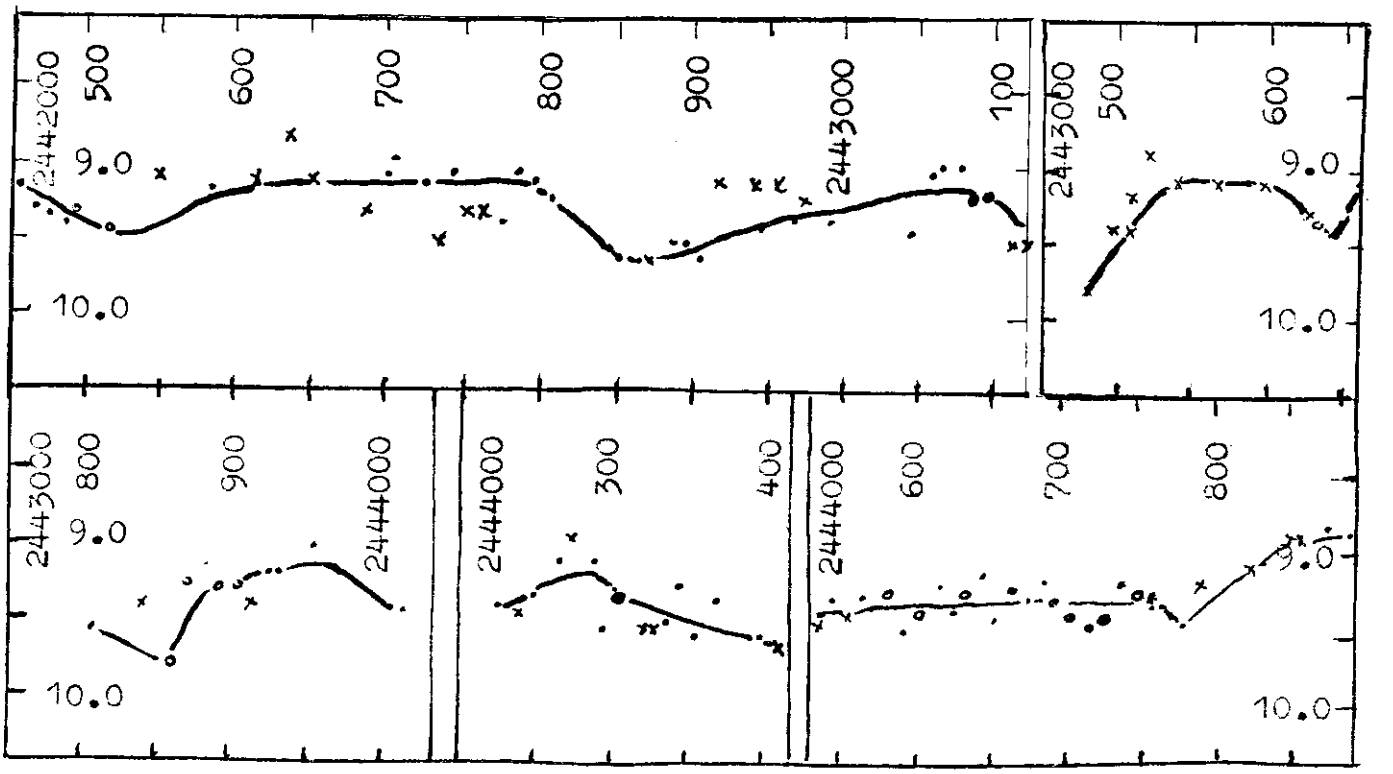


FIGURE 1. Light Curve of CSV 6467 Pictoris.

REPORT OF VARIABLE STAR SECTION, ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND

FOR YEAR ENDED 1982 December 31

This report covers 15 months since the previous report in order to bring it into line with the change in the Society's year to 31 December. However, in order not to disturb strict comparison of one year with another the totals of observations is maintained on the same annual basis as previously.

OBSERVATIONS The table on page 66 lists the visual observations received for the 12 months to 31 August, 1982. The total of 37,114 observations is an increase of 4,890, or just over 15%, on those in the preceding 12 months. There were 64 active observers, of whom 10 contributed more than 1,000 records each. Their contributions accounted for 71.2% of the total which means that the less prolific observers made a slightly larger contribution than usual in the 12 months.

PUBLICATIONS. During 1982 a Newsletter--"CHANGING TRENDS"--was added to the publications of the Section. Three issues appeared and the fourth is ready to be distributed with Monthly Circular M82/12. The Newsletter is distributed to active visual observers only as the costs of printing and distribution are carried entirely by myself. For that reason only one copy is sent to each group, or Society, in which there are active observers. It is left to the local societies to make it available to their members. It is proving very popular and appears to be achieveing its aim of binding observers closer together.

TABLE OF OBSERVERS OBSERVATIONS.

OBSERVER	OBS.-	STARS	OBSERVER	OBS	STARS
ADCOCK, B.	8	2	KILBEY, P.	162	26
BALDWIN, A.	91	20	LESLIE, A.	366	13
BARRETT, A.	16	10	LOADER, B.	97	31
BEGG, D.	90	10	LUMLEY, E.	163	31
BLANE, D.	65*	14	MARINO, B.	3666	119
BOURKE, P.	4	2	MARTIN, D.	15	5
BROWN, N.	440	51	MAZUR, F.	34	2
BRYANT, K.	29	7	MENZIES, B.	1238	44
COULING, G.	305	15	MOREL, M.	2	2
CRAGG, T.	1417*	473	McNAMARA, G	150	28
CRISP, R.	55	15	O'KANE, J.	135	24
CURNICK, C.	167	34	ORCHISTON, W.	336	64
DIETERS, S.	396	44	OVERBEEK, D.	6105*	278
DODSON, A.	364	75	PAGANO, L.	19	6
DREDGE, A.	68	18	PARK, J.	204	15
EMMERSON, R.	21	7	PEARCE, A.	23	14
FISHER, D.	1070	89	PROSSER, G.	23*	23
FLEET, R.	424*	46	ROWE, G.	262	48
GILLER, R.	127	47	ST. GEORGE, L.	199	7
GOLTZ, W.	243	106	SAUNDERS, S.	429	47
HARRIES-HARRIS,E	861	58	SHINKFIELD, R.	75	21
HAYWARD, G.	1	1	STEPHANOPOULOS, G.	540	95
HENNESSEY, D.	215	27	TAYLOR, N.	1510	121
HERDMAN, G.	442	47	THOMAS, R.	170*	118
HERS, J.	553*	21	THOMPSON, R.	37	25
HIGGS, N.	301	33	TRAYNOR, F.	27	10
HIGGS, S.	41	12	TREGASKIS, B.	598	210
HOVELL, S.	2183	275	TURLE, L.	390	8
HULL, O.	1894	163	VENIMORE, C.	611	56
JONES, A.	5632	108	VINCENT, J.	108*	16
KINNUNEN, J	169	8	WILLIAMS, P.	1711	135
KENT, K.	16	8	ZENOS, S.	1	1

* = Results also communicated to A.A.V.S.O.

TOTAL OBSERVATIONS 37,114

The Monthly Circulars have been distributed each month. Publications No. 9 (C81) was also distributed, and No.10 is almost completed. It will require a further six weeks to complete the proof reading. It is planned to issue at least one more issue of the Publications in 1983.

Under a personal grant to the writer two issues of CHARTS FOR SOUTHERN VARIABLES have appeared, Nos. 14 and 15. The subscriptions to these charts enables the original grant to be maintained for the production of future issues.

The fourth, and new, edition of "THE OBSERVATION OF VARIABLE STARS" was completed and sent to the printer prior to the Christmas holidays. It will be available soon after the printer resumes work after the holiday break.

Reprints of "AN ATLAS OF SOUTHERN & EQUATORIAL DWARF NOVAE" byN. Vogt and F.M. Bateson published in Astron. Astrophys. Suppl. Ser. 48, was distributed mainly to professionals requesting copies.

GENERAL. The Section has now completed 55 years of continuous operation. In that time there has been a tremendous explosion in astronomical knowledge and in new techniques. This has been reflected in the changes in emphasis for visual observations, which to-day are in much greater demand by professional astronomers than seemed possible 55 years ago. I can report, with great satisfaction, that 1982 has been the most productive in the Section's history. There are many reasons for this. Not the least being that I have given up the many outside interests which had involved me in numerous charitable and service organisations for whom voluntary work required a considerable amount of time.

Thus I have been able to devote the full working day of 16 hours for 5 days a week to the Section. The past year has also seen the culmination of much long term planning and this will be apparent from this report.

HEADQUARTERS. Whilst there are no funds available to employ staff it has been possible to make some changes at Headquarters for the more efficient running of the Section. I disposed of an old Roneo duplicator and an Olympia electric typewriter. The former has been replaced by a very satisfactory arrangement for photostating with a Tauranga firm. This has resulted in a saving in costs.

An IBM 843 electric typewriter was purchased I gratefully acknowledge a grant of Five hundred dollars towards the cost of this machine from the Kingdon-Tomlinson Trustees, on the recommendation of Council. This grant covered 39% of the purchase price and the balance came from the Director and other sources. The value of this machine can be seen from the fact that it has already been possible to process over 60,000 observations with it as well as producing the various publications.

Steady progress has been made reorganising chart material and sequences. When the new system is completed it will bring together a vast amount of material on sequences and charts so that it is all readily accessible.

During the course of the year over 2,000 letters have gone out from Headquarters. These range from simple answers to enquiries from the public to the supplying of data for use by professionals. I am very much indebted to my wife for her assistance with so much of the routine work. My daughter has also, during her visits, been most helpful in advice on the operation of the office equipment and in help with the typing.

PAPERS. I wish to express my sincere appreciation to A.W. Dodson, G. Stephanopoulos, N.W. Taylor and C. Venimore, all of whom are actively engaged in the preparation of light curves, papers and tables from the Section's observations for publication. The results of their splendid work will be apparent to members in the Publications from No. 10 onwards.

RECORDS. Our Recorder, Gordon Smith, has continued to check and enter all observations on to the permanent sheets. His painstaking care not only saves me from much routine work but maintains the records in excellent order. Additionally he complies the routine lists of copies of our observations that are supplied to the A.A.V.S.O. and B.A.A.

A.A.V.S.O. Largely stemming from the meeting between Dr. Janet Mattei, Director A.A.V.S.O., and myself in 1981 and the ensuing correspondence cooperation between our respective organisations is on a very firm and most satisfactory basis. They produce the current light curves and predictions for Mira variables. By our supplying, on a regular basis, copies of our observations their data and predictions are considerably enhanced whilst at the same time the best use is made of our observations. We have also agreed

to make available to them observations of a number of stars that we have observed for years and which are new to their lists. We benefit from their predictions and light curves. The rate at which this data can be supplied depends on the time that I can spend on typing. The A.A.V.S.O. are supplying us with copies of their observations of southern dwarf novae in which we have a particular interest. Many of their observers send us, and have done so for years, copies of their observations usually on the basis that we are free to make whatever use we wish of their records. It is the aim of both Janet Mattei and myself to bring our respective organisations even closer together for our mutual advantage.

B.A.A. With the Variable Star Section, B.A.A., the arrangement is that we supply them with copies of our observations of a few dwarf novae that lie north of the celestial equator. They do the same for us with their records of dwarf novae south of the equator. Since the observations of all these stars in the equatorial belt are rather fragmentary it enables more complete light curves to be produced by combining the records from both groups. Their Director, Doug Saw, has already published the combined results for 1970-79 on U Gem and X Leo in J., B.A.A. 92, Nos. 3 and 5. Their observations will be used in a computer programme after their observations for 1982 reach me in mid 1983.

COMPUTER PROGRAMMES. My most sincere thanks are due to Brian Marino and Stan Walker, Auckland Observatory, for their offer to provide computing services for the analysis of southern dwarf novae. As the result of discussions between us a programme was suggested and I supplied some observations of WX Hyi for a trial run so that any 'bugs' could be ironed out. This has been followed by my tabulating for this programme about 4,700 observations of VW Hyi. These observations continue those published in the Memoir on VW Hyi. In 1983 additional records will be supplied and I look forward to further discussions with them. Once everything is running well this most valuable assistance will not only speed up the publication of results but enable better analysis to be made of them.

D. Kilkenny, S.A.A.O., has been supplied with copies of several thousand observations of southern R CrB stars for a computer analysis of their semi-regular short term variations. One of the main aims of this programme is to ascertain whether these semi-regular periods have changed with time as theory suggests should happen.

D. Kenyon, Illinois & Cambridge, has been supplied with observations of symbiotic variables for a computer programme.

Work on tabulating decades of observations of Mira variables for our own computer programme has resumed.

DWARF NOVAE. These stars have continued to be the subject for a number of special programmes with professionals throughout the year. This is due to the importance of dwarf novae with regard to stellar evolution. We have supplied many observations as part of these programmes which is a very clear indication that visual observations are important and valuable despite the modern techniques employed in studying them. In fact visual records are more important than ever. There is no need in this report to list the Institutions with whom cooperative programmes have been run since members were kept well informed on these through the Monthly Circulars. Publications No. 10 sees a discussion of 19 dwarf novae, mainly faint members of this class. These are variables best suited to moderate apertures and I must sound a note of warning to observers. The majority of these faint dwarf novae have maxima no brighter than 13.0 and the majority do not even reach magnitude 13.5. Some observers have obtained long lists of negative estimates with an instrumental threshold of 12.5 or brighter. Such records are quite useless for these faint stars and the same amount of time devoted to the brighter members of this class will be much more useful.

NOVAE Novae discovered during the period covered by this report have been well observed. These include Nova Sgr 1982; Nova Aql 1982 and Nova CrA 1981. Preliminary charts were distributed promptly due to the work of Mati Morel. These were followed by more detailed charts later, which was made possible by the photos secured by A.C. Gilmore, Mt. John University Observatory, and H.O. Williams, Auckland. Their assissitance is much appreciated.

A number of old novae and recurrent novae have been kept under observation. A summary of these observations will appear in Publications No. 11.

SUPERNOVAE. Some observations were obtained of the supernovae, bright enough to be seen in moderate instruments. There has been more than the usual numbers of false alarms with reports of suspected supernovae. These have mainly arisen from the current programme of visual searching for these objects and also from some photographic work. All were followed up and one has to expect this kind of reports from visual searching.

CHARTS The production of first class charts by Mati Morel has continued. His care and attention to detail provides excellent charts that are very much in demand. Many of these charts are based on photos secured for us by A.C. Gilmore, Mt. John University Observatory, and others.

The determination of sequence magnitudes unfortunately lags well behind the production of charts. W. Goltz hopes to use the 1m telescope at the University of Tasmania to secure some sequences in 1983. D. Kilkenny, S.A.A.O., is endeavouring to obtain sequences for us for the southern R CrB stars for which charts appeared in Series 14. Any member with the necessary equipment willing to obtain sequence magnitudes will greatly aid the Section.

PHOTOGRAPHIC SEARCH FOR DWARF NOVAE. It is probable that some dwarf novae have been catalogued as Miras, or suspected Mira variables. Some time ago a search was commenced to look for such objects by photographing the fields through different filters. This method readily reveals the colour of the star so that likely candidates can be picked out. It was found that the catalogued positions were not accurate enough for astrometric needs. To remedy this finding charts, together with other details, have been supplied to both A.C. Gilmore and H.O. Williams. Some regions have already been photographed by Alan Gilmore at the Mt. John University Observatory. The rate at which this work can be done naturally depends on (a) weather and (b) availability of telescope time.

RED VARIABLES. Regular observations of Miras, Semi-regular and Irregular variables have been obtained by several observers. There is still need to observe these stars more closely so that light curves are complete. In particular Miras require more observations during their minima with instruments with thresholds of 14.0 or fainter.

SUSPECTED VARIABLES. With the assistance of Colin Venimore we are endeavouring to discuss the observations of suspected variables which have been under observation for some time. Several of these stars are low amplitude variables and once sufficient observations have been discussed to show their nature they can be dropped from the observing list in favour of more important objects.

NEBULAR VARIABLES. The rapid irregular variables associated with nebulosity have been well observed by many members. A start has been made in reducing these extensive records for publication. We are indebted to G. Stephanopoulos for undertaking the analysis of the observations of T CrA.

FINANCES. A few years ago ASTRONOMICAL RESEARCH LTD took over the finances of the Section. This has proved to be a very wise move since it has freed the Director from much of the routine book-keeping by having a Public Accountant to do this. Although there is not yet sufficient reserves to permit the employment of paid assistance it has been possible to so arrange matters that Publications will now be more frequent without any increase in subscriptions. At the same time it has become easier to secure grants and other assistance both from the Director personally and from elsewhere. The main aim here is to build up the financial position for the future after the writer has passed on.

ACKNOWLEDGEMENTS. As I have commented on some many occasions without observers there would be no Section. It is their accurate and consistent observations that alone make the Section a valuable source of data on southern variables. My appreciation goes to each and every observer, be the contribution large or small. The work of the ovservers has been greatly enhanced by the careful checking of records by the Leaders of the various groups and Societies. To each and everyone of these good people I extend my thanks for their assistance and cooperation.

My sincere thanks are also due to our Recorder, Gordon Smith, for his excellent work in maintaining so well the observational records.

Mati Morel has provided excellent charts and I deeply appreciate all that he has done to further the objectives of the Section and to maintain such a high standard in his work.

Alan Gilmore has at all times been willing to secure photos for our use and his cooperation and that of Pam Kilmartin in measuring positions is very much appreciated.

Many professionals have maintained their interest in our work and have always been ready to offer advice and assistance. My sincere thanks are due to them all.

During the year the Section lost one of its oldest supporters when Dan O'Connell passed away. Despite his eminence in professional astronomy he was the person largely respons ible, with Harlow Shapley, for encouragement and advice in the early days of the Section. That interest is shown by his preface to Memoir No. 1 and his kindly advice throughout the ensuing years. A deep friendship developed between us and the Rev. D. O'Connell will be sadly missed.

Finally I wish to thank all subscribers who have supported our efforts in a most practical way.

The Section can look forward to another most productive year due to the support not only of its members but also by so many who have provided assistance in so many ways.

1982 December 31

Frank M. Bateson
DIRECTOR

NOTICE TO CONTRIBUTORS.

Papers are invited for publication on all aspects of research on Variable Stars, as well as articles of general interest to variable star observers.

STYLE:

(a) TEXT. All contributions should be typewritten on one side of the paper only, double spaced and with a margin on the left of at least 3 cm. The pages should be numbered in pencil. The original and one copy, including figures and tables, are required.

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