B No. 16 (C88)

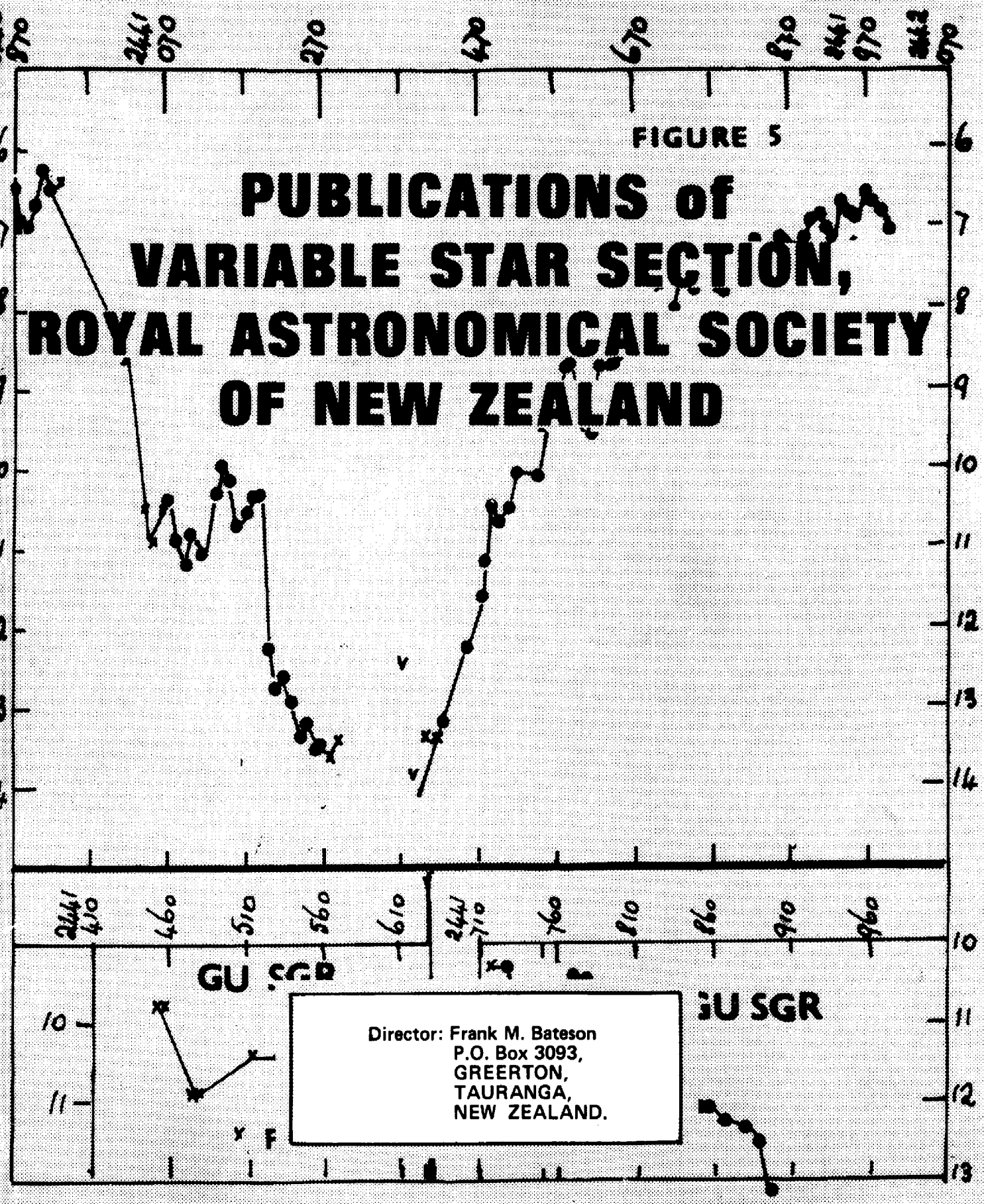

FIGURE 5

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

Director: Frank M. Bateson
P.O. Box 3093,
GREERTON,
TAURANGA,
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PUBLICATIONS OF THE VARIABLE STAR SECTION, ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND

No. 16

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EDITORIAL

We apologise for the long delay in the publication of this issue. The main reasons for the delay are: (a) the continuous interuptions to our work caused by the Rosat and other special programmes, which prevented work on the papers; (b) the many urgent requests from professionals for data in advance of publication; (c) our aim of making available to the astronomical community the data accumulated by the Variable Star Section, R.A.S.N.Z. during many decades.

To accomplish this aim has required that all data, prior to 1987 April 1, be transferred from the hand-written ledger sheets to diskettes for processing on the computer. This has been made possible by the dedicated voluntary assistance from Don Brunt, who has already transferred many thousands of observations on to diskettes. This has enabled Ranald McIntosh to store this data in the computer he maintains on a voluntary basis for us, and to supply the necessary print-outs and light curves. Prior to this processing, I have had to check all entries, which has placed an extra heavy burden on me in addition to running the Section and dealing with the normal routine matters. We have no paid staff other than a part-time Secretary, employed when funds are available. Otherwise all assistance is from volunteers.

Fortunately, I have just received a grant for the purchase of a computer at headquarters which will assist the processing of data. The paper in this issue on EX Lupi provides an example of the type of information that will now be made available. Publication No. 17 , work on which has now commenced, will continue bringing up to date light curves and other information on dwarf novae, whilst No. 18 will start the publication of data on other types of variables. That issue we hope to have available for printing at the end of the year, after which there will be a regular issue of the Publications.

I express my appreciation for the forebearance and understanding of all subscribers over the delay in publication, while we overcame the enormous problems posed in the preparation of about three million observations made during the past six decades.

Frank M. Bateson

1991 August 20

GORDON SIEVWRIGHT SMITH

It is with the greatest regret that we have to record the death of Gordon Sievwright Smith on June 12, 1991 at the age of 92.

He was born in Mataura in 1899 and was educated at the Mataura Primary School and the Gore High School. The Smith family moved to Dunedin in 1916 and it was there that Gordon started work in the drapery firm of Brown Ewings Ltd. It was whilst with that firm that he revealed an aptitude for figures that led him to commence accountancy studies in which subject he later passed several examinations. After a few months with Brown Ewings Gordon started work as a clerk in the tramways department of the Dunedin City Council. On his retirement from the Council in 1959 he had spent 43 years with thetramways and gas departments.

What became a life-long interest in Astronomy was sparked by the appearance of Comet Halley in 1910. He probably also saw the Great Comet of 1910 (1910 I), although in later life he commented that he retained no impression of that brilliant comet probably because it was first visible in daylight and moving towards the Sun. He did retain very vivid memories of Comet Halley. His aroused interest in astronomy was fostered and encouraged by a science master at the Gore High School.

His long and close association with the Variable Star Section started on 29th September 1929, after reading Alec Crust's astronomical notes in the previous evening's Dunedin Star. That prompted him to write to me seeking information on how he could start observing. At that time he had no telescope. That was the start of a voluminous correspondence which spanned 60 years and now fills two volumes.

Once Gordon's interest in observing Variable Stars had been kindled he rapidly became a keen and skilful observer of almost uncanny accuracy. As he often remarked he was brought up on figures and the recording of his observations came easy to him. He acquired two small refractors of 2.45 and 3 in apertures and then a 6½ in reflector. In those distant days the Variable Star Section commenced, at the request of Leon Campbell, its first international programme. This was concentrated on observing the bright naked eye Cepheids, Beta Dor and l Car. Apart from that programme observations were centred on Miras, semi-regular variables and a number of suspected variables and a few of short period. The only unusual variable which figure so largely in today's activities was then the R CrB star, RY Sgr.

It was not long before Gordon was making a large number of observations of all the variables then under observation , and, at the same time getting other observers in Dunedin interested. Soon he had a group of six others contributing. When the First Memoir of the V.S.S. was published in 1944, covering the results from 1927 to 1940, out of a total of 35,379 observations Gordon himself had made 15,827.

The outbreak of World War II curtailed Gordon's astronomical activities and later he suffered ill health during which he wryly wrote that he had lost nine pounds of fat and meat which he hoped to replace as his health improved. He then offered his services as Recorder for the V.S.S. feeling that with a fondness for figures he could be useful as his health had forced him to forego observing. Naturally his offer was gladly accepted. He took over the writing up of the permanent ledger sheets on which all observations were recorded after being checked, a task to which he applied himself with the care and neatness that was always a characteristic of his records. From 1973 to 1987, when a computer recording of observations commenced, Gordon entered many hundreds of thousands of observations. It is estimated that the total he handled exceeded one million individual observations.

He maintained his interest in the V.S.S. almost to the last and in addition was a benefactor of the Section. Every time he visited his sister, in Mount Maunganui, he would always come across to see me and maintained a very lively interest in what the Section was doing.

A high point in his astronomical interest was a visit to North America with his son, Alan, during the course of which he attended the AAVSO Meeting in Cambridge (U.S.A.). He often recalled with pleasure those whom he had met at that meeting.

Gordon was a man with wide interests. He was an active lawn bowler, being a member of the Opoho Bowling Club for 38 years and green-keeper for 20 years. He was also a keen indoor bowler with Opoho Indoor Club and was a life member of both these clubs. His other interests included the Boy's Brigade and the Presbyterian Church. He also had a passion for his heritage which turned him to reading and learning to speak Scottish Gaelic.

The Society has now lost one of its oldest members, as Gordon joined in 1931. The Society recognised his services to Variable Stars by awarding him the Murray Geddes Memorial Prize in 1974 and again in 1988 - the only person to receive that tribute twice.

The Variable Star Section has lost a sterling member who over the years has contributed so much to its success in a quiet unassuming way which with his dry sense of humour was an outstanding characteristic.

His wife, Beth and younger son Ewen, pre-deceased him by several years in 1985. He leaves one son, Alan, two sisters, a brother, six grand-daughters and six great grand-children. To them we extend our sincere sympathy in the loss of a loved one, who was held in the highest esteem by all who were privileged to know him.

OUTBURSTS OF THE DWARF NOVA, V442 CENTAURI

F.M. Bateson, R. McIntosh & D. Brunt
Variable Star Section, R.A.S.N.Z.
P.O. Box 3093, GREERTON,
Tauranga, New Zealand

SUMMARY: A light curve for the interval J.D.2,443,184 to 2,448,257 is reproduced and 135 outbursts observed tabulated. Wide and narrow outbursts differ marginally in maximum brightness and their main parameters are listed and discussed.

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1, INTRODUCTION

Observations of V442 Cen to J.D. 2,443,183 were discussed by Bateson (1). The present paper brings the published data up to J.D. 2,448,257.

2. OBSERVATIONS

Approximately 8,050 visual observations were made by members of the Variable Star Section, Royal Astronomical Society of N.Z. between J.D. 2,443,184 and 2,448,257. This was plotted as indivual observations on the light curve in Figs. 1 -6. Negative observations are denoted by carets, indicating that the variable was invisible and fainter than the magnitude shown. The top curve in Fig. 1 repeats a small portion of the curve previously published.

Observed outbursts are listed in Table 2, which is in the same format as the previous paper. The individual estimates were used in determining the dates of ourburst, giving due weight to the class of observation.

3. DISCUSSION

The coverage of V442 Cen has been good in each year, except in the southern sping months when the variable is unfavourably placed. This usually means that there is an interval of about 100 days each year during which observations are few.

The types of maxima assigned in Table 2 are the same as previously discussed by Bateson (1). Essentially outbursts are either wide (W) or narrow (N). There was one anomalous maximum recorded, which in this discussion is included in the wide maxima.

The main parameters of maxima are shown in Table 1.

TABLE 1

SUMMARY OF MAXIMA OF V442 Cen

	WIDE	NARROW
MEAN MAXIMUM MAGNITUDE$_V$	12.0 (33)	12.37(59)
MEAN CYCLE	32.17 days (33)	24.32 days (59)
MEAN WIDTH AT 13.0I-D	7.4 days (32)	2.7 days (52)
NUMBER OUTBURSTS IN 1000 days	7 or 8	12 to 19.
RANGE IN CYCLE LENGTH	$14^d.2$ to $54^d.0$	$16^d.4$ to $51^d.9$

The figures in brackets in Table 1 indicate the number of maxima used to determine the values shown. These were outbursts that definitely appeared to be consecutive. We found no regular pattern in the number of normal outbursts that separated consecutive wide maxima as the number of the former ranged from 0 to 7.

Minimum magnitude is fainter than 16.0 and no information can be given on the variable at minimum, nor on the early stages of the rise to maxima. Essentially all positive observations are of the top of the rise and indicate a very rapid rise from magnitude 13.0 or 14.0. The latter are only indicated in Table 2 when there are positive observations at magnitude 14.0.

4. CONCLUSIONS

V442 Cen is a member of the SS Cyg sub-class of dwarf novae with frequent outbursts, the rise to which is steep. Outbursts are either wide or narrow with the former having a greater width at magnitude 13.0. Wide maxima tend to occur at longer intervals from the preceding outburst irrespective of its type. They also have a slightly brighter maximum magnitude.

Consecutive normal maxima occur at mean intervals of $24^{d}.32$, which is identical with $24^{d}.48$ found in the previous paper. Combining all maxima, irrespective of type, the mean cycle is $27^{d}.13$. No regular pattern was found in the number of normal outbursts recorded between consecutive wide maxima.

ACKNOWLEDGEMENTS

We express our appreciation to all observers for their observations and their close monitoring of V442 Cen.

REFERENCE

(1) Bateson, F.M. 1977. Publ. 5, Variable Star Section, R. astr. Soc. of N.Z.

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TABLE 2---OBSERVED OUTBURSTS OF V442 Cen.

No.	TYPE	MAXIMUM J.D.	MAX MAG$_v$	INT d	13.0I	13.0D	WIDTH 13.0I-D d	14.0I	14.0D	WIDTH 14.0I-D d
267	N4?	2,443,233	12.3	56	233	236	3.0	...	...	...
268	W2	258.9	12.1	25.9	257.6	265.0	7.4	259	267?	8?
269	N4	285.9	12.9	27.0	285.5	288.9	4.4	...	...	...
270	N2	310.9	12.6	25.0	310.7	312.0	1.3	310	314.2	4.2
271	N5	336.0	11.9	25.1	335.7	339.0	3.3	335	340	5
272	N1	361?	13.4?	25.0?	359	361.5	2.5	...	...	...
273	?	386?	12.0	25	...	...	...	...	...	...
274	N3?	462.6	12.5?	(76.6)	462.2	463.1	0.9	...	...	...
275	W2?	487.1	12.2	24.5	486.6	494.7	8.1	...	...	..-
276	N1	521.9	12.5	34.8	520.5	523.0	2.5	...	...	...
277	N4	553.9	12.6	32.0	553.7	557.0	3.3	,,,	558.2	...
278	W1	593.9	11.4	40.0	591.0	601.0	10.0	590.5	601.8	11.3
279	N1	624.8	12.4	30.9	623.8	626.8	3.0	623.2	627.4	4.2
280	N1	646.1	12.1	21.3	645.0	647.8	2.8	...	...	...
281	N2	663.9	12.7	17.8	663.8	666.1	2.3	662.9	667.5	4.6
282	W2	686.0	12.5	22.1	685.8	692.8	7.0	685.6	695.0	9.4
283	W2	728.9	12.2	42.9	728.1	731.2	3.1	727.8	732.4	4.6
284	?	740.8?	13.2	11.9	...	...	...	...	...	...
285	?	799.1?	11.9	(58.3)	...	...	...	...	...	...
286	?	845.1	12.7	(46.0)	...	...	...	...	...	...
287	W1	871.2	11.9	26.1	868.9	876.0	7.1	868.5	879.0	10.5
288	N5	906.9	12.5	35.7	906.5	908.4	1.9	906.4	910.0	3.6
289	N5	924.1	12.1	17.2	923.8	925.7	1.9	923.5	927.0	3.5
290	N2	950.2	12.0	26.1	949.6	953.0	3.4	949.3	953.7	4.4
291	N3	975.8	11.8	25.6	975.3	980.4	5.1	...	...	...
292	N2	2,444,003.9	12.0	28.1	003.0	005.0	2.0	...	...	...
293	N2	028.8	12.4	24.9	028.3	030.2	1.9	027.8	033.1	5.3
294	?	201?	12.7?	(172.2)	...	202.1	...	...	...	...
295	W2	225.2	12.3	24.2	223.3	230.1	6.8	222.0	231.6	9.6
296	N1	254.0	11.8	28.8	253.0	256.3	3.3	252.2	257.5	5.3
297	N2	282.0	12.4	28.0	281.7	284.1	2.4	281.0	286.1	5.1
298	?	299?	12.1	17?	...	...	...	...	...	...
299	W2	322.0	12.0	23?	321.3	329.0	7.7	320.5	329.8	9.3
300	N2	357,8	12,3	35.8	356.9	359.2	2.3	...	...	...
301	N2	374.9	12.5	17.1	374.5	375.8	1.3	373.9	376.9	3.0
302	N2	395.8?	12.8?	20.9	395.0	396.9	1.9	...	399.0	...
303	W1	424.8	12.0	29.0	422.9	431.2	8.3	422.0	432.3	10.3
304	N2	454/9	12.2	30.1	454.3	456.0	1.7	453.9	457.1	3.2
305	?	491?	12.7?	36.1?	...	...	...	...	...	...
306	?	533?	12.3	42?	...	...	...	...	...	...
307	?	560?	12.4	27?	...	...	...	...	...	...
308	?	590?	12.7?	30?	...	...	...	...	...	...30
309	W2	613.2	12.3	23.2?	612.8	620.6	7.8	612.4	622.2	9.8
310	N3	647.6	12.0	34.4	647.3	650.5	3.2	647.0	651.2	4.2
311	W	681.9	12.0	34.3	...	689.0	...	...	692.3	...
312	N2	719.2	11.6	37.3	718.3	720.8	2.5	...	...	...
313	N	737.9	12.2	18.7	...	...	...	...	...	...
314	W2	759.3	11.9	21.4	758.7	764.8	6.1	758.0	765.8	7.8
315	N4	783.2	11.9	23.9	782.8	785.9	3.1	...	...	...
316	W1	818.8	12.0	35.6	816.3	824.8	8.5	...	...	...

TABLE 2 (cont)

OBSERVED OUTBURSTS OF V442 Cen.

No.	TYPE	MAXIMUM J.D.	MAX. MAG$_V$	INT d	13.0I	13.0D	WIDTH 13.0I-D d	14.0I	14.0D	WIDTH 14.0I-D d
317	N	2,444,876	12,3	(57.2)	...	...	...	...	...	...
318	N2	967.2	12.0	(91.2)	966.2	969.3	3.1	...	971.0	...
319	W2	2,445,004.6	11.8	37.4	003.3	011.7	8.4	...	...	...
320	N1	038.9	12.2	34.3	036.9	039.9	3.0	...	...	...
321	N	060.8	13.2	21.9	...	...	...	060.0	062.5	2.5
322	W2	114.8	11.7	54.0	113.0	121.8	8.8	...	...	...
323	N2	154.9	12.6	40.1	153.7	156.8	3.1	...	...	...
324	?	235.2	12.0	(80.3)	...	...	...	...	...	...
325	W2	330.6	11.6	(95.4)	329.0	336.2	7.2	...	...	...
326	N1	372.9	12.4	42.3	371.3	374.6	3.3	370.2	377.0	6.8
327	N5	390.1	12.7	17.2	389.9	390.2	0.3	388.9	391.8	2.9
328	N5	433,8	12.9	43.7	433.6	433.9	0.3	432.3	436.2	3.9
329	W2	448.0	11.9	14.2	447.3	456.0	8.7	...	...	...
330	?	480.8?	12.4?	32.8?	...	...	...	...	...	...
331	W2	517.9	12.1	37.1	516.7	521.7	5.0	...	...	...
332	W1	553.9	11.6	36.0	550.8	558.8	8.0	...	...	...
333	?	581.8	12.2	27.9	...	...	...	...	...	...
334	?	609?	13.2?	27?	...	...	...	...	...	...
335	N?	649	12.8?	40?	...	651?	...	...	...	...
336	W2	668.9	11.9	19.9	668.0	677.0	9.0	...	677.8	...
337	N2	704.0	12.0	35.1	703.1	706.1	3.0	...	...	...
338	N3	724.6	12.2	20.6	723.9	726.5	2.6	...	727.6	...
339	N2	742.4	12.6	17.8	741.3	745.0	3.7	...	...	...
340	W2	785.1	11.9	42.7	784.2	792.3	8.1	...	...	...
341	N4	824.9	12.2	39.8	824.4	826.9	2.5	824.0	...	...
342	N2	874.9	11.8	50.0	873.6	876.9	3.3	...	879.0	...
343	N?	938.9?	12.4	(64?)	...	...	...	...	...	...
344	N?	2,446,007.6	12.5	(68.7)	...	008.9	...	...	...	...
345	W2?	063.5	12.4	(55.9)	063.2	071.2	8.0	...	...	...
346	N4	102.0	12.3	38.5	101.5	105.2	3.7	...	...	...
347	W2	144.9	12.2	42.9	143.0	151.2	8.2	142.0	153.2	11.2
348	N5	180.2	12.7	35.3	179.9	180.9	1.0	...	...	...
349	N	207.9	13.0	27.7	...	...	...	...	213.7	...
350	N	232.2	13.4	24.3	...	...	...	...	232.9	...
351	W2	280.2	12.0	48.0	279.0	286.9	7.9	...	...	...
352	N?	343.6	12.8	63.4)	...	...	...	...	...	...
353	?	388.5	11.9	44.9	387.2	395.0	7.8	...	...	...
354	N2	433.0	12.7	44.5	432.0	436.5	4.5	...	...	...
355	W2	463.6	12.2	30.6	463.1	470.8	7.7	...	473.8	...
356	N2	502.9	12.0	39.3	501.5	504.3	2.8	...	506.0	...
357	W2	527.9	11.9	25.0	527.4	536.9	9.5	...	...	...
358	N2	572.2	12.5	44.3	571.2	574.9	3.7	...	...	...
359	W2	603.2	12.0	31.0	602.0	609.8	7.8	...	610.7	...
360	N3	640.8	12.5	37.6	640.0	643.8	3.8	...	...	...
361	N	658.8	12.7	18.0	...	...	...	...	...	...
362	N3	744.1	12.3	(85.3)	743.4	746.9	3.5	741.3	...	...
363	W1	781.0	11.9	36.9	778.2	787.1	8.9	...	...	...
364	N5	809.0	12.7	28.0	808.7	...	...	...	...	...
365	N3	823.6	12.6	14.6	822.9	824.9	2.0	...	...	...
366	N5	845.9	12.9	22.3	845.6	848.2	2.6	...	...	...

TABLE 2 (cont)

OBSERVED OUTBURSTS OF V442 Cen.

No.	TYPE	MAXIMUM J.D.	MAX. MAG$_v$	INT$_d$	13.0I	13.0D	WIDTH 13.0I-D$_d$	14.0I	14.0D	WIDTH 14.0I-D$_d$
367	N4	2,446,862.3	12.4	16.4	861.8	864.7	2.9	...	866.3	...
368	W2	883.0	12.2	20.7	882.4	889.0	6.6	882.0	890.2	8.2
369	N5	920.3	12.5	37.3	920.1	920.7	0.6	...	...	...
370	N3	951.2	12.0	30.9	950.6	953.8	3.2	...	955.5	...
371	N1	972.9	12.0	21.7	970.8	975.9	5.1	...	...	...
372	N?	997.2	12.6?	24.3	...	...	...	...	...	...
373	N2	2,447,019.8	12.3	22.6	018.6	021.0	2.4	...	...	...
374	?	038?	12.4?	18.2?	...	...	...	...	...	...
375	?	070?	12.0	32?	...	...	...	...	...	...
376	W2?	156.1	12.1	(86.1)	...	161.6	...	...	162.5	...
377	N5	183.1	12.0	27.0	183.0	185.2	2.2	...	...	...
378	N	204?	12.8?	20.9?	...	205.1	...	...	...	...
379	N3	220.9	12.4	16.9	220.1	221.2	1.1	...	...	...
380	W2	242.9	12.2	22.0	241.7	249.9	8.2	...	...	...
381	N4	277.8	12.0	34.9	277.3	279.7	2.4	...	...	...
382	N5	300.2	12.6	22.4	299.9	302.4	2.5	299.2	303.5	4.3
383	N3	319.8	12.5	19.6	319.2	321.9	2.7	318.9	323.7	4.8
384	N5	336.2	12.6	16.4	335.9	338.9	3.0	...	...	...
385	W1	358.0	12.0	21.8	356.0	365.2	9.2	...	...	...
386	N3	394.9	12.4	36.9	394.1	396.9	2.8	...	...	...
387	?	438?	12.3	43.1?	...	...	...	...	...	...
388	W1	525.6	12.0	(87.6)	522.9	530.5	7.6	...	532.1	...
389	N3	583.9	12.3	(58.3)	583.2	586.3	3.1	...	...	...
390	N?	637?	12.7?	(53.1?)	...	...	...	...	...	...
391	W2	669.8	11.8	32.8	668.0	677.7	9.7	...	...	...
392	N1	717.8	11.6	48.0	715.9	...	...	...	...	...
393	A1	764.9	11.9	47.1	759.0	767.0	8.0	...	...	...
394	N?	824.2	12.4	(59.3)	...	...	...	...	...	...
395	N1	870.1	12.3	45.9	868.0	871.3	3.3	...	...	...
396	W2	921.9	12.6	51.8	921.1	929.5	8.4	919.0	...	...
397	N4	973.8	12.0	51.9	973.3	976.1	2.8	...	977.3	...
398	W2	2,448,036.8	12.3	(63.0)	035.5	042.0	6.5	...	...	...
399	?	107?	12.0?	(70.2)	...	...	...	...	...	...
400	W?	167.2	12.2	(60.2)	166.5	...	...	...	...	...
401	N3	248.1	12.3	(80.9)	247.5	253.3	5.8	...	...	...

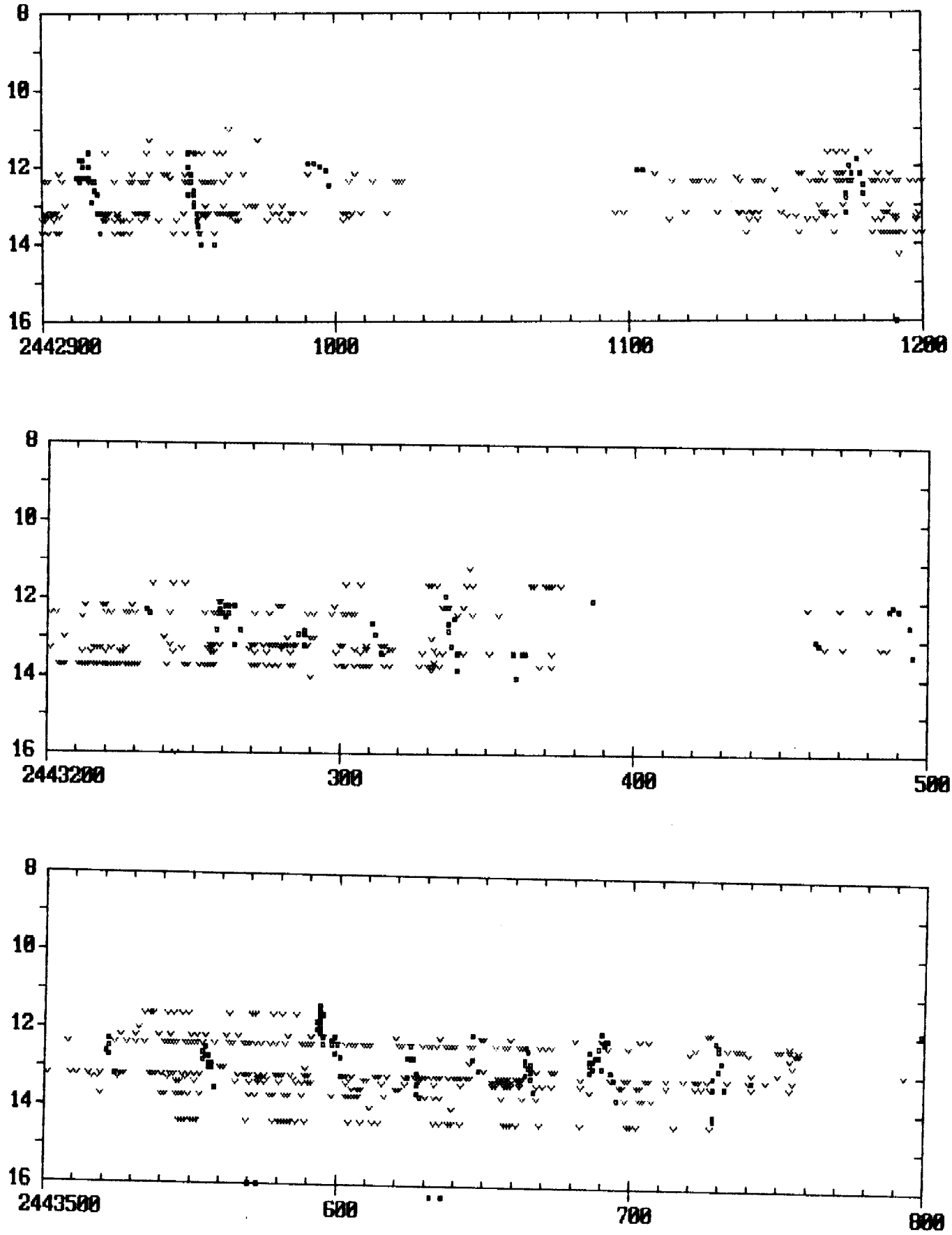

FIGURE 1

V442 Cen. LIGHT CURVE - JD 2,442,900 - 2,443,800

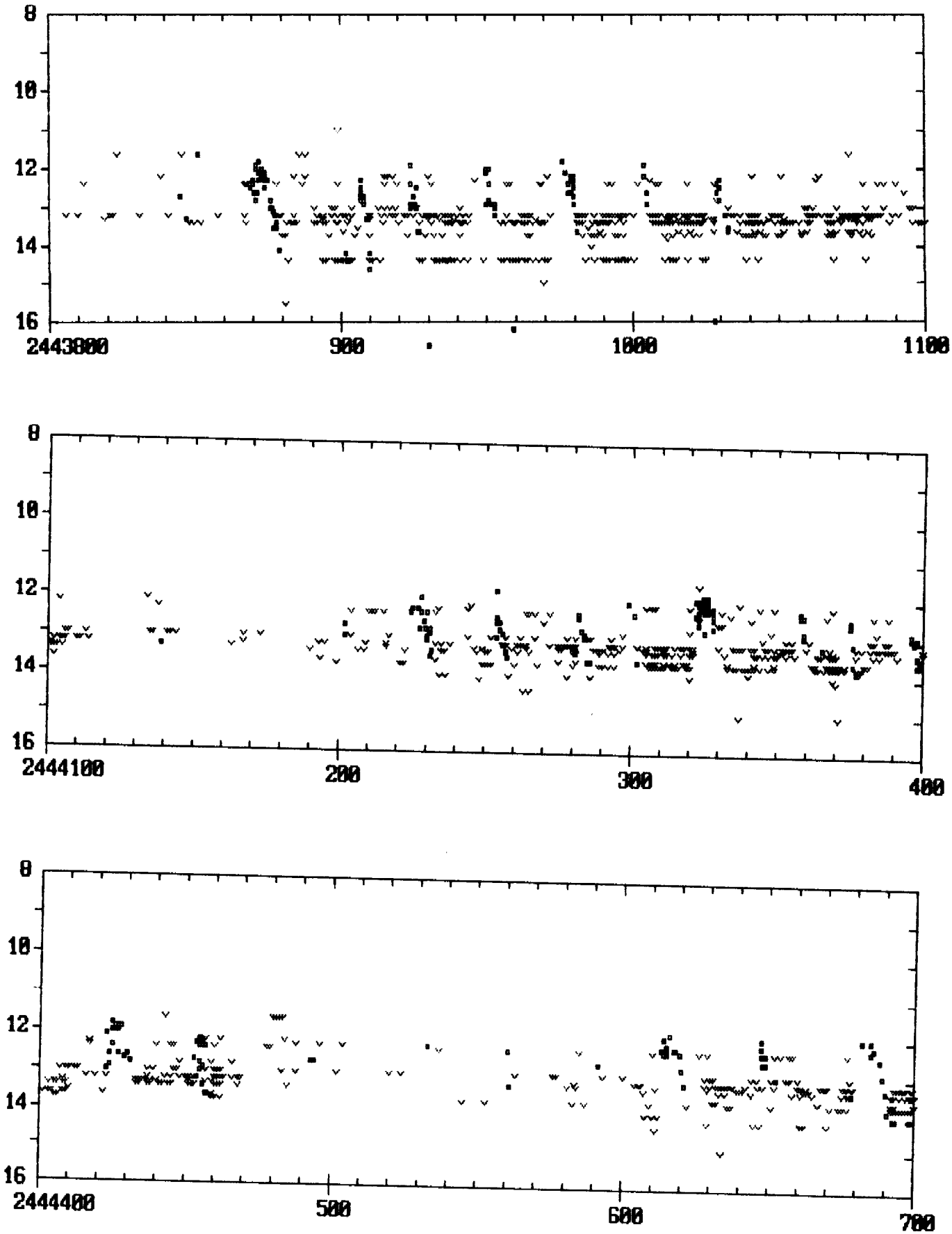

FIGURE 2

V442 Cen. LIGHT CURVE - JD 2,443,800 - 2,444,700

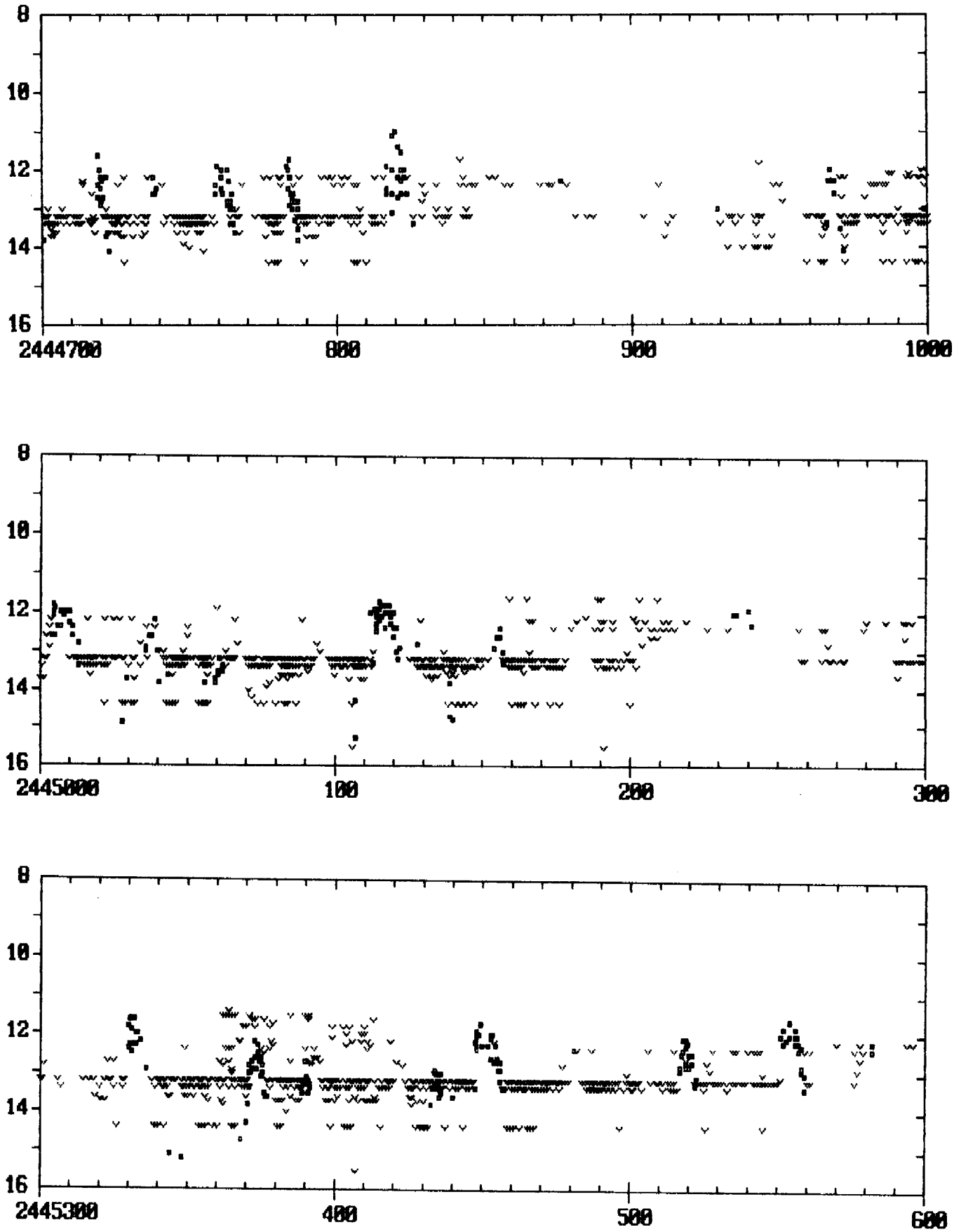

FIGURE 3

V442 Cen. LIGHT CURVE - JD 2,444,700 - 2,445,600

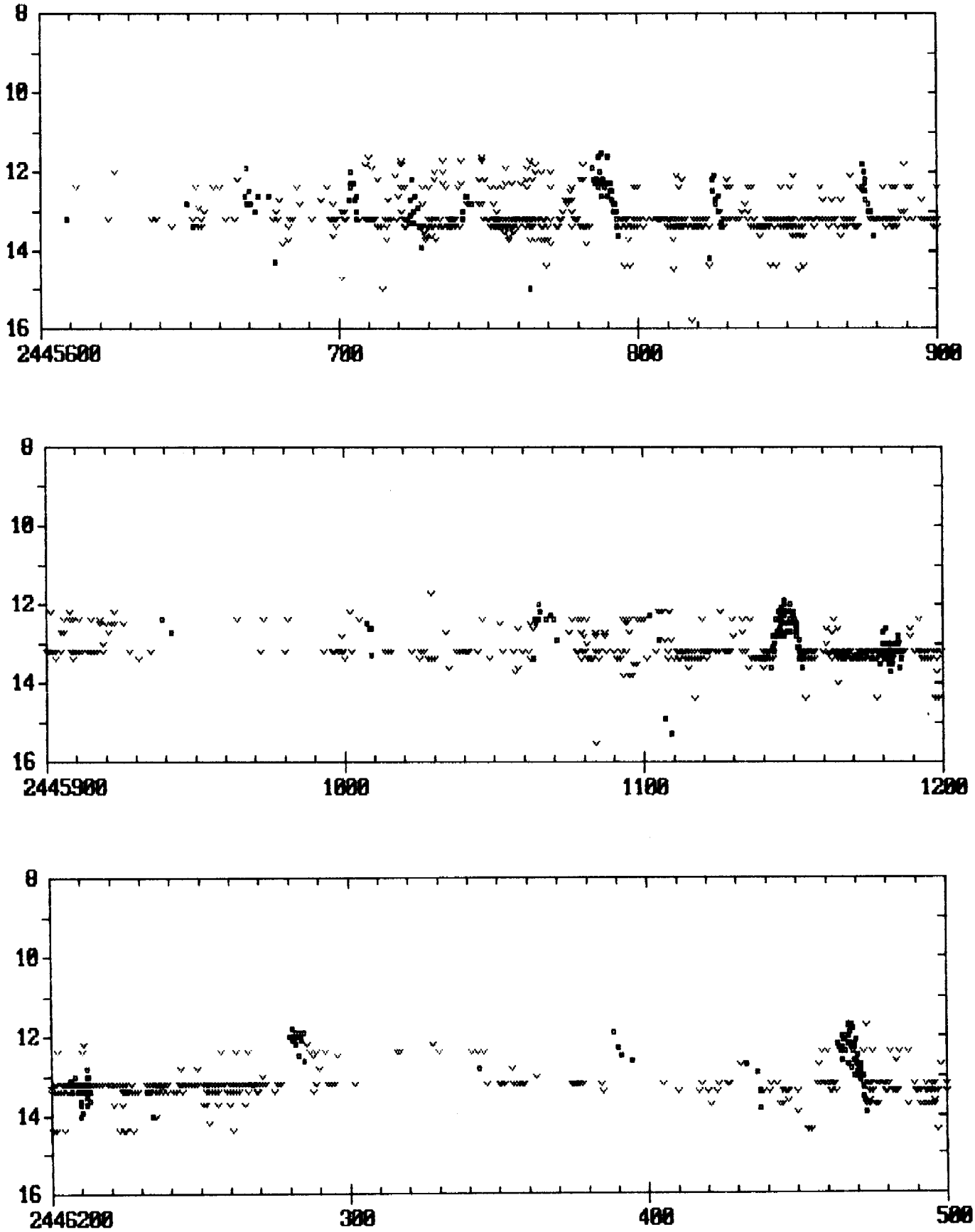

FIGURE 4

V442 Cen. LIGHT CURVE - JD 2,445,600 - 2,446,500

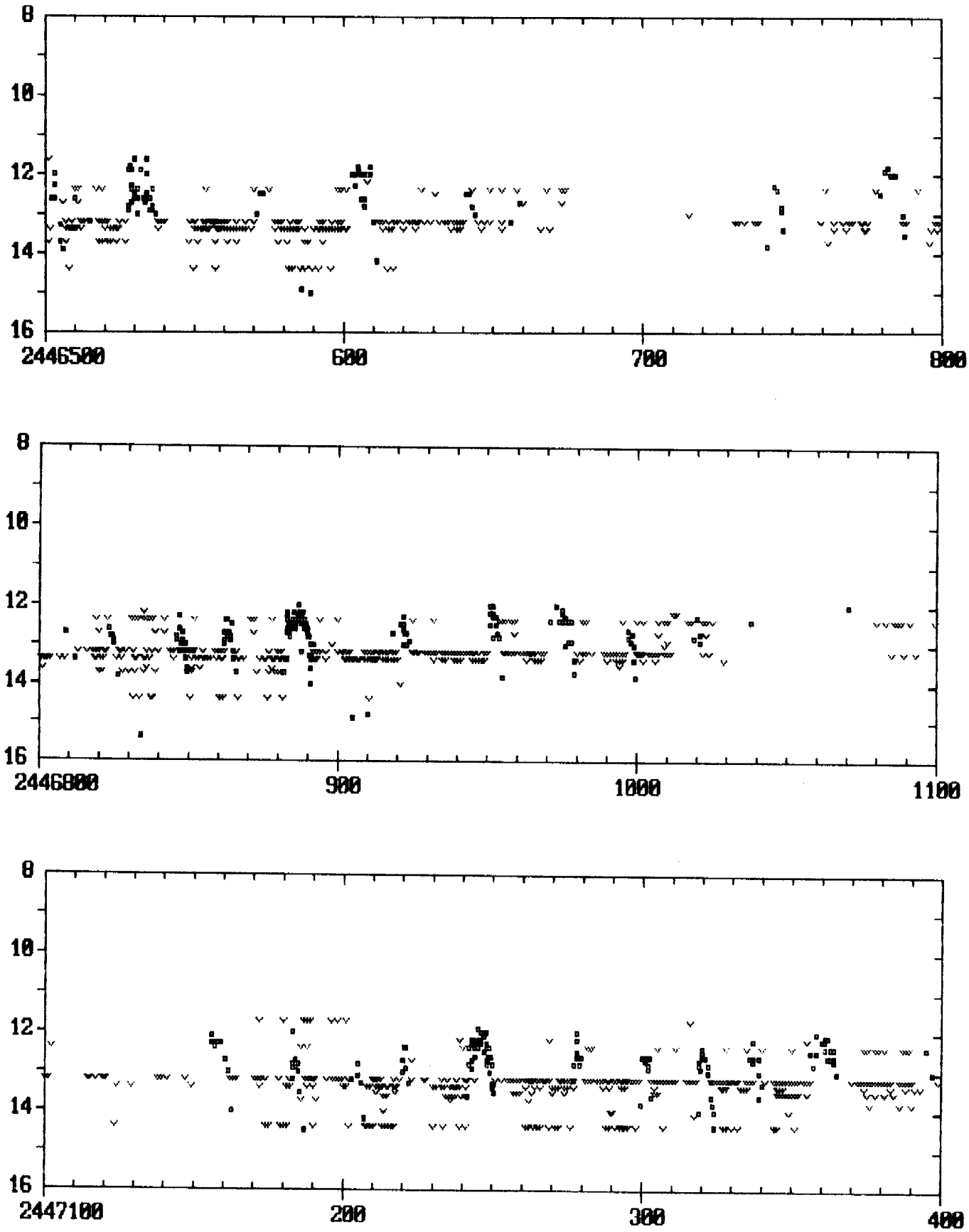

FIGURE 5

V442 Cen. LIGHT CURVE - JD 2,446,500 - 2,447,400

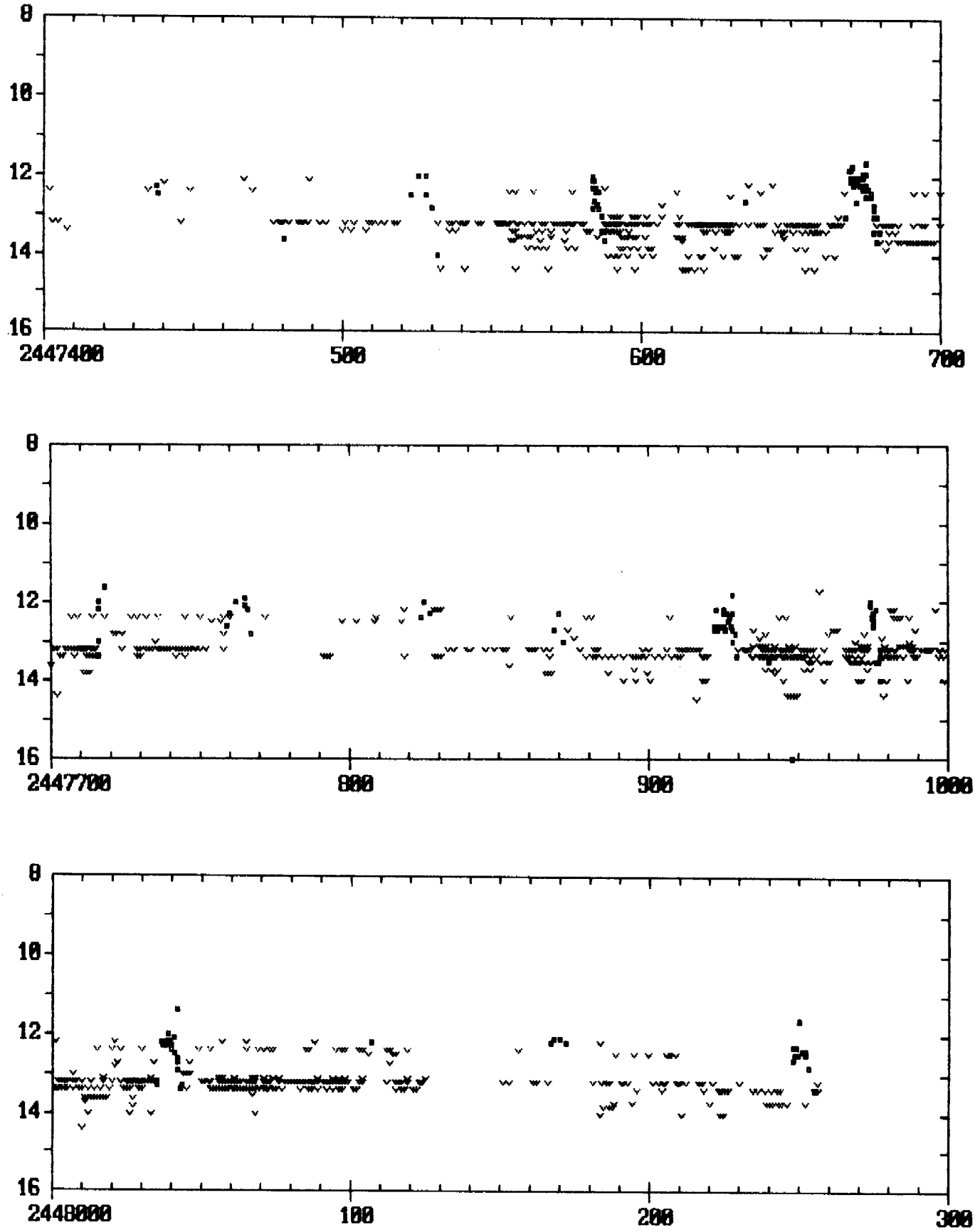

FIGURE 6

V442 Cen. LIGHT CURVE - JD 2,447,400 - 2,448,257

PHOTOELECTRIC MAGNITUDES IN TWELVE VARIABLE STAR FIELDS.

P.M. Kilmartin
Mount John University Observatory
Lake Tekapo, New Zealand.

SUMMARY: V and B-V measurements for comparison stars are listed for the variables RY Dor; BX Mon; - Cha; TT Crt; - Crv; V Cru; V854 Cen; RT Nor; V517 Oph; LR Sco; V3890 Sgr and TY PsA.

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INTRODUCTION

V and B-V values were obtained for lettered comparison stars in twelve fields, at the request of Frank Bateson. The measurements were made with the 0.6 m Optical Craftsman reflector with photometer No.2, tube EMI 9558B at 1700V, filters UBVRI at the Mount John University Observatory.

The results are listed below with the respective chart numbers published in "CHARTS FOR SOUTHERN VARIABLES." Dates on which the measurements were made are shown. Charts for V517 Oph are reproduced as some of the comparison stars measured did not appear on the original charts.

051466 RY Dor. Charts 1008 & 1009, Series 22. Measured 1991 March 6, 7, 11.

CHART LETTER	V	B-V	NOTES
a	11,49	1.05	
c	12,58	0.71	
d	13.06	-o.1	
e	12.86	0.64	
f	13.37	1.02	
g	14.2	-0.03	On chart as 14.3
h	14.06	0.29	

NOTES: k, l and m not measured. Other V magnitudes on charts can be also used for comparisons.

072003 BX Mon. Charts 917 & 918, Series 20.Measures average of two nights 1989 Apl.4 & 6.

			CHART LETTER	V	B-V
a	8.44	1.10	k	11.02	0.25
b	9.51	1.01	l	10.47	0.49
c	9.47	-0.00	m	10.47	1.03
d	9.01	0.10	n	10.88	0.44
e	10.02	0.53	o	11.18	0.54
f	10.14	0.05	p	11.95	0.21
g	10.25	0.47	q	12.45	0.38
h	9.93	1.36	r	12.72	0.33
j	10.75	0.97	s	13.30	0.58

B, V data switched

084876 - Cha. Chart 924. Series 20. Measured 1989 April 4.

A	8.03	0.1	H	10.10	1.0
B	8.09	0.1	K	11.09	0.6
C	9.30	0.4	L	11.59	1.2
D	8.90	1.0	M	12.24	0.7
E	10.12	0.5	N	12.95	0.4
F	10.31	0.6	O	13.93	0.1
G	11.35	0.4	P	13.74	1.4

112911 TT Crt. CHARTS 908 & 909,Series 20.Measured 1989 April 3.

CHART LETTER	V	B-V	CHART LETTER	V	B-V
a	12.64	0.7	d	14.2	1.3
b	13.21	0.6	e	14.4	0.7
c	13.09	0.5			

NOTE: f not measured.

121517 - Crv(Tombaugh's star). CHARTS 1038 & 1039, Series 22. Measured 1991 March 11, 12, 17.

a	11.02	0.56			
b	12.11	0.73	f	12.45	0.93
c	11.64	0.51	g	12.39	0.77
d	11.35	1.05	h	12.55	0.56
e	11.77	0.98	k	13.32	1.52

data switched

"d" is close to PGC 39839 (galaxy)

125057 V Cru. Chart 1046. Series 22. Measured 1991 March 12 & 17.

a	9.75	0.24	g	12.42	0.64
b	9.85	0.22	h	13.0	1.86
c	10.48	0.15	k	13.7	0.6
d	10.29	0.15	l	13.7	1.8
e	11.59	0.18	m	13.54	0.73
f	11.54	0.21			

142839 V854 Cen=NSV 6708. Charts 932 & 933, Series 20. Measures average of two nights 1988 July 1 & 12.

b	9.00	1.26	h	11.08	1.6
c	9.15	1.72	k	12.08	1.4
d	9.65	0.58	l	11.61	0.4
e	10.33	1.07	m	13.03	0.8
f	11.08	0.97	n	13.26	1.3
g	11.05	0.5	o	12.90	0.8
x	13.52	1.0 (Star nearly opposite F, on other (North) side of variable)			

161559 RT Nor. Charts 934;935;936. Series 20. Measured 1989 February 15.

b	9.53	0.6	h	10.98	1.2
c	10.11	0.1	l	11.62	0.4
d	10.33	0.2	m	12.13	0.3
f	10.83	1.4	n	12.05	1.7
g	11.15	0.4			

NOTES: e and d^1 not measured; o, p and s too faint to measure.

170928 V517 Oph. Charts 645;646;647. Series 14. Measured 1989 April 4.

A	9.63	1.9	g	12.05	0.4
a	10.43	1.3	h	12.28	1.7
b	10.33	1.7	k	12.49	1.4
c	11.07	0.7	m	12.36	1.0
e	11.05	1.7	o	12.79	2.5
e^1	11.37	0.4	p	13.57	1.8
f	11.53	0.5	q	13.43	1.0

NOTES: See charts at end of this paper. r, s, t and u not measured.

172043 LR Sco. Chart 959, Series 21. Measured 1990 April 10 and three stars on 9 or 10 nights in 1989.

CHART LETTER	V	B-V	CHART LETTER	V	B-V
aa	8.7	1.5	kk	11.1	0.9
bb	9.3	0.1	ll	11.6	0.5
cc	9.8	0.6	mm	11.6	0.5
dd	10.0	0.6	nn	11.3	0.4
ee*	10.3	0.5	~~oo~~	12.7	0.3
ff+	10.3	0.3	~~pp~~ S	11.9	2.0
gg	10.3	0.5	~~pp~~ N	12.7	1.2
hh	10.2	1.9			

NOTES: * chart doesn't match eyepiece view-ident. uncertain
+ includes close faint companion.
S south component of close pair
N north component of close pair

182424 V3890 Sgr. Charts 1040; 1041; 1042. Series 22. Measured 1991 March 11 & 12

c	8.42	0.30
d	8.86	1.27
e	9.19	1.33
f	9.57	1.13
h	10.11	0.13
k	10.47	0.35

224427 TY PsA. Chart 952,Series 21. Measured 1990 Sept. 7 & 19.

a	8.00	1.09	m	11.9	0.8
b	9.33	1.34	n	12.0	0.6
c	10.34	0.50	s	13.4	0.5
d	10.76	0.48	t	13.1	0.4
e	10.93	1.14	u	13.2	0.5
f	11.08	0.75	w	13.6	0.5
k	11.55	0.9			

PRECISE 1950 POSITIONS FOR V854 Cen & SOME NEARBY COMPARISON STARS

Below are positions of V854 Cen and nearby stars measured from a Carter Observatory astrograph plate taken 1975 January 12. Plate scale 102"/mm. Reductions by least squares, plate constants using 8 stars from the Cape Photographic Catalogue. Mean residuals 0.8 seconds of arc in both RA and Dec.

	R.A. (1950)	Dec.
V854 Cen	$14^h\ 31^m\ 41^s.59$	$-39^\circ\ 20'\ 12''.3$
"e"	14 31 35.51	-39 18 58.9
"f"	14 31 41.79	-39 20 45.4
Star NE	14 31 42.87	-39 19 40.4

The star NE (north-east) of the variable is about 13th magnitude. The other faint stars shown beside it on the chart do not appear on our blue (103a-O)plate.

DIRECTOR'S COMMENTS.

We thank P.M. Kilmartin for the foregoing sequences. Visu al observers should use the V magnitudes, rounded off to tenths, and insert the magnitudes on their charts.Many of these magnitudes have already been supplied to some observers but are reproduced here for permanent record. The copies of charts 646 & 647 on the following pages should be used by all observers.

646

170928 V517 OPHIUCHI.

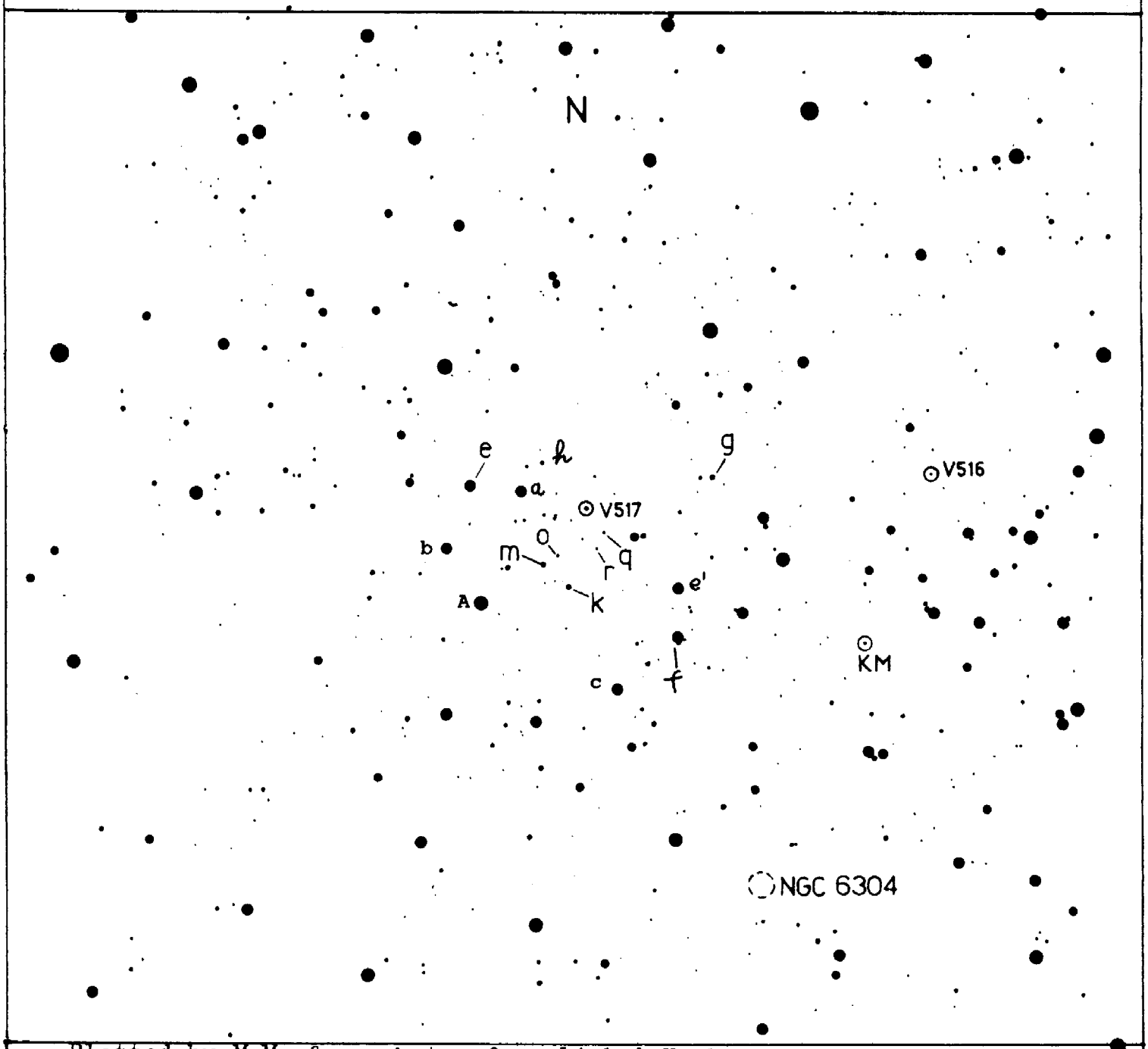
(1950): 17h 12m 10s -29° 02'.1
(2000): 17 15 19 -29 05.7

Lb. 12.6 - (16.5p. SPEC: RO

SEE ALSO CHARTS 645 & 647

ALSO SHOWN:
KM Oph ((M. 13.8-(17.0p).
V516 Oph ((M. 14.3 - (17.0p)

SCALE: 20" = 1mm



Plotted by M.M. from photos from Lick & Yerkes and field sketch by A. Jones.
Use lettered stars for comparisons.

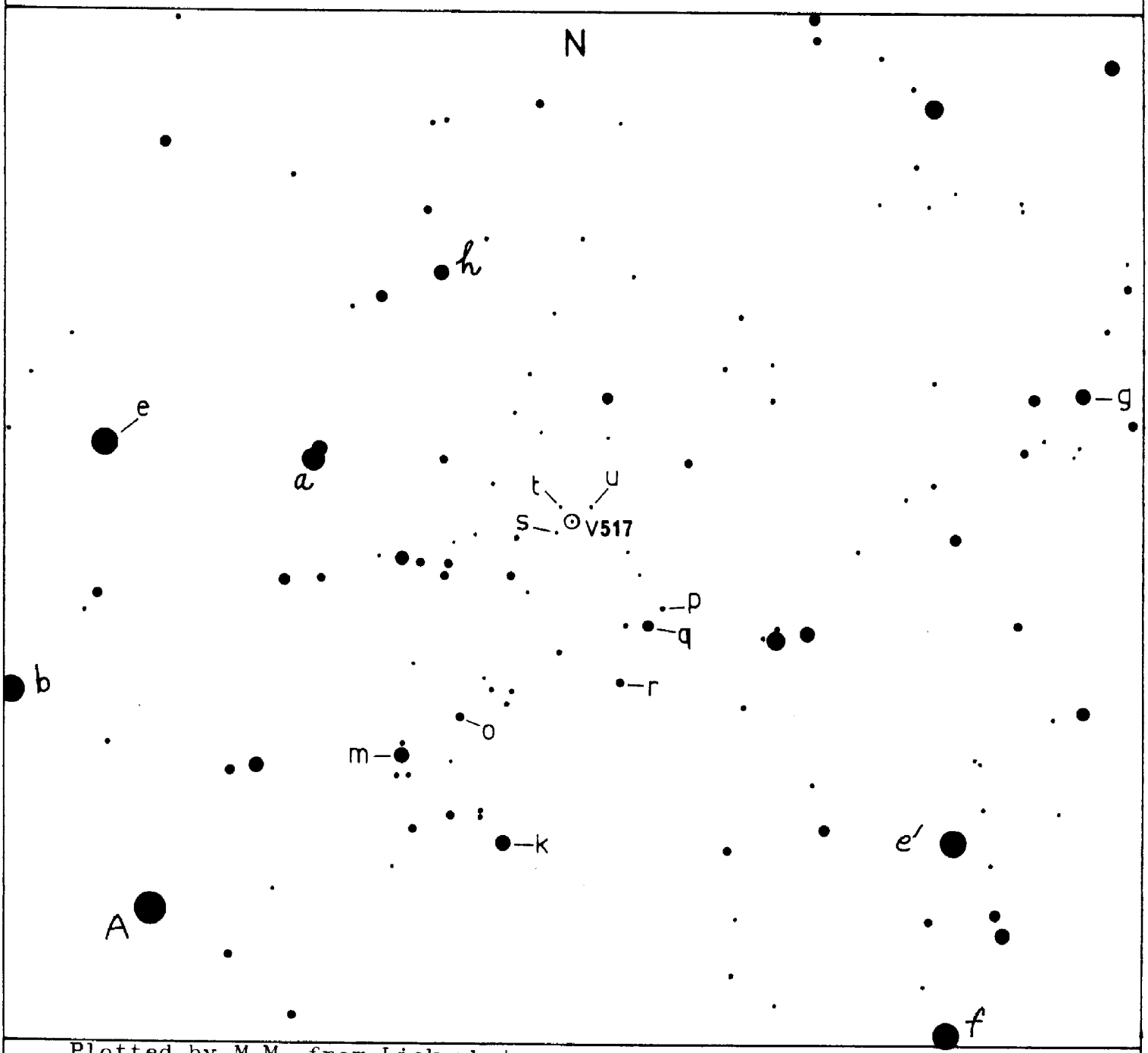
F.M.B. 2.12.81

647

170928 V517 OPHIUCHI.

(1950): 17h 12m 10s -29° 02'.1
(2000): 17 15 19 -29 05.7
Lb. 12.6 - (16.5p. SPEC: RO
SEE ALSO CHARTS 645 & 646.

SCALE: 5" = 1mm



Plotted by M.M. from Lick photo.
Use lettered stars for comparisons.

F.M.B. 2.12.81

LIGHT CURVE OF TT CRATERIS

Richard Fleet
Fairways, Grange Road,
Cookham,Berkshire,SL6 9TH
England
(revised 5 June 1990)

SUMMARY: Visual observations for the first three seasons after discovery of TT Crt are presented. Magnitudes of the comparison stars have been revised.

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1. INTRODUCTION

Since the discovery was reported (1,2) the designation TT Crateris has been allocated (3) to the object previously referred to by different organisations as FSV 113211, FSV 1132-11, 1129-11, 1130-11 Or - Crt. The accurate position obtained by the late Alan Young (4) was confirmed by R. McNaught. Spectra confirming the identification as a dwarf nova were obtained by Filippenko (5) and Margon (6). One pre-discovery outburst was found on Palomar Observatory Sky Survey plate O and E 1562, taken on March 10/11 1956.

2. COMPARISON STARS

V and B-V values for five comparison stars, a to e, were determined by Pam Kilmartin, Mt. John University Observatory, for the VSS, RASNZ and appear on page 16 of this publication.

Visual comparisons by Fleet with different source sequences suggests that f and g also need revision. Values of f = 14.8 and g = 16.0 have been adopted. To avoid confusion observers are requested to use these new values only from October 1990 onwards. Charts showing the lettered comparison stars are widely available (1,2,7,8,9)

3. OBSERVATIONS

The light curve in Figure 1 shows daily means, or the faintest negative estimate, for the interval J.D. 2,446,739 to 2,447,721 (probably incomplete after 2,447,620). Three well observed outbursts are shown in more detail in Figure 2. All the estimates have been adjusted to fit the new sequence. Observer totals are listed in Table 1 and outbursts are summarized in Table 2.

4. DISCUSSION

Because the field is near the ecliptic there are gaps in observation from late August to late October each year. In addition moonlight seriously hampers observation for a few days each month, so it is inevitable that some outbursts are missed. Despite this nine outbursts were reported in the first three years.

Most of them were brighter than comparison star d (14.2) for at least three days (about nine days where the rise and fall were seen) and had a maximum brightness of about 13.1. Only one outburst can definitely be classified as being shorter than three days (July 1988). The longer/brighter outbursts seem to have a mean cycle of about 100 days, although clearly this did not hold for the April 1988 outburst. The mean cycle and mean brightness of short outbursts are unknown.

5. CONCLUSIONS

While it is likely that the majority of long outbursts are being detected more observations with larger apertures will be needed to pin down the short outbursts. The sub-class has yet to be established and there is still much to be learned about this star's range of behaviour.

ACKNOWLEDGEMENTS

I would like to express my thanks to all those who took the trouble to check on this star. My thanks also to John Toone and Guy Hurst for their help and encouragement, to Frank Bateson for comment on an earlier draft, arranging new charts and for permission to use the new sequence in advance of publication. Finally my thanks to members of the Variable Star Section, Royal Astronomical Society of N.Z. for supplying a large proportion of the estimates used here.

REFERENCES

(1) Fleet, R.W. 1988. The Astronomer, 24, No. 285, pp. 177-178.
(2) Fleet, R.W. 1988, Publ. 14, Var. Star Section, R. astr. Soc of N.Z.pp.62-66.
(3) Kholopov,P.N. et al (eds). 1989,Info. Bull on Var, Stars No. 3323.
(4) Hurst, G.M. 1989 The Astronomer 25, No. 297,p. 181.
(5) Filippenko, A.V. 1989. IAU Circ. 4712.
(6) Hurst, G.M. 1989. The Astronomer 26, No. 301, p. 14.
(7) Bateson, F.M. & M. Morel. 1988, Charts for Southern Variables, Series 20. Publ. by Astronomical Research Ltd., Tauranga, N.Z.
(8) Toone, J. 1989. Sky & Telescope. 77, No. 4, pp. 404-405.
(9) Fleet, R.W. 1989, Astronomy Now 3, No. 5. p.7.

TABLE 1.

OBSERVER'S TOTALS

D. OVERBEEK	130	A. PEARCE	14
R. FLEET	124	M. BEGBIE	6
A. JONES	53	P. SVENTEK	5
T. COOPER	28	6 OTHERS	8
J. TOONE	20		
		TOTAL	386

TABLE 2.

Summary of Reported Outbursts

Month	First estimate JD 244+	Maximum daily mean brightness	Days brighter than 14.2	Remarks
Nov 86	6739.58	13.2	?	Discovery observation.
Feb 87	6837.60	13.2	>9d	Rise not seen,fall seen.
May 87	6941.25	13.1	9d	Rise seen, fall seen.
Apr 88	7275.41	13.2	>3d	Rise and fall not seen.
Jun 88	7337.22	13.6	<13d	Single positive observation.
Jul 88	7353.85	13.8	<3d	Single positive observation.
Dec 88	7520.57	13.1	9d	Rise and fall seen.
Mar 89	7615.67	12.9	8d	Rise and fall seen.
Jul 89	7721	13.2	>3d	Rise not seen, fall seen.

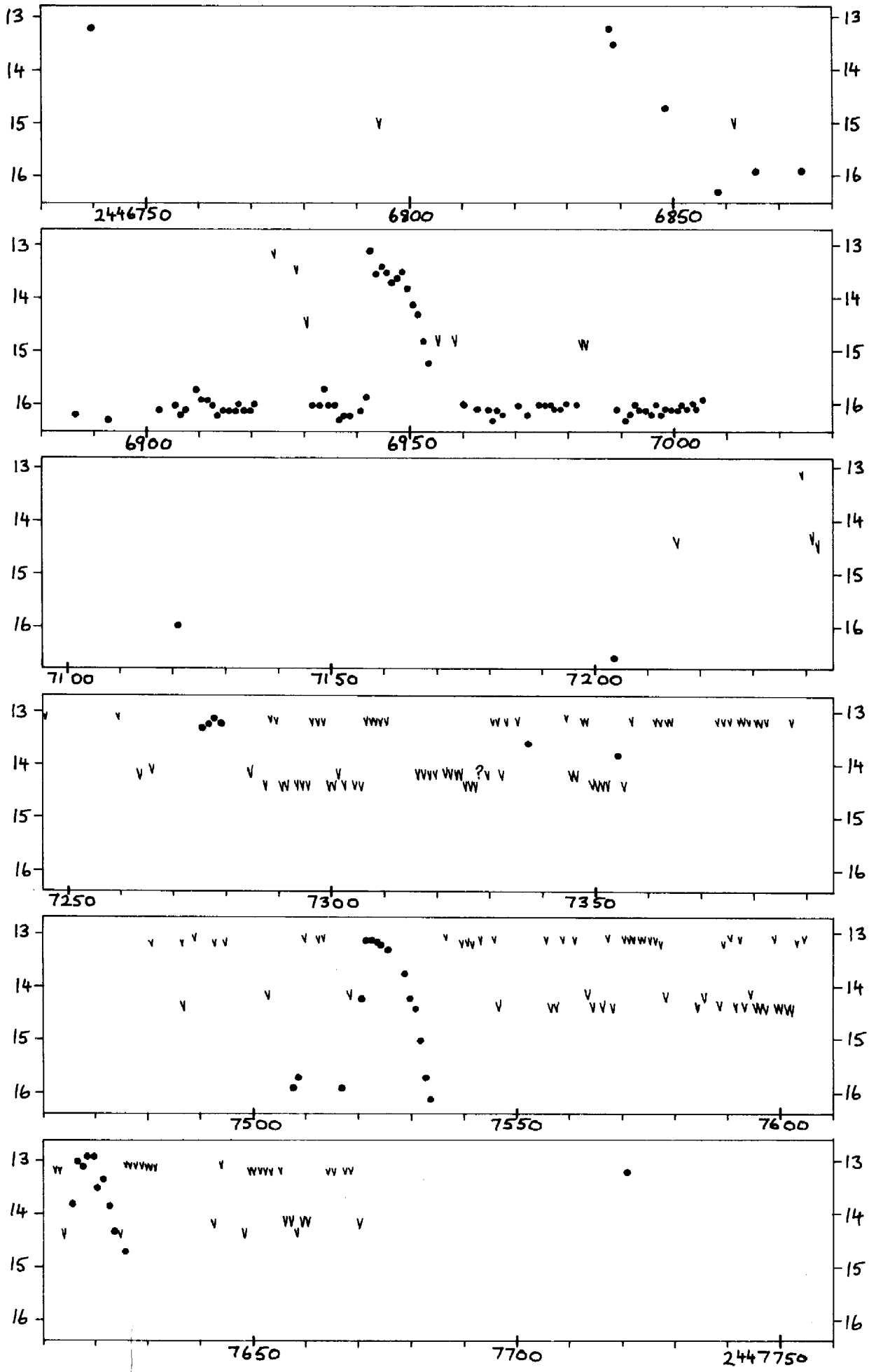

FIGURE 1. TT Crt. LIGHT CURVE FROM DAILY MEANS

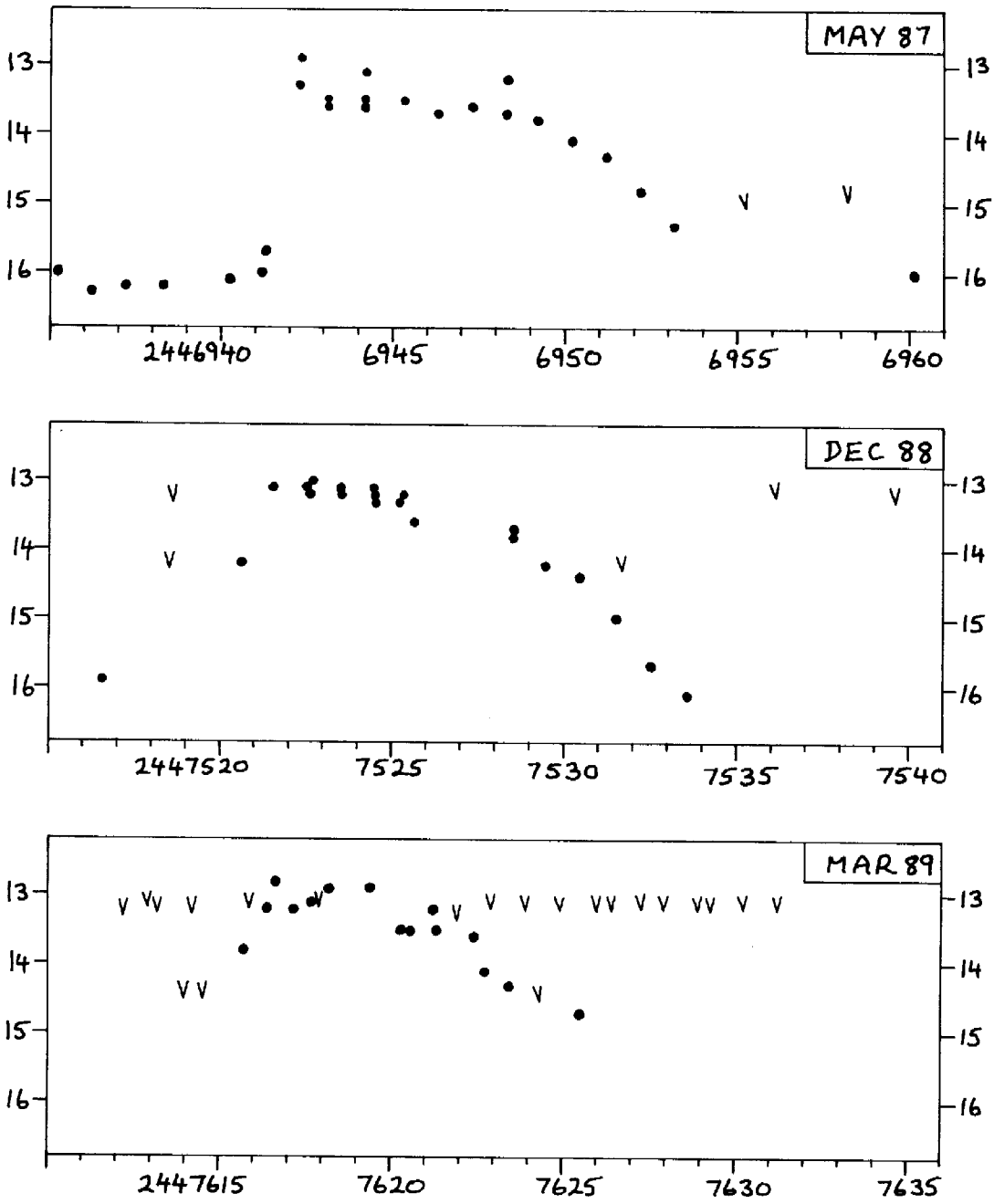

Figure 2. TT Crt. LIGHT CURVES FOR SELECTED OUTBURSTS FROM INDIVIDUAL OBSERVATIONS.

THE LIGHT CURVE OF THE R CORONAE BOREALIS STAR NSV 6708 (V854 CEN) AND THE ACCURACY OF VISUAL ESTIMATES

W.A. LAWSON, P.L. COTTRELL
Mount John University Observatory, Department of Physics
University of Canterbury, Christchurch, New Zealand

F.M. BATESON
Variable Star Section, Royal Astronomical Society of New Zealand
P.O. Box 3093, Tauranga, New Zealand

ABSTRACT The R Coronae Borealis star NSV 6708 (V854 Cen) has been monitored by visual observers for over 4 yrs and photoelectrically for 2 yrs. The comparison of the visual estimates and the photoelectric data offers some insight into the potential accuracy of visual light curves. We also make some suggestions about the selection of comparison sequences and sources of error in visual estimates.

INTRODUCTION

NSV 6708 has attracted a great deal of attention since it was first suspected of being an R Coronae Borealis (RCB) star by McNaught (see McNaught 1988). NSV 6708 has been studied by Kilkenny & Marang (1989) and Lawson & Cottrell (1989) who showed that it exhibited many of the usual characteristics of RCB stars, e.g. low amplitude variations at maximum, large amplitude declines and a circumstellar shell, but that it had unusually strong hydrogen lines compared to other RCB stars. The star has also been an ideal target for amateur variable star observers due to the brightness of the star at maximum ($V \approx 7$) and its frequent declines.

OBSERVATIONS

Observers of the Variable Star Section of the Royal Astronomical Society of New Zealand (VSSRASNZ) have monitored NSV 6708 since 1986 July. All of these estimates obtained prior to 1990 March (with the exception of a few erroneous values) and some additional estimates from *IAU Circulars*, are shown in Fig. 1. The visual light curve for NSV 6708 extends the long series of such light curves for RCB stars published by Bateson (1975, 1978) and Lawson, Cottrell & Bateson (1988, 1989). The estimates will be published in a future Circular of the VSSRASNZ.

Offset by 4 mags from the visual estimates are photoelectric V mags obtained at Mount John University Observatory (MJUO) during 1988 (Lawson & Cottrell 1989) and 1989 (Lawson 1990) as part of an extensive program to study the hydrogen-deficient Carbon (HdC) and RCB stars. The V data were obtained with the two 0.6-m reflectors at MJUO and automated single channel photometers. The observations were obtained differentially with respect to nearby comparison stars and then tied into the standard system. The light curve shows 3 declines and low amplitude (< 1 mag) variations at maximum.

DISCUSSION

There is a general impression that, unless the variability of a star exceeds several tenths of a mag, light curves derived from visual estimates are not capable of revealing lower amplitude variations or, if such variations are apparent, that they should be regarded with some suspicion. A comparison between the parts of the light curve in Fig. 1 that have been observed both visually and photoelectrically indicate quite clearly that there is excellent agreement between the features present in both datasets, in particular the low amplitude variations seen when the star is not in decline.

To further demonstrate the similarity of these datasets we show a part of the light curve (the data obtained during 1989) on an enhanced scale in Fig. 2a. The datasets are (from top to bottom respectively) the entire VSSRASNZ estimates, the estimates of P. Williams (which are also included in the VSSRASNZ dataset) and the MJUO V photometry. A comparison of the VSSRASNZ and the MJUO data shows that features with amplitudes as little as 0.1 mag are discernable in the visual light curve although there is sometimes disagreement between observers, e.g. near JD 2447580. The estimates of Williams show that an experienced observer is capable of resolving such features in the light curve independently (it is normal practice to combine or average all visual estimates in 5 or 10 d means). In Fig. 2b we show amplitude spectra for observations obtained between JD 2447570–2447780 for the three datasets. The spectra were calculated using the Lomb–Scargle Fourier technique for non–equally spaced data (Scargle 1982; Press & Teukolsky 1988 for a Fortran code). Note that although the amplitudes of the peak features are weakened in the spectra of the visual datasets, there is a general correspondence between the VSSRASNZ and MJUO spectra. A detailed analysis of the MJUO photometry of NSV 6708 suggested that the star may have 3 periods of $\sim$ 45 d, 70 d and 110 d respectively (Lawson 1990). An analysis of the VSSRASNZ data indicates that similar periods can be obtained from these data.

Several reasons account for the high quality estimates for this star. (i) The variable and its comparison sequence are bright. (ii) The comparison sequence is photoelectrically determined. The lack of accurate magnitudes remains a major source of error in many fields. (iii) The magnitudes and colors of several of the comparison stars are similar to the variable. Small ΔV and color terms minimise extrapolation errors when comparing the brightness of the variable to its comparison stars. (iv) The comparison stars for NSV 6708 are close to the variable. Astronomers would do well to consider (ii), (iii) and (iv) when requesting visual observations of variable stars.

Even for the NSV 6708 field, the influence of different observers upon the scatter in the VSSRASNZ light curve may be significant. Note that the scatter in the VSSRASNZ dataset is often greater than that of Williams estimates. Preliminary calculations for other variable stars indicate that differing zero-point mags for individual observers can have a significant effect on the light curve and that the agreement between photometric and visual data can be better than 0.05 mag if these offsets are removed. To enable such offsets to be made the name of the observer contributing the estimates must be preserved. Higher accuracy visual light curves may be useful for the long term monitoring of the periodic behavior in low amplitude variables.

CONCLUSIONS

The light curve for NSV 6708 indicates that visual estimates can resolve features at the 0.1 mag level. The analysis of visual estimates for this star compares favorably with the analysis of photoelectric data. We suggest that an optimised comparison sequence is

essential to obtain such high quality results. We also indicate that differing zero–point magnitudes for individual observers may be a significant source of scatter in visual light curves.

ACKNOWLEDGEMENTS

WAL would like to thank Peter Williams for his estimates (sent by Rob McNaught). WAL and PLC thank Alan Gilmore and Pam Kilmartin for obtaining many of the MJUO observations as part of the HdC and RCB star observing program. Finally, we thank the efforts of those observers who contributed visual estimates of NSV 6708.

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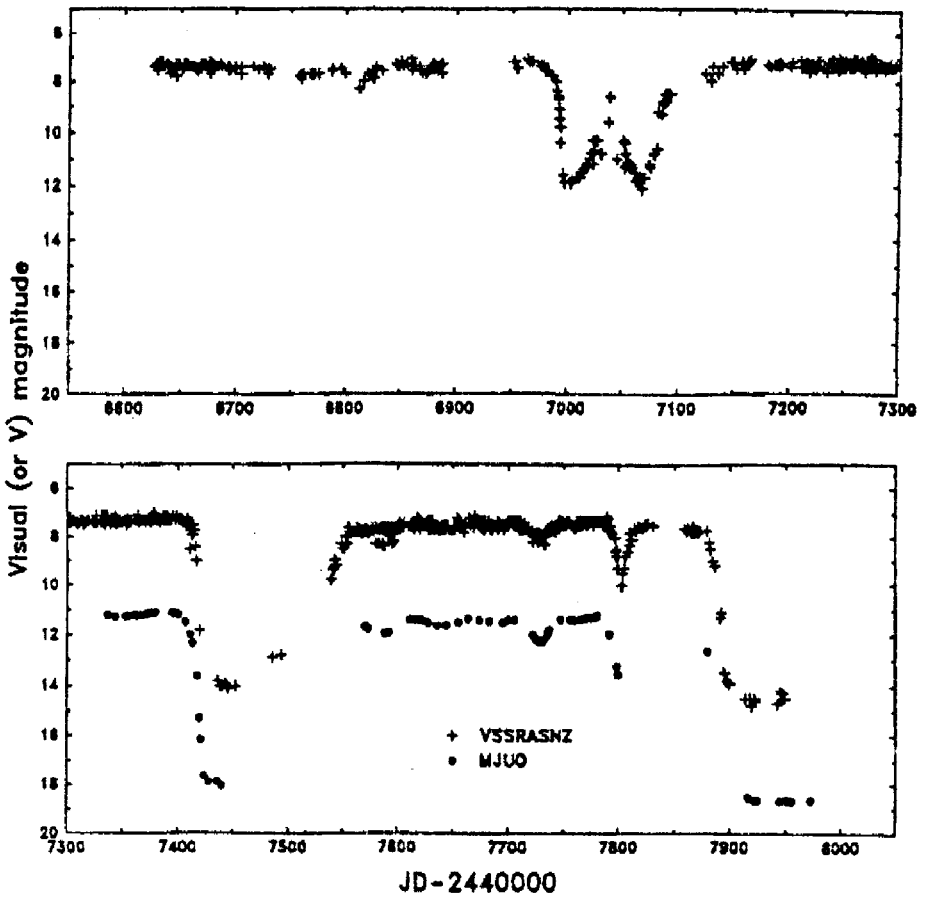

Fig. 1. Light curve of the R Coronae Borealis star NSV 6708 (V854 Cen). The pluses are visual estimates mainly from observers of the Variable Star Section of the Royal Astronomical Society of New Zealand (VSSRASNZ). The filled circles are photoelectric V mags obtained at Mount John University Observatory (MJUO) offset by 4 mags with respect to the visual estimates.

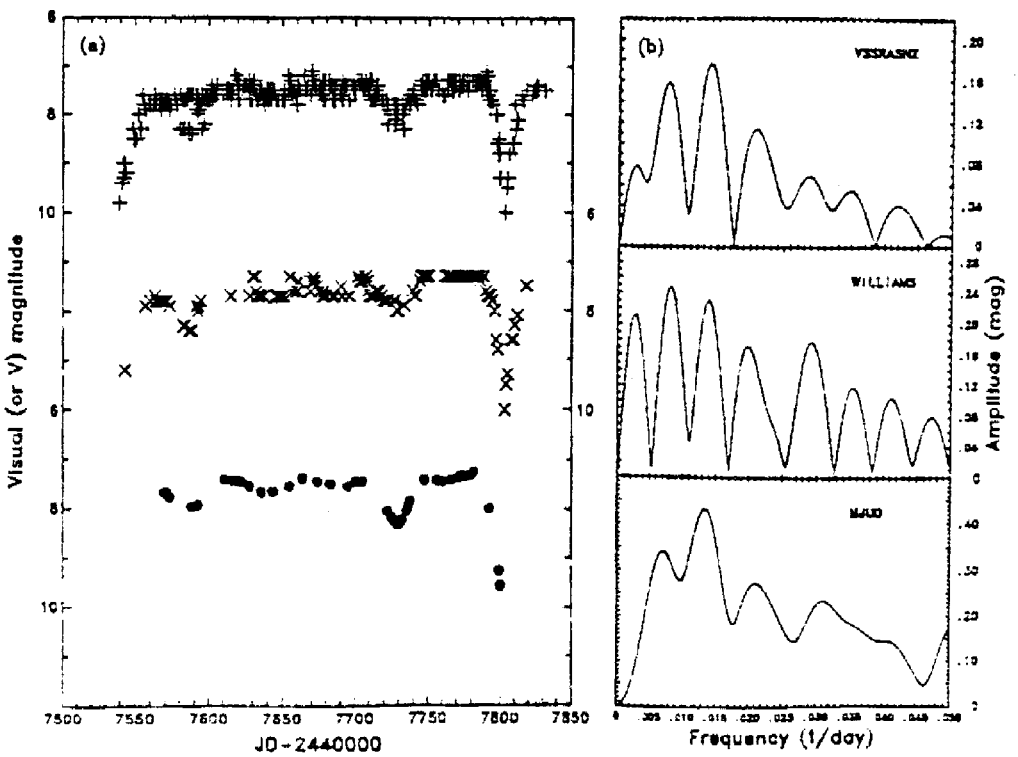

Fig. 2. (a) Light curves for NSV 6708 between JD 2447540–2447830. The data are (from top to bottom) the VSSRASNZ estimates, the estimates of P. Williams and the MJUO V photometry. (b) Amplitude spectra versus frequency for these three datasets.

AH ERIDANI---A DWARF NOVA WITH FAINT MAXIMA

Frank M. Bateson
Director, VSS.,RASNZ.
P.O. Box 3093, Greerton
Tauranga,New Zealand

SUMMARY:

Fourteen outbursts were observed during six years from 1984 Aug.7 with a mean maximum magnitude of 13.8. It is shown that the most probable mean cycle is 23.5 days.

. . . . . .

1. INTRODUCTION

Previous observed outbursts of AH Eri were listed by Bateson (1,2). This paper extends the previous lists and covers the interval J.D. 2,445,920(1984 Aug.7) to 2,448,134 (1990 Aug.30).

2. OBSERVATIONS

A total of 627 visual observations were made by members of the Variable Star Section, Royal Astronomical Society of New Zealand during the six year interval now reviewed. The observed outbursts are shown in Table 1 in the same format as in the previous papers.

The observing season for AH Eri runs from August through March, with a limited number of observations in July and April but none in May and June each year.

3. DISCUSSION

Fourteen outbursts are shown in Table 1, of which Nos. 22, 26, 30,32, 33 and 34 have sufficient observations to make them definite. The remainder for which there are only one or two positive observations were not well observed.

Determination of a mean cycle with any certainty is difficult because maximum brightness is 13.8, which is close to the limit of many telescopes used by members. This means that AH Eri is less well monitored than dwarf novae with brighter maximum magnitudes and results in gaps in the observations. The months in which few, if any, observations are possible also causes large gaps in the data.

I have assumed that intervals of less than 50 days between any two observed outbursts indicate that they were consecutive. There are eight such intervals since observations were first published. These give a mean cycle of 23.5 days. The inclusion of intervals between 50 and 60 days increases the number of intervals that may be consecutive to 12 and the mean cycle becomes 32.1 days.

AH Eri has both wide and narrow maxima. The former have widths of five days, or longer, whilst narrow maxima last no longer than 3 days and usually less. Wide maxima are more likely to be observed, whilst it is only fortuitous if a narrow maximum is seen. However, I suggest that there are probably many outbursts which only attain a maximum magnitude between 14 and 15 that have passed unobserved.

The minimum magnitude is below 17 and no data can be given on behaviour at minima.

TABLE 1

AH ERIDANI - OBSERVED OUTBURSTS

No.	J.D. Max	Mag_v	Int_d	$Width_d$	Type	N. Obs
21	2,446,029	13.8	(382)	1?	N	1
22	059	13.7	30	8	W	15
23	460	13.8	(401)	1	N	2
24	469?	14.0	9?	1	N	1
25	815	13.7	(346)	1	N	2
26	877	13.8	62	6	W	9
27	2,447,009?	13.7	(132)	1?	N	1
28	126	13.8	(117)	2?	N?	2
29	186	15.0	60	1	N	1
30	214	13.8	28	2	N	3
31	580	13.6	(366)	1?	N?	2
32	770	13.8	(190)	6	W	7
33	857	13.8	(87)	8	W	6
34	964	13.8	(107)	5	W	7

4. CONCLUSIONS

The most probable mean cycle for AH Eri is about 23.5 days. This star is a typical dwarf nova of the SS Cyg type with both wide and narrow maxima. Maximum magnitude is 13.8_v, but it is suggested that many narrow outbursts do not reach this brightness and have gone unobserved. That assumption can only be verified, or disproved, by closely monitoring with larger apertures.

ACKNOWLEDGEMENTS

I thank all observers who have contributed observations. My thanks are also due to Ranald McIntosh for providing the print outs of the observations.

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REVISED PERIOD FOR THE MIRA VARIABLE, W CHAMAELONIS

Frank M. Bateson & W. Goltz
Variable Star Section,R.A.S.N.Z.

SUMMARY: 23 years of visual observations of W Cha give a Table of 25 maxima. These give revised elements of: Epoch (Max) J.D. 2,439,317 ± 283.65 days. Mean maximum magnitude is 11.83_v. At minimum the variable is fainter than 15.5 or fainter.

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1. INTRODUCTION

Bateson (1) published a list of seven maxima from which he derived a period of 286.3 days. W Cha is shown on charts 82 & 83 (2) on which the comparison stars were identified by letters. Magnitudes for these were subsequently published (3). These V magnitudes, rounded off to tenths, are shown in Table 1 for the benefit of members who have recently joined the Section.

2. OBSERVATIONS

Members of the Variable Star Section, RASNZ have made approximately 1,800 visual estimates of W Cha, including those discussed by Bateson (1). The interval covered is from J.D. 2,438,976 (1965 Aug.3) to 2,446,885 (1987 March 28). Most of the observations were negative.

A light curve, from ten day means, appears in Figs. 1 - 4. Preliminary dates of maxima were read off from this curve. Then all positive observations for each maximum were plotted on a large scale. The plotted points were weighted in accordance with the realibity of each observation, which also took into consideration the sky conditions under which each estimate was made. More precis dates for the maxima were then tabulated.

It was obvious that a number of observations had to be rejected because they were of a field star that had been misidentified as the variable. This was probably caused by the poor quality of the charts (one of the first published) as these were primarily intended for observations of R Cha but as W Cha fell within the chart limits it was included.

3. DISCUSSION

The finally determined dates of maxima are given in Table 2. The elements derived from this table are:

EPOCH (Max) 2,439,317 ± 283.65 Days.
Mean maximum Visual magnitude 11.83

This period differs slightly from that determined by Bateson from a small number of maxima, but appears from the O-C residuals in Table 2 to fir the observations better.

The curve from ten day means appears to suggest that some minima are not much fainter than 14.0 this is misleading. . A limited number of observations, mainly negative show that minima are below 15.5. Additionally there are many occasions in which observations between 13.8 and 14.5 suggest that W Cha had a standstill at this phase. We are satisfied that this does not occur and the decline is rapid to a fairly sharp minimum. These observations were at the threshold of the instruments used and appear to be unreliable and probably of a field star.

We therefore consider that any list of dates of minima would be largely guesses in the absence of a reliable mean curve covering more than the top segment of the variations, which is all the observations do.

4. CONCLUSIONS

W Cha is a typical Mira variable with a period of 283.65 days with sharp minima, probably fainter than 16.0, and maxima that are generally sharp, although less so than the minima. As far as can be judged both the rise and fall are at equal rates, at least between 13.5 and maximum brightness.

Note that Table 2 appears below and Table 1 on page 35 after Figure 4.

ACKNOWLEDGEMENTS

We express our appreciation to all observers of W Cha.

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(3) Bateson, F.M., Gordon, P. & Menzies,B. 1971. Circ. 177. Var. Star Section, R. astr. Soc. of N.Z.

TABLE 2.

OBSERVED MAXIMA OF W. Cha

No.	J.D.MAX.	MAX MAG$_v$	INT$_d$	O-C$_d$
-1	2439,045	12.1	...	+12
+0	317	12.0	272	0
+1	591	11.8	274	- 9
2	880	11.5	289	- 4
3	2440,183	11.7	303	+15
4	470	11.5	287	+18
5	755	11.5	285	+20
6	2441,020	12.2	265	+ 1
7	304	11.9	284	+ 1
8	574	11.3	270	-12
9	866	12.0	292	- 4
10	2442,154	12.2	288	0
11	433	12.0	279	- 4
12	714	11,5	281	- 7
13	998	12.2	284	- 6
14	2443,286	11.8	288	- 2
15	578	11.9	292	+ 6
16	856	11.6	278	+ 1
17	2444,140	11.5	284	+ 1
18	421	11.8	281	- 2
19	709	12.2	288	+ 3
20	2445,004	12.0	295	+ 14
21	275	11.4	271	+ 1
22	568	11.9	293	+11
23	841	12.0	273	0

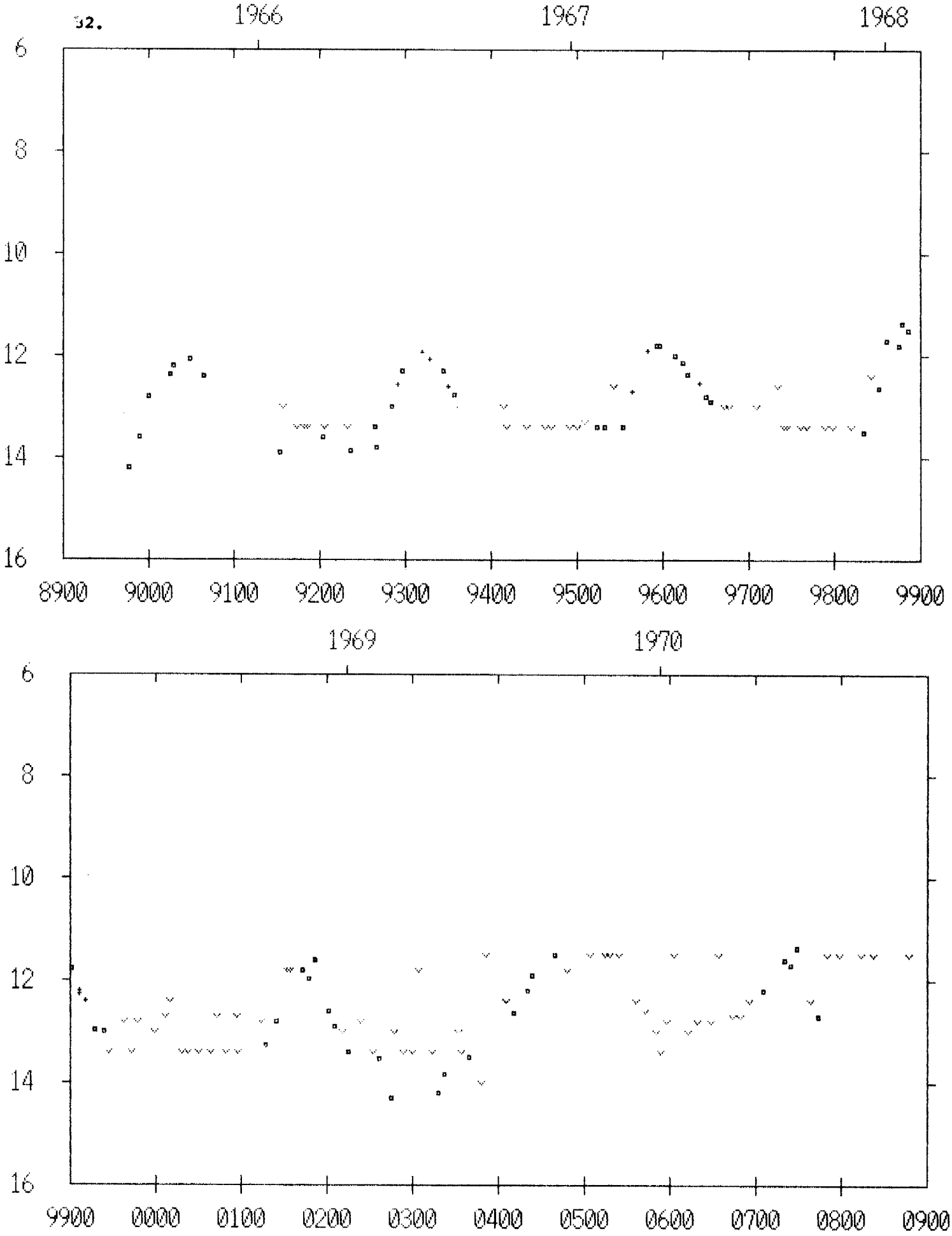
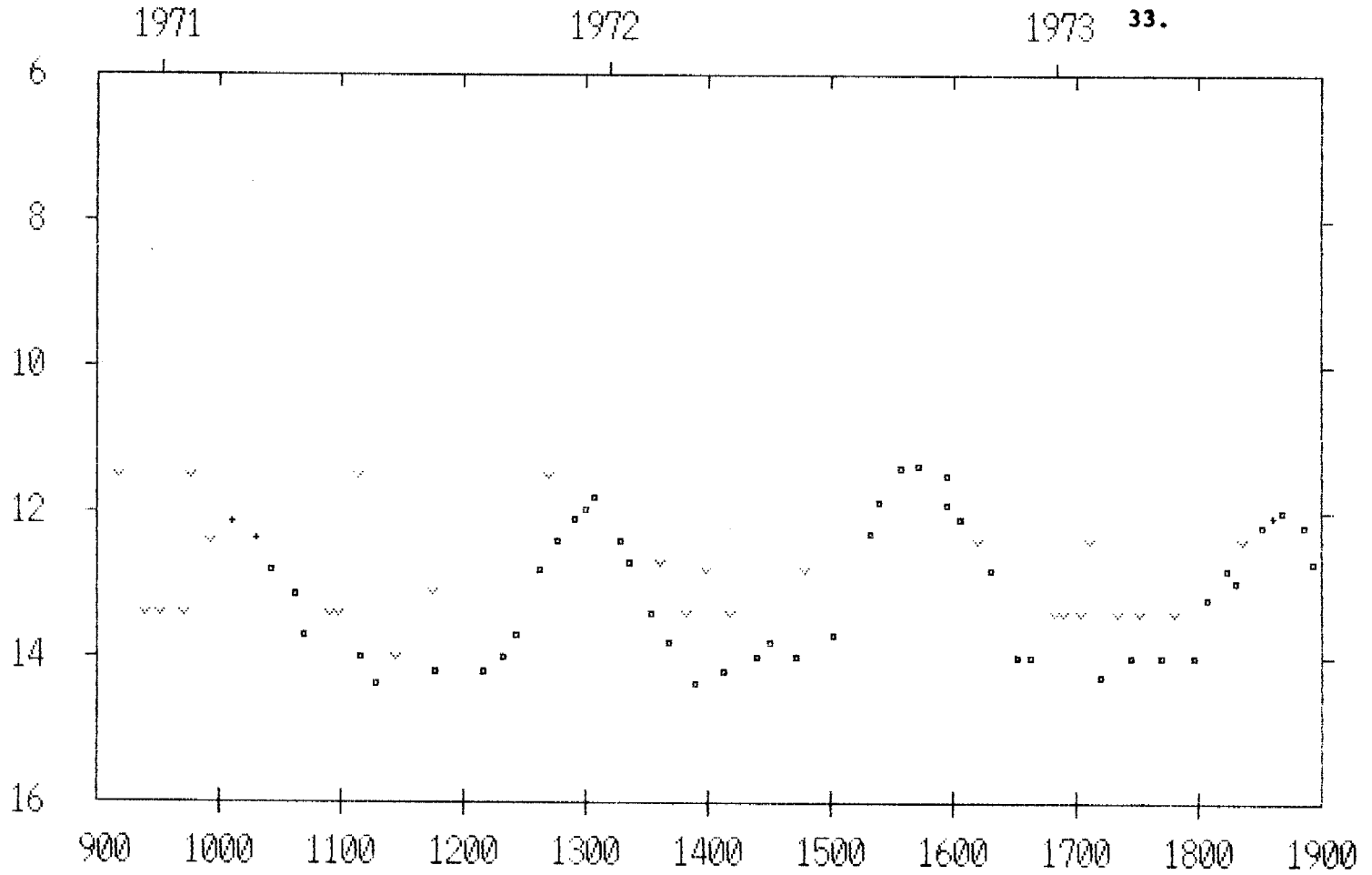


FIGURE 1

W Cha - Light Curve from Ten Day Means JD 2,438,900 to JD 2,440,900



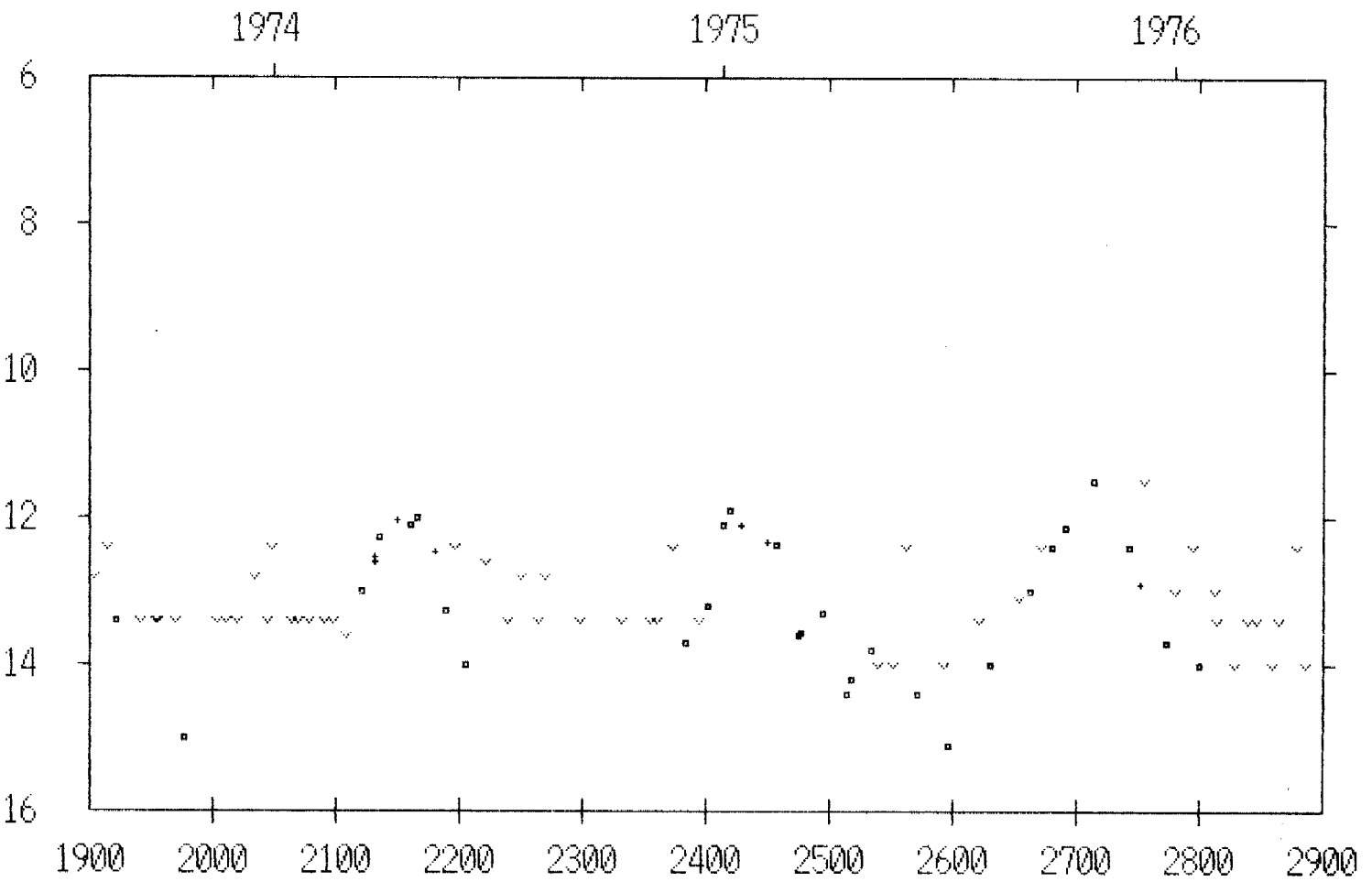


FIGURE 2

W Cha - Light Curve from Ten Day Means JD 2,440,900 to JD 2,442,900

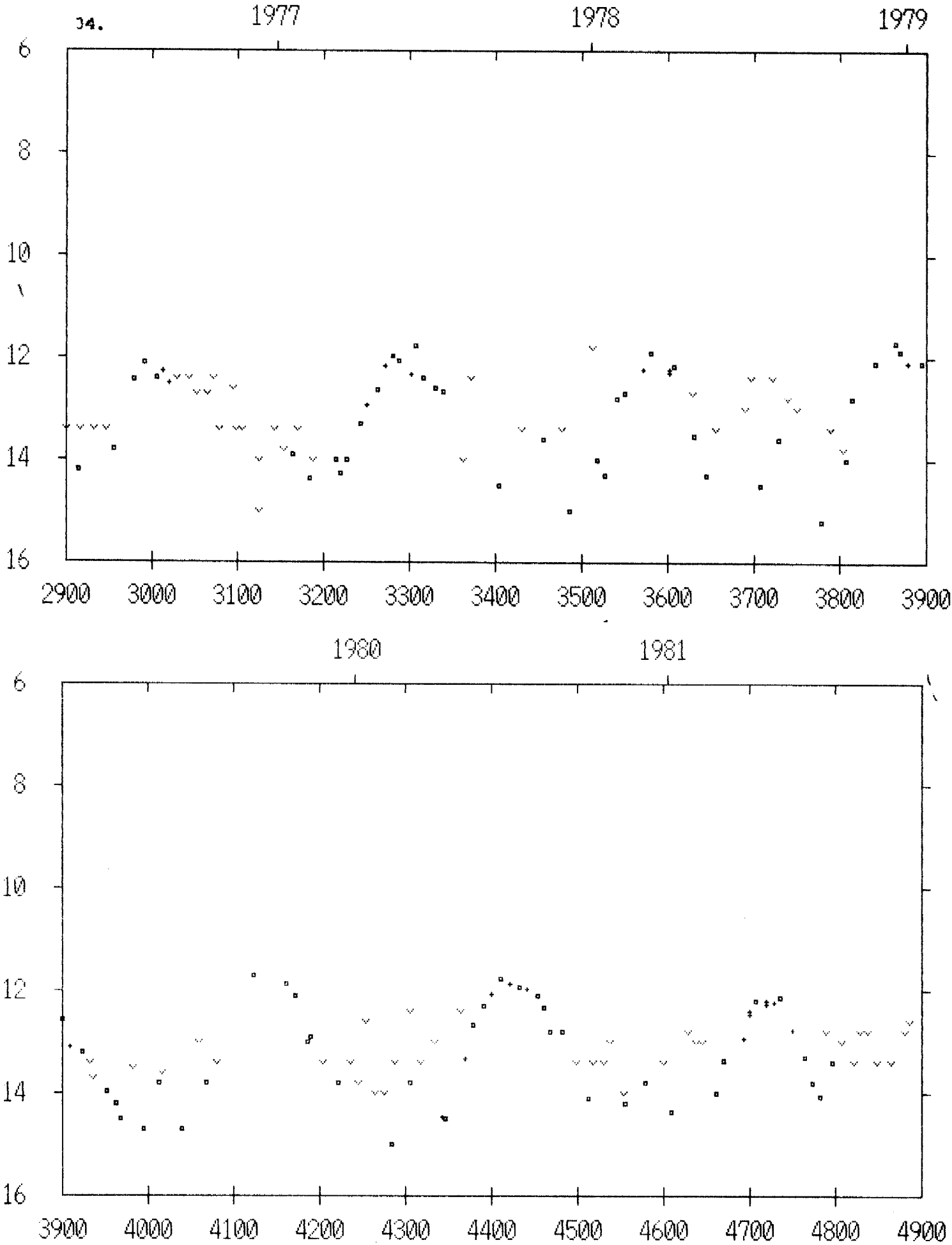


FIGURE 3

W Cha - Light Curve from Ten Day Means JD 2,442,900 to JD 2,444,900

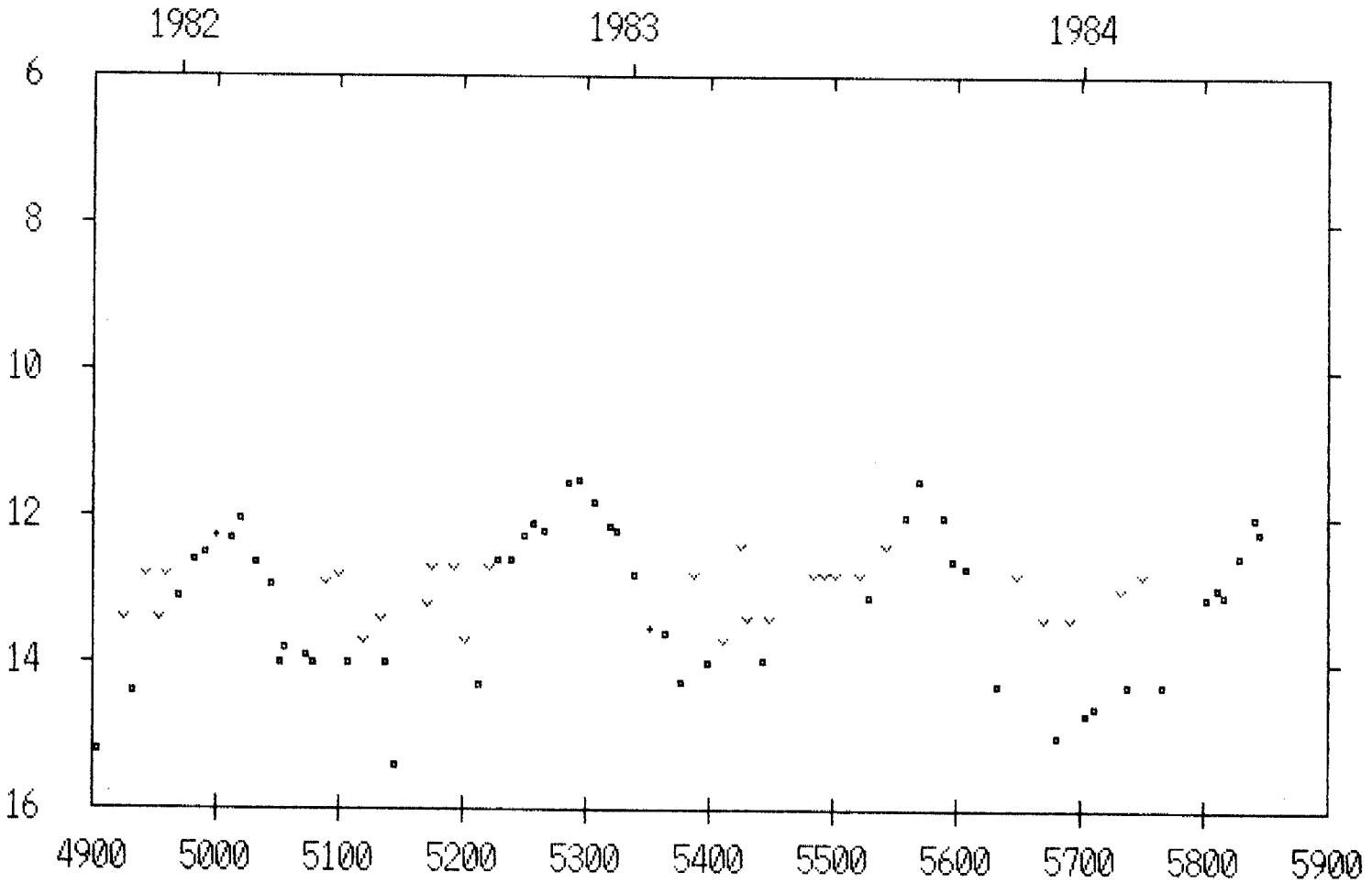


FIGURE 4

W Cha - Light Curve from Ten Day Means JD 2,444,900 to JD 2,445,900

TABLE 1.

MAGNITUDES FOR COMPARISON STARS FOR W Cha.

CHART LETTER	V MAG
q	11.5
p	11.8
r	12.4
u	12.7
s	12.8
w	13.0
x	13.4
v	Appears to vary 12.8 - 13.1. Do not use.

THE DWARF NOVA TT INDI

F.M.Bateson & R. McIntosh
Variable Star Section,RASNZ.

SUMMARY: Data on thirteen observed outbursts of TT Ind are tabulated. These have a mean maximum magnitude of 12.68_v. There is no evidence to suggest that TT Ind is a Z Cam star unless it has frequent outbursts fainter than 14th magnitude. The mean cycle may be about 151 days and the variable may be of the SS Cyg type.

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1. INTRODUCTION

The G.C.V.S. classifies TT Ind as a Z Cam star with a range of 14.0 to (16.5p and a possible mean cycle of 15 days.(1). Bateson (2) published details of the only outburst observed during the first 940 days of observation by members of the Variable Star Section, R.A.S.N.Z. He suggested that the star be more closely monitored.

2. OBSERVATIONS

Between J.D. 2444,030 and 2448,129 members of the Variable Star Section, Royal Astronomical Society of N.Z. made about 1,350 estimates of TT Ind. They used charts 571 and 572 (3) which show the V magnitudes for the comparison stars as determined by Vogt (4).

Coverage has been good from J.D. 2446,900 onwards, except for those months in which the variable is badly placed.

The observed outbursts are listed in Table 1, in which the width is the number of days on which TT Ind was visible. The sixth column gives the type of outnurst as either W (Wide) lasting 5 days, or more, and N (Narrow) with durations of 2 or 3 days. The seventh column gives the number of positive observations for each outburst. The light curve appears in Figures 1 and 2 from J.D. 2446,900 onwards. Before that date the observations are too scattered in time to make a light curve meaningful.

3. DISCUSSION

The mean visual magnitude of the outbursts in Table 1 is 12.68, ranging from 12.0 to 13.6. Minimum brightness is certainly fainter than 16.0 as shown by the negative observations

The intervals between outbursts range from 132 to 825 days making it difficult to decide which maxima are consecutive. We consider, from the light curve, that there are three intervals that are probably consecutive, i.e. between outbursts 8 and 9; 10 and 11; 12 and 13. The negative observations between each pair of these outbursts are sufficiently close in time to indicate that few, if any,other outbursts took place. Of course, it is possible that outbursts fainter than 14.0 may have gone unobserved. Certainly outbursts brighter than 13.6 do not occur at frequent intervals as is usual for Z Cam stars.

4. CONCLUSIONS

We conclude that TT Ind is not a Z Cam star, but probably is of the SS Cyg type. The observations do not suggest that it belongs to the SU UMa type although more observations are needed to prove, or disprove that. Maxima with a mean magnitude of 12.68 are brighter than previously thought. Minima are certainly fainter than 16.0. A mean cycle of about 151 days may prevail.

ACKNOWLEDGEMENTS

We thank all observers for their estimates on which this paper is based. Observers are requested to pay closer attention to TT Ind and more observations from those with larger apertures will be most valuable.

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(2) Bateson, F.M. 1982. Publ.10, Var. Star Section, R. astr. Soc. of N.Z. p.22
(3) Bateson, F.M., Morel,M., Sumner,B. & Winnett,R. 1981. CHARTS FOR SOUTHERN VARIABLES, Series 13. Astronomical Research Ltd.,Tauranga, N.Z.
(4) Vogt, N. 1980. Publ. 8, Var. star Section, R.astr. Soc of N.Z. p.11.

TABLE 1.

OBSERVED OUTBURSTS OF TT INDI

No.	J.D.MAX	MAX.MAG$_v$	INT$_d$	WIDTH$_d$	TYPE	No.OBS.	REMARKS
1	2444,491	12.2	...	4+	W	5	(1)
2	2445,316	12.5	(825)	...	?	1	
3	2446,028	13.0	(712)	5	W	7	
4	270	12.0	242	11	W	9	
5	666	12.5	396	10	W	18	
6	726?	13.6?	60?	2?	N?	2	(2)
7	975?	12.8	249	10	W	12	(3)
8	2447,328	12.7	353	11	W	16	
9	474	12.6	146	8	W	11	
10	662	12.6	188	15	W	11	
11	837	12.8	175	8	W	7	
12	969	13.2	132	3	N	4	
13	2448,101	12.4	132	5+	W	12	(4)

REMARKS TO TABLE 1

(1) Published in Publ. 10 (1982) V.S.S., RASNZ.
(2) This outburst considered very doubtful as both observations were class 3. TT Ind was at 16.0 on 724.9
(3) Outburst may have been earlier as there was a gap of 10 days in the estimates before 975. Two observations each at 11.8 considered too bright.
(4) Two observations at 11.8 considered too bright.

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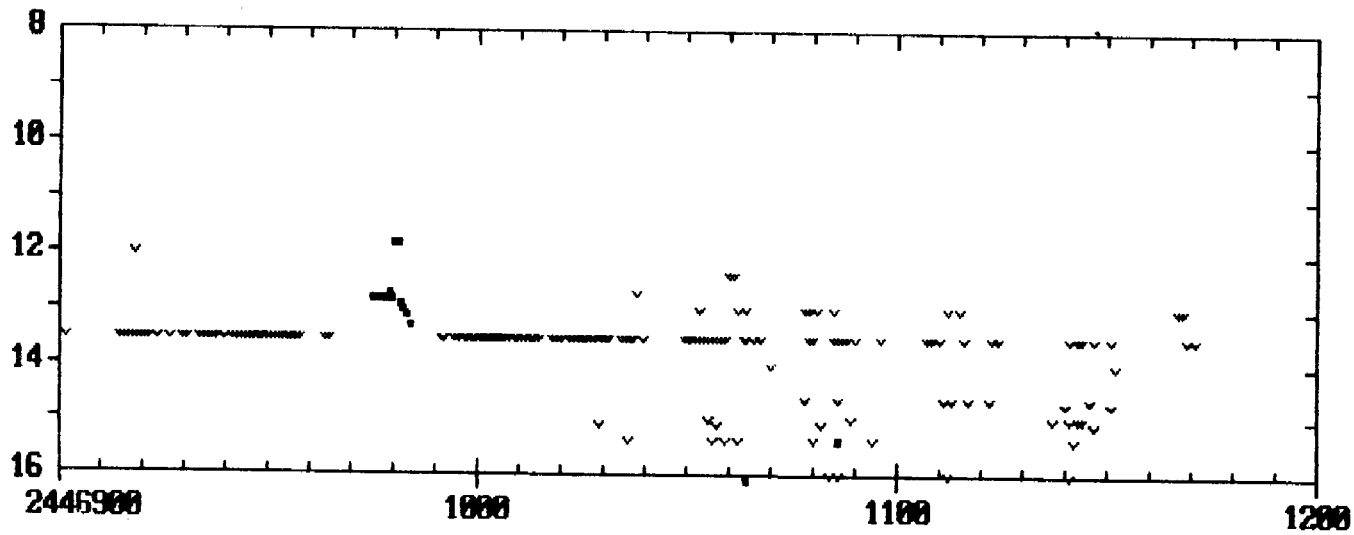


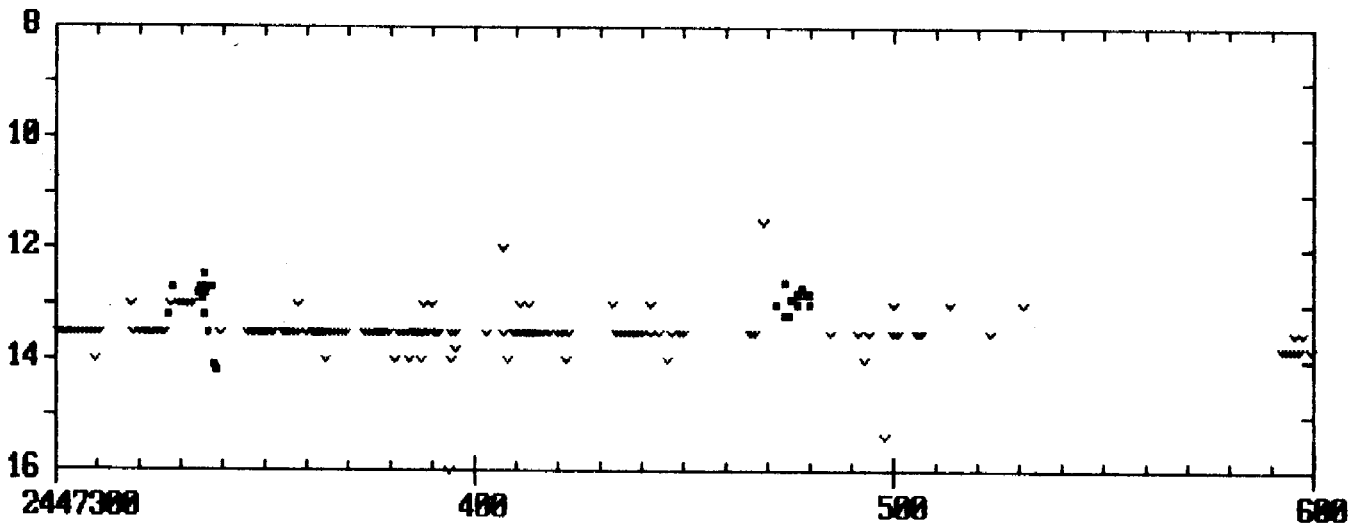
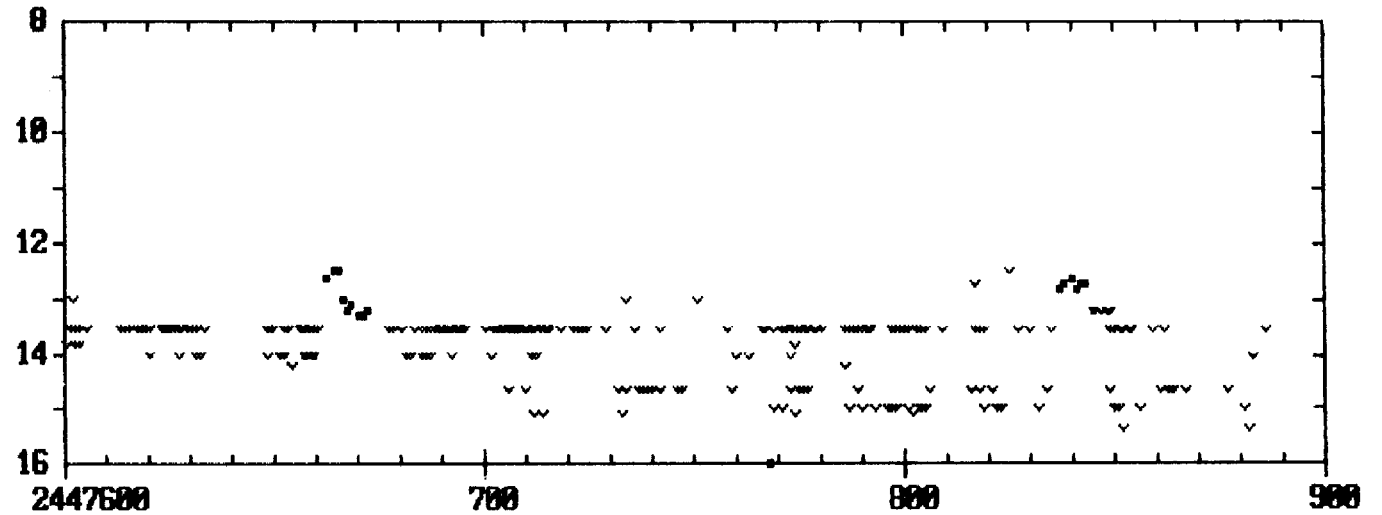


FIGURE 1.

TT Indi. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS.

(Top) J.D. 2,446,900 to 2,447,200

(Bottom) J.D. 2,447,300 to 2,447,600



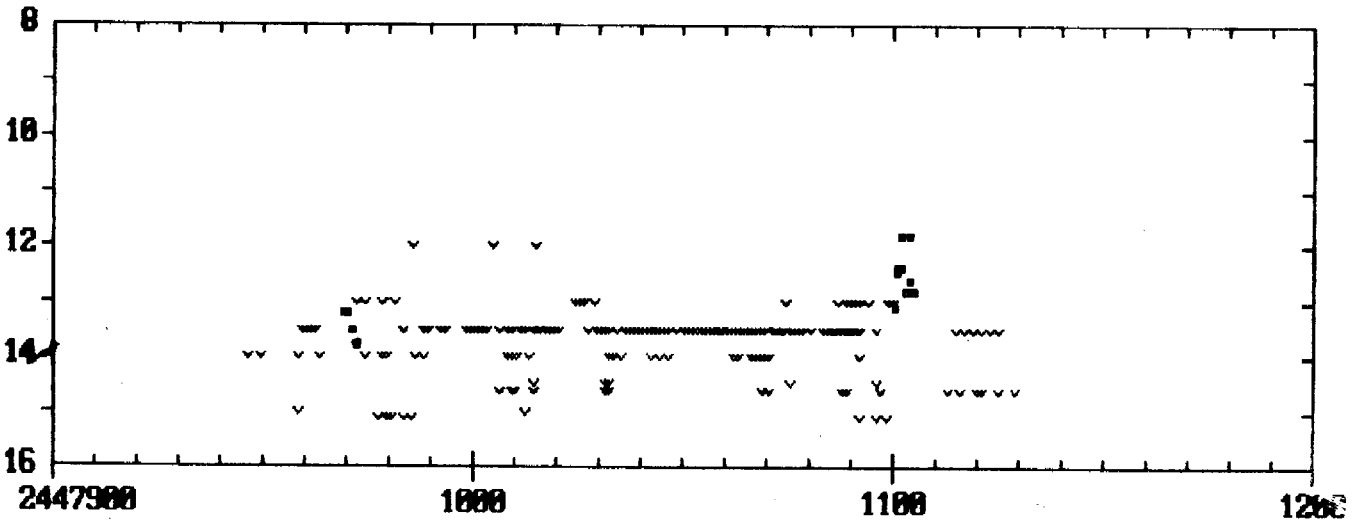


FIGURE 2.

TT Indi. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS

J.D. 2,447,600 to 2,448,130.

OUTBURSTS OF THE DWARF NOVA, TU MENSAE, 1985-1990.

Frank M. Bateson
Director, V.S.S., R.A.S.N.Z.
P.O. Box 3093,Greerton,Tauranga
New Zealand.

SUMMARY: Outbursts of TU Men between 1985 and 1990 are tabulated as a continuation of previous papers. It is shown that the mean cycle and mean maximum brightness changed drastically, probably as the result of two unusually prolonged super outbursts.

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1. INTRODUCTION

Visual observations from 1963 May 31 to 1984 December 31 were discussed in previous papers (1,2,3). The present paper presents the results from 1985 January 1 to 1990 August 31.

2. OBSERVATIONS

Members of the Variable Star Section, Royal Astronomical Society of N.Z., have made about 3750 visual estimates during the interval under review. Most were negative due to the infrequency of outbursts. However, it appears unlikely that many maxima have gone unobserved, because the high southern declination of TU Men has resulted in excellent coverage in all months each year.

All observations have been reduced using the same sequence as in the previous papers. The observed outbursts are listed in Table 2, whilst a portion of the light curve appears in Figs. 1 and 2.

3. DISCUSSION

The outbursts in Table 2 appear to be consecutive, despite there been few normal, short maxima. This may imply that they have been missed during bad weather. However, there are few gaps in the records exceeding four days so I consider that few, if any passed unobserved.

The intervals between outbursts range from 155 to 226 days with a mean of 186.9 days. The mean maximum magnitude was 11.86_v.

I now discuss all the published observations. The most unusual feature was two supermaxima of prolonged duration. These were:

No. 74	2,442,369	Duration 20 days. Maximum Mag.	11.8
No.90	2,444,557	Duration 24.5 days.	11.6

The intervals from the outburst which preceded them were 239 and 215 days respectively. These outbursts appear to have caused a change in cycle length and in mean maximum magnitude as shown in Table 1, in which the figures in brackets indicate the numbers in each sample. Uncertain values were excluded. The faint peaks listed in Table 4 of a previous paper (1) have been ignored in compiling Table 1, because they depend on scanty data and are questionable as discussed in a separate paper in this issue on possible precoursers to out bursts of C.Vs.

TABLE 1.

TU MENSAE--MEAN CYCLE LENGTHS AND MEAN MAXIMA MAGNITUDES

MAXIMA Nos.	MEAN CYCLE	MEAN MAX. MAG.
Before No. 74	$184^{d}.1$ (16)	11.93 (14)
From 74 to 90	164.4 (12)	12.27 (10)
From 91 to 102	95.8 (12)	12.67 (11)
From 103 to 115	186.6 (13)	11,86 (11)

The third interval in the above table was affected by more frequent and fainter maxima. This trend continued until Outburst No. 102 (J.D. 2445,707), after which they disappeared in the observations. The cycle length and mean maximum magnitude then returned to almost the same values as in the first interval.

Abrupt changes in cycle lengths are known for many dwarf novae. The first very long supermaximum (No.74) switched the cycle to a shorter length, whilst the second (No.90) prolonged super maximum almost halved the initial cycle length, and, for a time, produced fainter and more frequent outbursts before returning to the original cycle length.

4. CONCLUSIONS

TU Men has drastically changed in cycle lengths, possibly caused by two exceptionally long duration supermaxima. The second of these suggests that the star had accreted matter for such a lengthy time that, at least for a time, the mass flow was reduced to small "puffs". The mean duration of the supermaxima in Table 2 is 7.3 days, which is much shorter than a number of other stars of the SU UMa type. The changes in the mean maximum magnitude appears to be a natural result of the decrease in mass flow.

ACKNOWLEDGEMENTS

I thank all observers for their excellent monitoring of Tu Men, without which this paper could not have been written. I also thank Ranald McIntosh for providing a computer listing of the observations and for the computer light curves.

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(1) Bateson, F.M. 1979, Publ. 7, Var. Star Section, R. astr. Soc. of N.Z.pp.5-10.
(2) Bateson, F.M. 1982. Publ. 9, Var. Star Section, R. astr. Soc. of N.Z. pp. 2-3.
(3) Bateson, F.M. 1985. Publ.12, Var. Star Section, R. astr. Soc. of N.Z. pp.58-63

TABLE 2.

OBSERVED OUTBURSTS OF TU MENSAE.

MAX. No	J.D. MAX.	MAX. MAG_v	INT_d	WIDTH d	TYPE	No. OBS.	REMARKS
104	2,446,130	12.0	200	7	S	18	(1)
105	332	10.9?	202	5	S	4	(2)
106	488	11.9	156	7	S	25	
107	667?	12.7?	179	?	?	2	(3)
108	838	11.6	171	8	S	17	
109	2,447,023	11.8	185	8	S	23	
110	197	11.5	174	7	S	21	
111	361	11.8	164	4?	S?	11	(4)
112	587	11.8	226	8	S	43	
113	779	11.9	192	6	S	14	
114	934	12.3	155	7	S	44	
115	2,448,123	12.0	189	10	S	9	

REMARKS TO TABLE 2

(1) Occurred in moonlight. Gap of 3^d from 129.8 to 132.8.
(2) Gap of 4 days after outburst commenced. Magnitude probably too bright.
(3) Gap 7 days before 667. Outburst probably earlier & brighter. If this is correct outburst would be a super maximum.
(4) Gap of 3 days before 361. Maximum may have been a day or two earlier.

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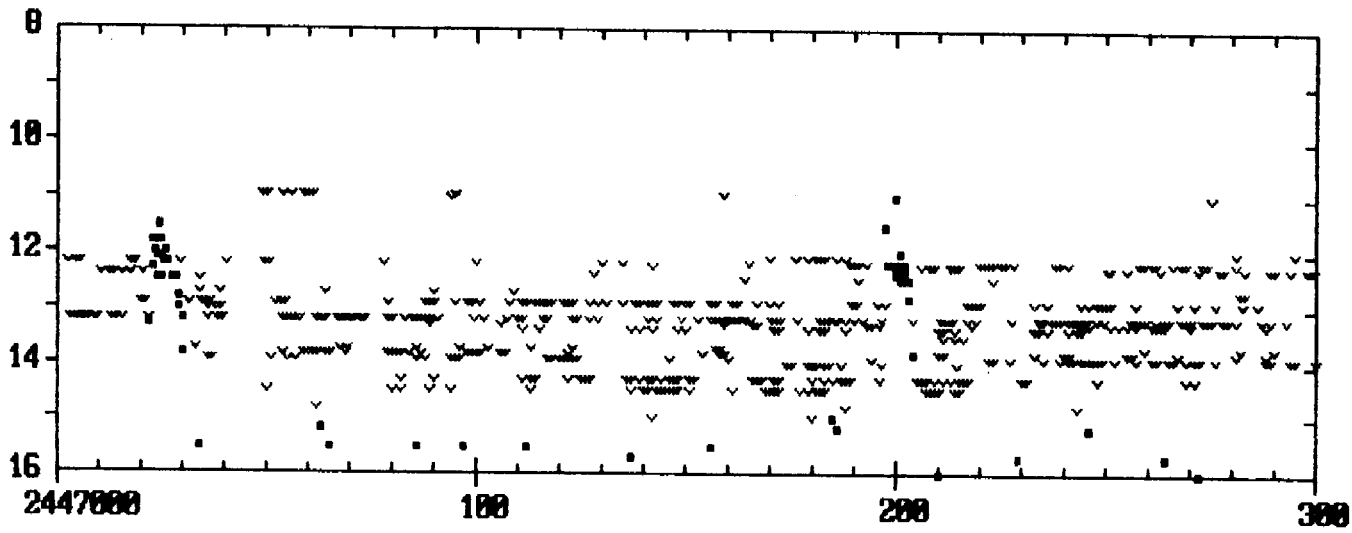

FIGURE 1.

TU Men. Light curve from Individual observations. J.D.2447,000 to 2447,300.

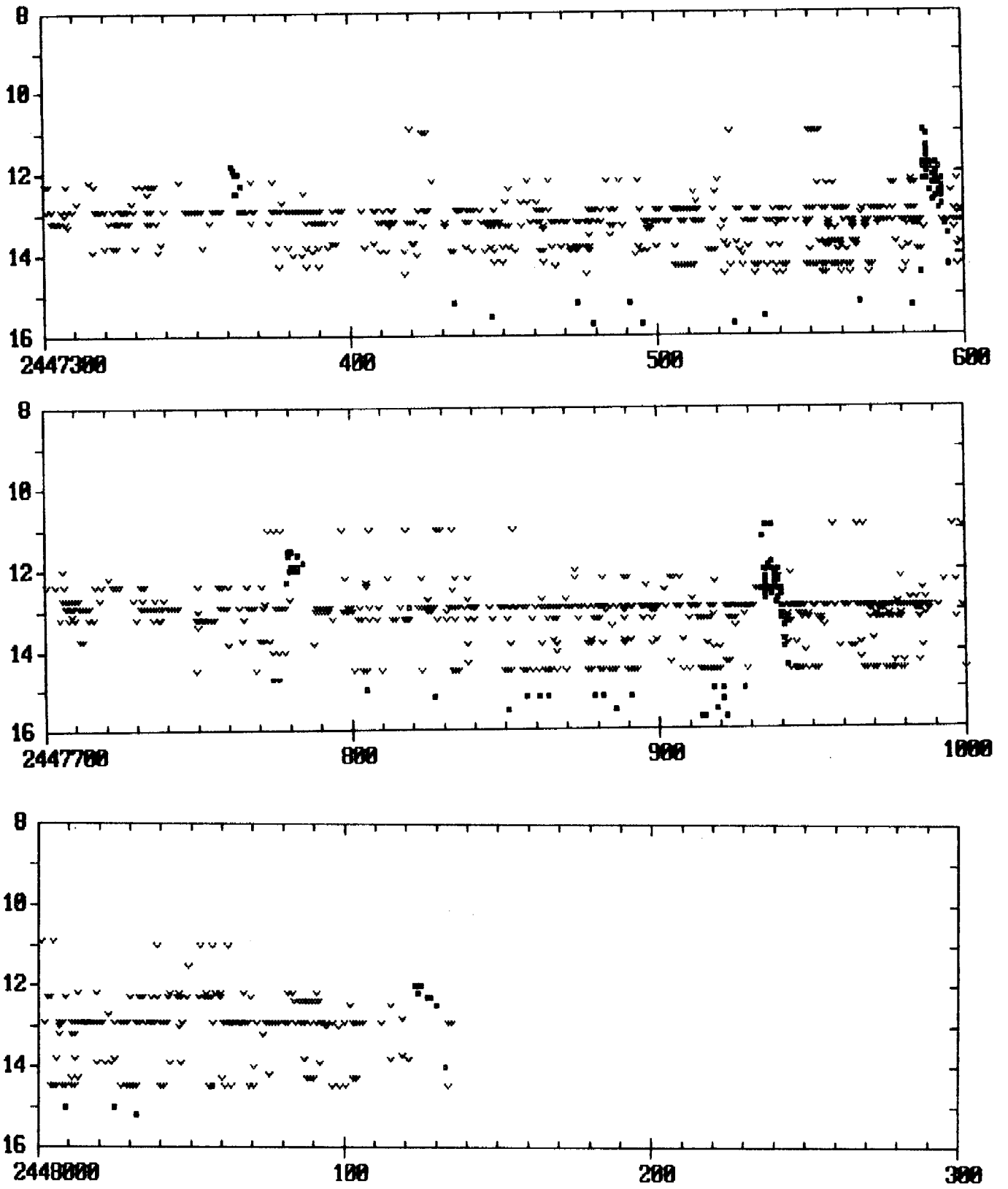

FIGURE 2

TU Men. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS

J.D. 2,447,300 to 2,447,600 and
J.D. 2,447,700 to 2,448,135

TWO OUTBURSTS OF WX CETI

Ranald McIntosh
Unit 68,36 McLeod Road,
Henderson, Auckland
New Zealand

SUMMARY: Observations and a light curve for two outbursts of WX Cet are given. These suggest that possibly maxima are either bright and wide or faint and short.

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1. INTRODUCTION

WX Cet was formerly classified as a recurrent nova, but is now regarded as a U Gem variable with a range of 9.5 to 18p and a possible cycle of about 450 days (1). Bateson (2) reported on earlier observations all of which were negative. This paper deals with the observations from 1982 September 17 to 1990 September 5.

2. OBSERVATIONS

WX Ceti was poorly observed up to 1984 June with only a few estimates each month. Since then it has been closely monitored each month during the observing season (each year (June through January) with a few observations in May and February. About 900 visual observations were made by members of the Variable Star Section, Royal Astronomical Society of N.Z. These were mainly negative.

3. OUTBURSTS

The following two outbursts were recorded.

2,447,681	10.8	Width 18 days	53	positive observations
2,448,086	13.0	1 day	3	" "

The positive observations are listed in Table 1, which also shows the negative estimates that immediately preced and followed the positive ones. All other observations were negative and are not shown. However the light curve in Figure 1 shows how closely the variable was monitored.

The interval between the two outbursts is 405 days.

4. CONCLUSIONS

All that can be said from records of two outbursts is that they suggest there are two maxima types; one bright and wide and the other faint and short.

ACKNOWLEDGEMENTS

My thanks are due to the observers for their results.

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(1) Kholopov, P.N. (Ed). 1985. General Catalogue of Variable Stars. Vol. 1, 4th ed/ Nauka, Moscow.
(2) Bateson, F.M. 1985. Publ Var, star section, R. astr. Soc of N.Z. 12, p.45.

TABLE 1 - OBSERVATIONS OF WX CETI.

J.D.	Mag.	Obs.
2,447,677.2300	<13.2	Jo
.6490	<13.2	Ov
678.2600	<12.5	Jo
681.4167	10.8	Pm
682.1979	10.8	Jo
.2729	11.0	Jo
.3333	11.4	Pm
.3424	11.5	Pm
.3528	11.4	Pm
.3689	11.4	Pm
2,477,682.3785.	11.4	Pm
.4030	11.5	Pm
.4100	11.5	Pm
683.2049	11.6	Jo
.2708	11.6	Jo
.5810	11.0	Ov
684.2090	11.8	Jo
.3694	11.7	Pm
.3819	11.7	Pm
685.3396	12.1	Pm
2,447,685.3556	12.2	Pm
.3736	12.2	Pm
.3924	12.2	Pm
.4104	12.1	Pm
686.3333	12.3	Pm
686.3563	12.1	Pm
.3715	12.3	Pm
687.3403	12.4	Pm
.3576	12.5	Pm
.3750	12.5	Pm
2,447,687.4035	12.5	Pm
688.6130	12.3	Ov
689.3300	12.8	Pm
.5850	12.5	Ov
690.2375	13.0	Jo
.3300	12.8	Pm
.6300	12.5	Ov
691.2431	13.0	Jo
692.2396	13.1	Jo
.3611	12.9	Pm
2,447,692.3750	13.0	Pm
.6210	13.0	Ov
.6250	13.0	Ov
693.3486	13.1	Pm
694.2486	13.3	Jo
.3889	13.1	Pm
.4028	13.1	Pm
.6210	12.9	Ov
695.6240	13.0	Ov
696.3854	13.2	Pm
2,447,696.6060	13.0	Ov
697.3924	13.3	Pm
.6280	13.1	Ov
698.2500	<12.0	Jo
.3924	13.3	Pm
2,448,085.5000	<13.2	Ov
086.2600	<12.5	Jo
.5620	13.0	Ov
087.2201	13.1	Jo
.5380	13.4	Ov
088.6000	<13.9	Ov

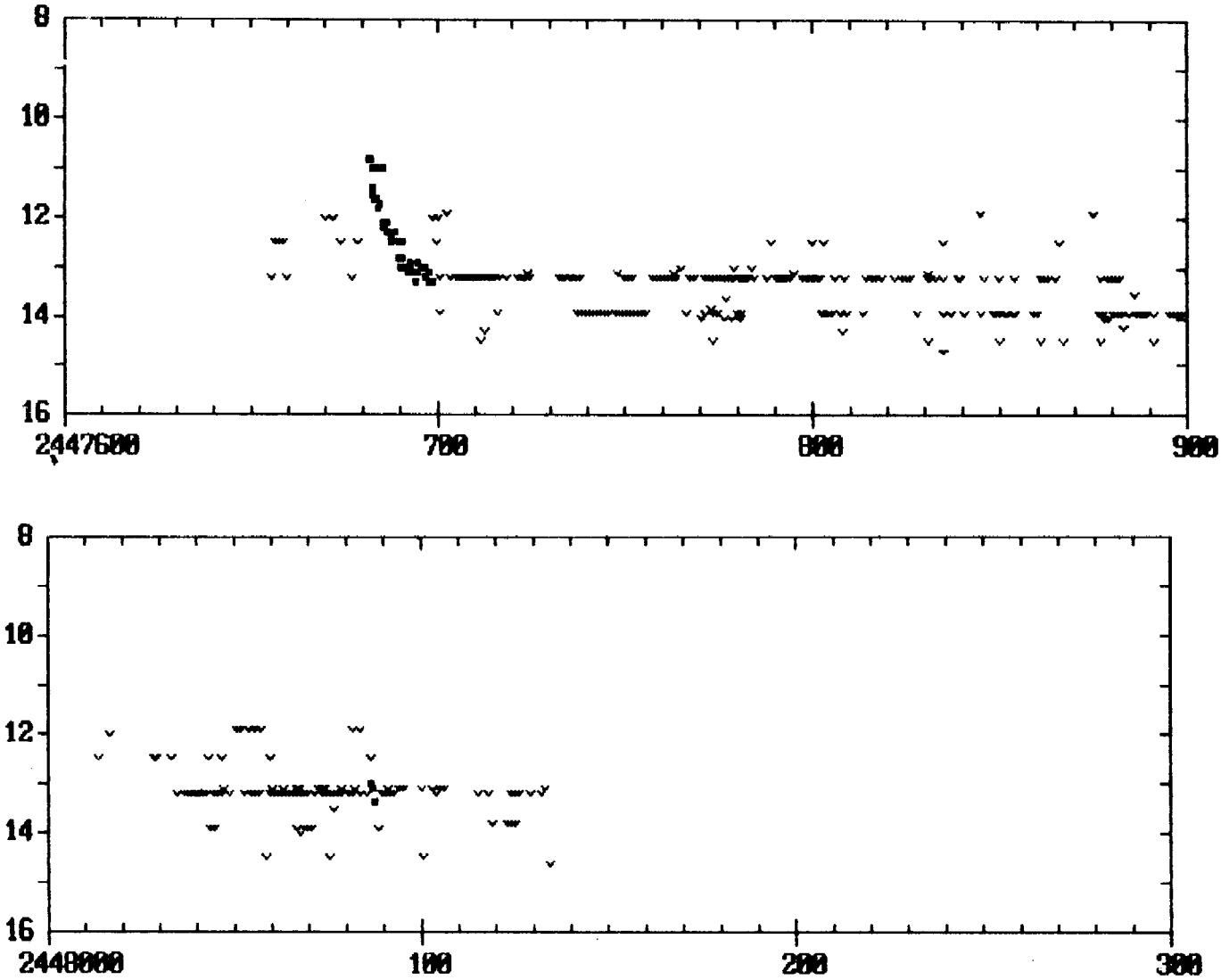

FIGURE 1

WX CETI - LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS.
J.D. 2,447,660 to 2,448,135.

NOTE FOR ALL OBSERVERS OF RR PICTORIS

CHART 270. Would all observers make certain that they have amended some of the magnitudes on this chart to agree with the values published in Publ.5. Below the first column shows the magnitude on chart 270 and the second the amended values, The remaining magnitudes on chart 270 do not need amendment.

CHART 270	V. MAG
"106"	10.4
"112"	10.9
"115"	11.2
"129"	12.7

The reason for this note is to make certain that all observers use the same correct values for the comparison stars as our observations are being used in a special theoretical investigation that depends on all observations being made using the correct magnitudes

OUTBURSTS OF THE DWARF NOVAE TU INDI

Frank M. Bateson
Director, Variable Star Section,RASNZ
P.O. Box 3093, Greerton, Tauranga
New Zealand

SUMMARY: A list of 41 outbursts observed from 1983 August 1 to 1988 December 31 is given. The most probable mean cycle is shown to be 22.17 days. The visual range is 12.5 to fainter than 16.0.

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1. INTRODUCTION

In the interval J.D. 2,442,271 to 2,445,538 Bateson (1,2) listed 21 observed maxima of TU Ind. This paper extends those lists to JD 2,447,527 (1988 December 31).

2. OBSERVATIONS

TU Ind is not a popular star with members of the Variable Star Section, because of the faintness of its outbursts. This means that the records are fragmentary despite some improvement in the coverage compared to earlier periods. There are still numerous gaps in the records.

The observed outbursts are listed in Table 1 in the same format as in previous papers. The widths of each outburst have been determined using negative observations, if these were close to the positive estimates in time and of sufficient faintness to show the outburst had finished. If such estimates were not available then aquestion mark appears. Narrow (N) maxima are those with widths of less than 5 days; Wide (W) those lasting 5 days or longer. The final column gives the number of positive estimates for each maximum.

3. DISCUSSION

The main observing season is from April to early December with a limited number of observations in March in some years. The results now discussed are for all maxima given in Table 1 and in previous papers.

The fragmentary nature of the observations makes it difficult to decide which maxima are consecutive. There are 41 intervals, ranging from 7 to 39 days that are probably consecutive. These give a mean cycle of 22.17 days. If the eight intervals between 30 and 39 days are excluded then the mean cycle becomes 19.2 days. However, I consider that 22.17 days is correct.

The mean maximum magnitude is 13.79 from 58 outbursts for which the magnitude is reliable. The extreme range is from 12.5 to 14.5, noting that only one maximum has been brighter than 13.0. Minima appears to be fainter than 16.0 from a limited number of observations.

Twenty-two narrow maxima have a mean width of 2.2 days, whilst for 5 wide maxima the mean is 6.4 days.

4. CONCLUSIONS

TU Indi has a visual range of 12.5 to (16.0 with a mean maximum magnitude of 13.79. Narrow outbursts are numerous but wide ones infrequent. The most probable mean cycle is 22.17 days. All that most observers can see is the top of the light curve.

ACKNOWLEDGEMENTS

All observers are thanked for their estimates.

TABLE 1

OUTBURSTS OF TU INDI

No.	J.D. Max 24	Max m_v	Int. d	Width d	Type	No. of Obs.
22	45,557	14.0	80	?	N"	1
23	588	13.8	31	4	N	2
24	603	13.2	15	5	W?	3
25	633	13.7	30	2	N	2
26	935	14.2	(302)	1	N	2
27	944	13.4	9	1	N	1
28	963	14.4	19	1?	N?	1
29	997	13.8	34	3	N	4
30	46,026	13.7	29	2?	N	2
31	201	13.0	(175)	8	W	6
32	46,239	13.6	38	2	N	3
33	255	13.0	16	2	N	2
34	343	14.0	88	?	?	2
35	373?	14.6?	30?	?	?	1
36	386	14.0	13	2	N	3
37	554?	13.3?	(168)	?	?	1
38	568	13.6	14	2?	N	2
39	590	14.0	22	?	?	1
40	618	13.7	28	1	N	2
41	46,653	14.0	35	2?	N	2
42	46,679	13.8	26	1	N	1
43	686	13.5	7	1	N	1
44	711	14.3	25	1	N	2
45	729	13.2	18	1	N	1
46	755?	13.8?	26	?	?	1
47	883	13.5	(128)	4	N	3
48	936	13.6	53	3	N	3
49	956	14.1	20	1	N	1
50	982?	13.7?	26	?	?	1
51	47,059	14.0	77	3	N	4
52	47,084	14.2	25	3	N	3
53	096	14.0	12	2	N	2
54	112?	14.5?	16	?	?	1
55	122?	14.5?	10?	?	?	1
56	140	14.0	18	7	W	8
57	247	13.7	(107)	4	N	6
58	329	13.5	82	5	W?	5
59	364	14.0	35	1	N	1
60	377	14.0	13	7	W	10
61	394	14.3	17	1?	N	2
62	47,478	13.3	84	2+	?	4
63	493	14.2	15	?	N	1

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(1) Bateson, F.M. 1982. Publ. Var. Star Section, R. astr. Soc. of N.Z. 10, pp 21-22.

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THIRTY-SIX YEARS VISUAL MONITORING OF THE ERUPTIVE VARIABLE, EX LUPI.

F.M. Bateson (1), R. McIntosh (2) & D. Brunt (2)

(1) Director, VSS,RASNZ.
(2) Members, VSS,RASNZ.

SUMMARY: A Visual light curve is presented for the interval 1954 April 5 to 1990 October 31. The results are briefly discussed as a supplement to a paper that is to appear elsewhere. Earlier observations by McLaughlin are summarised The main aim of the present paper is to show observers the value of monitoring variables over long time periods.

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1. INTRODUCTION.

McLaughlin (1) estimated the magnitude of EX Lupi on about 500 Harvard plates from 1893 to 1940. He found no conspicuous variations from 1893 to 1899, but the variable was slightly fainter than its normal photographic minimum magnitude of 13.2. Similar periods of near constancy were found from 1905 to 1913,when there was a good distribution of observations, and probably from 1917 to 1923. There were few observations in this latter period, although all these agreed in showing the star near minimum.

McLaughlin found "nova-like maxima" in 1901, 1914, 1925, 1929 and 1934. He commented, "Each time, except perhaps in 1914 and 1925, the observed range was approximately two magnitudes, but any of these outbursts may have reached a maximum brightness much brighter than the brightest recorded.

McLaughlin considered that EX Lupi showed a considerable resemblance to Z And both in its spectrum and its light variations.

Bateson & Jones (2) published visual observations from J.D. 2,434,838 to 2,435,685 with a light curve, chart and list of comparison stars. Within this limited interval there was one bright outburst to magnitude 8.7. They considered that at times small amplitude oscillations had a period of roughly 34 days,superimposed on a long term variation of approximately 520 days. However, they concluded that the interval they discussed was too short for any definite conclusions, and, pointed out that it was difficult to separate any small amplitude oscillations from the normal slight scatter on the visual observations.

Herbig (3) found no high excitation lines in spectra in 1949-1950 characteristic of Z And spectra.

Ex Lupi =HD325367=HV11089= HV11976 is classified as an irregular eruptivevariable of Type IN(YY) (4)connected with diffuse nebula. The symbol (YY) indicates the spectra show absorption components on the long wave side of emission lines, evidence for the infall of matter on the surface.

2. OBSERVATIONS

The visual observations in this paper cover the interval J.D. 2,434,838 (1954 April 5) to 2,448,196 (1990 October 31). All observations were made by members of the Variable Star Section, Royal Astronomical Society of New Zealand, using charts 15 and 16 with the visual sequence published with those charts (5). There are few, if any, observations in November and December each year when the variable is unobservable.

The individual observations are plotted in Figures 1 to 15 with carets denoting negative observations. A curve has been drawn through Figs. 1 to 5. Thereafter the variable was at minimum when any curve would be virtually a straight line, broken occasionally by low-amplitude flares.

3. DISCUSSION.

There has been considerable interest in EX Lup. The senior author has given permission for part of the light curve to be reproduced in a book. Pogosyants and Bateson will be joint authors of a paper to be published elsewhere. The aim of the present paper is to show observers the results of their careful monitoring, and, so that the new generation of our members can see the value of long term monitoring of variable stars.

Our discussion is therefore limited to pointing out some of the main features. The most prominent is the slow, erractic rise to a maximum of 9.0 on J.D. 2,435,385, followed by a brief decline to 10.0 and a subsequent rise to 8.5 on J.D.2,435,459.There was a gap in the observations preceding this latter date when the variable was unobservable. There was a slow fading from this maximum, which lasted 540 days, and showing a number of short, low amplitude flares.

Another slow rise commenced about J.D. 2,436,300. Possibly another bright outburst may have occurred around J.D. 2,436,900 during the annual gap in observations. Several outbursts with amplitudes of two magnitudes followed including one on J.D. 2,438,530 which appears to be double-peaked. Since 2,439,300 EX Lup has remained at minimum with occasional low-amplitude flares.

4. CONCLUSIONS

The extreme visual range of EX Lup is 8.5 to 14.3. We have found no relationship between the occurrence of bright maxima nor any semi-periodicity in the frequency of low-amplitude flare activity. Bright outbursts are rare events. The activity shown in the present paper is very similar to that found in earlier years by McLaughlin. In recent years EX Lup has remained at almost constant minimum brightness broken only by occasional short-lived, low-amplitude flares.

Pogosyants (6) has pointed out that according to Herbig EX Lup is a prototype of a group of eruptive T Tau stars (EXORS) which are similar to FU Ori. This conclusion may be correct although the light curve appears to resemble Z And stars as much as FU Ori variables.

ACKNOWLEDGEMENTS

We wish to thank all members of the V.S.S., RASNZ for their careful monitoring of EX Lup. The senior author is indebted to his co-authors for their processing of all the data on computers,

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(3) Herbig, G.H. 1950. P.A.S.P. 62,211.
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(6) Pogosyants, A. Yu. 1991 Jan. 28. Private communication.

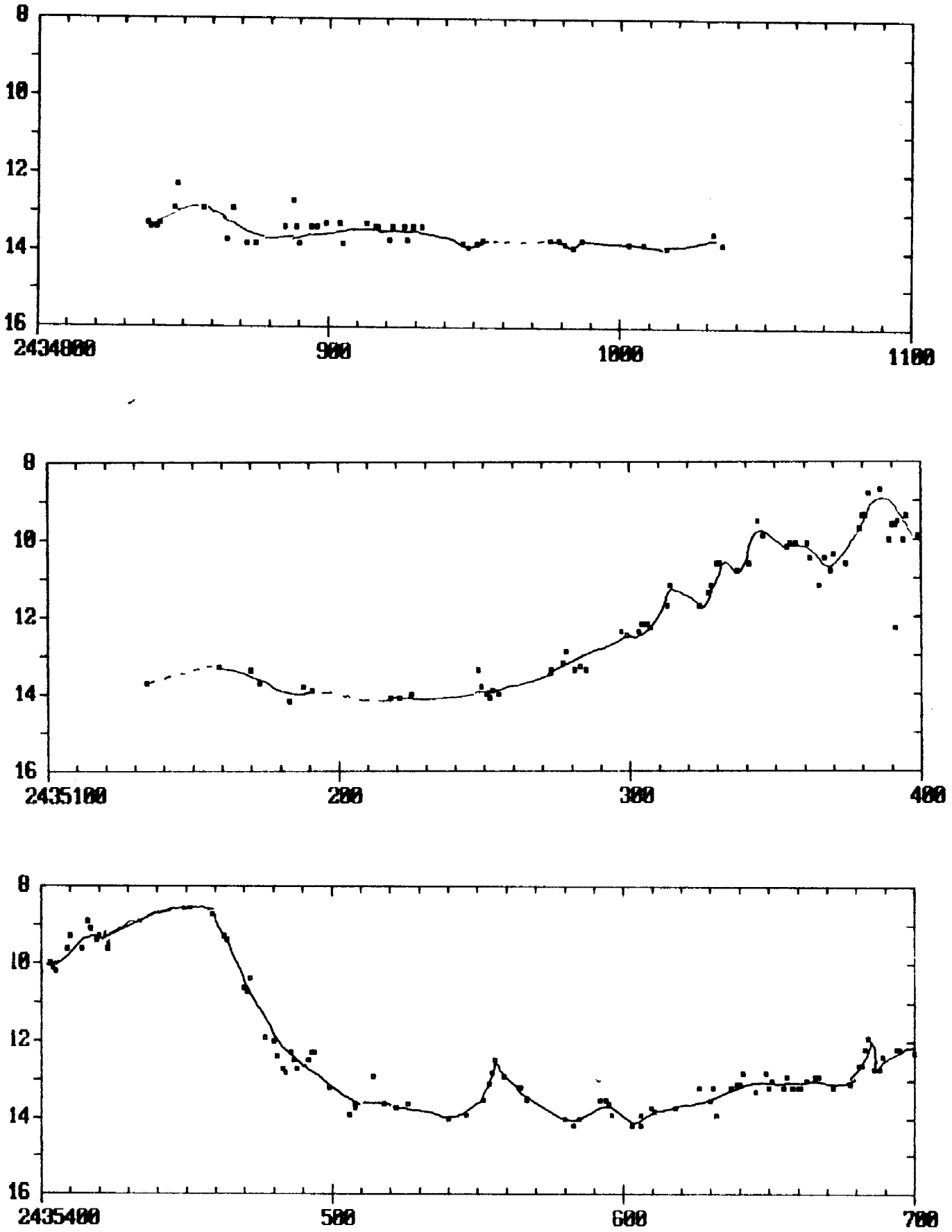

FIG. 1
EX Lupi. LIGHT CURVE--J.D. 2,434,800 - 2,435,700

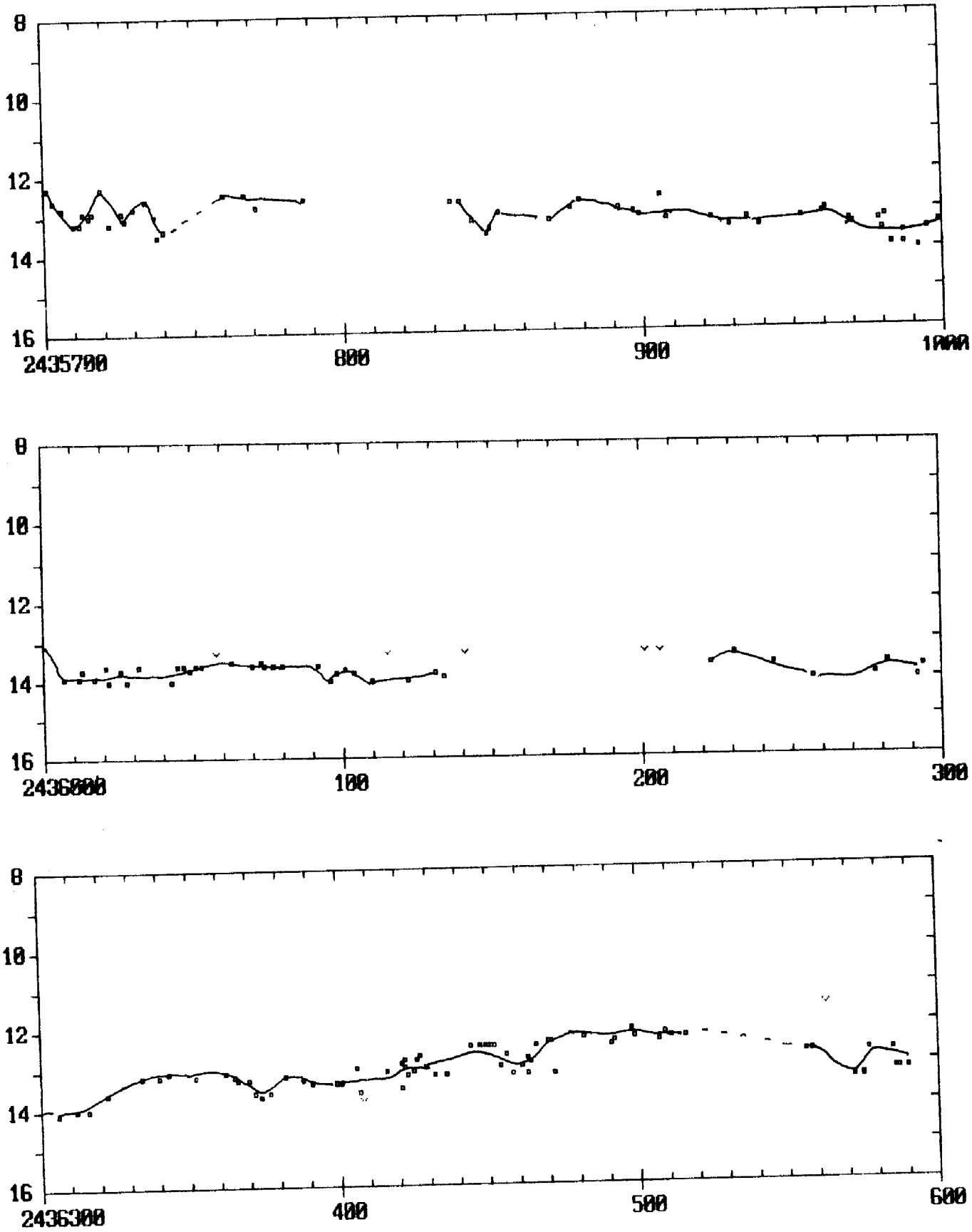

FIG. 2

EX Lupi. LIGHT CURVE - J.D. 2,435,700 - 2,436,600

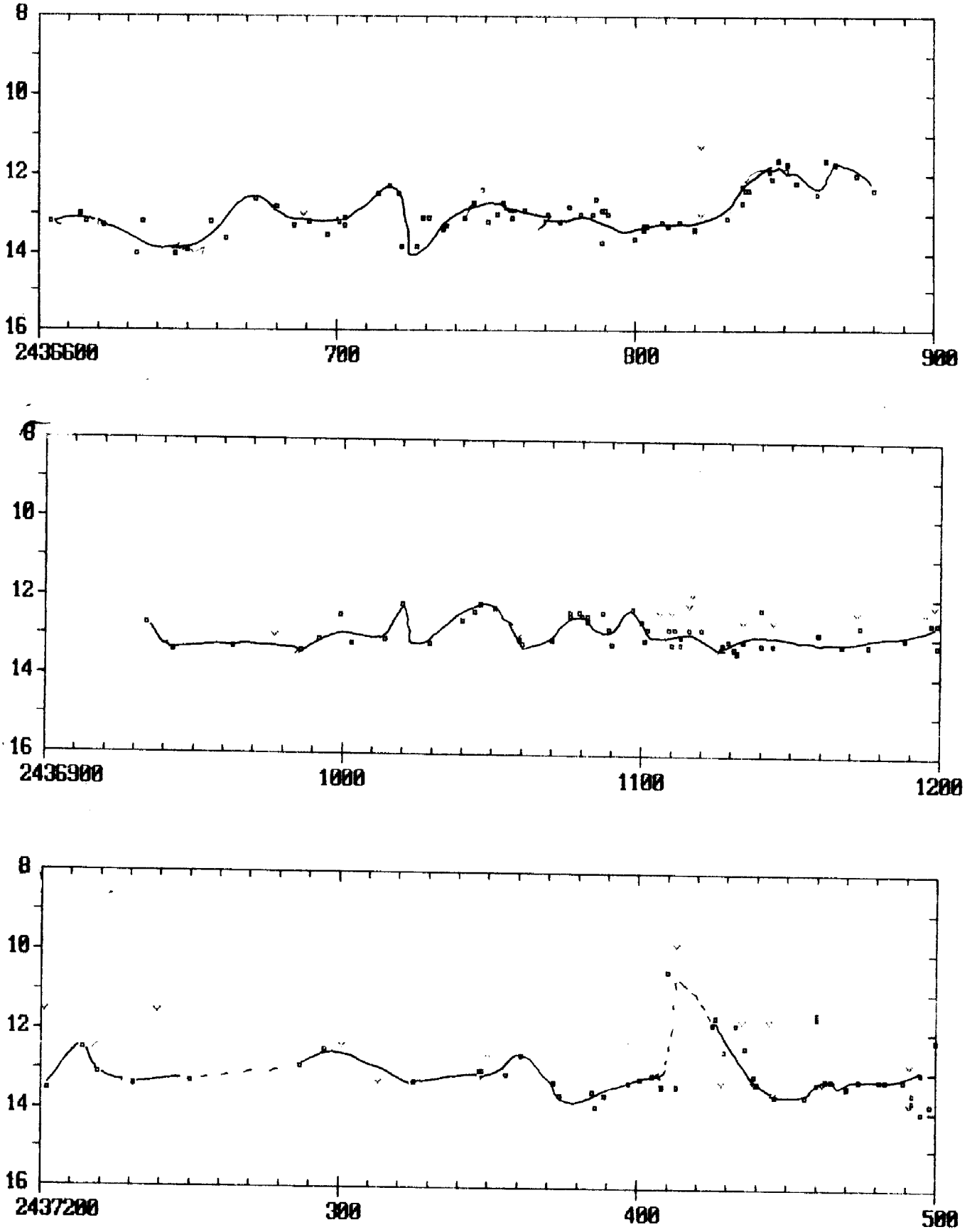

FIG. 3

CX Lupi. LIGHT CURVE - J.D. 2,436,600 - 2,437,500

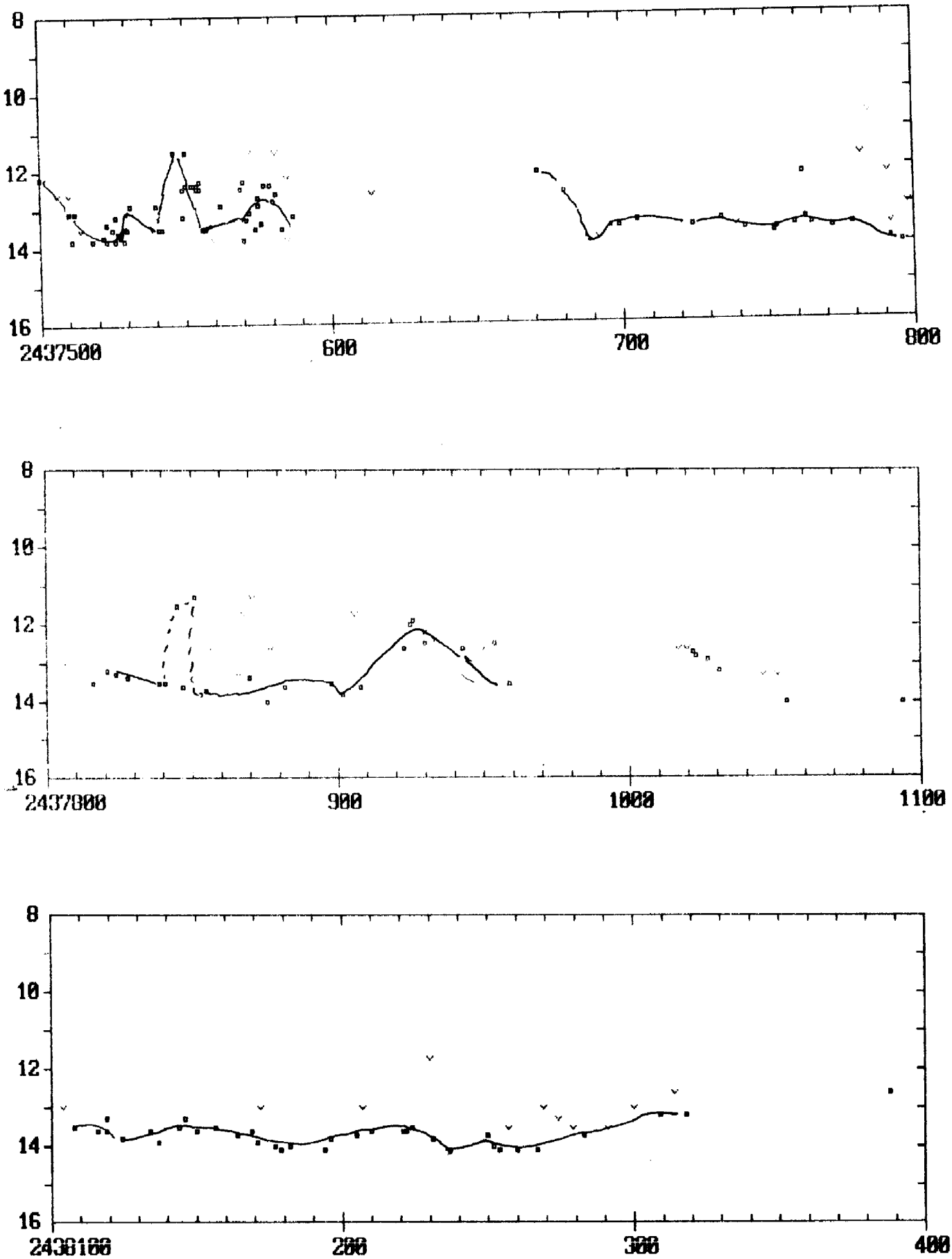

FIG.4
EX Lupi. LIGHT CURVE - J.D. 2,437,500 - 2,438,400

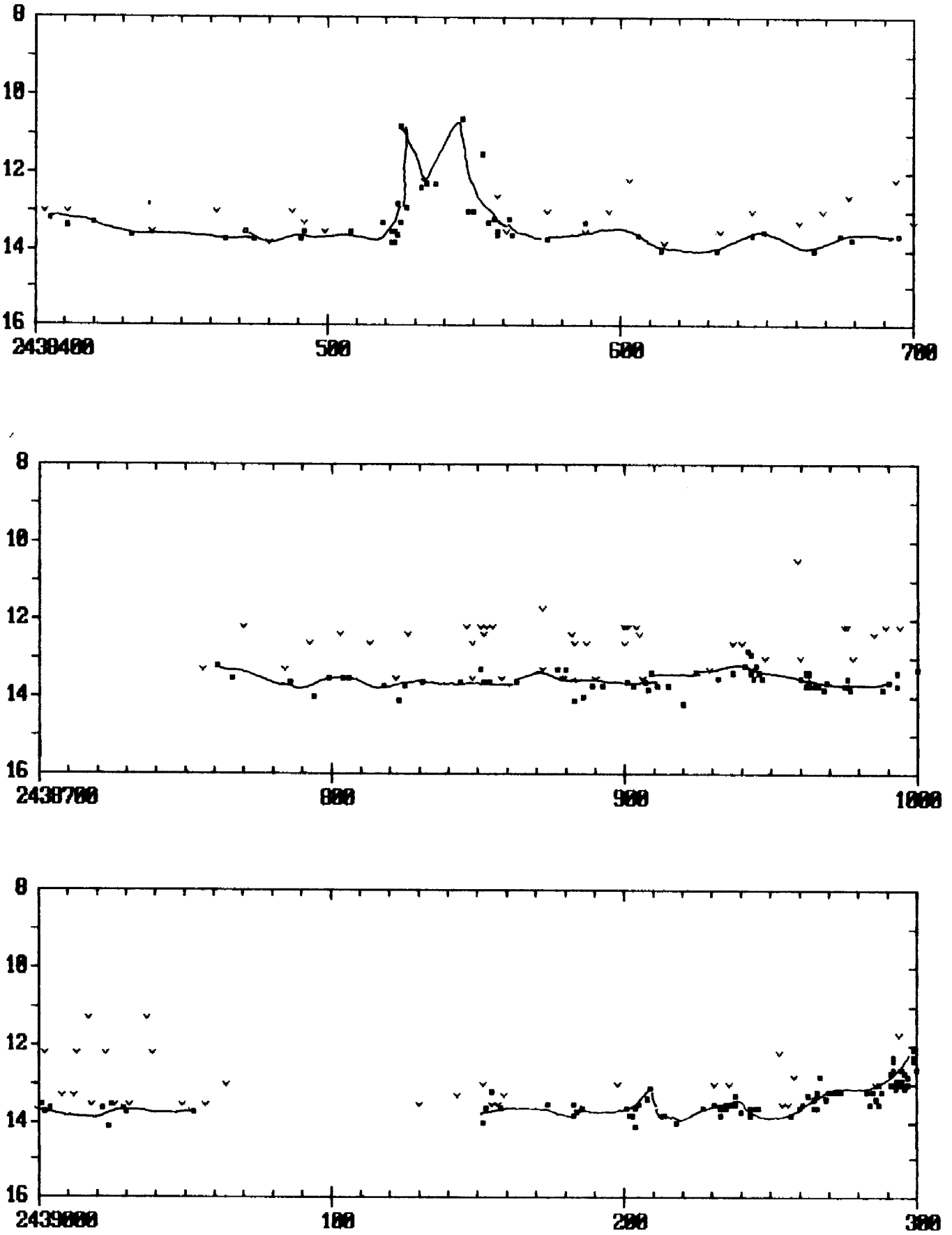

FIG. 5

EX Lupi. LIGHT CURVE - J.D. 2,438,400 - 2,439,300

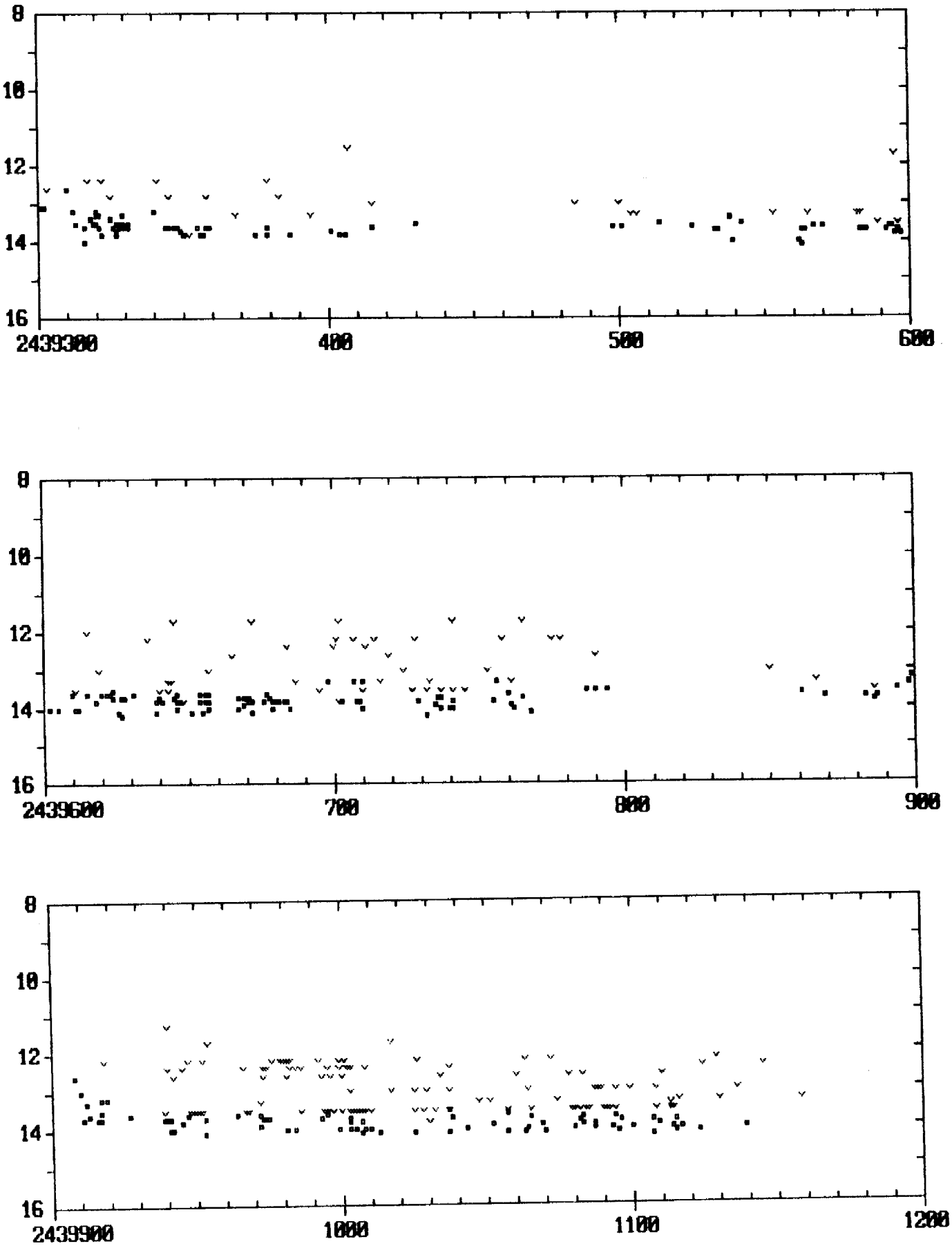

FIG. 6

TX Lupi. LIGHT CURVE - J.D. 2,439,300 - 2,440,200

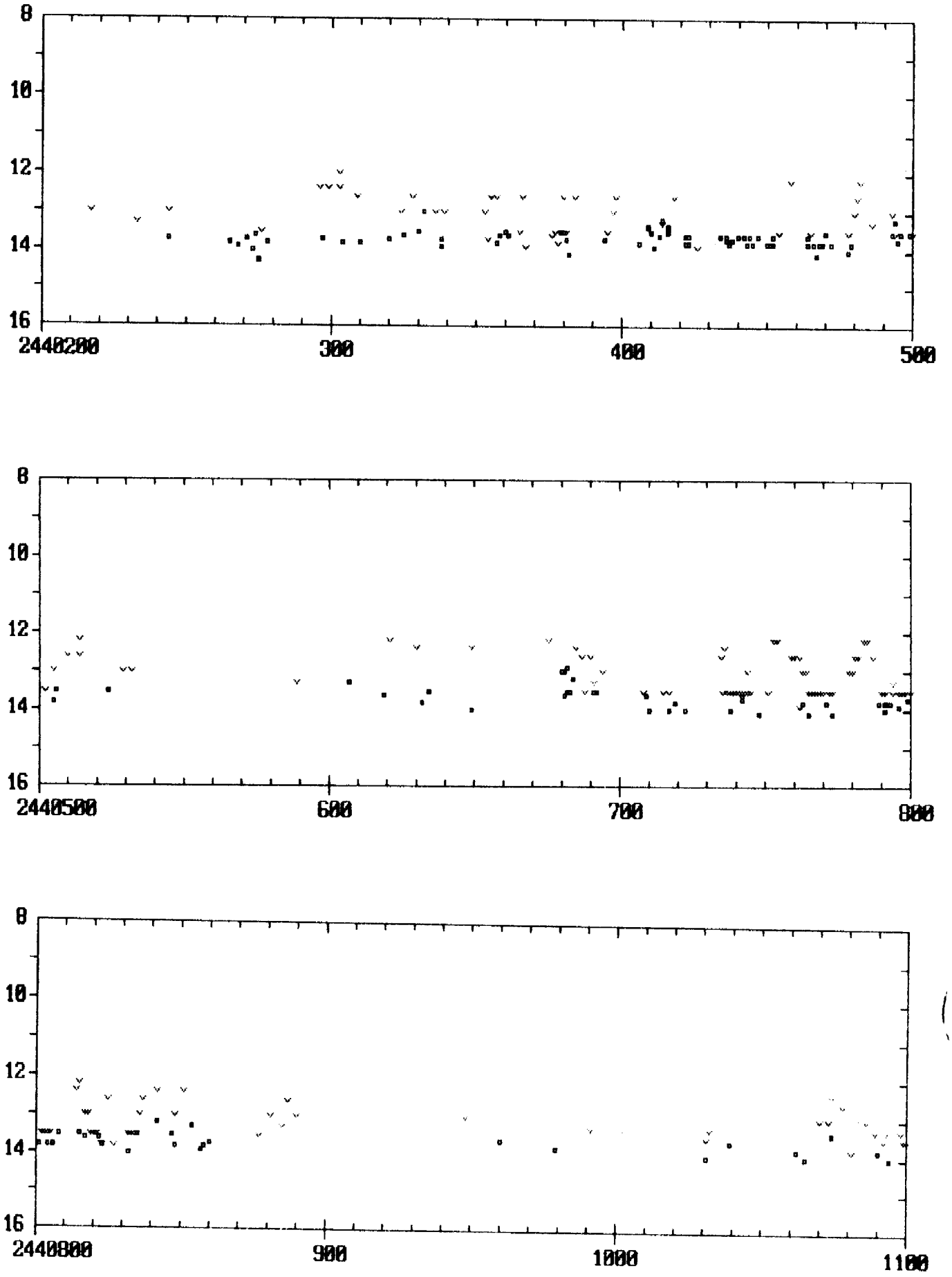

FIG. 7

EX Lupi. LIGHT CURVE - J.D. 2,440,200 - 2,441,100

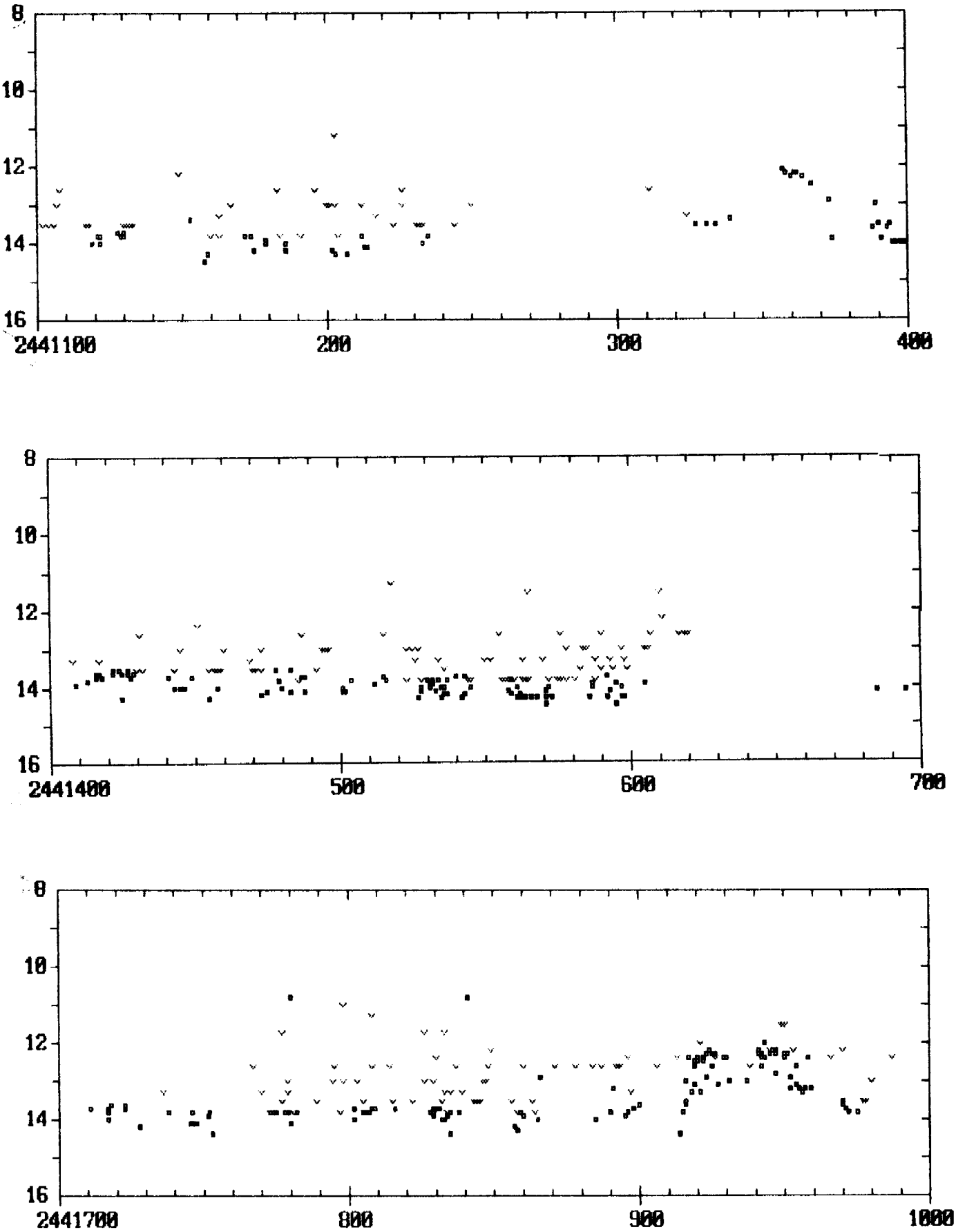

FIG. 8

EX Lupi. LIGHT CURVE - J.D. 2,441,100 - 2,442,000

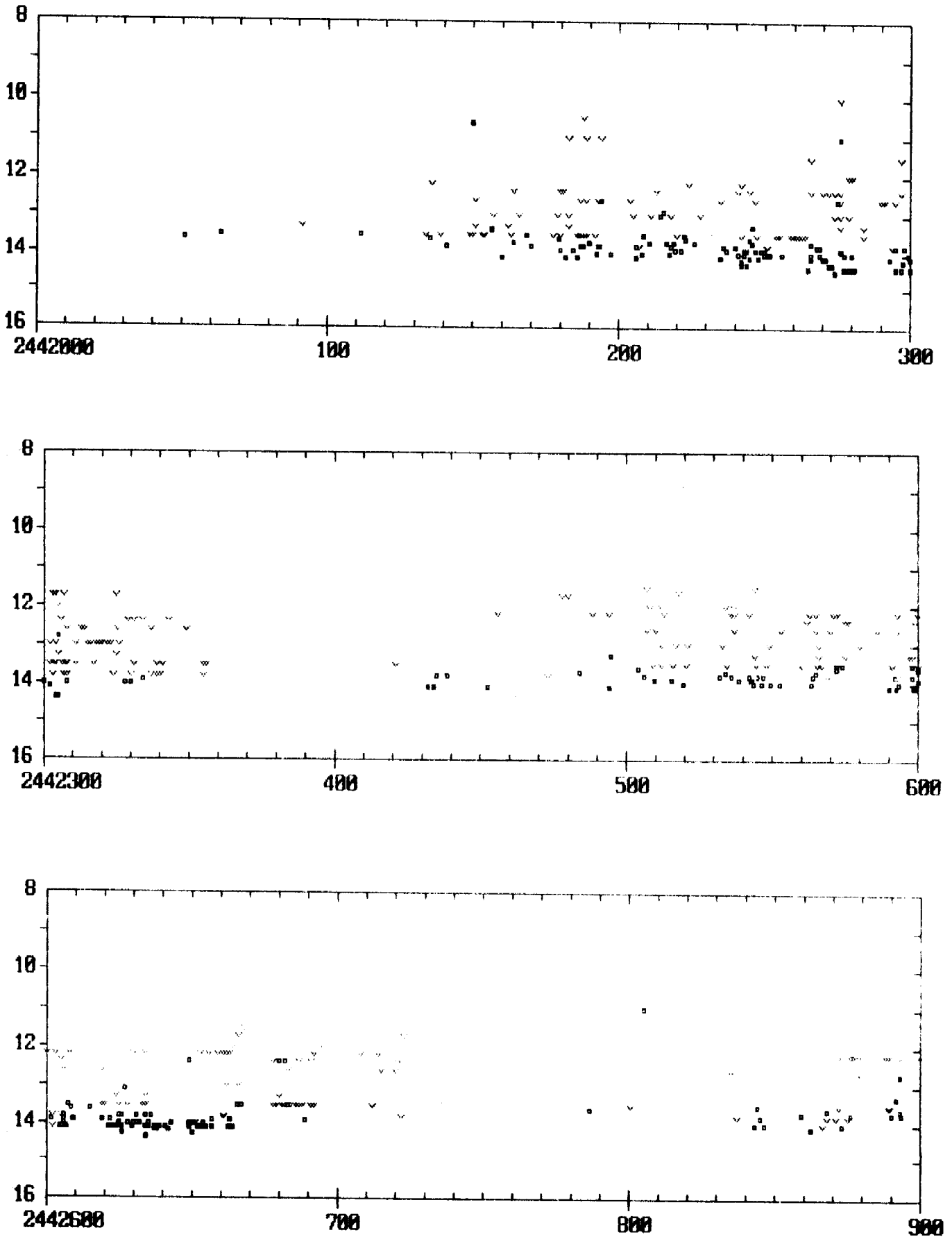

FIG. 9

EX Lupi. LIGHT CURVE - J.D. 2,442,000 - 2,442,900

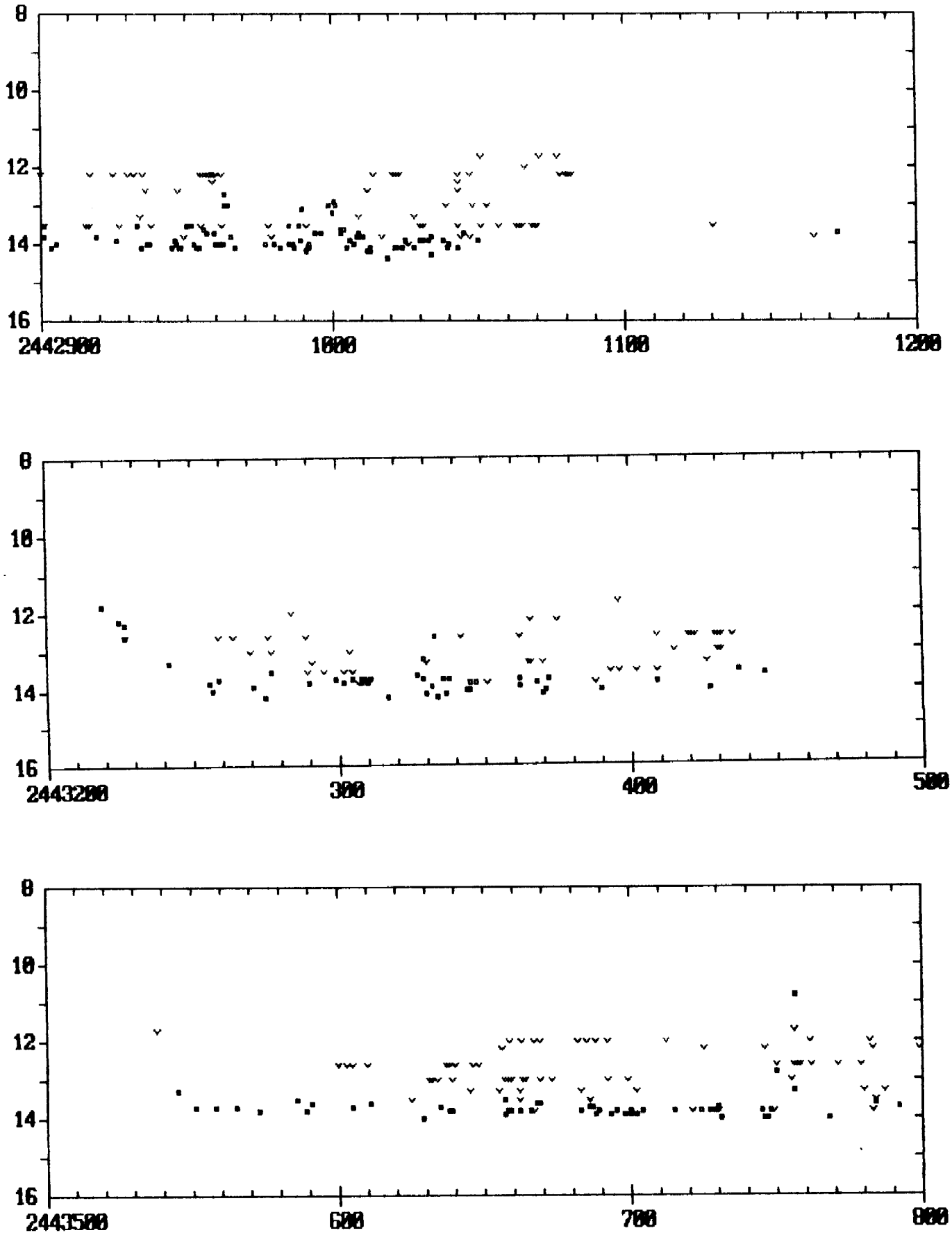

FIG. 10

EX Lupi. LIGHT CURVE - J.D. 2,442,900 - 2,443,800

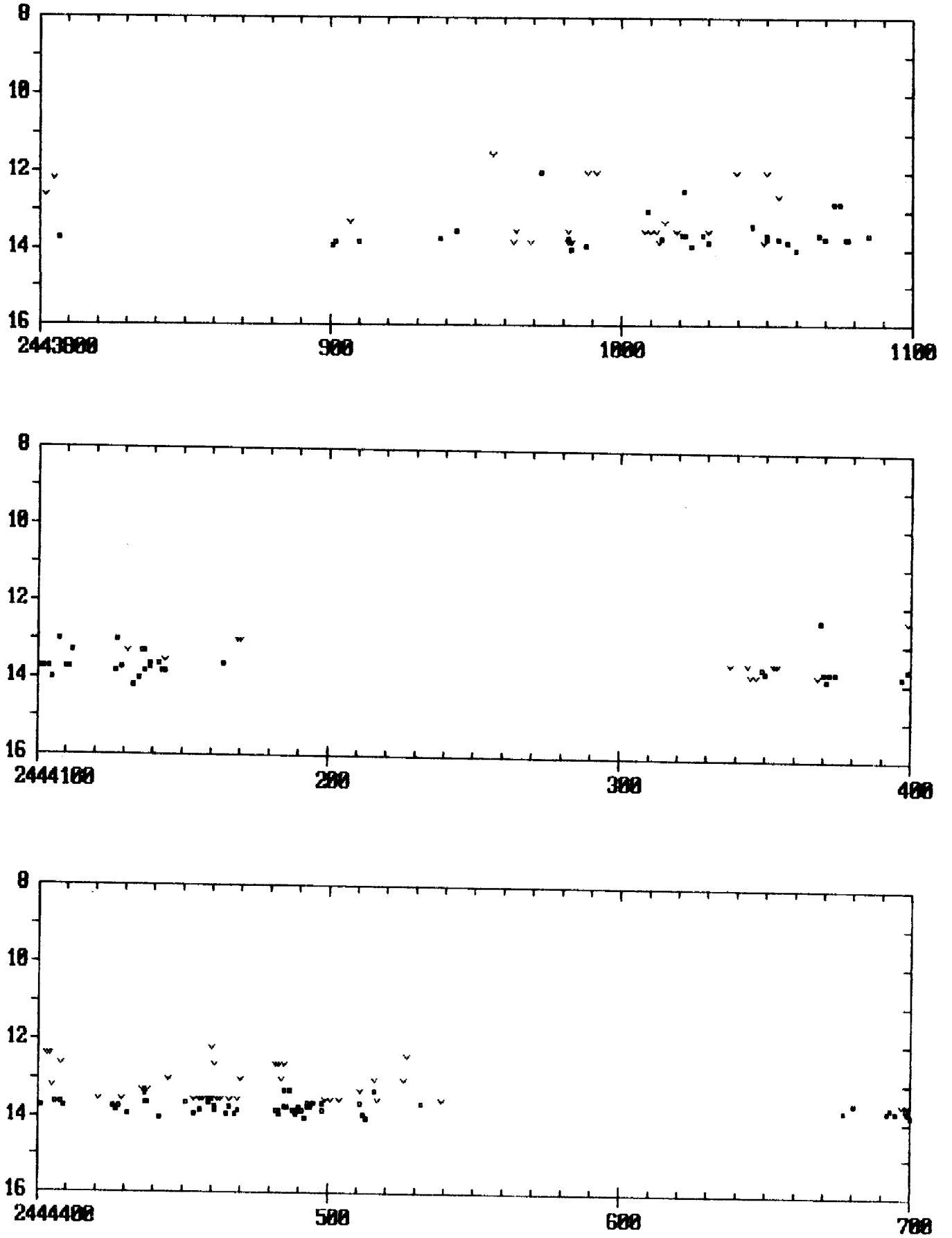

FIG. 11

EX Lupi. LIGHT CURVE - J.D. 2,443,800 - 2,444,700

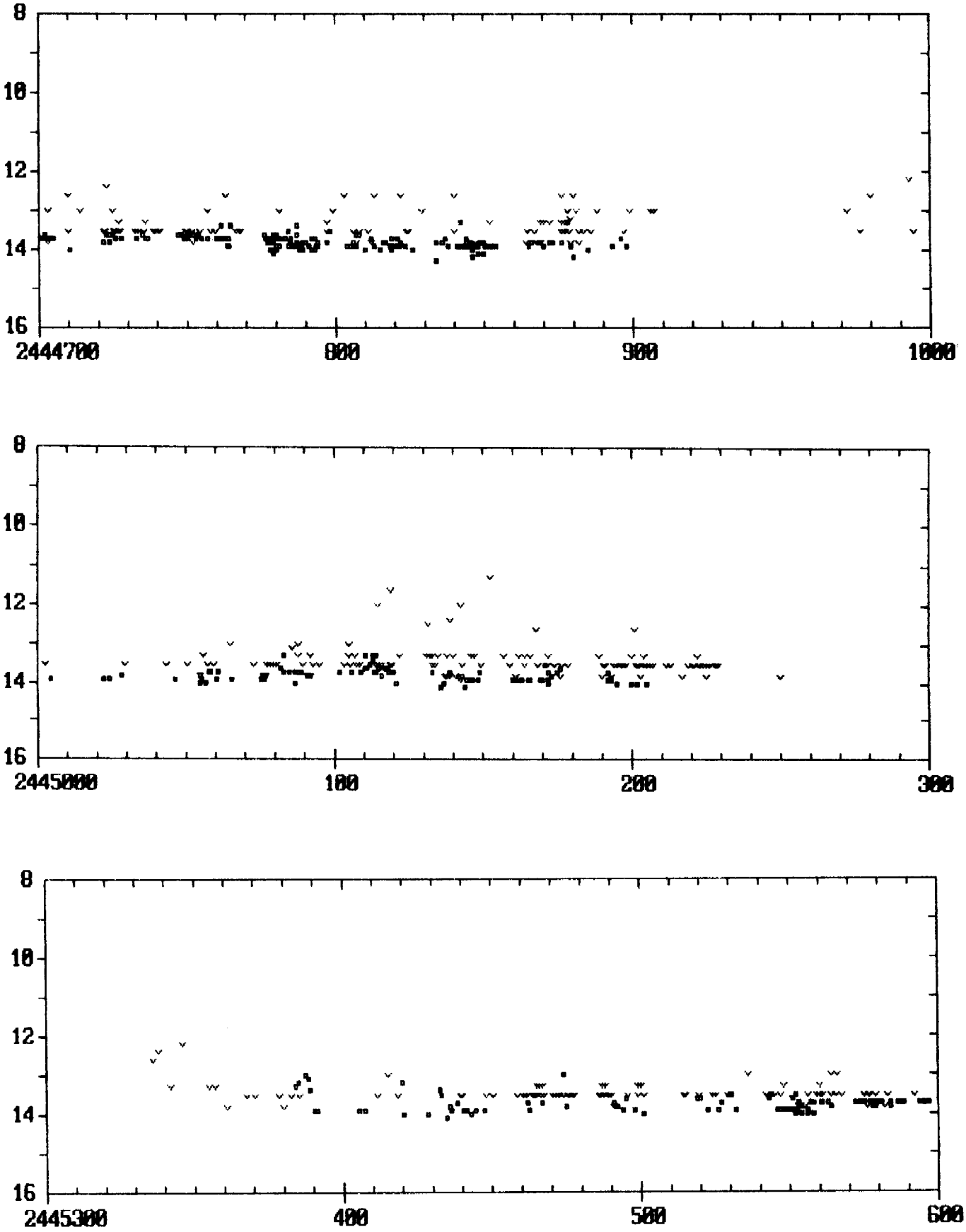

FIG. 12

EX Lupi. LIGHT CURVE - J.D. 2,444,700 - 2,445,600

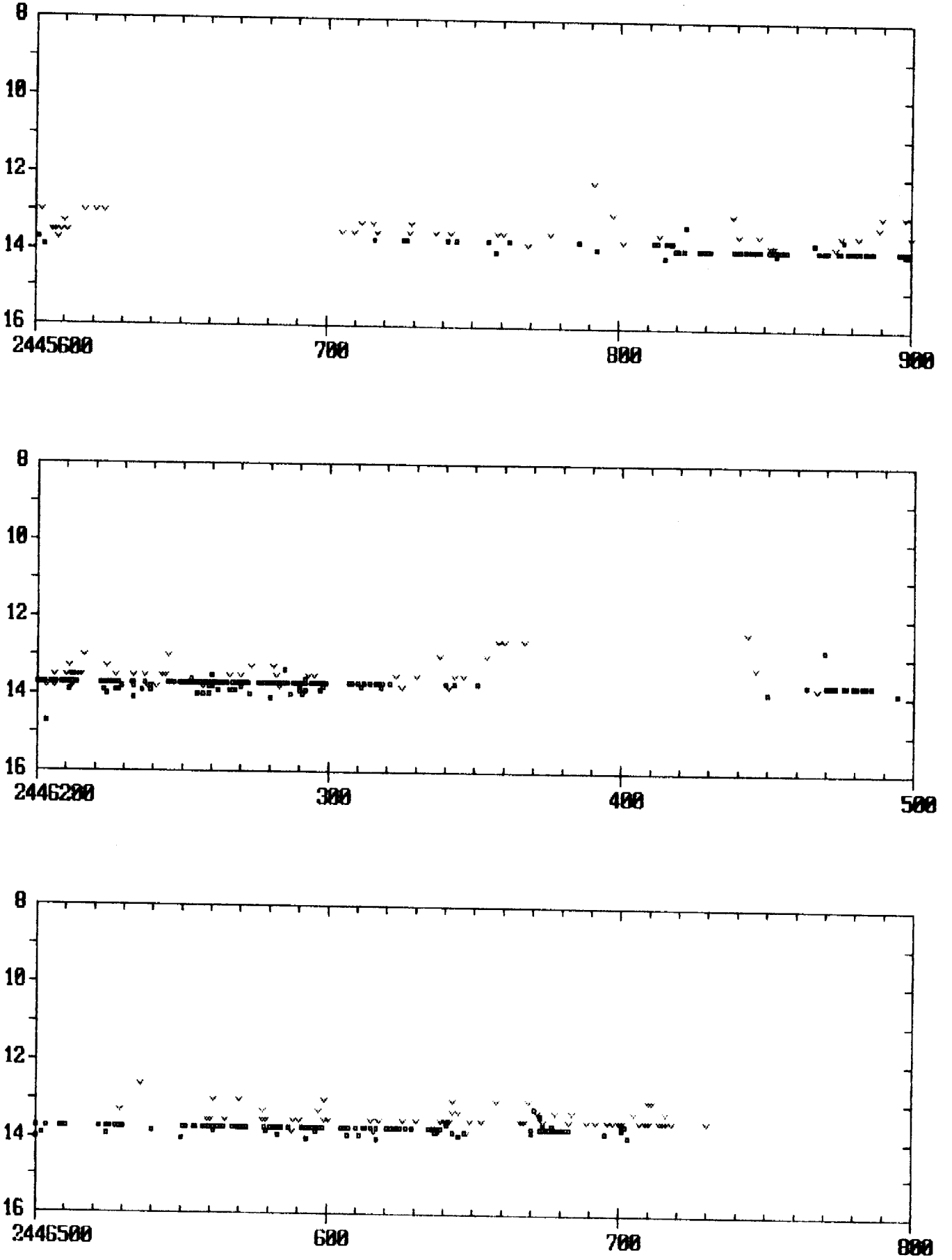

FIG. 13

EX Lupi. LIGHT CURVE - J.D. 2,445,600 - 2,446,800

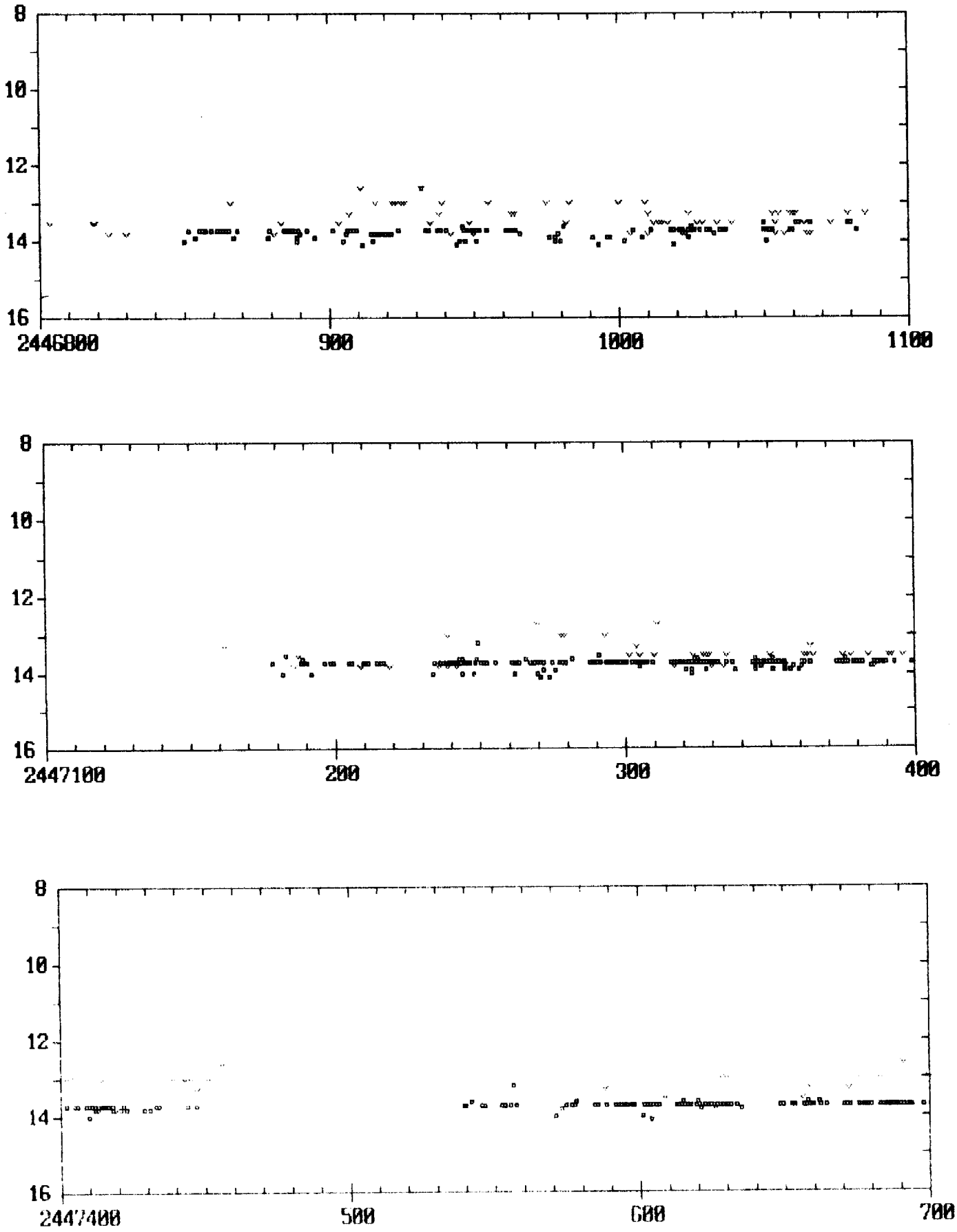

FIG. 14

EX Lupi. LIGHT CURVE - J.D. 2,446,800 - 2,447,700

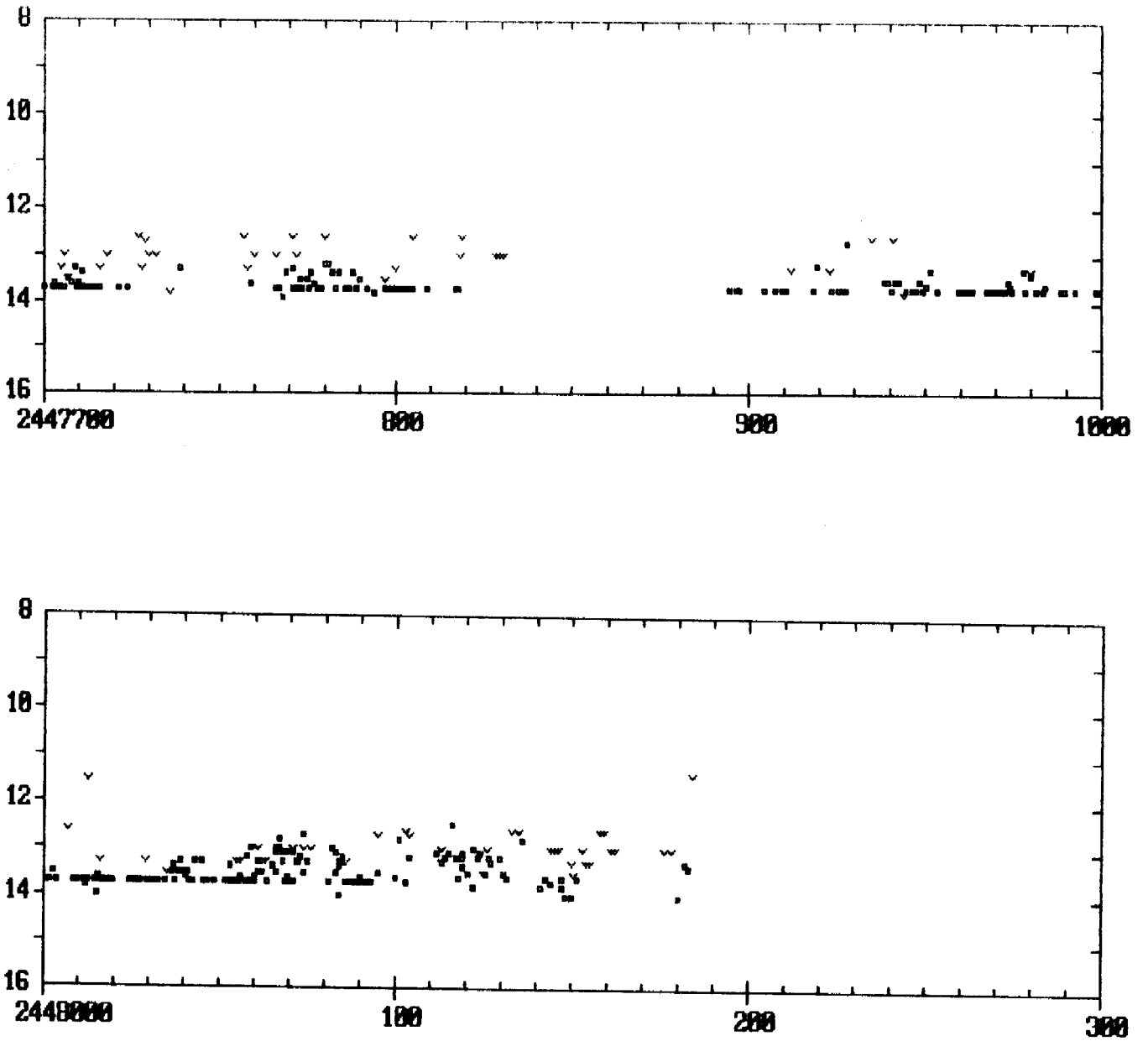

FIG. 15

EX Lupi. LIGHT CURVE - J.D. 2,447,700 - 2448,300

THE DWARF NOVA VZ AQUARII

Ranald McIntosh
Unit 68, 36 McLeod Road
Henderson, Auckland
New Zealand

SUMMARY: A list of 22 outbursts observed between 1981 September 23 and 1990 August 21 shows this variable is a typical SS Cyg dwarf nova with both narrow and wide maxima. A mean cycle of 43.4 days prevails.

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1. INTRODUCTION

Bateson (1) published a list of observed outbursts of VZ Aqr before J.D.2,444,870 (1981 Sept. 22) and suggested that the mean cycle was less than 53 days. Values for his 12 maxima have been used in this paper.

2. OBSERVATIONS

The outbursts listed in this paper are from visual observations by members of the Variable Star Section, R.A.S.N.Z. from 1981 Sept. 23 to 1990 Aug. 21.They have all been reduced from the sequences by Vogt (2) and Kilkenny (3). The observing season is May through December each year with a few in late March and April. There are many gaps in the records, probably due to observers concentrating on more southerly variables.

3. DISCUSSION

Observed outbursts are shown in Table 2, whilst portions of the light curve are in Figs, 1 to 4. The latter illustrate the coverage given during times when the star was best monitored. At other times VZ Aqr was either unobservable or there were large gaps in the estimates, some of which are mentioned in the remarks to Table 2.

The gaps in the observations make it difficult to decide which outbursts were consecutive. However, I took all intervals less than 70 days both from Table 2 and from Bateson;s paper (1). There are nine such intervals, ranging from 14 to 62 days. These give a mean cycle of 43.4 days. There are two types of outbursts, narrow and wide, for which the main features are given in Table 1.

TABLE 1.

VZ Aqr--MEAN MAGNITUDES & DURATIONS OF OUTBURSTS.

TYPE	MEAN MAX MAG	MEAN WIDTH d
WIDE	12.53 (7)	8.7 (7)
NARROW	13,17 (12)	2.1 (12)

In the aboce table only those outbursts for which the values are reliable have been included.

4. CONCLUSIONS

VZ Aqr is a typical SS Cyg type dwarf nova with both wide and narrow maxima.The former are also brighter usually. The mean cycle is 43.4 days, but possibly may be shorter.

TABLE 2.

OBSERVED OUTBURSTS OF VZ Aqr

No.	J.D.MAX	MAX MAG$_v$	INT d	WIDTH d	TYPE	No OBD	REMARKS
13	2445,167?	13.0?	(313)	2+?	?	3	(1)
14	266?	12.8?	99	?	?	1	(2)
15	442?	13.4?	(176)	?	?	1	(3)
16	528	13.0?	86	?	?	1	(4)
17	616	13.5?	88	?	?	2	(5)
18	911	12.6	(295)	8	W	7	
19	2446,180	13.3	(269)	1	N	1	
20	240?	12.9	60	?	?	1	(6)
21	373	12.1	(133)	8	W	8	
22	621	12.0	(248)	10	W	20	(7)
23	762	12.5	(141)	2	N	5	
24	944	12.6	(182)	9	W	15	
25	2447,025	13.0	81	2	N	4	
26	095	12.9	70	2	N	2	
27	296	12.9	(201)	3	N	3	
28	379	12.5	83	7	W	11	
29	413	13.2	34	1	N	1	(8)
30	444	13.1	31	5	N	4	
31	667	12.9	(223)	6?	W?	5	(9)
32	826	13.5	(159)	2?	N	1	(10)
33	999	13.2	(173)	1	N	2	
34	2448,115?	12.9	(116)	3?	N?	4	(11)

REMARKS TO TABLE 2

(1) Gap of 13 days before 167.
(2) Gaps of 8 days before & 11 days after 266.
(3) Gaps of 5 days before and after 442.
(4) Gaps of 6 days before and after 528.
(5) Gaps of 7 days before 616 and 16 days after 618.
(6) Gaps of 3 days before and 5 days after 240.
(7) Rose from 14.0 in 1 day.
(8) Negative observations indicate this maximum faint and short.
(9) Gap 5 days after 672. Maximum probably longer than 6 days.
(10) Negative observations indicate that outburst short and faint.
(11) Gap of 8 days before 115.

ACKNOWLEDGEMENTS

My thanks are due to all observers and to Frank Bateson for his guidance.

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(1) Bateson, F.M. 1982, Publ. Var. Star Section, R. astr. Soc of N.Z. 10, p.22
(2) Vogt, N. 1980. Publ. Var. Star Section, R. astr. Soc.of N.Z. 8, p.11
(3) Kilkenny, D. 1989. Publ. Var. Star Section, R. astr. Soc. of N.Z. 15, p.36.

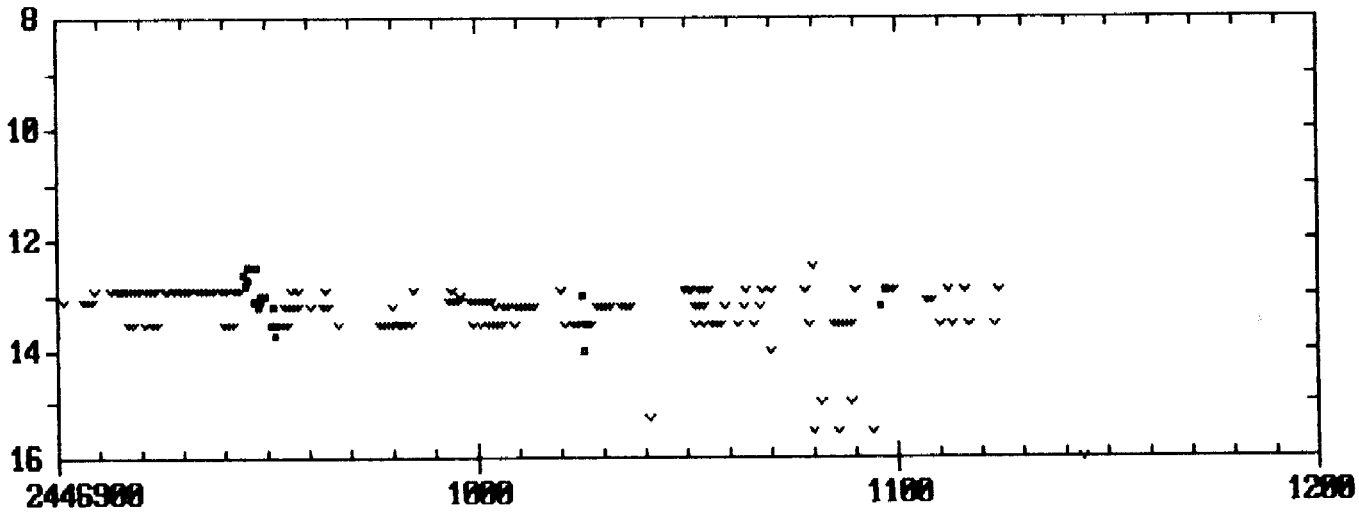

Fig. 1. VZ Aqr. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS.

J.D. 2,446, 900 to 2,447. 200

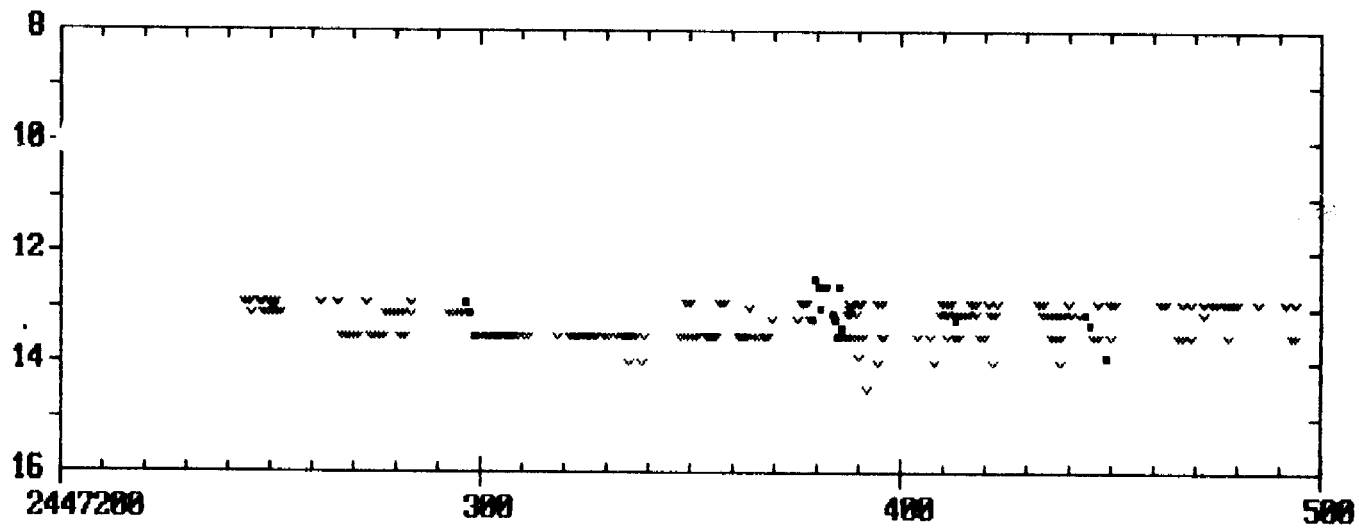

Fig. 2. VZ Aqr. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS

J.D. 2,447,200 to 2,447, 500

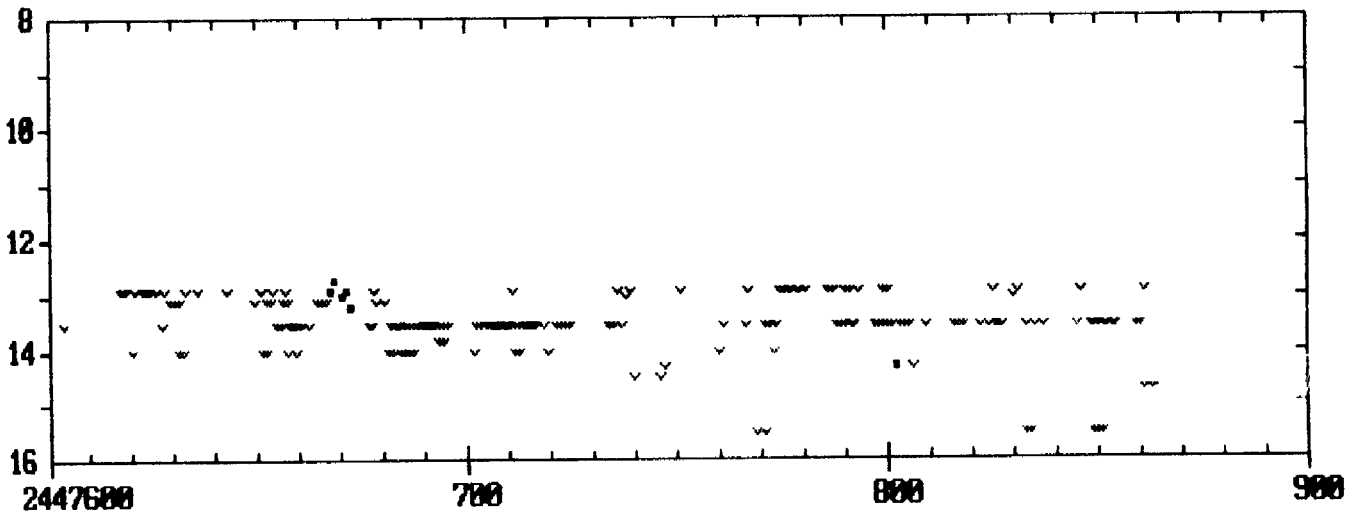

Fig. 3. VZ Aqr. Light Curve from individual observations.

J.D. 2,447,600 to 2,447, 900

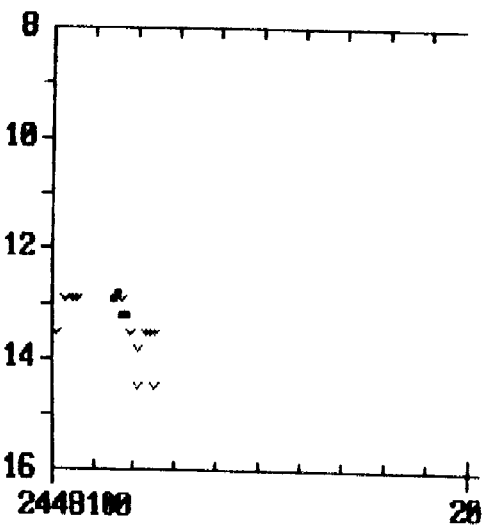

Fig. 4. VZ Aqr. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS

J.D. 2,448,100 to 2,448,125

THE DWARF NOVA, WW CETI---1984-1990

Frank M. Bateson & Ranald McIntosh
Variable Star Section,R.A.S.N.Z.
P.O. Box 3093, Greerton,Tauranga
New Zealand

SUMMARY: A list of 27 outbursts is given from which a mean cycle of 30.70 days is derived. Types of maxima are discussed and it is shown that WW Cet also has many minor peaks, indicative of frequent fluctations.

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1. INTRODUCTION

Previous papers by Bateson & Jones (1); Bateson & Dodson (2) and Bateson (3)summarised visual observations to J.D. 2,445,902 (1984 July 20). We now present the data from 1984 July 21 to 1990 August 30 (J.D. 2,448,134) in the same format as in the previous papers.

2. OBSERVATIONS

Members of the Variable Star Section, Royal Astronomical Society of N.Z. made 1,700 visual observations during the interval covered by this paper. These have all been made using the same sequence as given in (1). The outbursts observed are listed in Table 1 and portion of the light curve appears in Figs. 1 and 2. A list of minor peaks appears in Table 2.

3. DISCUSSION

The observing season for WW Cet runs from late April to the end of January each year. This means that there is always a gap of at least 80 days in the records, which is usually extended because of few and scattered observations when the star can only be observed in the morning sky. Additionally there are often gaps in the estimates in the main observing months.

It is, therefore, difficult to decide which outbursts are consecutive. We consider that there are ten such intervals, ranging from 18 to 44 days. These give a mean cycle of 30.70 days, which is almost identical with 31.2 and 31.1 days given in the previous papers. If all intervals of 50 days, or less, are consecutive then the mean cycle would be 34.85 days from thirteen intervals. However, we do not think that this value is the correct one, because we doubt that the intervals of 48 and 50 days represent consecutive maxima.

Maxima are of two main types, according to their widths at magnitude 13.0. Wide have widths of 7 days or more; Narrow widths of less than 6 days. Both types have steep rises taking a day, or less, to increase from around 14th magnitude to maximum. The declines are less steep although narrow maxima decline rapidly. However, the wide maxima tend to level out around 11.3, often rising to a sharp peak about half a magnitude brighterafter varying slightly around 11.3 for a day or two. Maxima of type W2 are infrequent and differ from other wide maxima (W1) in oscillating just below 11th magnitude for about 4 days before the decline sets in.

In addition there appears to be a number of short, faint peaks with maxima ranging from 13.4 ro 14.2. Table 2 shows that many of these have only a single positive observation, whilst others are supported by from 2 to 10 positive estimates. The remarks in Table 2 show the observations immeadiately preceding and following that of these peaks. We consider these peaks are due to continuous oscillations, similar to the photoelectric observations given in (1). We also consider that they should not be regarded as outbursts but a flickering phenomena.

The mean maximum magnitudes and widths of outbursts are shown below, which shows in brackets the number in each sample that are considered to be reliable.

TYPE	MEAN MAX, MAG_V	RANGE	MEAN WIDTH AT 13.0	RANGE	WIDTH AT 12.0	RANGE
W1	11.03 (6)	10.7-11.3	10^d(5)	8-13^d	8.2^d(6)	4-12^d
W2	11.00 (2)	10.5-11.5	-..	...	7.5(2)	6-9?
N	11.57 (15)	10.7-13.6	4.7(7)	1-6	2.5(11)	1-5

There are a limited number of positive observations at 14.4 to 14.7 which suggest the minimum visual magnitude is about 14.7. However, such observations are few and scattered in time so no definite data on minimum brightness can be given.

4. CONCLUSIONS

The extreme visual range of WW Ceti is 10.5 to 14.7. There are both wide and narrow maxima which do not occur in any regular sequence. There are also faint peaks which we consider to be indicative of oscillations which appear to be a feature of WW Ceti. The most probable mean cycle is 30.70 days.

ACKNOWLEDGEMENTS

Our thanks are due to all observers for their estimates.

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(1) Bateson, F.M. & Jones, A.F. 1979. Publ. Var. Star Section, R.astr Soc of N.Z. 7, pp/ 1-5
(2) Bateson, F.M. & Dodson, A.W. 1985. Publ. Var. Star Section, R. astr. Soc. of N.Z. 12, pp. 1-7.
(3) Bateson, F.M. 1985. Publ. Var. Star Section, R. astr. Soc. of N.Z. 12, pp45-46.

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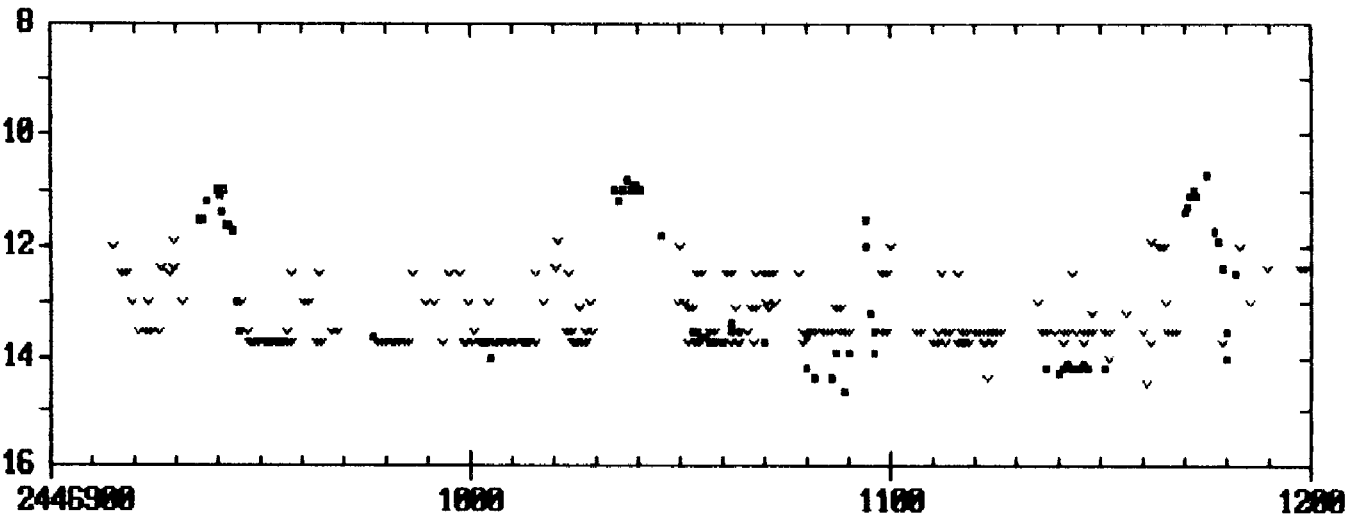

FIGURE 1.

WW Ceti. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS. J.D.2,446,900 to 2,447,200

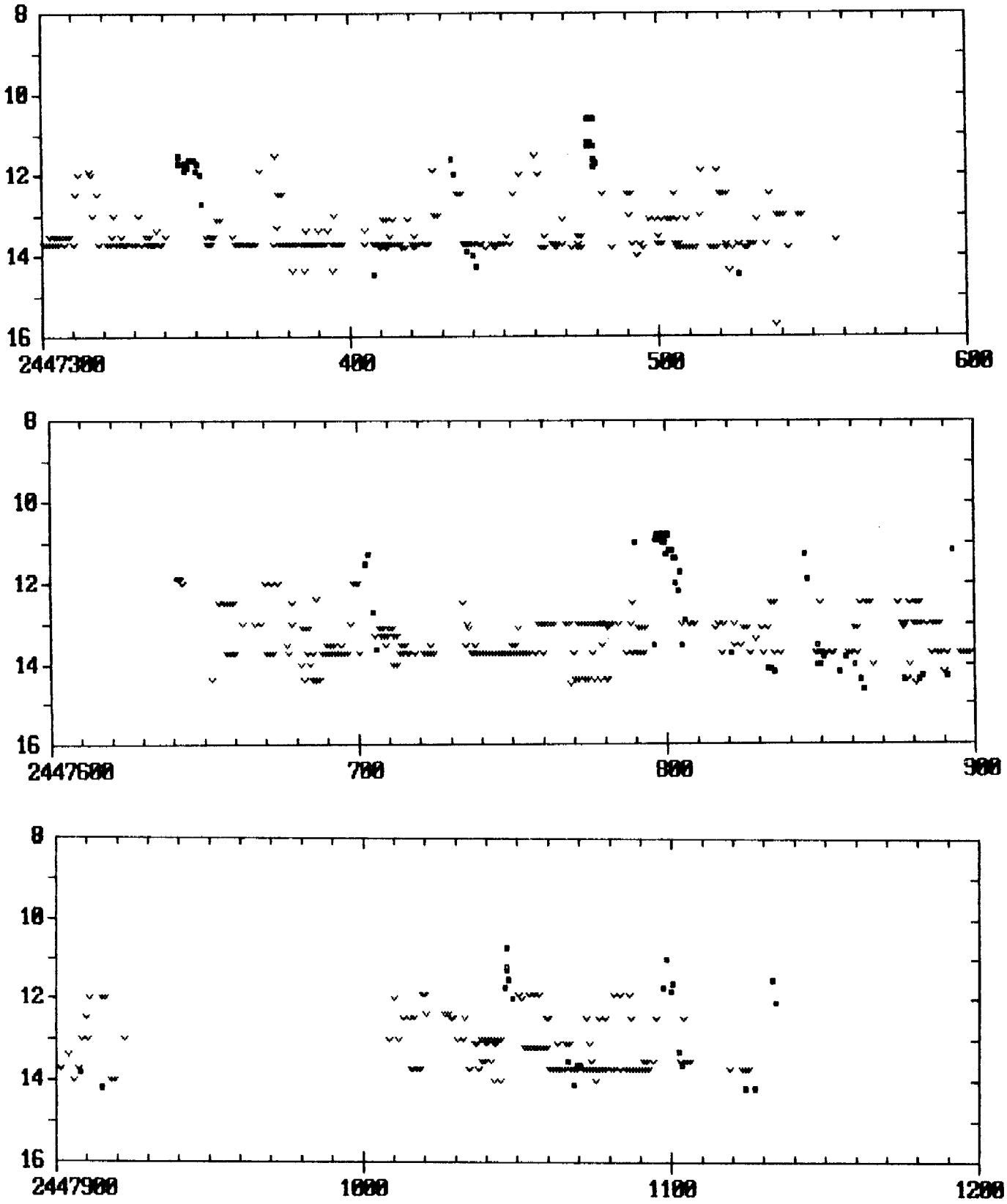

FIGURE 2

WW Ceti. LIGHT CURVE FROM INDIVIDUAL OBSERVATIONS.
J.D. 2,447,300 to 2,448,135.

TABLE 1

OBSERVED OUTBURSTS OF WW CETI

No.	J.D. Max 24.....	Max m_v	Int. d	z-13.0 R	z-13.0 F	Width d	z=12.0 R	z=12.0 F	Width d	Type	No Obs	Remarks
77	46,187	11.7	(305)	...	...	...	...	...	...	?	3	(1)
78	213	11.9	26	212	216	4	...	...	...	N	3	
79	352	13.6	(139)	...	...	...	...	...	...	N	7	
80	379	11.2	27	375	383	8	378	382	4	W1	24	
81	405	12.1	26	...	407	...	...	...	...	N	5	(2)
82	570	11.3	(165)	568	...	...	569	574	5	N	6	
83	640	10.5	70	...	...	...	639	648?	9?	W2?	9	
84	703	11.4	63	699	705	6	701	704	3	N	6	
85	753?	11.3	50	...	755	...	746	755	9	W1	7	(3)
86	784	11.5	31	782	787	5	784	786	2	N	7	
87	804?	12.0	20?	...	...	...	...	...	...	?	1	(4)
88	938	11.2	(134)	935?	945	10?	936	943	7	W1	12	
89	977?	13.6?	39	...	...	...	...	...	...	?	1	(5)
90	47,035	11.0	58	034	047	13	034	046	12	W1	12	(6)
91	053	13.5	18	...	...	...	...	...	...	W?	7	(7)
92	094	11.7	41	092	096	4	094	095	1	N	7	
93	175	10.7	81	169	179	10	169	178	9	W1	14	(8)
94	344	11.5	(169)	?	352	?	345	351	6	W2?	14	(9)
95	433?	11.6	89	?	436	?	?	434	?	N?	5	(10)
96	47,477	11.3	44?	?	481	?	476	480	4	N	12	(11)
97	702	11.5	(225)	701	705	4	701	704	3	N	4	(12)
98	797	10.8	95	796	805	9	796	804	8	W1	21	
99	845	11.3	48	?	847	?	844	846	2	N	5	(13)
100	893	11.2	48	892	?	?	893	894	1	N	2	
101	48,046	10.7	(153)	046	050	4	046	047	1	N	6	
102	098	11.0	52	096	102	6	097	101	4	N	7	
103	133?	11.5	35	?	?	?	133	134	1	N	3	(14)

REMARKS TO TABLE 1

(1) Gaps 94 days before 186 and 9 days after 188.

(2) Gap 4^d before 405.

(3) Maximum probably earlier than 753 as was 12.0 on 746. Next observation 11.3 on 753.

(4) Gap 2^d before and 4^d after 804. A single positive estimate, class 3 - made in moonlight.

(5) Gap 9^d before 977.

(6) Gap 4^d after 045 - Star still at 11.8.

(7) Possibly a faint peak as was <13.7 on 052.2 and 053.3 with a single estimate of 13.5 on 052.9296.

(8) Gap of 3^d between 172 and 175 during maximum.

REMARKS TO TABLE 1 (Cont)

(9) Gap of 4^d before 344.

(10) Gap of 4^d before 433.

(11) Gap of 2^d before 477.

(12) Gap of 2^d before 702.

(13) Gap of 8^d before 845.

(14) Was 14.2 on 127; then gap of 6^d to 133.

TABLE 2

WW CETI - FAINT PEAKS

J.D. 24...	Mag v	No Obs	Remarks
45,914	14.1	1	913.64 <13.8; 915.21 <13.5
46,054	14.2	1	052.9 <13.5; 054.99 <13.7
229	14.1	2	(228.6 <14.0; 229.6 & 230.6 both 14.1 (232.26 <13.5; 233.6 <14.0
274	14.3	1	273.6 <14.0; 275.2 <13.7; 275.6 <14.0
321	14.0	1	319.5 <14.0; 321.9 <13.7
348	13.8	2	(343.98 <13.7; 347.97 & 348.92, 13.8 (349.08 <14.4
413	13.4	3	May be a maximum as the 3 obs. have gaps between them.
588	13.9	1	587.6 <13.7; 588.6 <13.7
697	14.0	1	695.93 <13.8; 697.6 <12.5; 698.6 <13.0
738	14.0	1	736.9 <13.4 739.3 <13.7
819	13.4	1	818.2 <13.0; 820.3 <13.0
47,005	14.0	1	004.6 <13.7; 005.6 <13.7
062	13.4	3	061.068, 14.1; 062.058,13.4; 062.16 <13.7
080	13.6	4	079.027 <13.5; 079.9042, 13.6; 080.0130,14.2; 082.0380, 14.4
137	14.2	10	From 136.9780 to 136.9810 ten obs. at 14.2 or 14.1, all other obs. <13.5 or <13.7
821	13.7	3	819.0420,14.4; 820.9227, 13.7 821.95 <13.5; 822.0490, 14.6
47,858	13.8	2	856.0050,14.2; 857.9860, 13.8; 858.9 <13.7
908	13.8	1	907.3 <13.7; 907.9710, 13.8; 908.3 <13.0
48,066	13.5	4	065.6 <13.7; 066.3812, 13.5; 067.6 <13.7 068.3764,14.1; 069.3813, 13.6; 070.3020, 14.6

DO SOME DWARF NOVAE HAVE SHORT-LIVED FLARES OR PRECOURSERS TO OUTBURSTS--PAPER 1.

Frank M. Bateson

Director, Variable Star section,
Royal Astronomical Society of N.Z.
P.O. Box 3093, Greerton,Tauranga
NEW ZEALAND.

SUMMARY: Five decades of visual observations of three dwarf novae are examined for examples of possible short-lived flares or precoursers to outbursts. In this first paper of a series the objectives of visual monitoring of dwarf novae are detailed and possible errors in visual estimates discussed.

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1, INTRODUCTION

Members of the Variable Star Section, R.A.S.N.Z., have, over five decades, made many hundreds of thousands individual estimates of dwarf novae. In processing this mass of data, I have noted that the records include a number of what appear to be either precoursers to outbursts, or short-lived flaresFor many years I regarded such estimates as due to the effect of weather and other conditions that affect visual observations. However, as records of such events accumulated I considered that they warranted closer examination. First, I mentioned the subject to N. Vogt, who urged me to carry out a detailed investigation and to publish complete details. This is why this series of papers is being written.

2. OBJECTIVES

It may be helpful, especially to observers, if the objectives of close monitoring of dwarf novae are outlined. These are:

(a) To monitor each star as closely as possible to determine the frequency and types of its outbursts and any changes in these that may occur in time.

(b) To provide prompt advice of the onset of outbursts to those professional astronomers who require this information for their programmes.

(c) To provide light curves to professional astronomers, who often request these for use with their data obtained at wavelengths other than the visual

(d) Observers shoukd be encouraged to make accurate observations of the eclipses and even rotation periods of some dwarf novae.

(e) This programme can only achieve valuable results if direction is provided from a headquarters that supplies the necessary charts and reliable sequences of the comparison stars. It is also essential that the headquarters publish the results in a form that makes them useful to the astronomical community.

(f) It is essential that the observers be widely spaced in geographical locations to avoid large gaps in the records of each variable.

3. VISUAL OBSERVATION

In evaluating visual observations close attention has to be given to a large number of factors. Firstly, our widely scattered observers operate under diverse conditions and with diverse instruments. Some are fortunate enough to have dark skies, free of light pollution, whilst others have to contend with sites in, or near, cities.

The telescopes vary in aperture and mounting. Some observers operate from well equipped observatories with well mounted instruments with accurate driving mechanism. Others use portable telescopes which are set up nightly on a pre-aligned place.

Each observer has his, or her, systematic deviation, meaning that an observer has a tendency to either estimate too faint, or too bright. The amount of this deviation is generally very small, especially for those very experienced observers for which it rarely exceeds 0.2 magnitude and is usually much less. The thresholds of most instruments currently in use is in the range of 13.5 to 14.5. There are, however, a few observers for whom the limit is 15.5 to 16.5.

Visual observations can, naturally, be affected by sky conditions, clouds, haze and moonlight. There has never been an observer who at some time does not make a mistake in identifying the variable or a comparsion star, or in recording his estimate. Otherwise they would not be human.

In order to enable observations to be evaluated correctly observers give with their estimates their opinion of sky conditions on a scale of 1, 2 or 3,with 1 meaning good conditions of sky in the region being observed; 2 is inferior due to the presence of cloud, haze, moonlight, etc whilst 3 shows conditions were very poor with much hindrance to seeing.

Observers also rate their observations according to the degree of reliability they attach to their estimate, where 1 means a good accurate estimate; 2 not so good owing to some hindrance to seeing and 3 implies the observer considers his estimate very poor and unreliable. In practice, observers omit 1 for both sky and class to save unneccesary writing but always indicate 2 or 3 with abbreviations for the reason why the observation is so rated.

In processing observations for these papers I have excluded all estimates for which the observer rated sky conditions, or degree of reliability, as 2 or 3.The occasional misidentification or error in recording generally is obvious in the records through inter-comparison with the results from other observers.

There are other factors which can also affect observations such as the presence of light, high cirrus not easily observable and even such events as trails from meteors or satellites may cause an apparent brightening, or fading, of a variable or the comparison stars. Observers also tend, except when observing and timing eclipses, only to make a single observation of a variable in order to cover as many stars as possible during each observing spell.

Taking every factor into consideration the results presented in this, and subsequent papers, are considered accurate and reliable as far as my judgement goes, subject only to such comments as are given following each Table.

In selecting dwarf novae for this study I have restricted this to those with minima well below the thresholds of the telescopes used and which also have very rapid rises to maxuma. Thus stars like VW Hyi, BV Cen and EX Hya which are visible at minima have been excluded.

It appears possible, under current theories, for dwarf novae to have precoursers to their outbursts. Flare activity is also observed in a wide variety of stars and these may occur in dwarf novae. However, at this stage I draw no conclusions and merely present the evidence for possible events, for which purpose I have used the original records from the many observers.

For each variable discussed the observations are given in tables, in which the first column gives a running number to the observation. This is followed by the J.D. of the observation, magnitude and abbreviation for the observer as used in our Monthly Circulars. The fifth column gives the J.D. of the outburst that followed the observation and then the interval, in days, which elapsed between the observation and this outburst.

The remaining columns give details of the observations which immediately preceded and followed that give in the second column.

4. V442 Cen.

This variable is of the SS Cyg type with wide and narrow maxima, which differ in their durations but not much in mean brightness; the mean cycle is 27.13 days (1). Minima are fainter than 16.0 and the rise to maximum is rapid and steep.

Table 1 lists 19 examples of events which may possibly be precoursers to outbursts.

TABLE 1.

V442 Cen--POSSIBLE PRECOURSERS TO OUTBURSTS

OBSERVATION						PREVIOUS OBS			FOLLOWING OBS.		
No.	J.D. 24	MAG_v	OBS.	MAX.J.D. 24	INT_d	J.D.	MAG_v	OBS	J.D.	MAG_v	OBS
1	34852.81	14.2	Jo	34864	11	851.83	(12.1	Jo	854.82	(12.7	Jo
2	35213.81	13.7	Jo	35228	14	211.00	(13.4	Jo	214.91	(13.2	Jo
3	35247.79	14.0	Jo	35251.9	4	246.88	(13.4	Jo	247.92	(13.7	Jo
4	35546.15	14.3	Jo	35552	6	545.94	(13.7	Jo	546.95	(13.7	Jo
5	37526.81	13.4	Jo	37539.3	12	525.81	(13.4	Jo	527.81	(13.4	Jo
6	37829.95	12.7	Jo	37836.9	7	827.81	(13.2	Jo	830.83	(13.2	Jo
7	38961,91	13.9	Jo	38975?	13	959.84	(13.7	Jo	962.89	(13.4	Jo
8	39999.89	13.3	Jo	40004	4	998.91	(13.7	Jo	001.12	(13.4	Hn
9	40283.21	13.7	Jo	40295.5	12	282.15	(13.7	Jo	283.87	(13.0	Jo
10	41496.82	13.6	Jo	41505.9	9	495.90	(13.0	Jo	497.86	(13.4	Mt
11	42258.82	13.3	Jo	42273.1	14	256.88	(13.4	Jn	258.88	(12.4	Jn
12	43300.94	13.7	Jo	43310.9	10	300.91	(13.2	Hl	301.94	(13.7	Jo
13	43902.06	14.2	Dt	43906.95	5	901.97	(14.4	MA	902.09	(14.4	Sb
14	44365.3	13.2	Vi	44374.9	10	364.92	(13.4	Ty	365.9	(13.7	Jo
15	44998.95	13.0	MA	44504±6	6	998.92	(14.4	Hv	999.01	(13.4	Jo
16	45029,473	13.7	Ov	45038.9	9	029.02	(14,4	Dt	029.89	(13.4	Jo
17	45055.83	13.8	MA	45060.8	5	055.4	(13.4	Hz	055.83	(13.4	Hl
18	45107.06	14.3	Dd	45114.8	8	106.96	15.3	Cj	107.22	(13.2	Ov
19	45439.97	13.6	Mf	45448.0	8	438.91	(13.4	Ty	440.01	(13.2	Wu.

Most of the observations in Table 1 are at faint magnitudes. This would be expected, because the maximum magnitude of V442 Cen is 12.0. The intervals by which these observations preceded a maximum range from 4 to 14 days, with an average of 8.8 days. This appears to suggest that they may possibly be precoursers to outbursts.

5. OY Car.

A SU UMa variable. superoutbursts have a mean visual magnitude of 11.53; mean width at phase 13.0 I-D of 11.5 days, whilst the corresponding values for narrow maxima are 12,38 and 1.8 days (2). The mean cycle for super outbursts is about 328 days, but this appears to change abruptly so that cycles of around 234, 324 and possibly 419 days operate at times with narrow outbursts following super maxima at intervals of about 171 days (2). Eclipses of the hot spot and primary can be observed visually.

Table 2 lists eleven observations of what may be short-lived flares or precoursers to outbursts.

TABLE 2

OY CAR - POSSIBLE PRECOURSERS

No	OBSERVED JD 24	Mag v	Obs	JD Max 24 ...	Int	PRECEDING JD	Mag	Obs	FOLLOWING Jd	Mag	Obs
1	43,631.0	13.7	Cj	43,695	64	630.82	<13.2	Hl	631.78	<13.2	Hl
2	632.91	13.7	Jo	43,695	62	631.78	<13.2	Hl	633.07	<14.0	Sb
3	44,746.83	14.1	HV	44,869	122	746.80	<13.2	Jo	746.84	<13.2	Fl
4	44,963.95	14.3	HV	45,004	40	962.89	<13.2	Hl	964.40	<13.2	OV
5	45,111.84	12.3	Fl	45,157	45	111.81	<13.4	MA	112.19	<12.7	OV
6	45,368.02	14.3	Dt	45,542	174	367.90	<13.2	Jo	368.38	<13.2	OV
7	45,526.212	13.0	OV	45,542	16	525.81	<12.7	HA	526.87	<13.2	SF
8	45,665.11	12.8	Jo	45,791	126	662.90	<13.2	Mf	666.13	<13.2	Jo
9	46,038.575	13.6	OV	46,184	146	037.53	<13.2	OV	039.54	<14.1	OV
10	46,327.628	12.3	OV	46,829	502	322.80	<12.5	Hl	329.84	<12.7	Mf
11	46,472.527	12.3	OV	46,829	357	471.89	<13.2	Hl	472.90	<13.2	Jo

REMARKS TO TABLE 2

Nos. 1 & 2 Possibly a very faint and short outburst.

No. 4 The observer reported "faint but clear".

No. 5 Observer reported, "Dropped to fainter than 13.5 in five minutes".

Nos.10 & 11 The long intervals noted suggest some outbursts were not seen. Two doubtful observations, of class 2, were reported on 46,533.86 at 12.9 and 46,560.88 at 12.6. These preceded outbursts on 46,829 but are considered too doubtful.

Seven of the observations in Table 2 were made by the most experienced observers--- T.A. Cragg (Cj), A.F. Jones (Jo) and M.D. Overbeek (Ov). The latter two sometimes express their suprise at seeing a dwarf nova bright by exclamation marks or question marks, but their original records have nothing to indicate that their estimates were other than first class.

Nos. 1 and 2 can possibly be regarded as a minor, short outburst as it was recorded by two observers at magnitude 13.7 within two days of each other. However, the negative observations show that the star did not get any brighter.

No. 5 has the comment by the observer that the variable faded from 12.3 to fainter than 13.5 within five minutes. This implies that there was either a flare or that some atmospheric effect undected by the observer caused the variation.

The intervals listed in Table 2 range from 16 to 174 days, ignoring the last two entries whose long intervals suggest that some maxima went unobserved. OY Car has a long mean cycle in comparison to that of V442 Cen. This may possibly cause flares and or precoursers to have a more random distribution of intervals before the following outburst.

6. TU Men.

A SU UMa star with both supermaxima and narrow outbursts. This star is discussed on pages 40-43 in this issue. Bateson & Jones (3) gave a list of what they termed faint peaks as distinct from bright outbursts. I have carefully checked all these with the observers original records and found that with very few exceptions they fail to meet the standards I have outlined on the previous pages.

Table 3 lists seven possible flares or precoursers. The two observations shown for No.4 appear to be definite precoursers to the outburst which followed 20 days later, because they are separated from the onset of that outburst by six good negative observations.

The range of intervals in Table 3 is from 20 to 222 days, which when the mean cycle is considered suggests that they may be precoursers.

TABLE 3.

TU Men--POSSIBLE PRECOURSERS

No	OBSERVED JD 24,,,,,	Mag v	Obs	JD MAX 24.....	INT d	PRECEDING JD	MAG	Obs	FOLLOWING JD	MAG	Obs
1	38,733.11	14.2	Jo	38,832	99	731.94	(13.9	Jo	734.12	(13.9	Jo
2	41,196.21	13.9	Jo	41,256	60	195.87	(13.3	Jo	198.81	(13.3	Jo
3	41,549.22	14.1	Jo	41,658	109	546.25	(13.9	Jo	551.91	(13.3	Jo
4	(41,823.84	13.7	Jo)	41,844	20	817.23	(13.9	Jo	826.80	(13.1	Jo
	(41,824.90	13.7	Jo)								
5	44,012.9	13.5	Ty	44,060	47	012.79	(13.5	Jo	013.55	(13.5	Jo
6	45,606.912	13.7	Jo	45,684	77	606.88	(12.7	Hl	607.527	(13.0	Ov
7	45,707.97	13.2	Hi	45,930	222	706.10	(13.8	Hl	708.18	(14.5	Gp

REMARKS TO TABLE 3

No. 4. The two observations were separated from the onset of maximum on 41,844 by six negative observations of (13.7 or (13.9 between 827.82 and 839.87.

7. CONCLUSIONS

Until this series of papers is completed I draw no conclusions. However, I do invite comments on this subject. I also urge all observers, when they observe events like those now reported, that they repeat their observation within a few minutes and make certain that they provide a clear indication of the sky conditions and the degree of reliability of their estimates.

ACKNOWKEDGEMENTS

My thanks are due to N. Vogt for discussions; in fact without his interest this paper would not have been written. I also thank all those observers who have reported these unusual events.

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THE MEAN CYCLE OF THE DWARF NOVA, UY PUPPIS

Frank M. Bateson

SUMMARY: Over an interval of 4,367 days 90 outbursts of UY Pup have been observed. The most probable mean cycle is 34.93 days. Wide and narrow maxima occur in a random manner with wide being more frequent. They differ little in mean brightness and have widths of 10.11 and 4.0 days respectively. Wide maxima tend to have slow rises and declines.

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1. INTRODUCTION

Bateson (1) listed 37 outbursts during the interval J.D. 2,443,890 to 2,445,425. This list is now extended to 2,448,257 (1990 Dec. 31).

2. OBSERVATIONS

The observing season is from November through May with a limited number of observations in October and June. This results in large gaps in the records. All observations were made visually by members of the Variable Star Section, R.A.S.N.Z. using the sequence of comparison stars measured by Vogt (2) as shown on chart 524 (3).

Observed outbursts between J.D. 2,445,426 and 2,448,257 are shown in Table 1. The star has been more closely monitored than in (1), because of the attention paid to UY Pup by observers using larger apertures.

3. DISCUSSION

This discussion includes the data in Table 1 and that in the previous paper. The faint peaks in (1) have been disregarded, because they depend on single estimates and

are probably part of an outburst unobserved. Intervals of less than 60 days between outbursts I have taken as showing that those outbursts were consecutive. If this is incorrect, then the mean cycle determined will be shorter than indicated. There are 62 such intervals for which the intervals in Table 1 are reliable. These give a mean cycle of 34.93 days. This value has been arrived at by regarding several pairs of outbursts listed in (1) as being of the same outburst, which was not apparent due to the infrequency of the observations on which that list was based. Now that more accurate information is available on the nature of the outbursts this surmise appears correct. The outbursts referred to are: 2 and 3; 16 & 17; 22 & 23; 25 & 26; 28 & 29; 36 & 37.

There are both wide and narrow maxima, the main features of which are shown below.

TYPE	NEAN Mag_v=	RANGE	MEAN WIDTH$_d$	RANGE
NARROW (N)	13.81 (28)	13.4-14.5	4.0 (14)	1^d - 5^d
WIDE (W)	13.67 (42)	12.9-14.4	10.11 (35)	6 -17

The figures in brackets show the number of examples in each mean that were considered reliable. Widths show the number of days on which the star was brighter than 14.5, as shown by positive observations.

Wide maxima are more frequent and usually show rather slow rises and declines. The maximum brightness of wide outbursts generally varies little from the mean, but occasionally they peak at 14.3, with a slight tendency for subsequent maxima to be brighter than the mean.

Narrow maxima differ from wide only in their widths and because their rises and falls are more rapid, Minima are fainter than 16.0.

4. CONCLUSIONS

UY Pup has a mean cycle of 34.93 days. Wide maxima are more frequent than narrow, but both types differ little in maximum brightness. The widths are 10.11 and 4.0 days respectively. The extreme visual range is 12.9 to fainter than 16.0. Wide ,axima usually rise and decline slowly whilst narrow have rapid rises and falls.

ACKNOWLEDGEMENTS

My thanks are due to all observers, especially to those using larger apertures who have so closely monitored UY Pup in recent years.

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TABLE 1

OUTBURSTS OF UY PUPPIS

No.	J.D. Max 24	MAX m_v	INT. d	WIDTH d	TYPE	No. Obs.	REMARKS
38	45,443	13.8	45	2	N	2	
39	454	13.8	12	4	N	3	
40	678?	12.7?	(224)	?	?	1	(678.26 <15.0 (678.357, 12.7 (then gap 20^d.
41	701	14.3	23	6	W	4	
42	724	13.8	23	15	W	6	
43	756	13.5	32	8	W	6	
44	813	13.2	57	5	N	6	
45	854?	14.5?	41?	?	?	1	Gap 9^d before 854.
46	46,034	14.5	(180)	?	?	1	(Gap 179^d (before 034.
47	056	14.6	22	?	?	1	)Possibly the
48	46,063	14.3	7	5	N	3	)same outburst.
49	088	14.4	25	7?	W?	3	
50	098	13.6	10	22?	W	9	(Possibly this may
51	137	14.5	39	3	N	2	(be two outbursts.
52	175	13.8	38	2?	N	3	
53	379?	14.0	(204)	?	N?	2	Gap 17^d before 379.
54	412?	13.4	33?	?	?	1	Gap 4^d before 412.
55	451	13.9	39?	?	?	1	(Gaps 6^d before & (3d after 451.
56	46,461	13.8	10	6	W	4	
57	501	14.0	40	13	W	13	
58	46,539	14.0	38	9	W	8	
59	561	13.9	22	1	N	1	
60	577	13.8	16	6	W	8	
61	745	14.1	(168)	2	N	4	
62	797	13.8	52	6	W	5	
63	843	13.5	46	10	W	11	
64	889	13.7	46	5	N	11	
65	940	13.4	51	3	N	7	
66	47,069?	13.9	(129)	?	?	2	(Gap 15^d before & (3d after 069.
67	113	13.6	44	11	W	7	
68	47,151	13.8	38	8	W	7	
69	183	13.5	32	8	W	23	
70	214	13.9	31	10	W	12	
71	256	13.9	42	9	W	8	
72	293	13.5	37	15	W	33	
73	394?	13.5	(101)	?	?	2	(Gaps 76^d before & (18d after 394.
74	468?	13.4	74?	4?	N?	2	Gap 26^d before 468.
75	497?	13.8	29	?	?	1	(Gap 2d before & (9d after 497.
76	531	13.1	34	11	W	13	
77	568	13.5	37	12	W	11	

TABLE 1 (cont)

OUTBURSTS OF UY PUPPIS CONT'D.

No.	J.D. Max 24	MAX m_v	INT. d	WIDTH d	TYPE	No. Obs.	REMARKS
78	47,617	13.6	49	8	W	10	
79	661	13.2	44	13	W	13	
80	808?	13.5	(147)	?	?	2	Gap 23^d after 808.
81	859	12.9	51	14	W	10	
82	888	14.3	29	4	N	10	Rise from 15.0, 4^d.
83	908	14.3	20	9	W	9	Fall to 15.4, 9^d.8.
84	940	13.2	32	14	W	16	Rise from 14.2, 4^d; Fall to 14.3, 10^d.
85	979	13.9	39	11	W	14	Rise from 14.7, 8^d.
86	48,012	14.3	33	5	N	4	
87	057	13.8	45	4?	?	4	(Gap of 100^d (after 061.
88	48,178	13.1	(121)	14	W	13	(Rise not seen. (Unlikely maximum (was earlier - (Fall to 15.00, 16^d.
89	222	13.2	44	?	W?	5	(Rise from <14.7, 2^d. (Gap of 7^d after 225.
90	253	13.9	31	12	W	10	Rise from 14.7, 8^d Fall to 15.0, 11^d.

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KK TELESCOPII---A FAINT DWARF NOVA

Ranald McIntosh
Unit 68,36 McLeod Road
Henderson,Auckland
New Zealand

SUMMARY: KK Tel has a mean maximum magnitude of 13.81. Minima are well below 16.0. Details of five outbursts are given. The mean cycle is possibly around 100 days, but this is very uncertain, because the faintness of outbursts suggests that these are often not seen.

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1. INTRODUCTION

KK Tel is catalogued as of U Gem type with a range of 13.5 to 19.7:B (1). Four outbursts were reported (2) and none in (3). Charts 494 & 495 (4) had comparison stars lettered. A finding chart from an ESO print and a UBV sequence by N. Vogt(5) included some measures for the lettered stars on chart 495.

2. OBSERVATIONS

Between J.D. 2,445,862 and 2,448,129 members of the Variable Star Section, R.A.S.N.Z., recorded 593 visual estimates of KK Tel, almost all of which were negative. The observing season is May through December with a few observations in April each year.

The five outbursts observed are listed in Table 1.

3. DISCUSSION

Nine outbursts have been observed, including those previously published. These have a mean maximum visual magnitude of 13.81 with a range of 13.2 to 14.3. No data can be given on the durations of maxima, because of their faintness and the small number of positive observations. Possibly there are both wide and narrow maxima, but even this is uncertain as only a very small part of the light curve has been seen.

Although KK Tel was more closely monitored during 1989 and 1990 than in earlier years there were still gaps in the records during which outbursts could have passed unobserved. This makes it impossible to state anything about the mean cycle with any degree of certainty.

The intervals between outbursts range from 84 to 2490 days. Ignoring three very large intervals the remainder range from 84 to 322 days. Possibly the mean cycle is around 100 days. However, much closer monitoring is required to verify this suggestion.

Some observers have overlooked Vogt's finding chart and sequence. His V magnitudes, rounded off to tenths, are reproduced with his chart. Observers need to exercise care in order not to confues comparison star "3" ("s" on chart 495) with the variable.

4. CONCLUSIONS

The only definite statement I can make is that KK Tel requires much closer attention, especially from those using telescopes with thresholds well below 14th magnitude.

ACKNOWLEDGEMENTS

I thank observers for their estimates, especially W. Goltz and M.D. Overbeek who were responsible for the majority of the observations. I am also indebted to Frank Bateson for his guidance.

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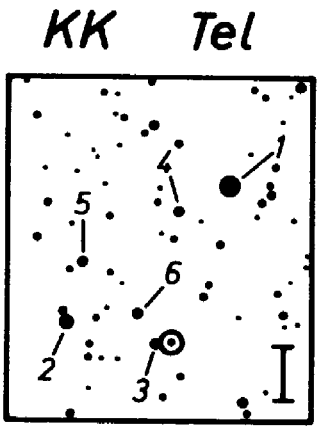
TABLE 1.

KK TELESCOPII--OBSERVED OUTBURSTS

No	MAX. J.D.	MAX MAG_v	INT_d	No. OBS	REMARKS
5	2446,945	13.4	(2490)	1	
6	2447,055	14.3	110	2	
7	2447,377	13.8	322	2	
8	2447,632	14.0	255	1	
9	2447,816	13.8	184	6	Fell to 14.7 in 6 days



FINDING CHART FOR KK Tel
By N. Vogt from ESO print
(North at top;West to right)

V MAGNITUDES FOR SEQUENCE ON ABOVE CHART

No. 1	11.0		
2	11,9		
3	13.8	= "s"	on chart 495
4	14.7	= "x"	do
5	15.1	= "w"	do
6	16.5		

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THE DWARF NOVA BV PUPPIS

Frank M. Bateson & Ranald McIntosh
Variable Star Section, R.A.S.N.Z.

SUMMARY: Seventy-two outbursts are listed. A mean cycle of 19.26 days was found. Narrow and wide maxima occur with the former twice as frequent. The mean widths at maximum are 3,08 days for narrow and 8.33 days for wide with only a slight difference in their mean brightness at maximum.

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1. INTRODUCTION

Details of ourbursts of BV Pup to J.D. 2,445,782 were published by Bateson (1,2). We now extend these to 2,448,257 (1990 December 31).

2. OBSERVATIONS

All observations were made visually by members of the Variable Star Section, using

charts 467-469 (3) and the sequence of V magnitudes shown thereon. The observed outbursts are shown in Table 1.

3. DISCUSSION

The main observing season is November through June during which BV Pup has been reasonably well observed. Outside these months there are large gaps in the records. We have used the data in previous papers as well as those shown in Table 1.Bateson's first list (1) showed most outbursts therein depended on very limited estimates. Since then the coverage has steadily improved.

There are 87 intervals between maxima that appear to be consecutive. These give a mean cycle of 19.26 days. Maxima are either narrow or wide as shown below:

BV Pup--SUMMARY OF MAXIMA

TYPE	MEAN MAX M_V	RANGE	MEAN WIDTHS d	RANGE OF WIDTHS
NARROW	13.62(58)	12.0 -14.2	3.08(58)	1-5 days
WIDE	13.38(30)	13.0-14.1	8.33(30)	6-14 days

The figures in brackets show the number of outbursts used to determine the means. These represent those outbursts with parameters considered reliable. The magnitude 12.0 for outburst No. 69 we consider overstated, unless there was a sudden flare which is most unlikely.

Narrow maxima are roughly twice as frequent as wide ones. We found no regular sequence in which wide maxima followed each other as on occasions two wide maxima were seen in quich succession, whilst at other times consecutive wide maxima were separated by large intervals.

The rates of rises and declines could rarely be determined with accuracy, because the faintness of maxima means that only the top segment of the light curve was seen. However, it does appear that the rise is usually steep although there were some outbursts that had slow rises. Declines were less steep.

A preliminary plot of some very well observed wide maxima gave us the impression that they resembled the superoutbursts of SU UMa stars. However, when allowance was made for the systematic deviation of each observer this resemblance disappeared. The resultant curve then became that of a normal U Gem variable.

All that we can state about minima is that they are fainter than 16.0.

4. CONCLUSIONS

BV Pup belongs to the SS Cyg sub-class of dwarf novae with narrow and wide maxima that differ from each other in their duration at maximum but only marginally in their mean maximum brightness. The mean cycle is 19.26 days.

ACKNOWLEDGEMENTS

We are indebted to all observers for their excellent observations.

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TABLE 1.

OUTBURSTS OF BV PUPPIS

No.	J.D. MAX 24	MAX m_v	INT d	WIDTH d	TYPE	No. Obs.	REMARKS
69	45,821	12.0	42	1	N	2	(Rise from <14.0, $0.^d5$. (Fall to 14.5, $1.^d2$.
70	852?	14.1	31	1?	N	1	Gap 3^d before 852.
71	46,002	13.1	(150)	9	W	6	Rise 3^d. Fall 6^d.
72	037	13.9	35	3	N	5	
73	064	13.5	27	5+	W?	7	Rise 2^d. Gap 10^d after 067.
74	091	13.5?	27	2	N	4	Rise from 14.7 2^d.
75	113	13.5	22	7	W	15	Fall to 14.6 2^d.
76	137	13.8	24	5	N	6	Fall to 14.5 1^d.
77	162	14.0	25	7	W	6	
78	212?	13.7?	50?	?	?	1	(Gap 4^d before 212 (Observed in moonlight.
79	46,340?	14.0?	(128)	9+	W	6	Gap 29^d before 340.
80	379?	13.7?	39?	?	N?	2	Gap 5^d before 379.
81	394	13.6	15?	?	N?	2	(Rose from 14.7 in 2^d (Gap 7^d after 394.
82	410	13.8	16	4	N	5	Rose from 14.8 in $1.^d8$.
83	442	13.8	32	4	N	3	
84	459	13.0?	17	3	N	4	
85	477	13.8	18	2	N	2	
86	494	13.2	17	9	W	13	
87	519	13.8	25	3	N	2	
88	537	13.9	18	4	N	4	Rise 1^d from <14.7.
89	46,563	13.1	26	3	N	4	
90	747?	14.3?	(184)	?	?	1	Gap 11^d after 747.
91	774	13.6	27?	4	N	6	
92	798	13.2	24	6	W	6	
93	820	13.7	22	4	N	14	
94	842	13.1	22	9	W	14	
95	864	13.4	22	2	N	2	
96	880	13.8	16	4	N	10	Rose from 14.7 in 2^d.
97	919	13.4	39	2	N	3	
98	945	13.2	26	2	N	3	

TABLE 1 (cont)

OUTBURSTS OF BV PUPPIS CONT'D

No.	J.D. MAX 24	MAX m_v	INT d	WIDTH d	TYPE	No. Obs.	REMARKS
99	46,966	13.0?	21	4?	N	2	
100	47,053?	14.0	(87)	?	N?	2	(Gap 3^d before 053 (& 9^d after 054.
101	102?	13.7	49	?	N?	2	(Gap 3^d before 102 (& 10^d after 103.
102	127	13.8	25	2?	N	3	Gap 3^d after 129.
103	148	13.8	21	6	W	7	Fall to 14.8 2^d.
104	161	14.0	13	2	N	3	
105	170	14.0	9	2	N	3	
106	181	13.2	11	10+	W	39	(Rose from 14.5 in $0^d.6$ (Gap 3^d after 190 when (still at 13.9.
107	222	13.1	41	13	W	11	(Gap of 4^d between 223 (& 227 in middle of (maximum.
108	249	13.5	27	3	N	6	
109	47,269	13.0	20	4	N	7	
110	288?	14.4?	19	?	N?	2	Gap 5^d before 288.
111	302	13.0	14?	6	W	9	
112	319	13.7	17	3	N	3	
113	422	13.8	(103)	?	N?	1	Gap 5^d after 422.
114	442	13.9	20	3	N	3	
115	457?	13.8	15	?	?	1	Gap 11^d after 457.
116	480	13.4	23?	7	W	7	
117	532	13.6	52	4	N	4	
118	545	13.6	13	4	N	4	
119	47,560	13.8	15	4	N	9	
120	580	13.1	20	11	W	16	
121	604?	13.3	24?	?	?	1	(Gaps 2^d before & 6^d (after 604.
122	612	13.6	8?	9	W	8	
123	649?	13.5	37?	?	?	4	Gap 7^d before 649.
124	663	13.8	11?	?	?	3	(Gaps 3^d between 663 & (666 and 9^d after 667 (when still at 13.8

OUTBURSTS OF BV PUPPIS CONT'D.

No.	J.D. MAX 24	MAX m_V	INT d	WIDTH d	TYPE	No. Obs.	REMARKS
125	47,683	13.3	20	8+	W	8	(Gap 6^d after 691 when (still at maximum.
126	773	13.1	(90)	11	W	12	
127	808?	13.6?	35?	?	?	1	(Gaps 3^d before & 19^d (after 808.
128	857	13.1	49?	10	W	13	
129	897	13.5	40	3	N	4	
130	914	13.7	17	6	W	5	
131	943	13.7	29	8	W	9	
132	975	13.7	32	4	N	4	Fall 1^d to 14.6
133	997	13.5	22	3	N	3	
134	48,004	14.0	7	2	N	3	
135	48,018	13.0	14	11	W	8	(Gap 7^d between 018 & (025 during maximum.
136	049	13.8	31	?	?	1	(Gaps 2^d before & after (049.
137	061	13.7	12	3	N	4	
138	199?	13.8	(138)	7?	W?	4	Gap 5^d after 199.
139	225	13.5	26?	1	N	3	
140	244	13.8	19	5	N	9	

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THE MEAN CYCLE OF CW MONOCEROTIS

Frank M. Bateson

SUMMARY: Twelve additional observed outbursts of CW Mon are listed and the main features of its maxima summarised. The precise length of its mean cycle is uncertain, because of large gaps in the estimates. It appears to be about 160 days.

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1. INTRODUCTION

Observed outbursts to J.D. 2,445.792 were published by Bateson (1, 2). These are now continued to 2,448,408 (1991 May 31).

2. OBSERVATIONS

Visual observations were made by members of the Variable Star Section, R.A.S.N.Z. using chart 361 (3). A finding chart from a Palomar Survey print and three colour sequence of comparison stars were published by Vogt (4). His V values differs, for

some stars, by $0^{m}.1$ in V compared to the magnitudes shown on chart 361. The values on chart 361 have not been amended so that our results are strictly comparable with those of the AAVSO.

The main observing season is September through May. Coverage was poor prior to 1989. It improved thereafter, although there are still gaps in the records even in the main observing season, outside of which the gaps are long when the variable was unobservable..

Details of the outbursts seen are shown in Table 1.

3. DISCUSSION

The following means were derived from those outbursts for which reliable data was obtained.

	MEAN MAX M_V	RANGE	MEAN WIDTHS d	RANGE
NARROW	12.71 (8)	12.4 - 13.6	3.4 (5)	1 - 5 days
WIDE	12.09 (12)	11.6 - 12.7	8.1 (9)	6 - 11 days

It is difficult to determine the mean cycle precisely, because of the uncertainty of some of the intervals in Table 1 and especially of those in the earlier papers when observations were widely spaced in time. First, I used intervals between outbursts of less than 210 days which also fell during the main observing season.
Only such intervals as were reliable were used and they also had to have a number of estimates of the outbursts concerned. There were nine such intervals, ranging from 74 to 206 days. These gave a mean cycle of 151.5 days.

Next I took all intervals shorter than 300 days using lower standards of their reliability. There were 19 such intervals with a range from 35 to 291 days. These gave a mean cycle of 161.6 days.

The best that can be stated about the mean cycle at present is that it is probably about 160 days.

There were a limited number of positive observations during minima. These ranged from 16.0 to 16.4 indicating that the minmimum visual brightness lies in that range.

4. CONCLUSIONS

CW Mon is a SS Cyg variable with both narrow and wide maxima, which have mean maximum magnitudes of 12.71 and 12.09 respectively. Mean widths of maxima are 3.4 days for narrow and 8.1 days for wide. Minima are about 16.2. The most probable mean cycle is about 160 days.

ACKNOWLEDGEMENTS

As alwats I am indebted to all observers for their estimates.

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(3) Bateson, F.M., Morel, M. & Winnett,R. 1977. Charts for Southern Variables Series 9. Publ. by Astronomical Research Ltd., Tauranga, N.Z.
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TABLE 1

OBSERVED OUTBURSTS OF CW MONOCEROTIS

No	J.D. MAX 24.....	MAX M_V	INT d	WIDTH d	TYPE	No. OBS	REMARKS
24	45,957?	12.9	207	?	?	3	(1)
25	46,195	11.9	238	7+	W	4	(2)
26	388	12.6	193	3	N	6	
27	731?	12.5	343?	?	?	2	(3)
28	47,024?	12.1	293	7+	W	6	(4)
29	209	12.0	185	9	W	29	(5)
30	395	12.1	186	?	?	3	(6)
31	528	12.4	133	5	N	6	
32	563	13.6	35	1	N	2	(7)
33	939	11.6	376	6	W	10	(8)
34	48,143?	12.1	204	7	W	7	(9)
35	302	12.0	159	7	W	11	(10)

REMARKS

(1).Gaps 3 days before 957 & 6 days after 959.The 3 observations were all classed as 3 due to moonlight.
(2) Gap 11 days before 195 & 87 days after 202 when variable still at 13.1
(3) Gap 5 days before 731.
(4) Gap 9 days before 024.
(5) Rose from 13.7 to 12.0 in one day.
(6) Gap 5 days before 394, when rise first seen. Gap of 11 days after 397 when variable still at maximum.
(7) Negative observations showed that variable did not get any brighter than 13.6
(8) Rise 1 day; at maximum 1 day; fall to 14.0 in 4 days.
(9) Gap 114 days before 143.
(10) Rise 1 day; at maximum 1 day; fall to 14.5 in five days.

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THE FAINT DWARF NOVA, BB VELORUM

Frank M. Bateson

SUMMARY: It is suggested that BB Vel may be a Z Cam variable. A list of observed maxima shows outbursts of two types whilst this star also appears to have standstills at 15th magnitude.

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1. INTRODUCTION

The list of outbursts of BB Vel is continued from previous papers (1,2) to J.D. 2,448,408 (1991 May 31).

2. OBSERVATIONS

All visual observations were made using charts 366 & 367 (3) with the V magnitudes from the three-colour sequence measured by B. Warner (4). The majority of the observations were made from October through June and even in these months there were often large gaps in the records.

Table 1 shows the outbursts observed between J.D. 2,445,774 and 2,448,408.

3. DISCUSSION

In this discussion I have used the results previously published as well as those in Table 1. The main features of the variations of BB Vel are:

(a) Very short outbursts with a mean width of 1.9 days and a mean maximum visual magnitude of 14.0, (Range 13.4 to 14.5). Many of these probably passed unobserved, since it is pure chance if they were detected in a star that is not well monitored.

(b) Wide outbursts with mean widths of 8.4 days and a mean visual magnitude of 13.25. These wre better observed, because the longer duration provided a better chance that they would be seen at least in part. Their range in brightness was 13.2 to 14.0.

(c) Minima appears to be in the range 14.8 to 15.6

(d) Standstills of 10-15 days were occionally recorded at 15.0-15.2.

(e) The most probable mean cycle is 23.4 days. This is based on the mean of seven reliably determined intervals between consecutive outbursts ranging from 10 to 37 days. Intervals longer than 40 days probably do not represent consecutive maxima.

The information on minima and possible standstills came almost exclusively from observations by W. Goltz and A. Pearce.

4. CONCLUSIONS

BB Vel may be a Z Cam star if subsequent observations confirm the short mean cycle and the presence of standstills. However, it is essential that BB Vel be monitored much better in future.

ACKNOWLEDGEMENTS

I thank all observers with special appreciation to W. Goltz and A. Pearce for their valuable observations at faint limits. My grateful thanks also to Ranald McIntosh for supplying computer print-outs.

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(3) Bateson, F.M., Morel, M & Winnett,R. 1977. Charts for Southern Variables. Series 9. Published by Astronomical Research Ltd., Tauranga, N.Z.
(4) Warner, B. 1976. Publ. Var. Star Section, R. astr. Soc.,N.Z. 4,pp.18-22.

TABLE 1

OBSERVED OUTBURSTS OF BB VELORUM

No	J.D. Max. 24.....	MAX M_v	INT_d	WIDTH d	TYPE	No OBS	REMARKS
18	46,058	14.0	(300)	?	?	1	(1)
19	137	13.6	79	8	W	9	
20	356?	14.5?	(219)	?	?	2	(2)
21	387?	13.4	31	5+	W?	2	(3)
22	546?	13.5?	(159)	?	?	4	(4)
23	739?	14.3?	(193)	?	?	1	(5)
24	814?	14.5	75	?	?	1	(6)
25	822?	14.5	8?	?	?	1	(7)
26	832	14.3	10	?	?	1	
27	47,099?	13.6	(267)	?	?	2	(8)
28	279	12.9	(180)	?	?	1	(9)
29	349	13.8	70	9	W	8	
30	772	13.2	(423)	10	W	7	
31	808?	14.5?	36	?	?	1	(10)
32	881	13.3	73	1	N	2	(11)
33	973	13.2	92	11	W	10	(12)
34	48,178?	13.5	(205)	6	W	5	(13)
35	389?	13.1?	(211)	1	N	1	(14)

REMARKS

(1) Negative observations indicate did not become brighter than 13.7
(2) Gap 90 days before 356.
(3) Gaps 7 days before 387 & 12 days after 392 when still at maximum.
(4) 14.2 on 540; 14.0 on 541; then gap 6^d before 547.Maximum may have been earlier and brighter than shown.
(5) A class 3 observation.
(6) Gaps 2 days before & 4 days after 814.
(7) Possibly Nos. 24 & 25 are same outburst although there was a negative observation of (14.5 between them.
(8) Gaps 7 days before 099 & 19 days after 101 when still at maximum.
(9) Was (13.7 on 278; 12.9 on 279; then gap of 3 days & fainter than 13.7 on 282. Probably the 12.9 was estimated too bright.
(10) Gaps 3 days before and 23 days after 808.
(11) (14.5 on 878; 13.3 on 881; 15.0 on 882.
(12) Rose from 14.3 in 2 days; at maximum 2^d; fall to 14.2 in 6 days.
(13) Gap 15 days before 178.
(14) (13.7 on 387.9; (13.3 on 388.2; 13.1 on 389.217; 15.0 on 389.92.

BOOK REVIEW

WEBB SOCIETY DEEP-SKY OBSERVER'S HANDBOOK. Vol.8. VARIABLE STARS.Edited by K.G.Jones. Enslow Publishers inc., Aldershot, U.K.

The Webb Society has a long history of encouraging observations of double stars and deep-sky objects. This volume departs from this tradition as it is devoted to variable stars. It has been written by John Isles, Director of the Variable Star Section of the B.A.A. He is very well qualified to write such a book, both from his long practical experience in observing and his work in directing the B.A.A. Section.

This volume of 210 pagesis divided into two parts plus appendices. The first part opens with a brief historical account of variable star observing. This is followed by a chapter on the classification of variable stars, illustrated by some light curves. This is mainly intended for reference and is largely details from the General Catalogue of Variable Stars, so well known to our members.

Chapter 3 discusses the various observational techniques and is followed by an excellent chapter dealing with the analysis of observations. Chapter 5 is written to encourage amateurs to take up variable star observation and to suggests how to get started.

Part 2 of 89 pages is a field guide to a large number of selected variables, for each of which there is a finder chart on which the comparison stars are denoted by letters. The magnitudes for these are shown on the right of each chart. The finding charts have been reproduced from a variety of sources but redrafted to the same size with the result that they are not all on the same scale. The scale is shown on each chart. We gave permission for the use of some of our charts for this publication so that it might appeal to southern observers. Facing the charts are details of the variable concerned, which often includes a potted history of it or details of the class to which it belongs.

Unfortunately the author is an enthusiast and, a sa result, has tried to cover too many areas including providing a reference work, a guide to observing and the analysis of observations as well as a field guide. The charts will never stand up to much handling if used for observation, whilst as a refernce work this volume falls far short of a number of other books on variable stars. This is a pity because had the book been confined to being solely to being a guide to encourage amateur observation of variables it would have acieved a better balance. Despite this there are many interesting facts contained within its covers. However, it suffers in comparison with the books by John Percy; M Petit and C. Hoffmeister, so excellently translated by Storm Dunlop. All these works have the additional advantage of hard covers and better printing.

Despite these adverse comments observers may glean some items of interest to them, including a discussion of the various methods emplyed by the different amateur organisations. They should be warned, however, that rather naturally the author is not abreast of the latest data on some of the southern stars. Typical examples are the details on RU Lupi have no reference to the recent and important research which members have read about in "CHANGING TRENDS" in recent years. There are also errors in the details of VW Hyi and Z Cha, whilst the omission of reference to OY Car when mentioning SU UMa stars with eclipses on page 124 is suprising.

On the whole this is a disappointing book. Possibly that is because I have such a high opinion of John Isles that I was looking forward to an outstanding work and thus expected too much.

F.M.B.

OBITUARY

IGNAS STRANSON

It is with deep regret that we received advice of the passing of Ignas Stranson, a highly valued member of the Section. He died in his home at Wacol, near Ipswich, Queensland. He was in a poor state of health in his later years and had not been an active observer for some time.

It was on 1st January, 1961 that Ig, as Mr. Stranson was universally known, wrote to me enclosing his first observations of variable stars. It was W.J. Newell, Secretary, Astronomical Society of Queensland, who had suggested that Ig contact me. At that time Ig's instruments consisted of a 11.5 in Newtonian reflector; (f/ 5.75), a 2 in refractor (cemented doublet) f/16 and a 4 in aperture Schmidt camera f/4.5. The same mounting was used for all instruments, which were kept indoors when not in use, as at that time Ig had no fixed observatory or shelter.

The Schmidt camera had been completedsome four months before Ig first wrote to me. This had been a massive undertaking for an amateur astronomer. He made an extensive study of astrophotography, including a study of practical and theoretical optics. Then he proceded to make every single component himself. This included calculations and figuring of the 4 in primary mirror, the designing and precise figuring of the corrector plate. At first guiding was done by hand using the refractor and slow motions.

It was obvious that Ig was a man skilled in using his hands and with unlimited patience. The corrector plate he made from selected common window glass, which had very high absorption in the blue and infrared. He was then using Ilford HP3 cut film, but was thinking of changing to Ilford HPS. He also constructed a position microscope.

Against this practical background it was easy to see that Ig's field was photography. He wanted to do serious work that would be of value rather than just taking photos of deep sky objects. It was therefore easy to induce him to have a go at taking photos of variable star fields. In October 1961 he sent along his first photos adding the comment: "I am somewhat ashamed of the quality of the photos with the images of the stars strongly elongated due to the hand guiding."

Far from discouraging him such an obvious fault was merely something that had to be overcome and Ig set about improving the quality of his photos with better guiding. He then commenced to embark on taking photos of all variable star fields south of declination -30° in which the variable reached a maximum of 13th magnitude or brighter. His photos, as members know, have formed the basis for so many charts.

Unfortunately, in July 1962 Ig had other problems to contend with when it appeared that the Government wished to take over his property. Luckily, this threat was averted after I had written to the Government stressing the value of the work that Ig was doing. He also received considerable encouragement at this time when Bart Bok visited the local society and urged Ig to persist with his endeavours.

Over the next eleven years Ig took many hundreds of photos of variable star fields. He kept a very careful record of every photo--exposure time, film type and sky conditions. These all proved to be most valuable.

In March 1963 Ig was considering constructing a larger Schmidt of 7 in aperture, f/3.5 with a 6 degree field. It was typical of his determination that, after receiving some advice, he wrote about this new project: "I have never had any spare time, nor could I ever afford anything, but somehow I always manage to do what I desired." He promptly completed the mirror and was soon hard at work figuring the corrector plate. He had the new camera in operation in 1965.

In June 1965 Bart Bok was paying another visit to the Astronomical Society of Queensland. It was arranged that Ig would show Bart Bok many of the photos he had taken and Ig was keenly looking forward to this meeting and the practical advice that he would receive. Unfortunately, Bart was called back urgently to Canberra due to the sudden illness of Arthur Hogg and the meeting had to be camcelled. Ig was very disappointed.

Ig was not content just taking the photos of variable star fields but continued his visual observations. About 1969 he was appointed Director of the Variable Star Section of the Astronomical Society of Queensland. He quickly imparted his enthusiasm to others with the result that many other amateurs started serious variable star observations.

In the winter of 1967 Ig had a long battle with ill health, having great difficulty in shaking off a severe bout of the flu. He was also complaining that his "out of astronomy affairs were running me out of steam." That was caused by what he termed "a foolish mistake" when several years earlier he had gone into growing grapes, which he found to be only "a costly and time consuming effort." He was even relieved, when in November 1967, a hailstorm battered his grapes to pieces. Characteristically he counted this as a blessing since he could then get back to astronomy.

Ig continued to improve his equipment and was always coming up with new ideas on which he sought advice. He was very happy doing both his photographic work and visual observation. However, his health was causing problems. In fact these had plagued him for two years before he went to see a doctor. He responded to the treatment but complained that he was tired out.

It is probable that this was the start of ill-health that plagued him in his later years. He never complained except about the Queensland summer weather and rarely wrote about his own problems. We finally met in 1971 when I visited Brisbane and this brought him much pleasure. Unfortunately, by this time his health had really started to fail. By the end of 1972 his astronomical activities ceased. In one of Ig's very rare complaints he said that he was overburdened with work and was "getting much older than I used to be."

The Section has lost a highly valued member in the death of Ignas Stranson. He not only made a very valuable contribution in both his photographic and visual work but also in his encouragement to others. His determination to accomplish something useful against enormous problems and ill health is an inspiration to all.

Sue Dreves has advised me that Ignas Stranson died a very lonely man without any family. Ig had not attended meetings for some years and it was only in a roundabout way that the Society heard of his death six months later. By that time his home had been sold and the new owner had sent his library to the dump. All that was left was the Schmidt camera in its large domed observatory. The dome was falling apart and not salvagable.

The Schmidt camera was donated to the Astronomical Society of Queensland and, after some repairs and modernization, it will be erected as the Stranson Memorial Schmidt Camera to continue the work of a dedicated man who achieved his goal by making a useful contribution to astronomy.

F.M.B.