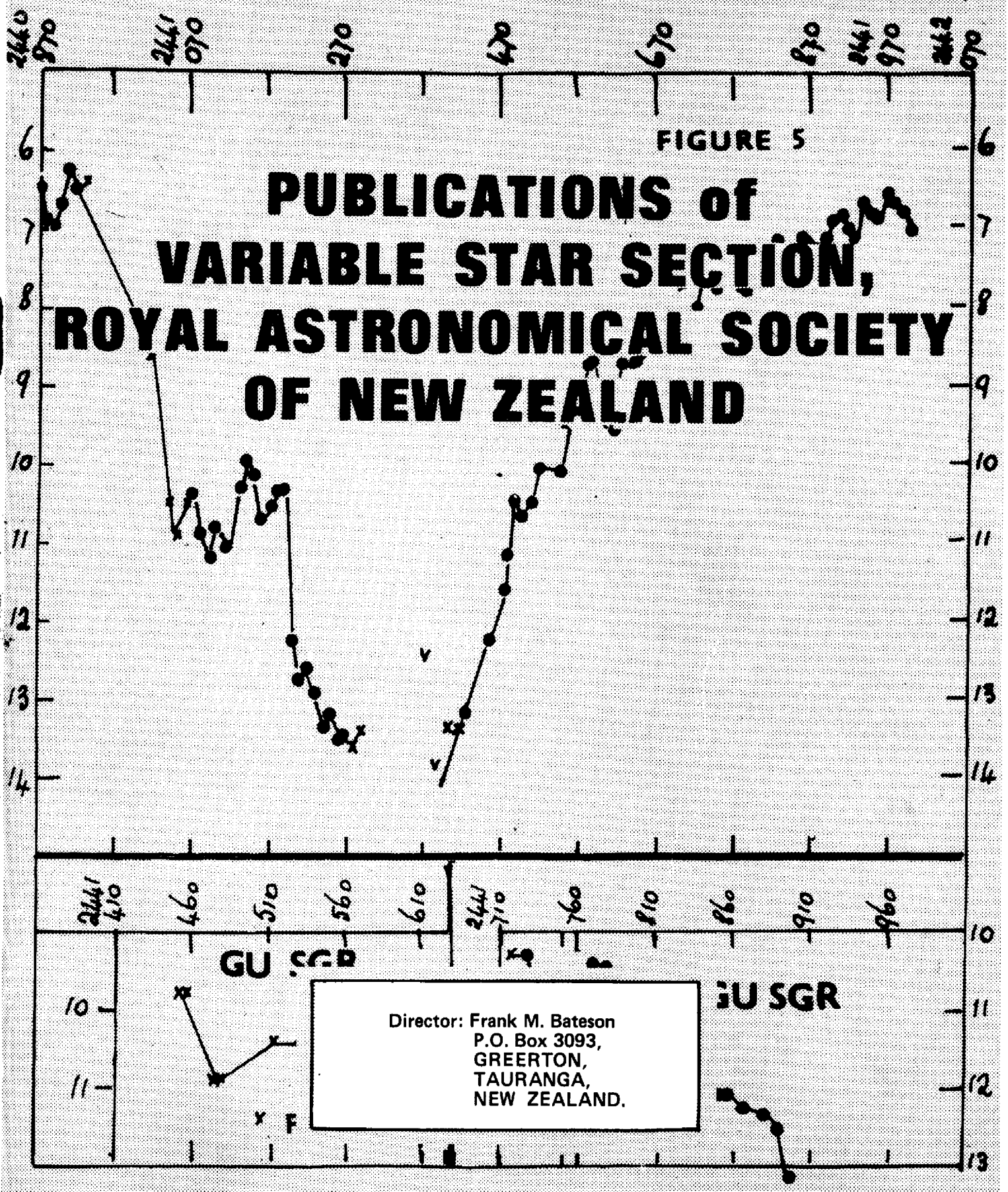
No. 13 (C85)

FIGURE 5

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



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PUBLICATIONS OF THE VARIABLE STAR SECTION, ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND.

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THE LIGHT CURVE OF THE DWARF NOVA, VW HYDRI.

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SUMMARY: A light curve for VW Hyi covering the interval J.D. 2,442,600 to 2,444,502 is presented. Seventy two observed outbursts are tabulated and individual light curves for most outbursts are reproduced on enlarged scales. The mean interval between successive outbursts, irrespective of their types, is $26^{d}.59$. The mean interval between successive super-outbursts is $174^{d}.90$. The results are discussed.

. . . . . .

1. INTRODUCTION

Bateson (1) published the light curve for VW Hyi covering the interval J.D. 2,434,604 to 2,442,600. His paper (hereafter referred to as Paper 1)listed details of 292 observed outbursts. J. Smak (2) made a statistical analysis of these results.
The present paper continues the light curve of VW Hyi from J.D. 2,442,600 to 2,444,502. A total of 4418 observations were made in this interval, excluding doubtful observations which were rejected.

2. GENERAL LIGHT CURVE

All the 4418 observations are plotted as individual points in Figures 1 to 7. These figures are arranged in segments of the light curve, each of which covering 300 days. These light curves illustrate how well VW Hyi has been monitored, and, provide, on a small scale, an overall record of the star's variations.
The sign "v" in all figures indicates that the variable was invisible and fainter than the magnitude shown. It should be noted that the positive observation of 12.4 at 2,442,672 in Fig.1 should have been shown as negative.

3. OBSERVED OUTBURSTS

Table 1 lists details of observed maxima as a continuation of Table 2 in Paper 1. The first column,N, of the table continues the numbering of each outburst. The next two columns give respectively the J.D. of maximum and its visual magnitude. The fourth column gives the interval, in days, between successive maxima, irrespective of type. The fifth column, Wt., indicates the degree of accuracy assigned to the data in the preceding columns on the scale of 5 to 1, with 5 representing data well determined and 1 poorly determined. Remarks, when considered necessary, are given in the final column.
The data in Table 1 has been derived from the computer produced light curves and reference to the observations when necessary.

Table 2 summarises information on normal maxima under their order of occurrence from the preceding super maximum. The second column gives the mean interval from the preceding normal maximum in the case of normal maxima from 2nd through 8th and for the 1st normal maximum the mean interval from the preceding super maximum. The range of intervals is shown in the third column, followed by the number of outbursts observed. The last three columns give the mean visual magnitude; the range in magnitudes and the number of outbursts used for the details of magnitudes.

TABLE 1.

OBSERVED OUTBURSTS OF VW HYDRI

N.	J.D. MAX. 2,440.000+	MAX. M_V	INT. d	Wt	REMARKS
293	2601.6	10.2	16.3	3	
294	2628.9	9.3	27.3	4	
295	2652.9	9.8	24.0	4	
296	2684.5	10.0?	31.6	3	Maximum in daylight. Probably brighter than 10.0
297	2700.0	9.9	15.5	5	
298	2709.9	9.0	9.9	5	
299	2722.6	11.4?	12.7	3	Maximum in daylight. Probably brighter than 11.4
300	2757.2	8.7	34.6	5	Supermaximum
301	2783.9	9.3	26.7	5	
302	2800.5	10.0	16.6	5	Outburst in daylight. Probably slightly brighter than 10.0.
303	2824.0	9.3	23.5	5	
304	2845.9	9.3	21.9	5	
305	2870.9	9.0	25.0	5	
306	2891.9	9.3	21.0	5	
307	2911.8	9.3	19.9	5	
308	2924.8	9.9	13.0	5	
309	2940.7	8.7	15.9	5	Supermaximum
310	2968.6	9.2	27.9	3	
311	2990.6	9.2	22.0	5	
312	3015.9	9.9	25.3	5	
313	3042.0	9.1	26.1	4	
314	3080.8	8.7	38.8	5	
315	3117.0	8.7	36.2	5	Supermaximum
316	3142.0	9.7	25.0	3	
317	3175.9	9.3	33.9	5	
318	3218.5	9.1	42.6	4	
319	3242.9	9.3	24.4	4	
320	3277.9	8.6	35.0	5	Supermaximum
321	3299.9	9.9	22.0	4	
322	3323.5	9.6	23.6	3	
323	3350.0?	9.3?	26.5	2	
324	3385.0	9.3	35.0	3	
325	3414.1	9.3	29.1	4	
326	3442.9	8.6	28.8	5	Supermaximum
327	3468.9	9.7	26.0	4	
328	3488.0	9.6	19.1	5	
329	3512.7?	9.6?	24.7	4	Maximum probably in daylight
330	3548.9	9.2	36.2	5	
331	3587.9	8.9	39.0	5	
332	3644.0	8.4	56.1	5	Supermaximum
333	3671.2?	9.3?	27.2	4	
334	3698.8	9.6	27.6	5	
335	3721.0	9.3	22.2	5	
336	3759.0	9.0	38.0	5	
337	3789.8	9.0	30.8	5	
338	3804.0	8.9	14.2	5	Supermaximum
339	3833.1	9.3	29.1	5	
340	3853.0	9.5	19.9	5	
341	3880.9	8.9	27.9	5	

TABLE 1 (cont)

OBSERVED OUTBURSTS OF VW HYDRI

N.	J.D. MAX. 2,440,000+	MAX. M_v	INT. d	Wt.	REMARKS
342	3918.0	9.1	37.1	3	
343	3955.0	9.2	37.0	5	
344	3980.5	9.1	25,5	5	Supermaximum
345	4007.7?	10.0?	27.2	3	Outburst in daylight. Probably brighter than 10.0
346	4021.7	9.7	14.0	5	
347	4036.4?	9.9?	14.7	2	Outburst possibly in daylight & brighter than 9.9
348	4068.8	9.2	32.4	5	
349	4095.8	9.5	27.0	3	
350	4120.0?	9.3?	24.2	2	Gap of 3 days in observations, at time of maximum.
351	4137.4?	9.5?	17.4	4	Outburst maximum possibly in daylight.
352	4161.0	8.6	23.6	4	Supermaximum
353	4190.0	9.6	29.0	5	
354	4213.3	9.7	23.3	4	
355	4243.9	9.5	30.6	5	
356	4264.9	9.5	21.0	5	
357	4281.6?	9.4?	16.7	4	
358	4315.9	9.1	34.3	5	
359	4351.9	9.0	36.0	5	Supermaximum
360	4377.5	9.8?	25.6	4	Maximum possibly in daylight
361	4394.0?	9.8?	16.5	1	Gap of 4 days in observations at time of maximum.
362	4418.7	9.6	24.7	3	
363	4446.8	9.1	28.1	5	
364	4484.8	9.0	38.0	5	Supermaximum

TABLE 2

NORMAL MAXIMA OF VW HYDRI

Number AFTER SUPER MAX.	MEAN INT. d	RANGE OF INTERVALS. d	No.	MEAN M_v	RANGE M_v	No
1st	28,78	22.0-29.1	11	9.61	9.2-10.0?	11
2nd	21.16	14.0-33.9	11	9.65	9.2-10.2	11
3rd	26.36	14.7-42.6	11	9.43	8.9-9.9	11
4th	29.47	21.0-38.0	11	9.26	9.0-9.8	11
5th	30.55	16.7-39.0	9	9.22	8.7-10.0?	9
6th	23.75	15.5-34.3	4	9.40	9.1-9.9	4
7th	15.73	9.9-19.9	3	9.27	9.0-9.5?	3
8th	12.85	12.7-13.0	2	9.9	...	1

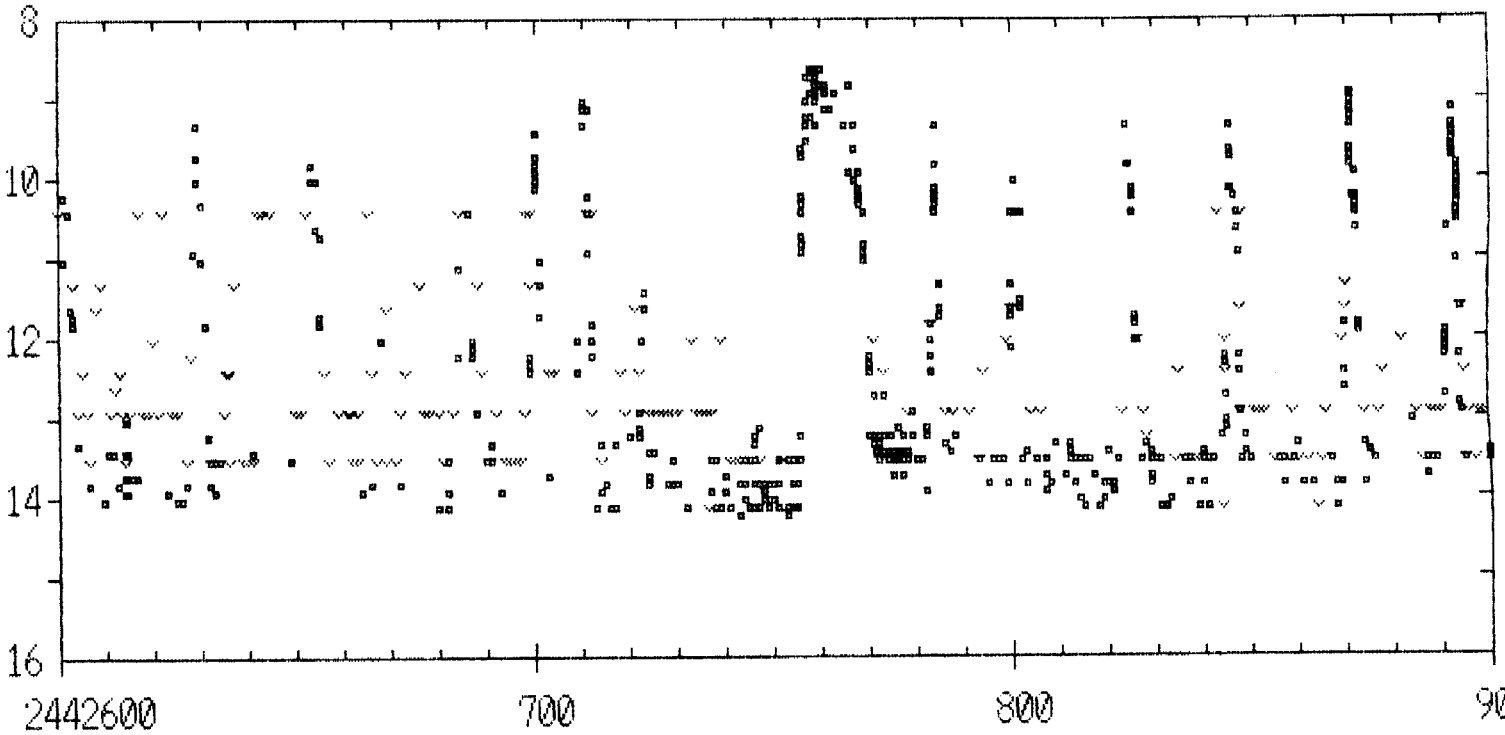


Figure 1. VW Hydri- Light Curve. 2,442,600 - 2,442,900.

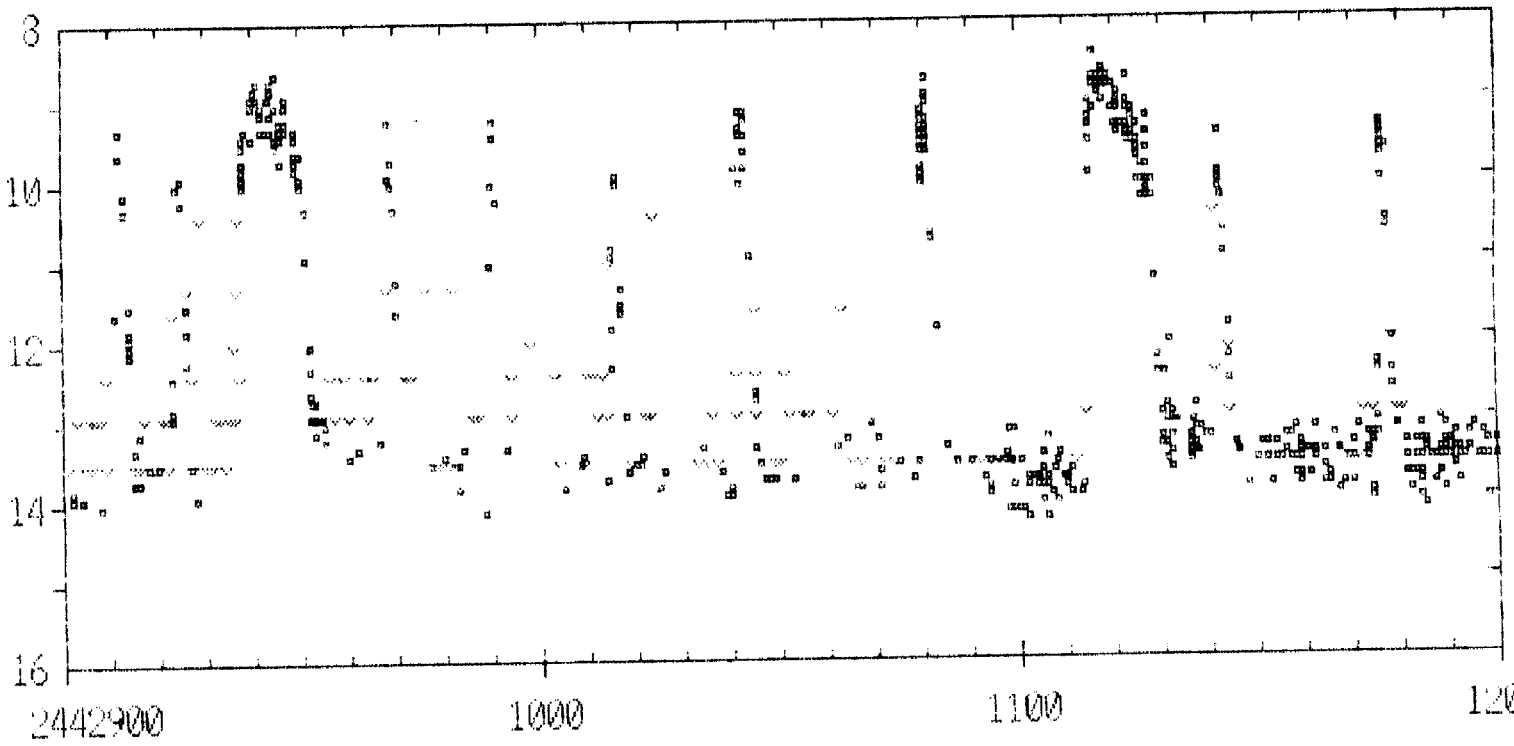


Figure 2. VW Hydri Light Curve 2,442,900 - 2,443,200

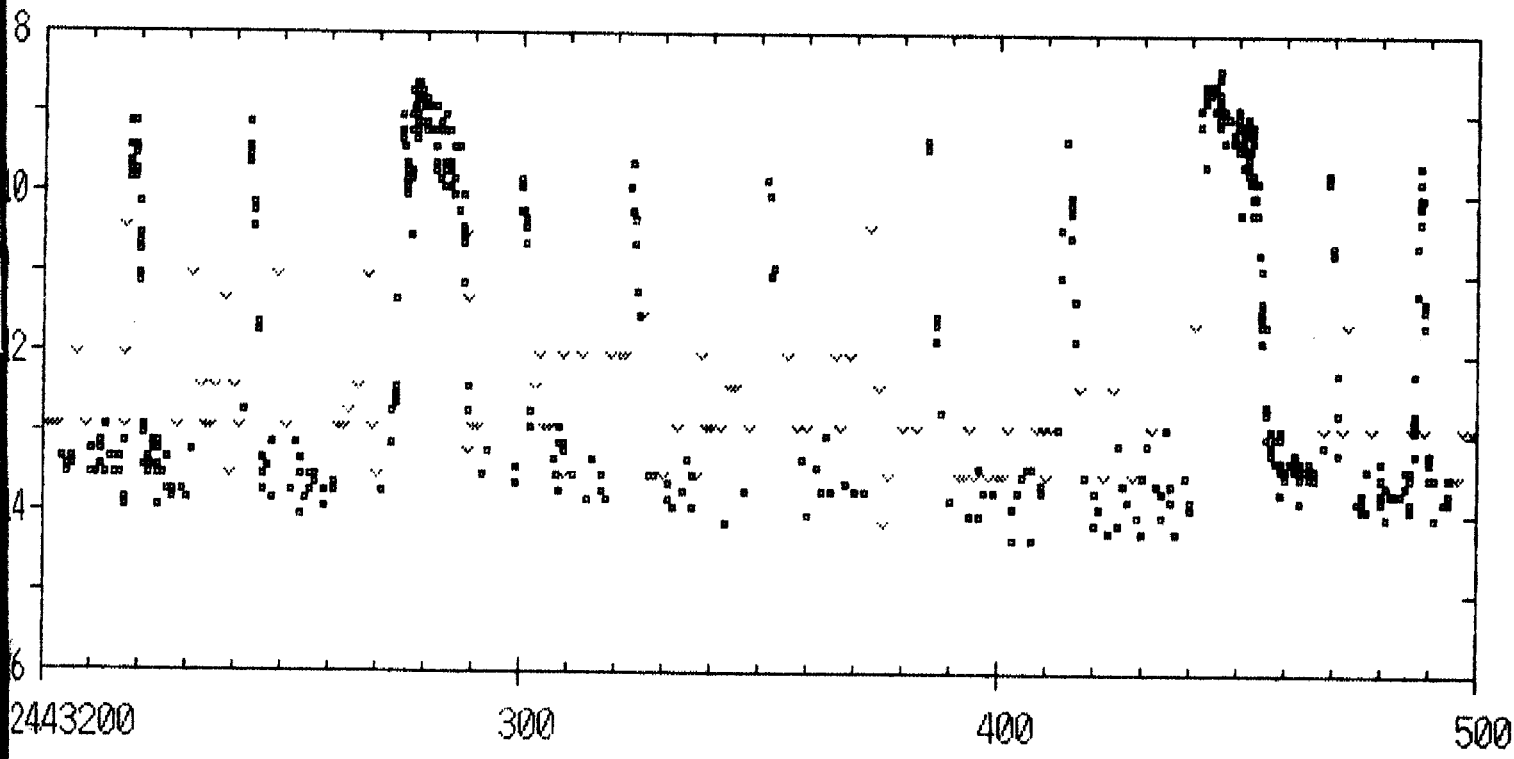


Figure 3. VW Hydri Light Curve 2,443,200 - 2,443,500

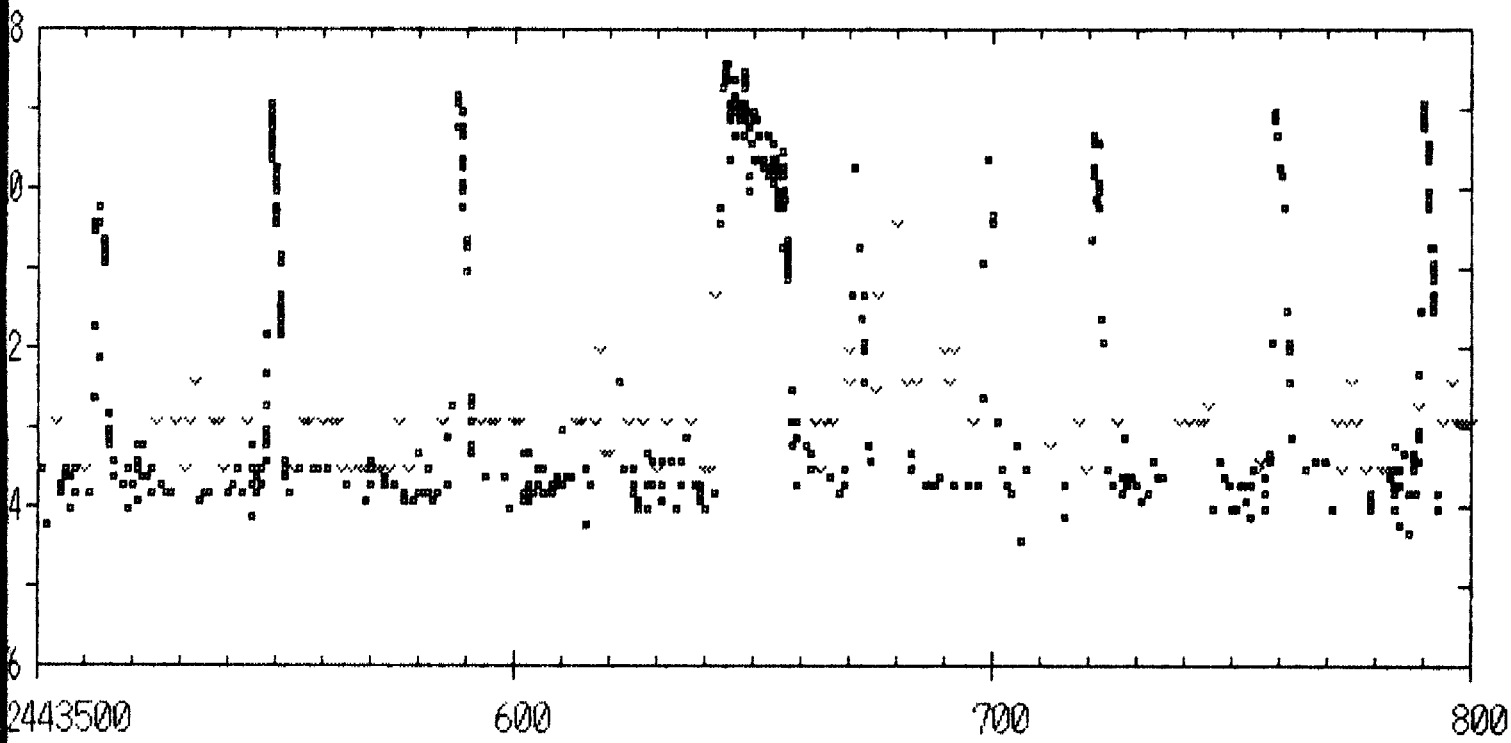


Figure 4. VW Hydri Light Curve 2,443,500 - 2,443,800

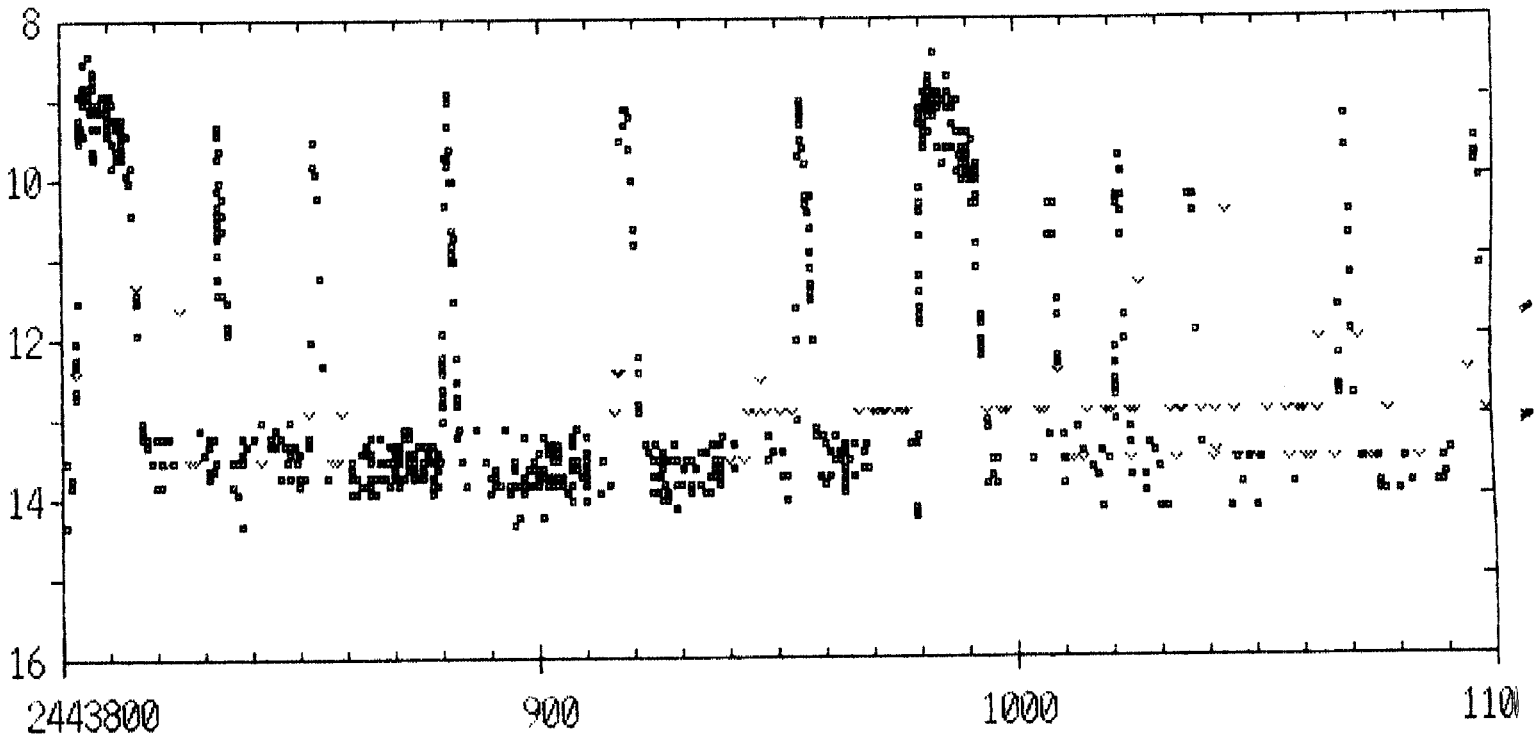


Figure 5. VW Hydri Light Curve 2,443,800 - 2,444,100

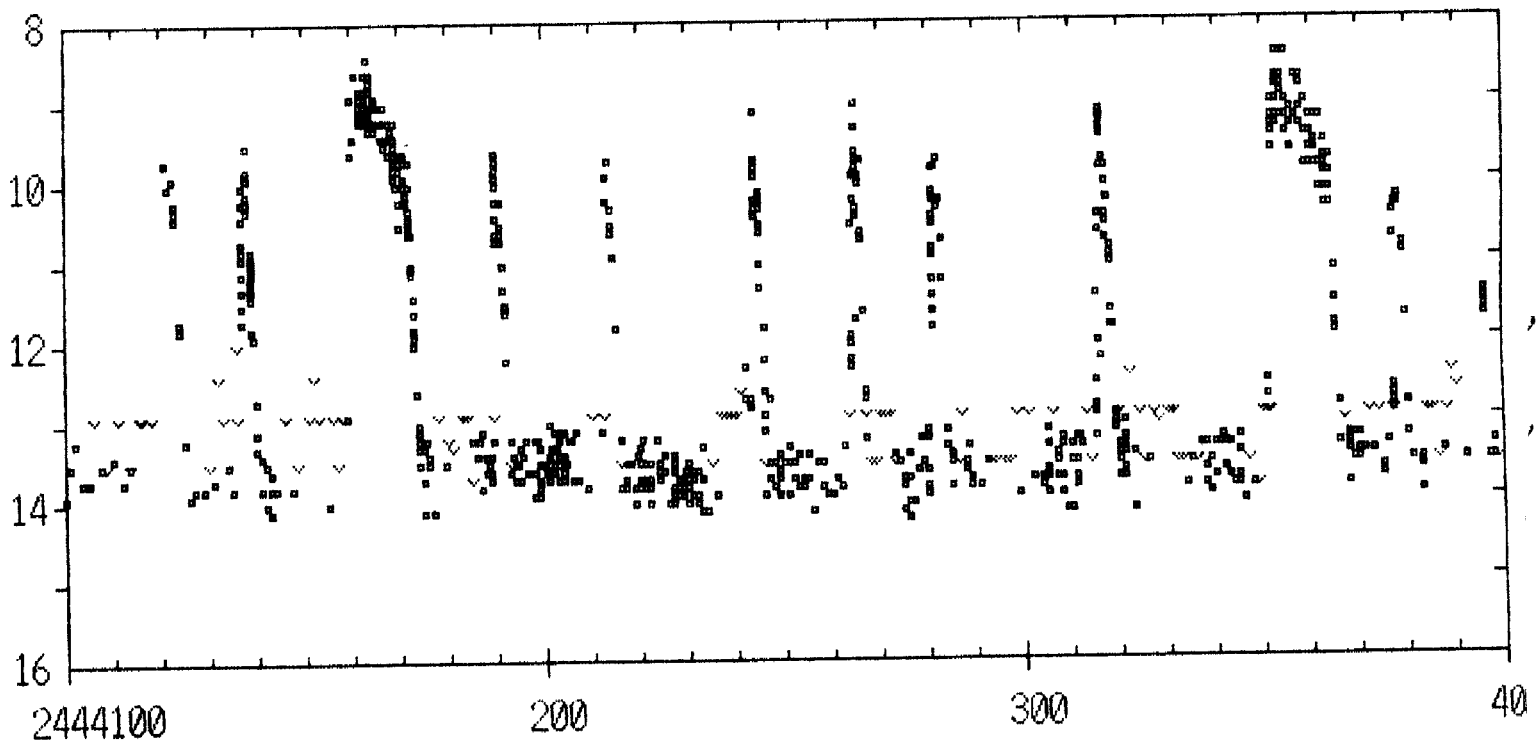


Figure 6. VW Hydri Light Curve 2,444,100 - 2,444,400

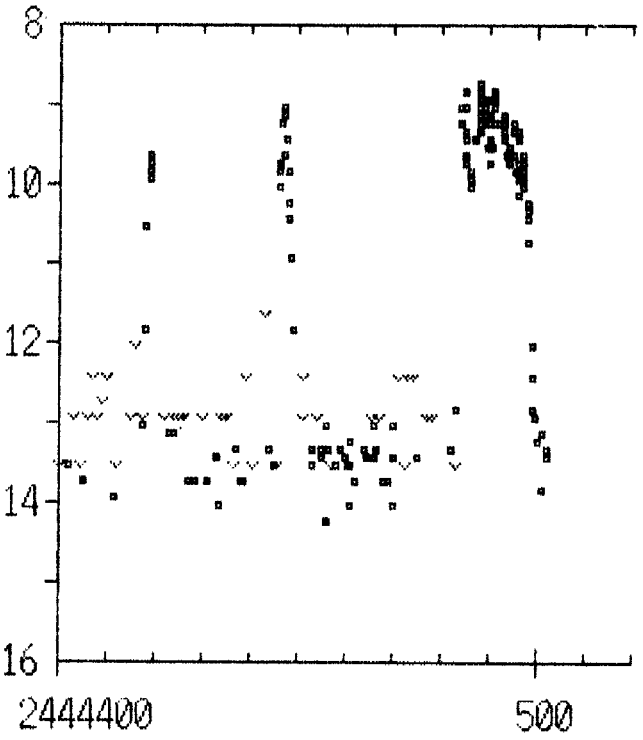


Figure 7.

VW Hydri Light Curve

2.444.400 - 2,444,502

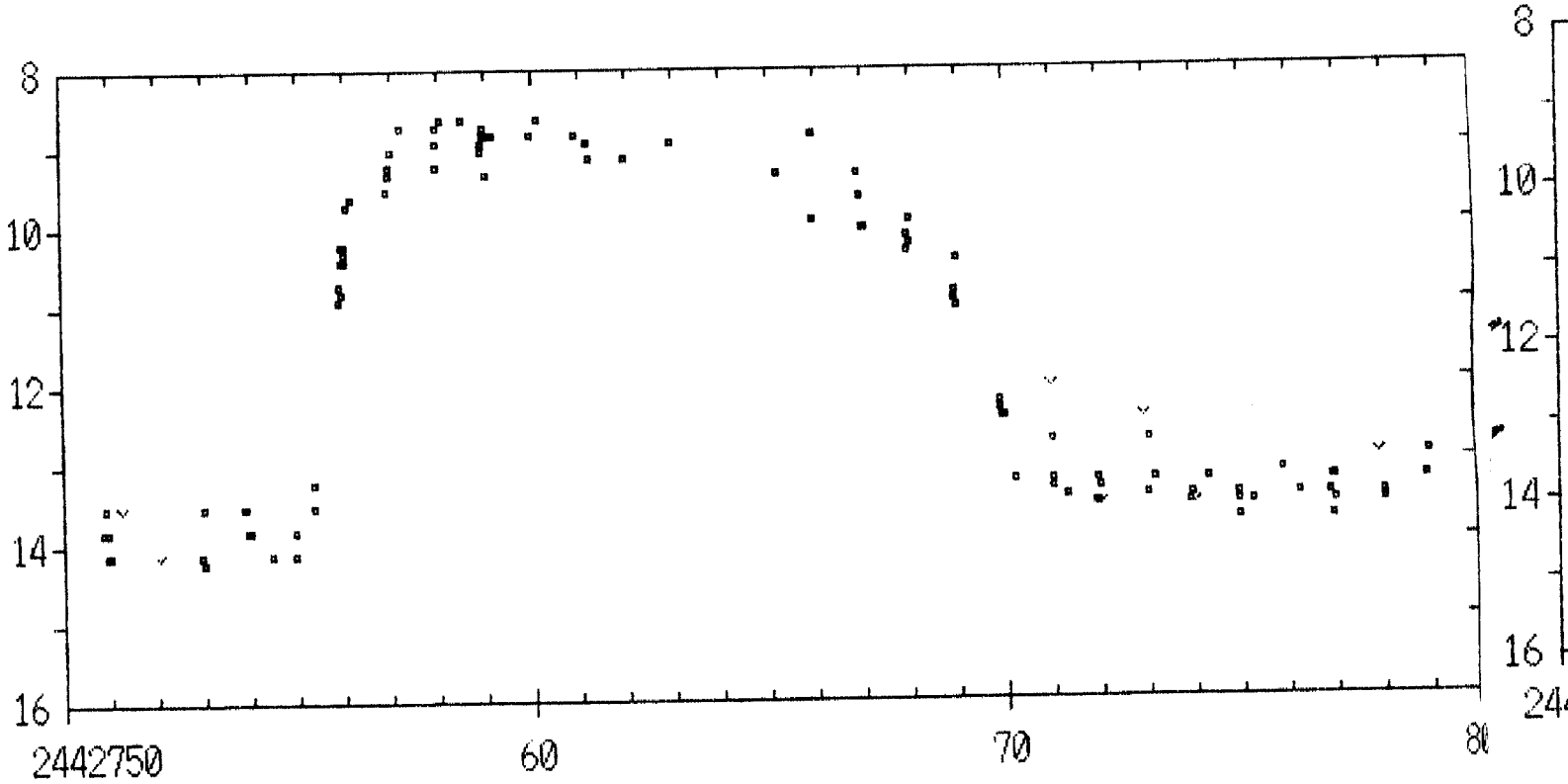
4. LIGHT CURVES OF SUPER OUTBURSTS

The light curves for the eleven super-outbursts are reproduced in two forms. Firstly, in Figs. 8 to 18 as plots from the individual observations, and, in Figs. 19 to 29 as daily means. All Figures are on an enlarged scale and cover intervals of 30 days. The running number of each outburst is shown below the figures and corresponds to the numbers in Table 1.

There is always some scatter in visual observations, which cannot be as precise as photoelectric results. Therefore, visual observations have to be treated with caution since it is all too easy to regard the normal scatter as evidence of short period variations. It appears, despite the foregoing reservation, that the observations are sufficiently accurate to show the occurrence of super-humps although it is only possible to indicate a probable period for them. The results are discussed in Section 6 of this paper.

5. LIGHT CURVES OF NORMAL OUTBURSTS

Most normal outbursts are plotted on an enlarged scale in Figures 30 to 80. Each light curve has been plotted from the individual observations with each plot covering 30 days. The running numbers from Table 1 are shown for each outburst. The main features from these light curves are discussed in Section 6, which appears after the light curves.



Fig, 8, VW Hydri, No, 300. Super-outburst 2,442,757.2

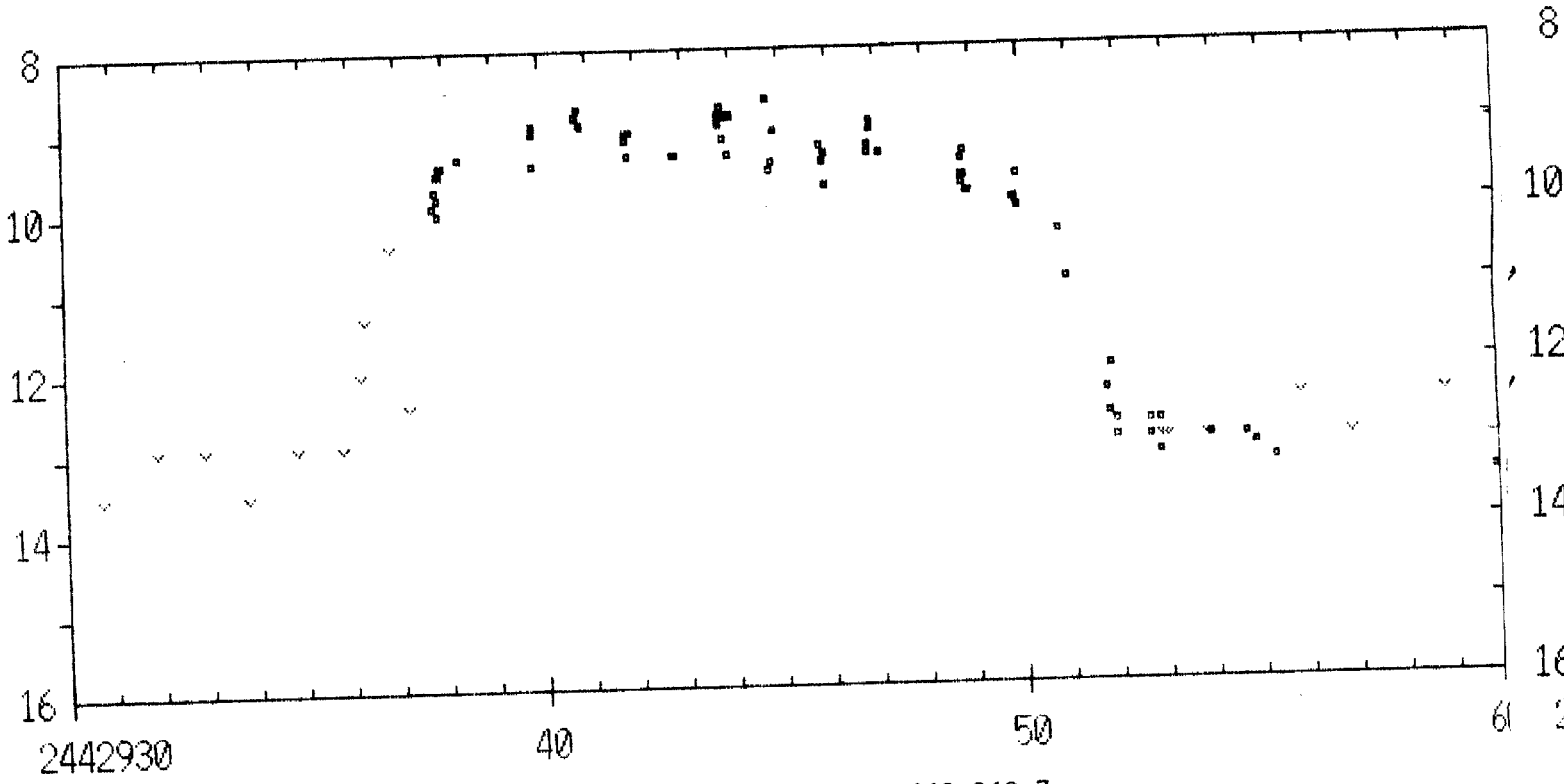


Fig. 9. VW Hydri. No. 309. Super-outburst 2,442,940.7

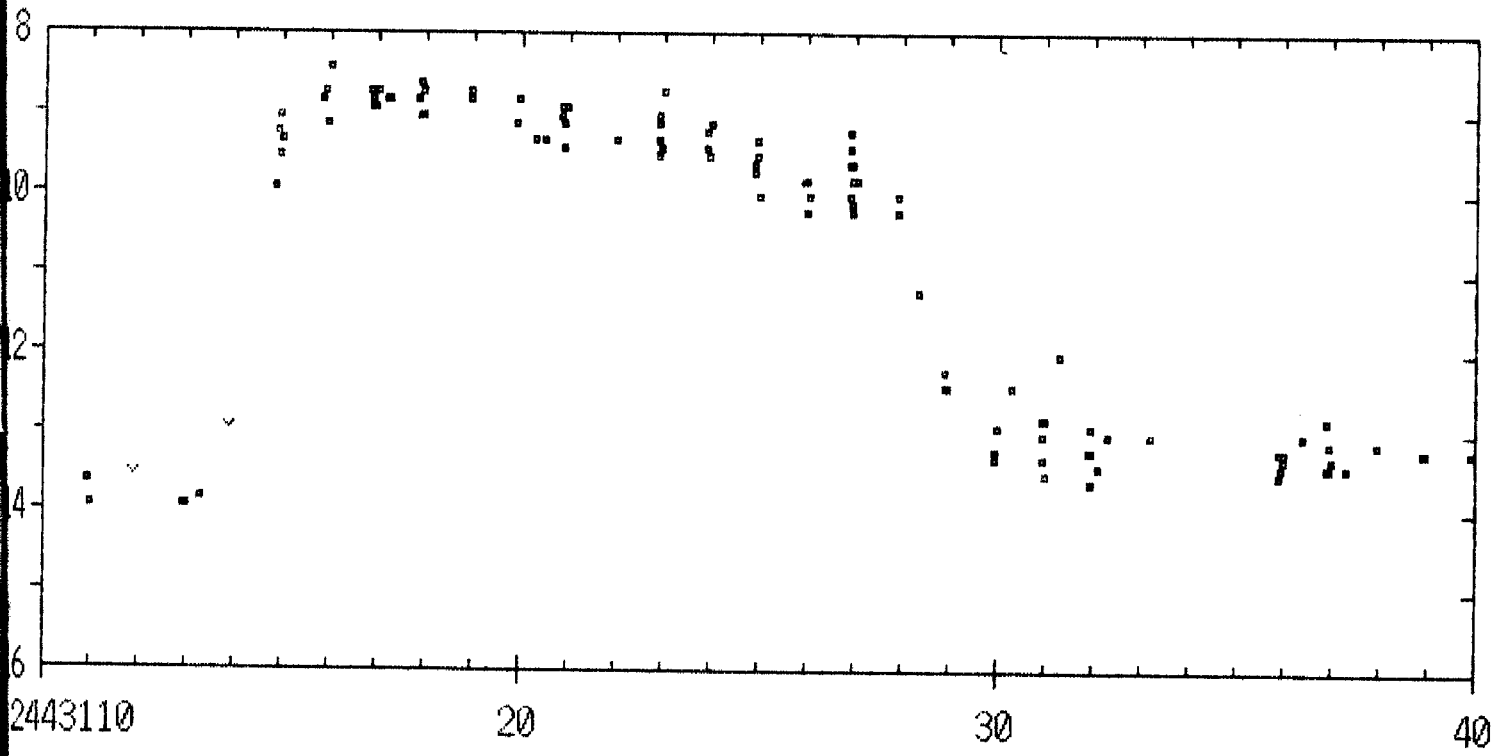


Fig. 10. VW Hydri No. 315. Super-outburst 2,443,117.0

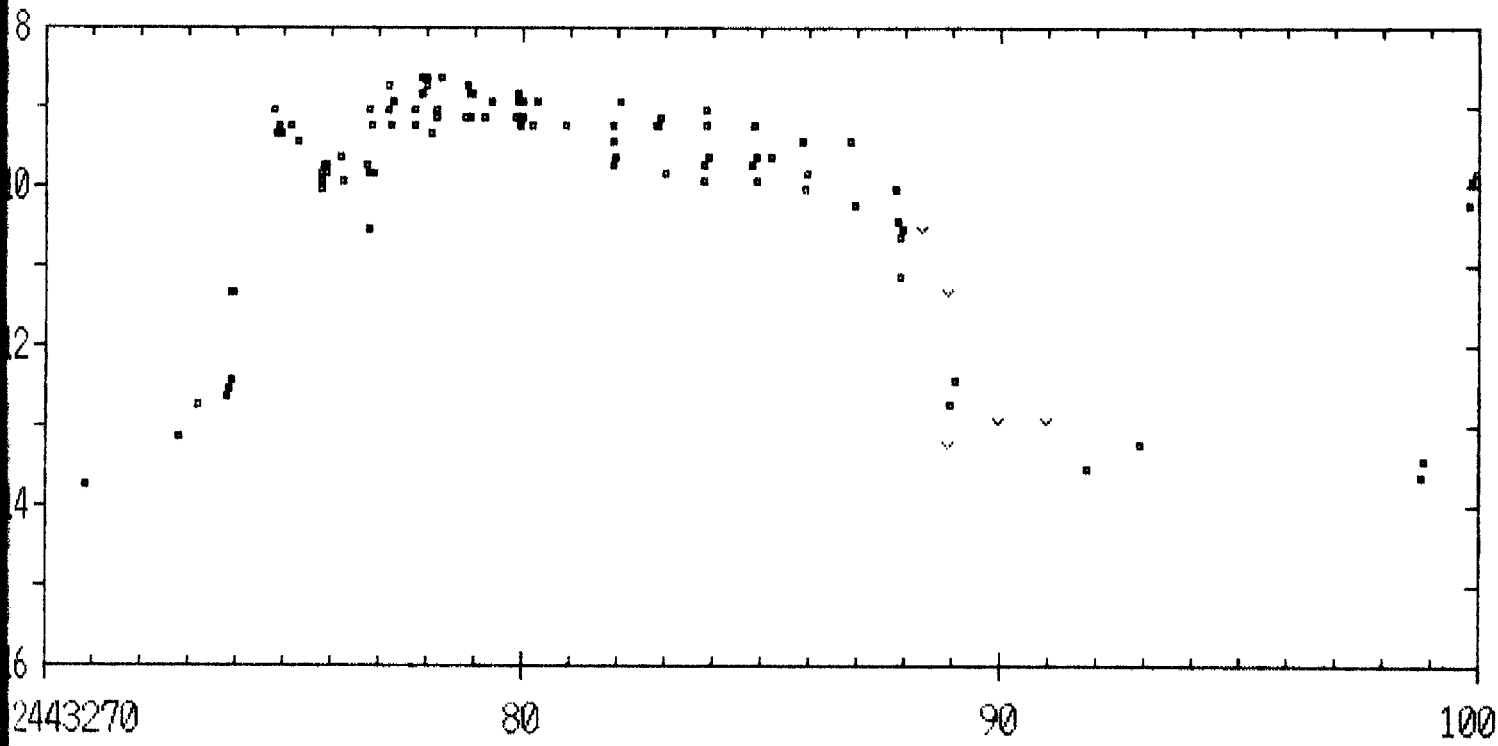


Fig. 11. VW Hydri No. 320. Super-outburst 2,443,277.9

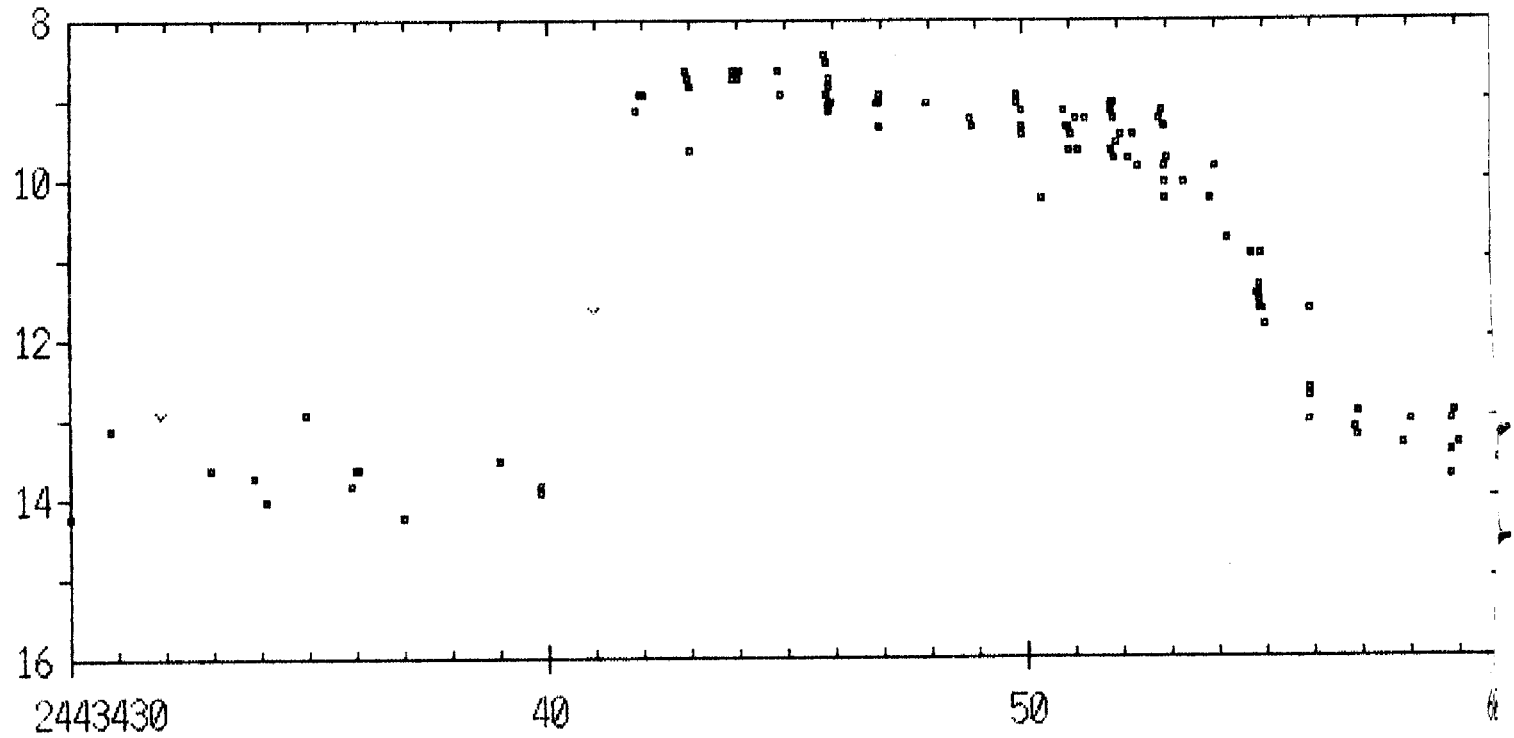


Fig. 12. VW Hydri No. 326. Super-outburst 2,443,442.9

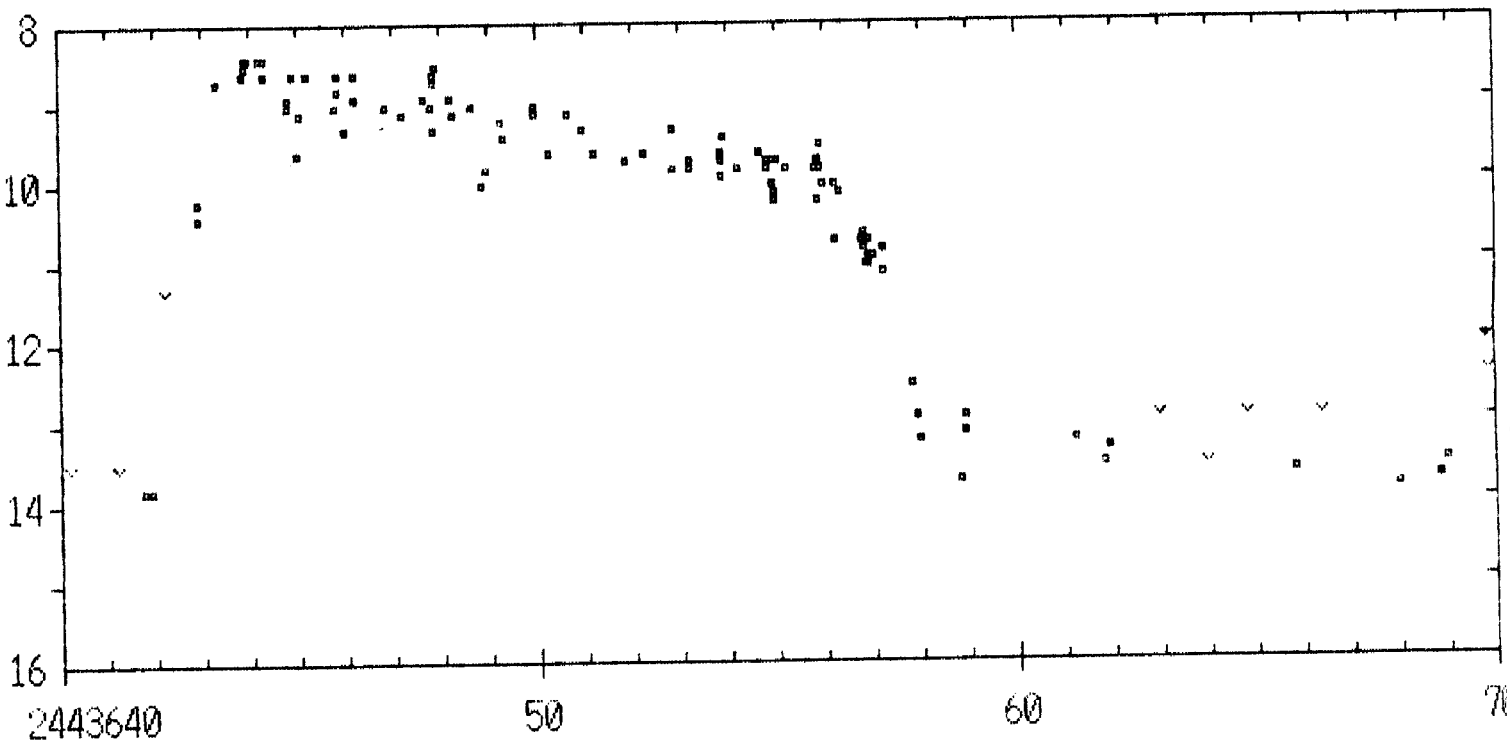


Fig. 13. VW Hydri No.332. Super-outburst 2,443,644.0

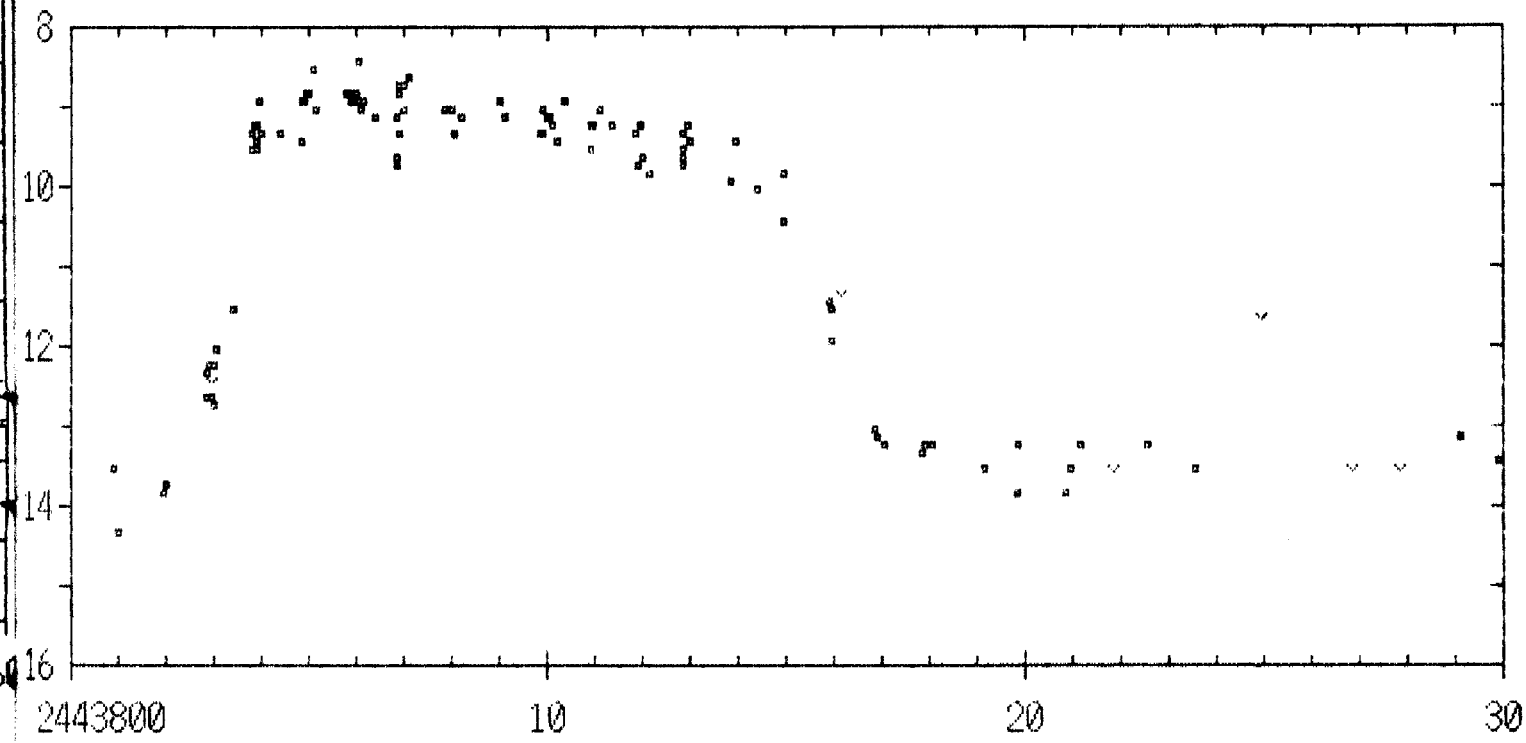


Fig. 14. VW Hydri No. 338. Super-outburst 2,443,804.0

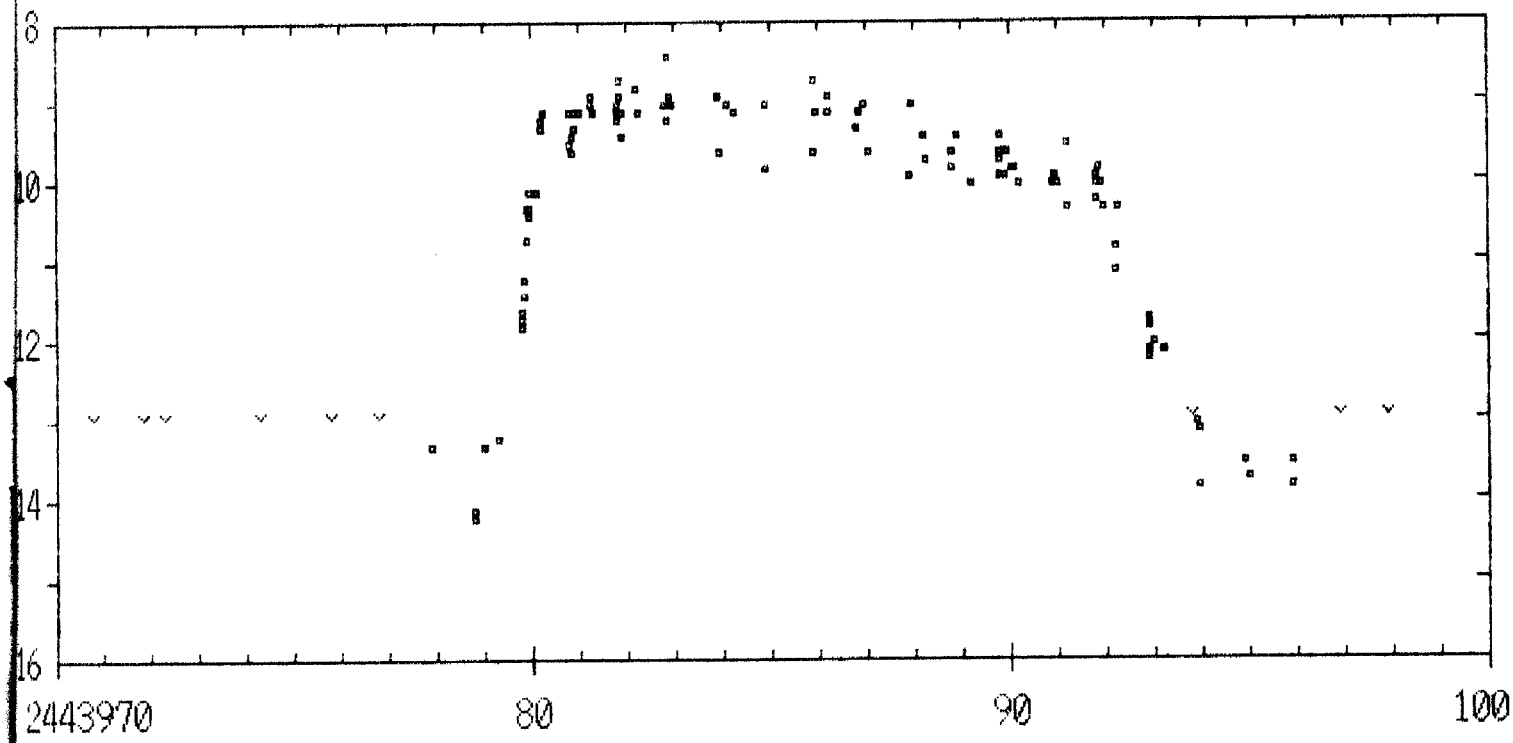


Fig. 15. VW Hydri No.344. Super-outburst 2,443,980.5

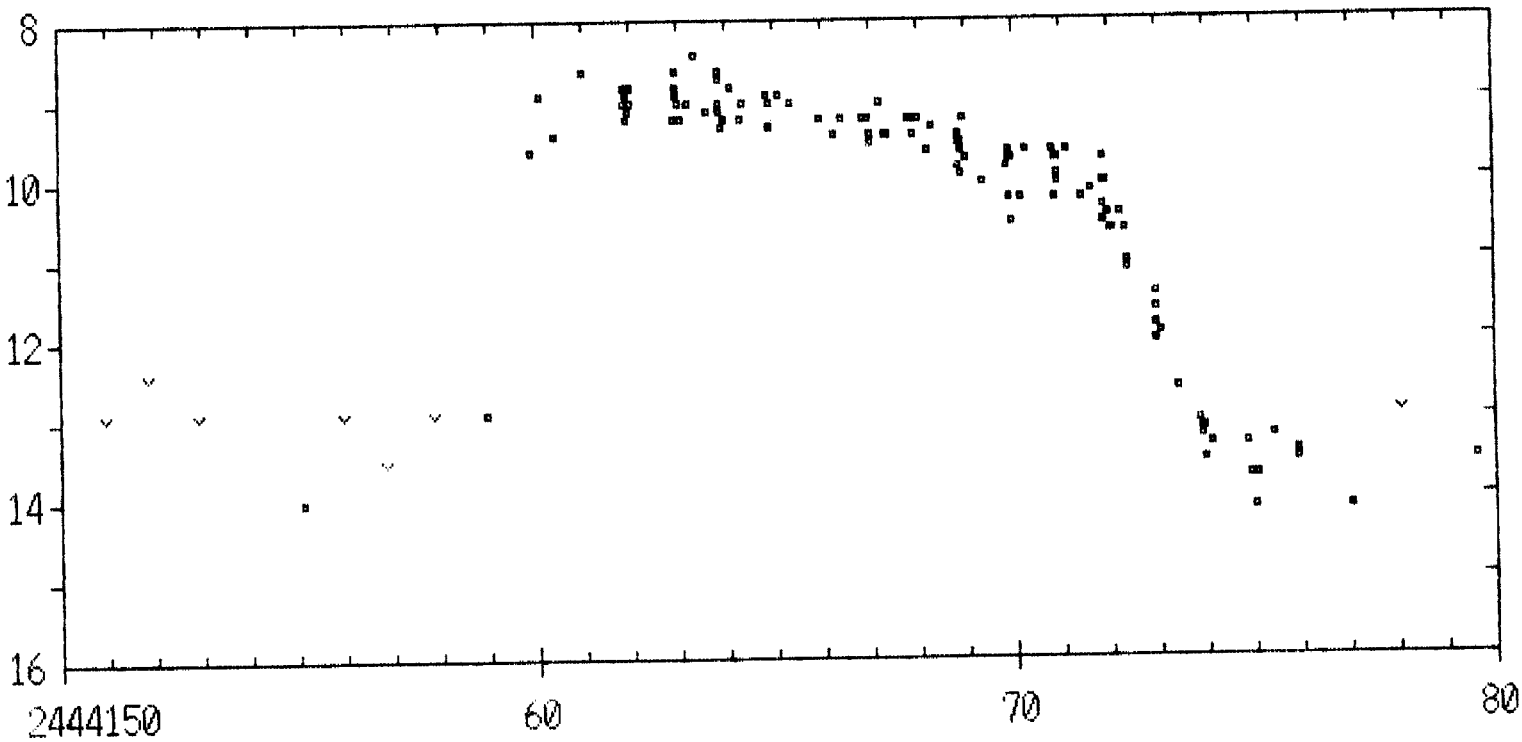


Fig. 16. VW Hydri No.352. Super-outburst 2,444,161.0

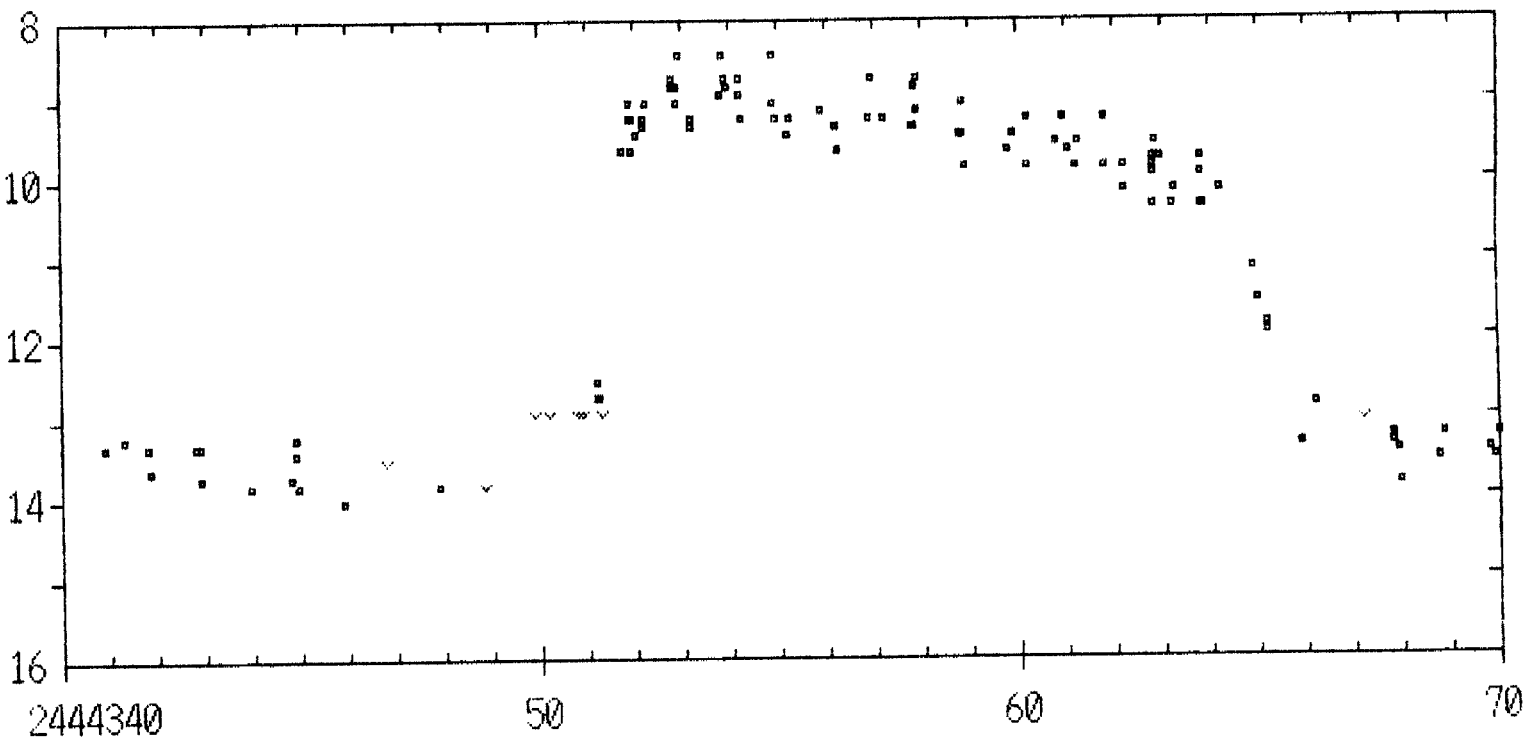


Fig. 17. VW Hydri No.359. Super-outburst 2,444,351.9

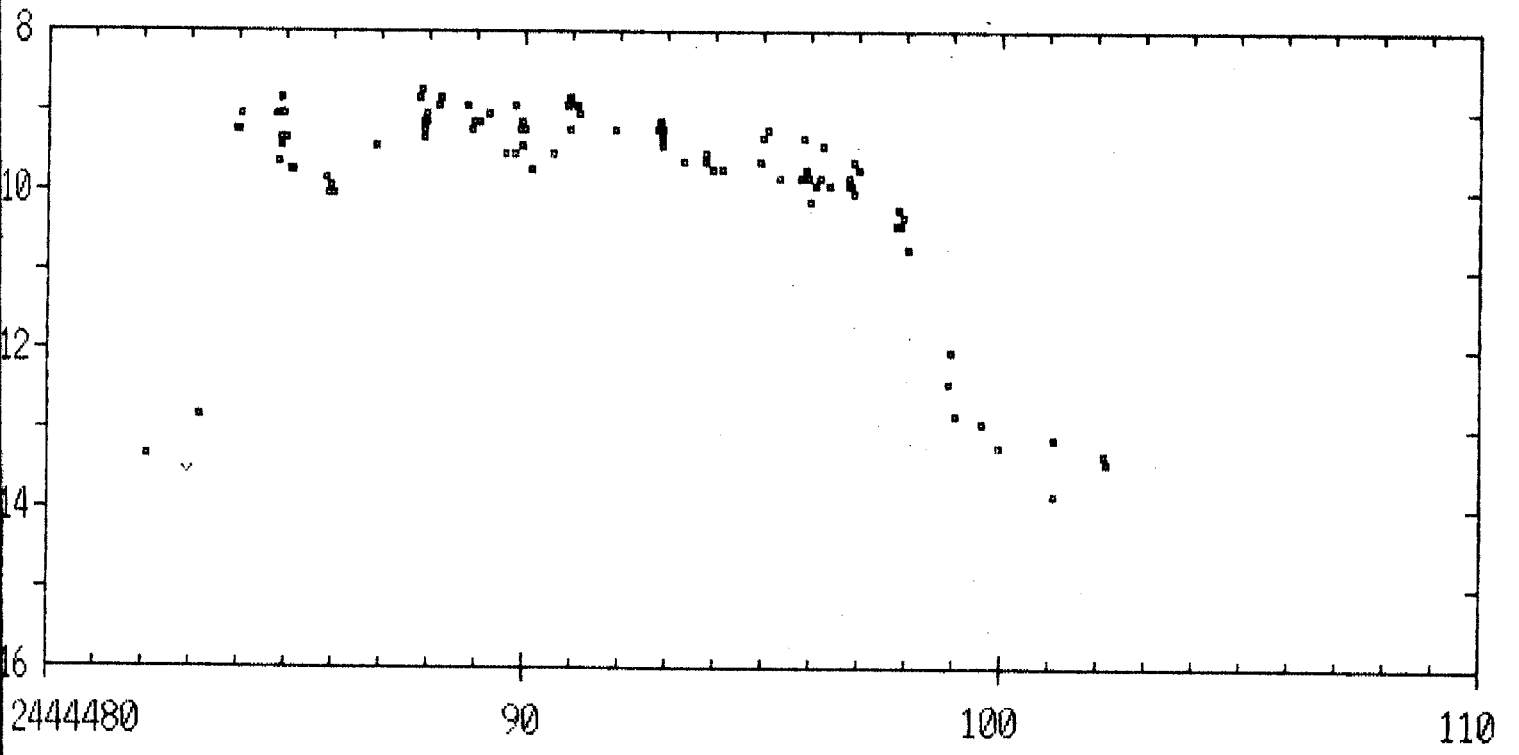


Fig.18. VW Hydri No.364 Super-outburst 2,444,484.8

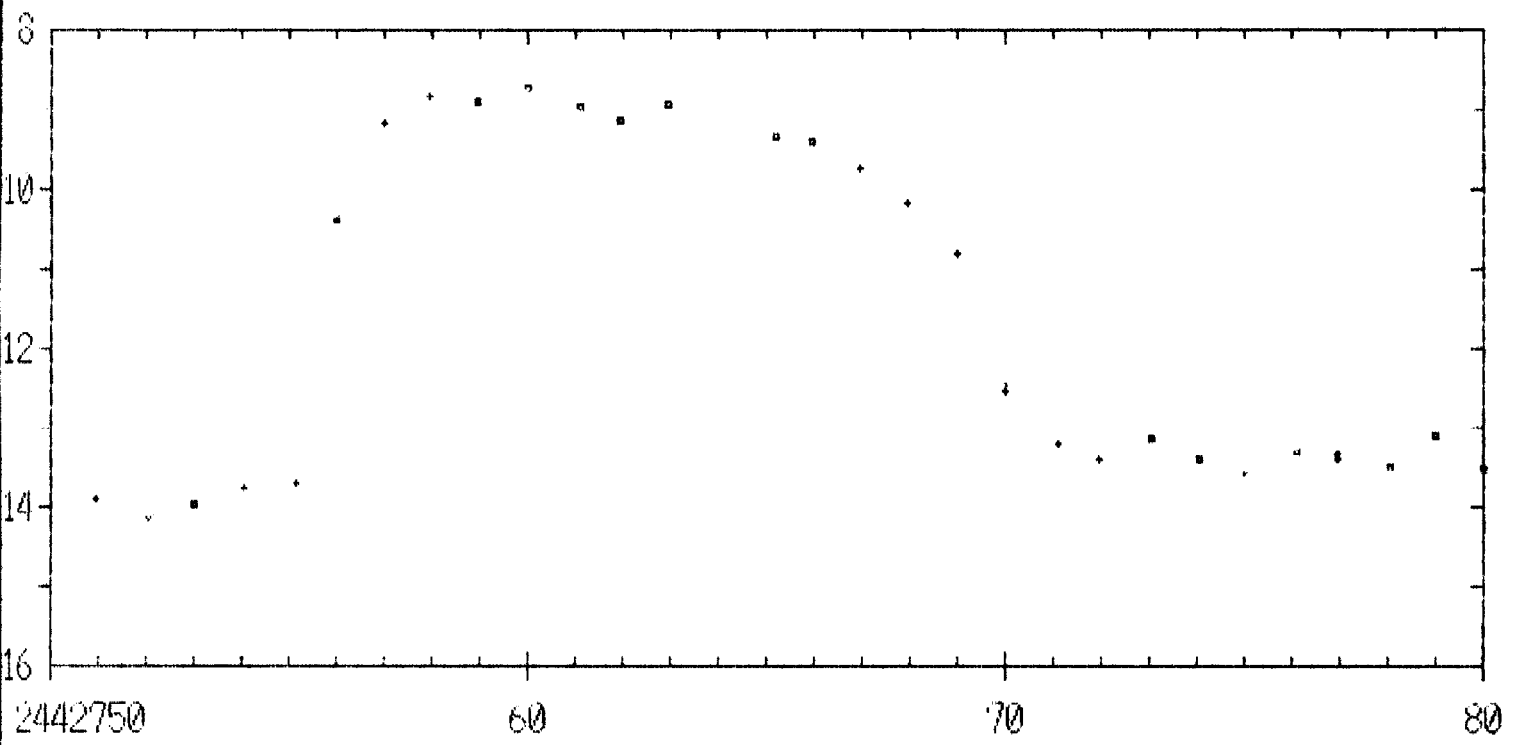


Fig. 19. VW Hydri Outburst 300 plotted from daily means.

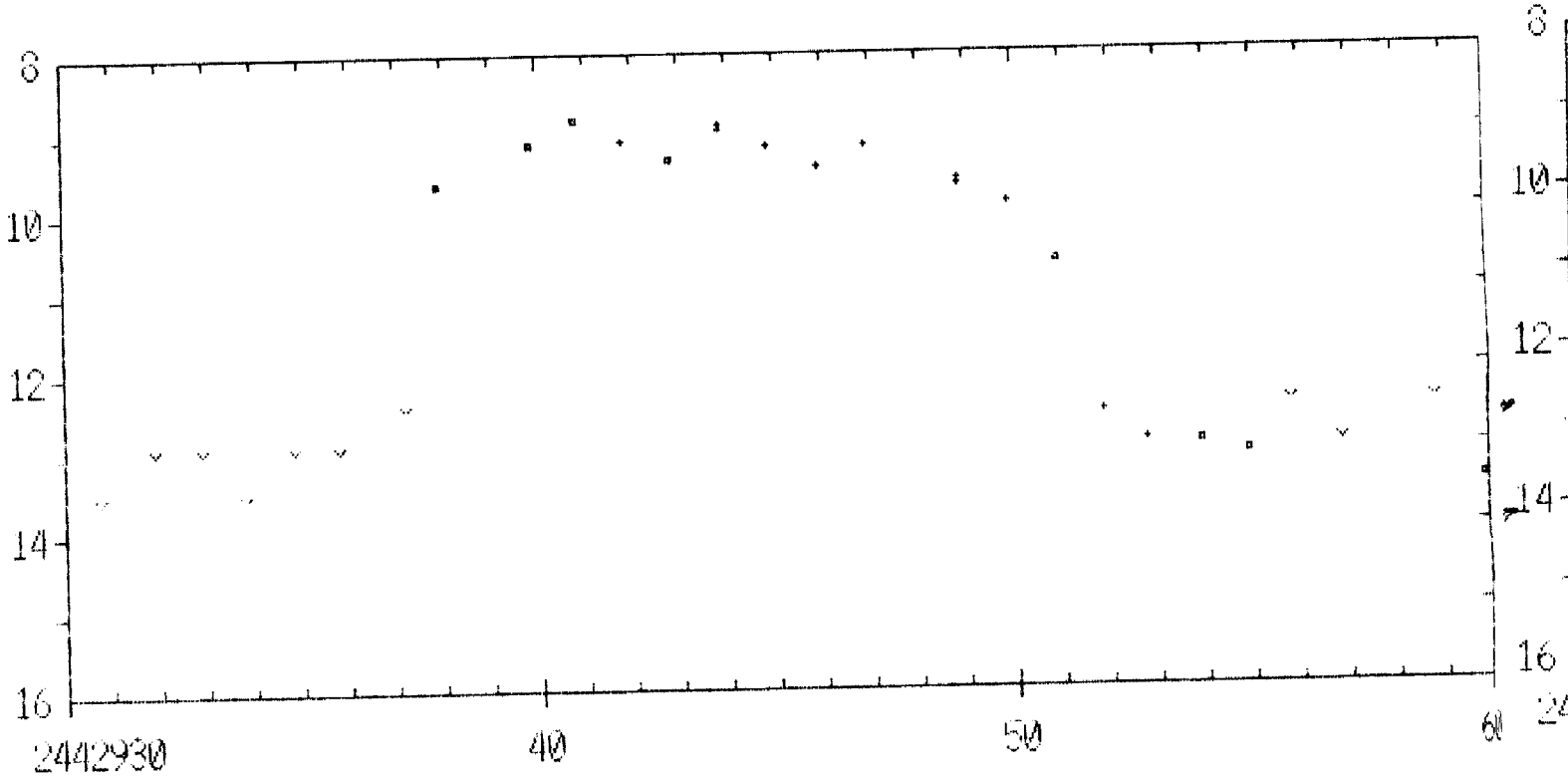


Fig. 20. VW Hydri. Outburst 309 plotted from daily means.

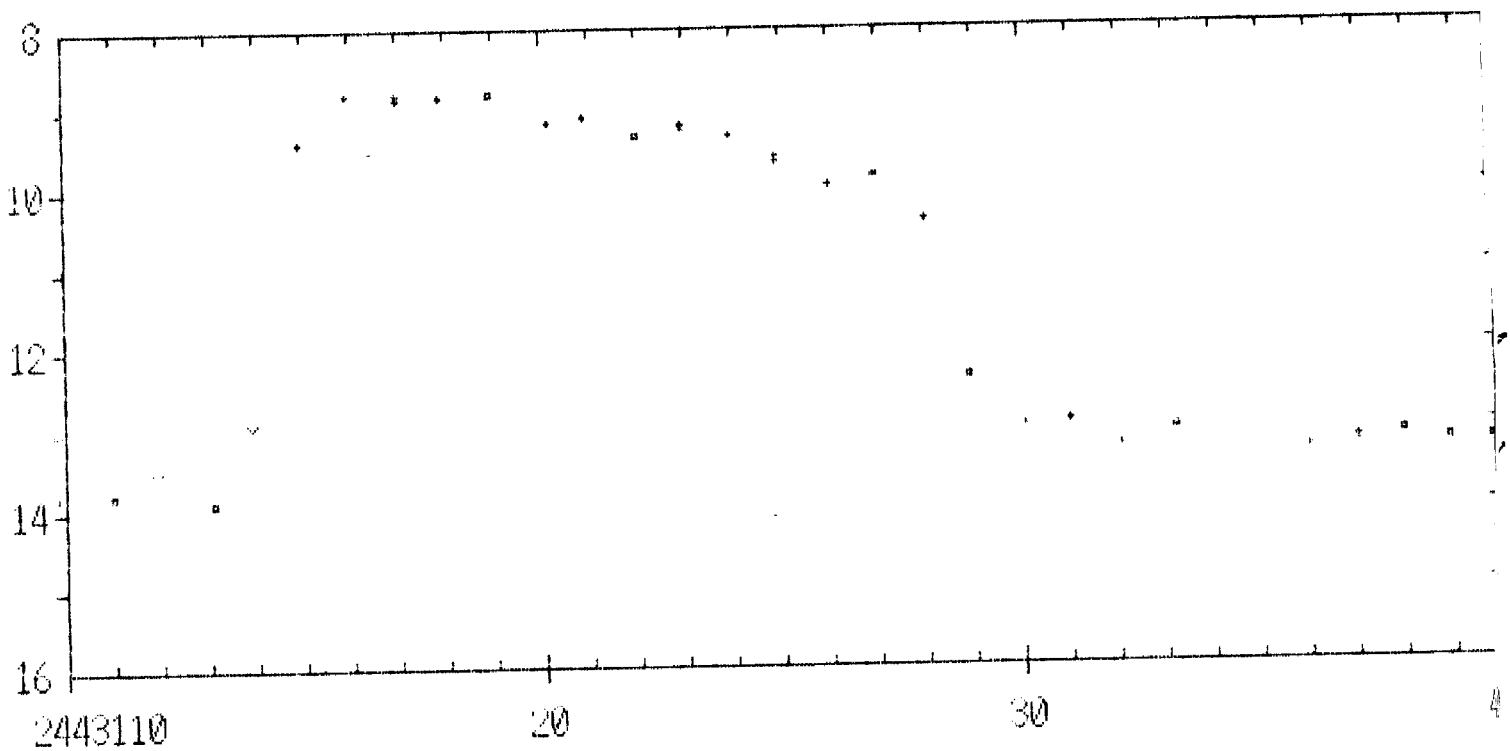


Fig. 21. VW Hydri. Outburst 315 plotted from daily means

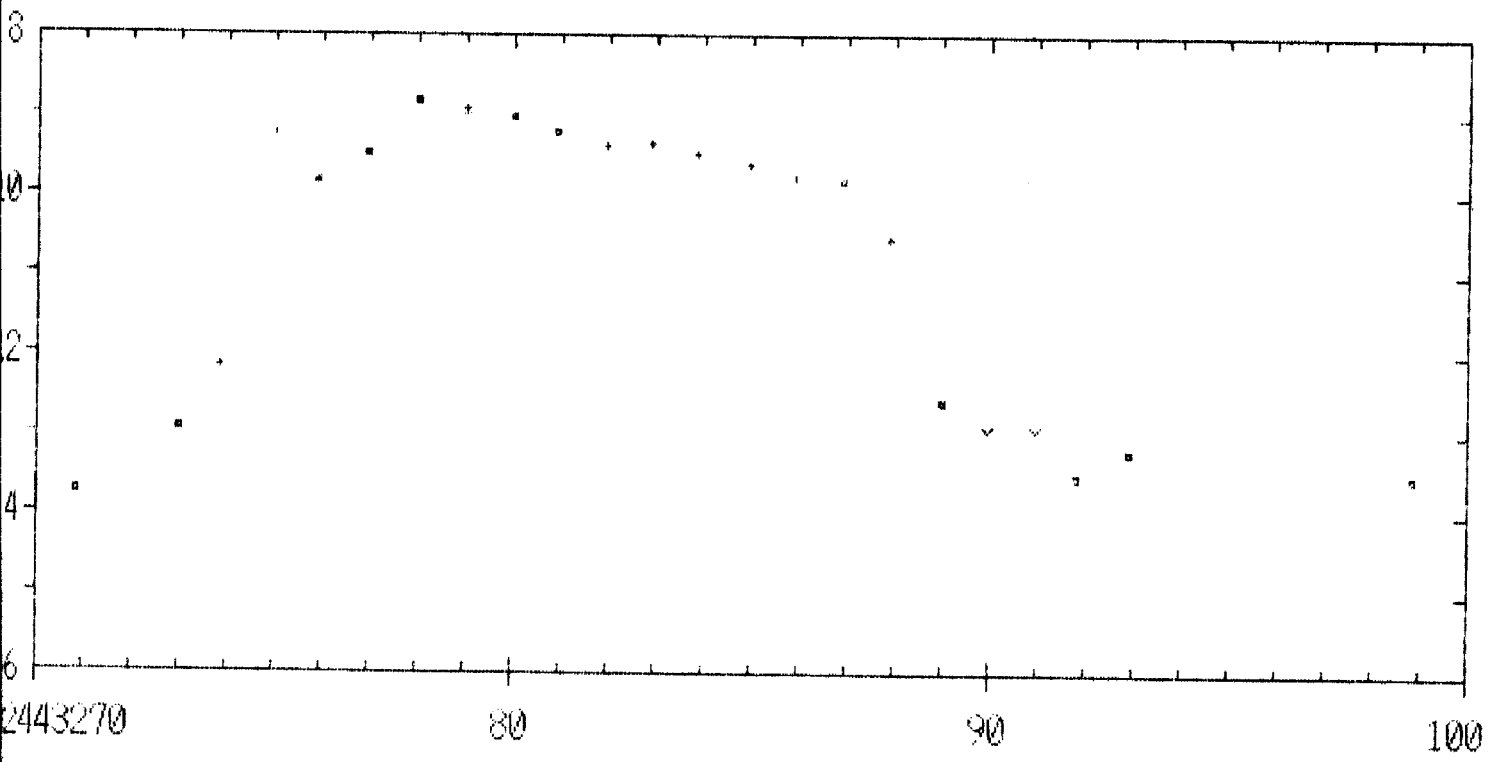


Fig. 22. VW Hyi. Outburst 320 plotted from daily means.

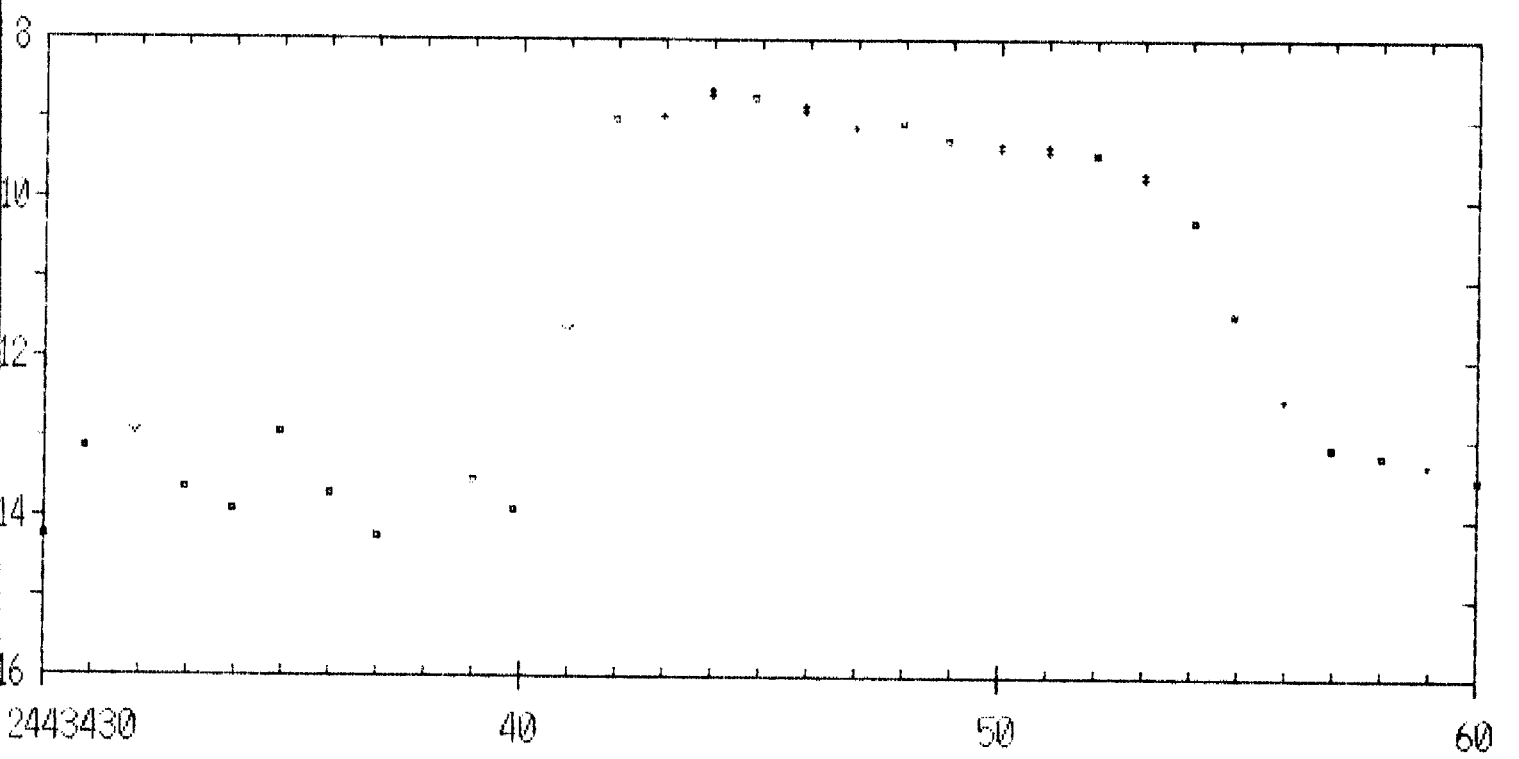


Fig. 23. VW Hydri. Outburst 326 plotted from daily means.

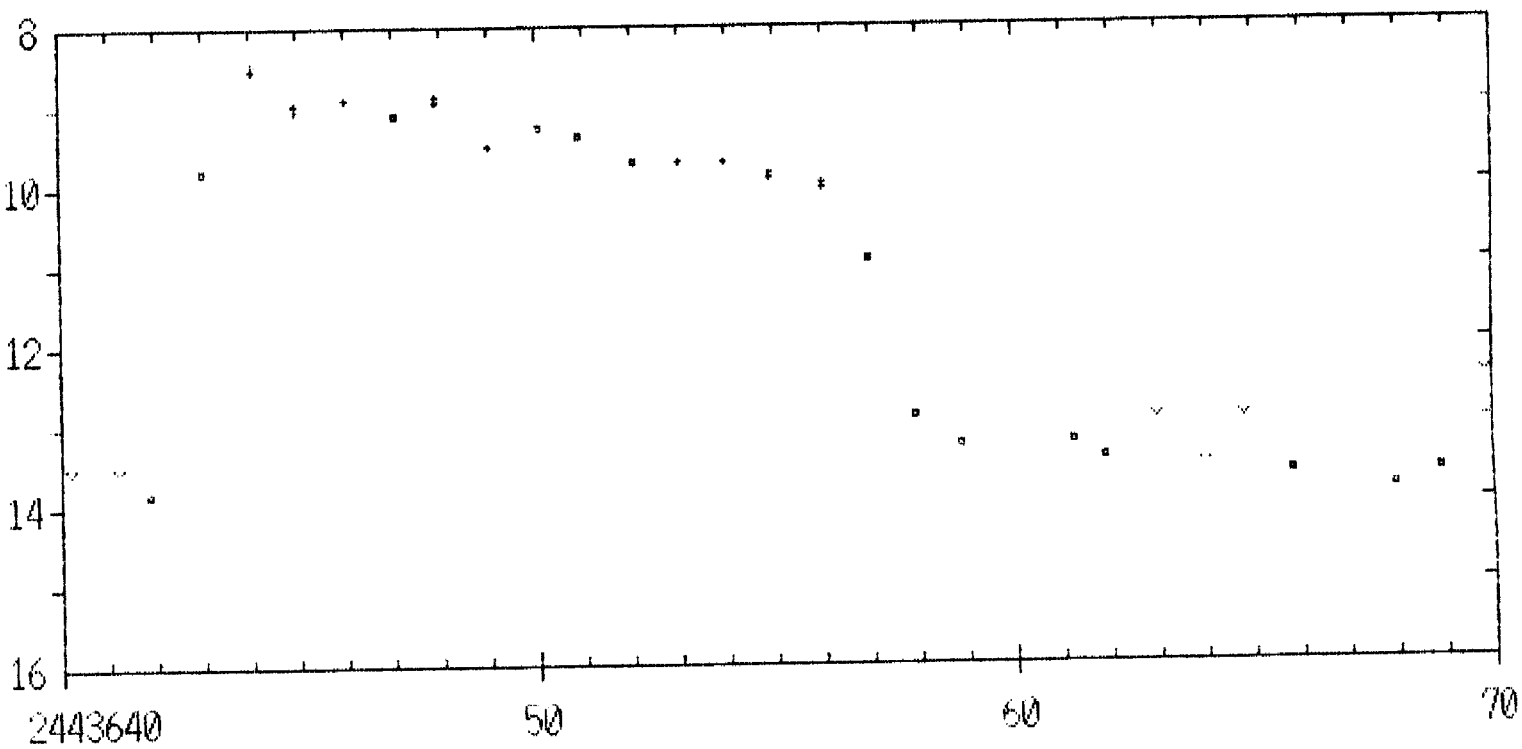


Fig. 24. VW Hydri. Outburst 332 plotted from daily means

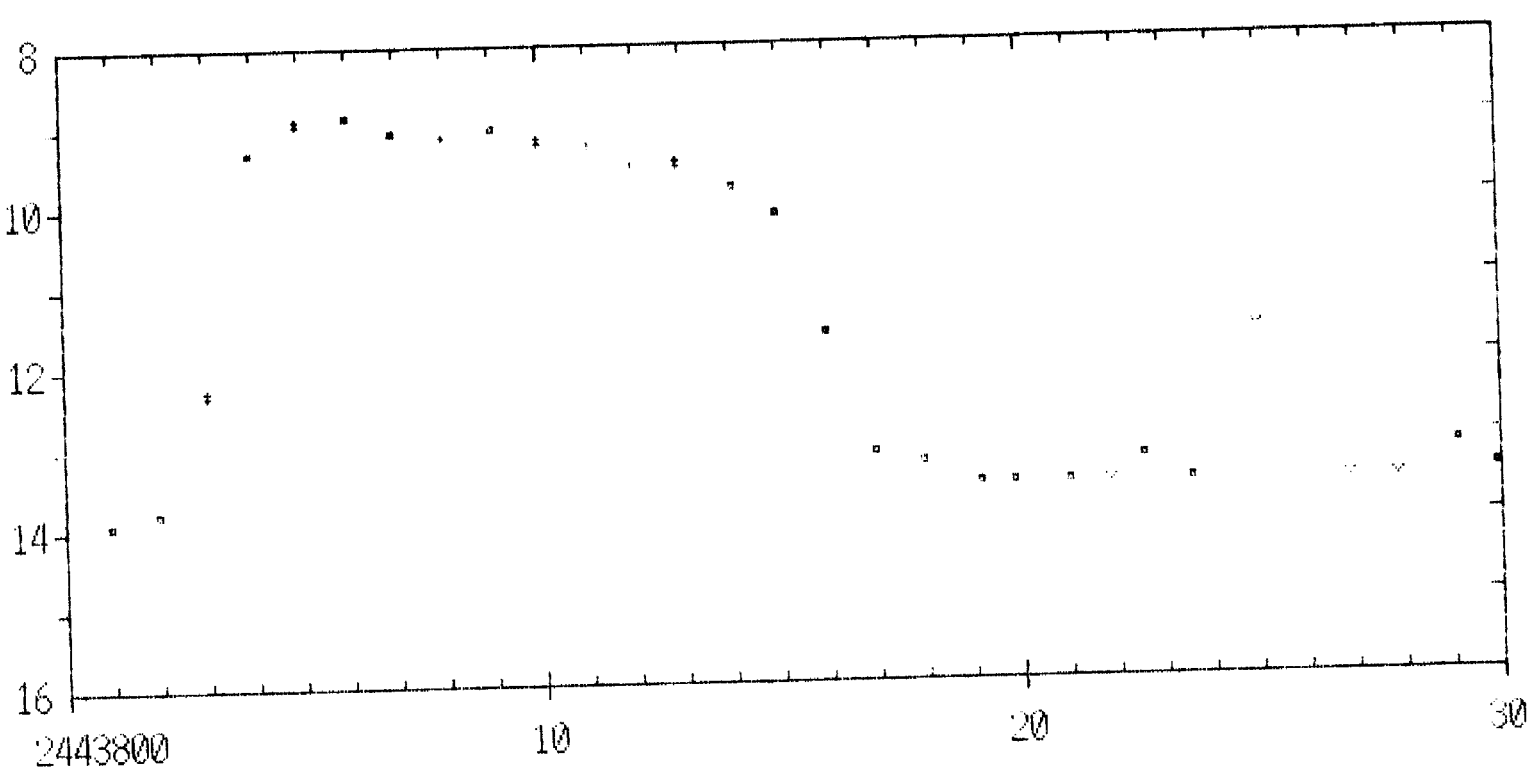


Fig. 25. VW Hydri. Outburst 338 plotted from daily means.

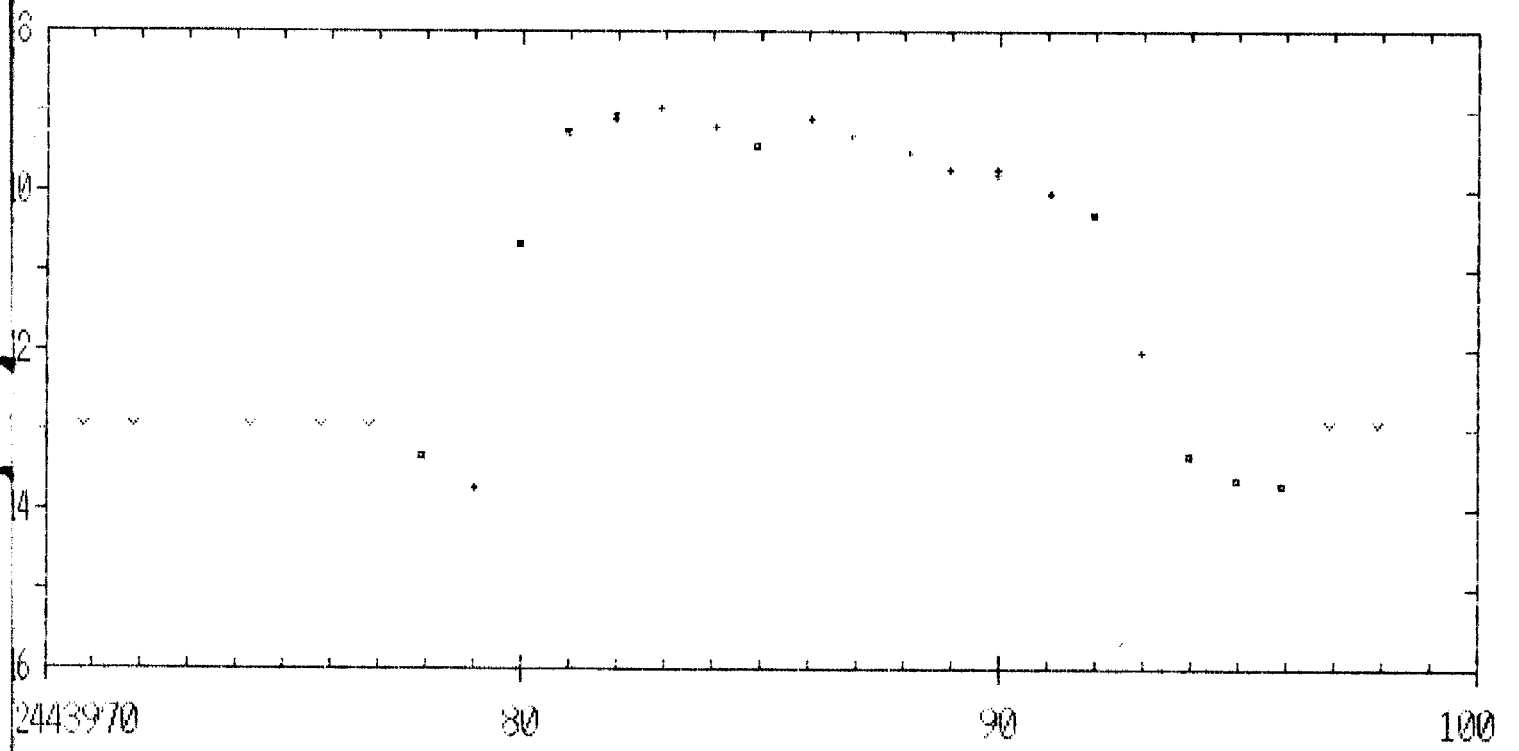


Fig. 26. VW Hydri. Outburst 344 plotted from daily means.

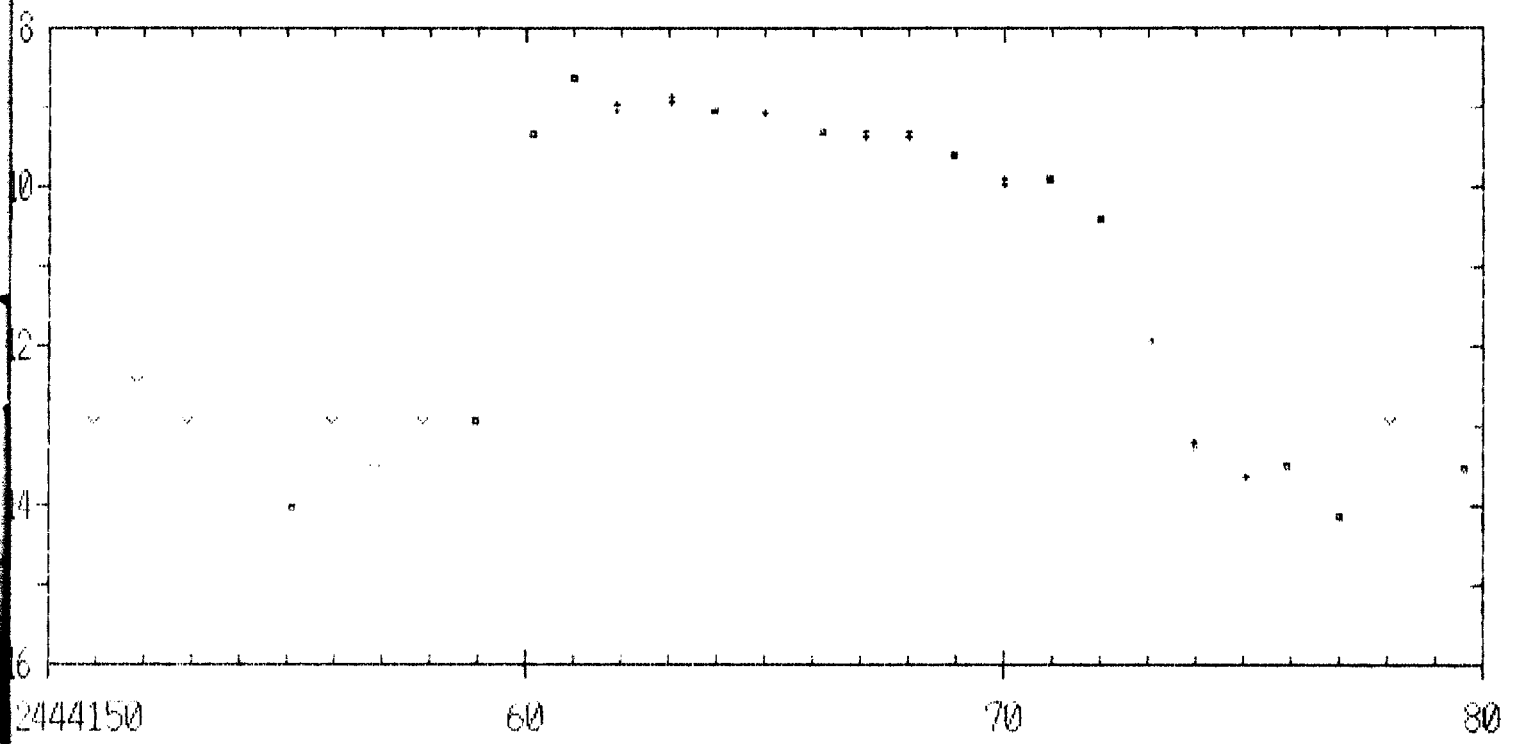


Fig. 27. VW Hydri. Outburst 352 plotted from daily means.

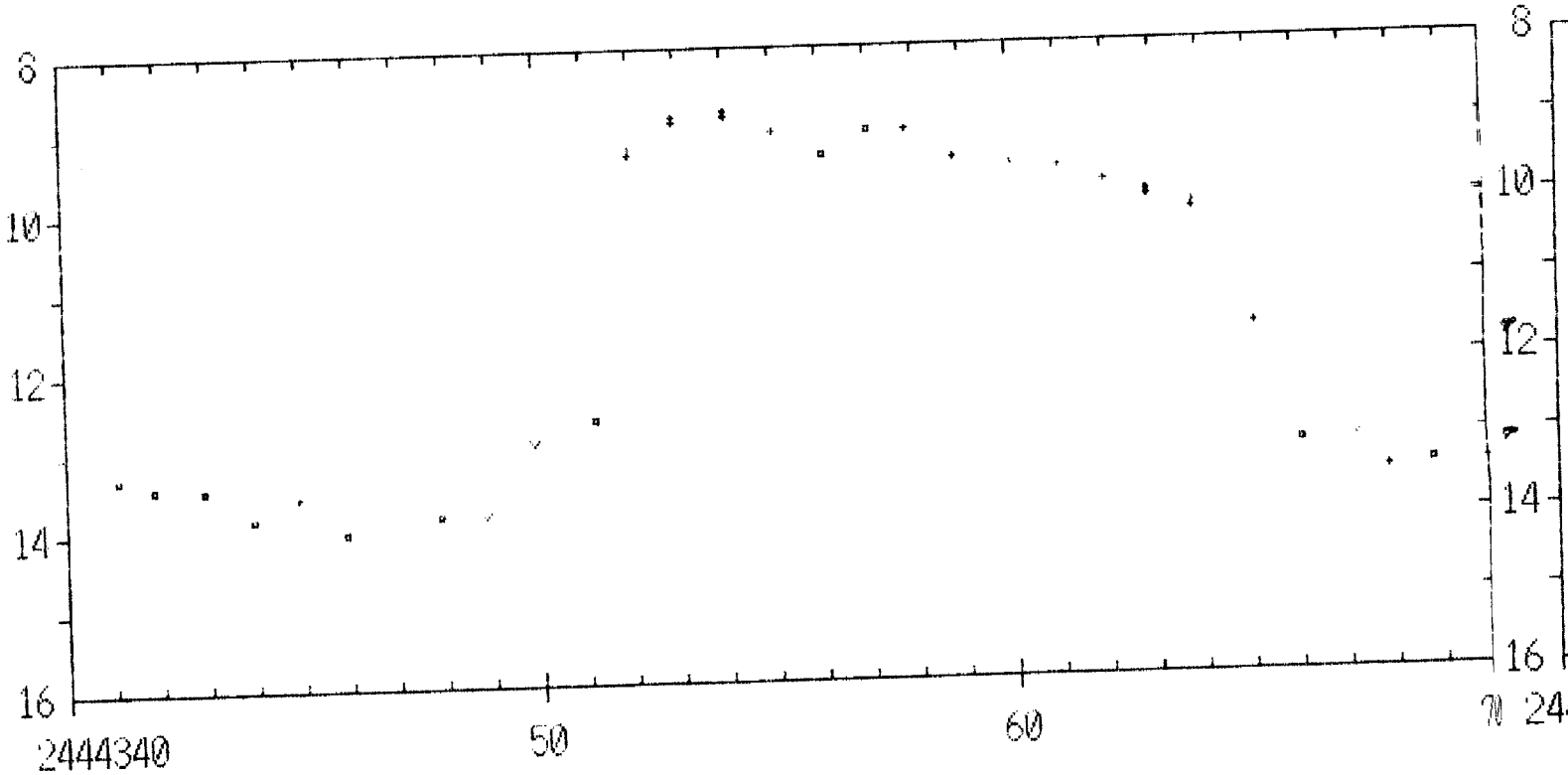


Fig. 28. VW Hydri. Outburst 359 plotted from daily means.

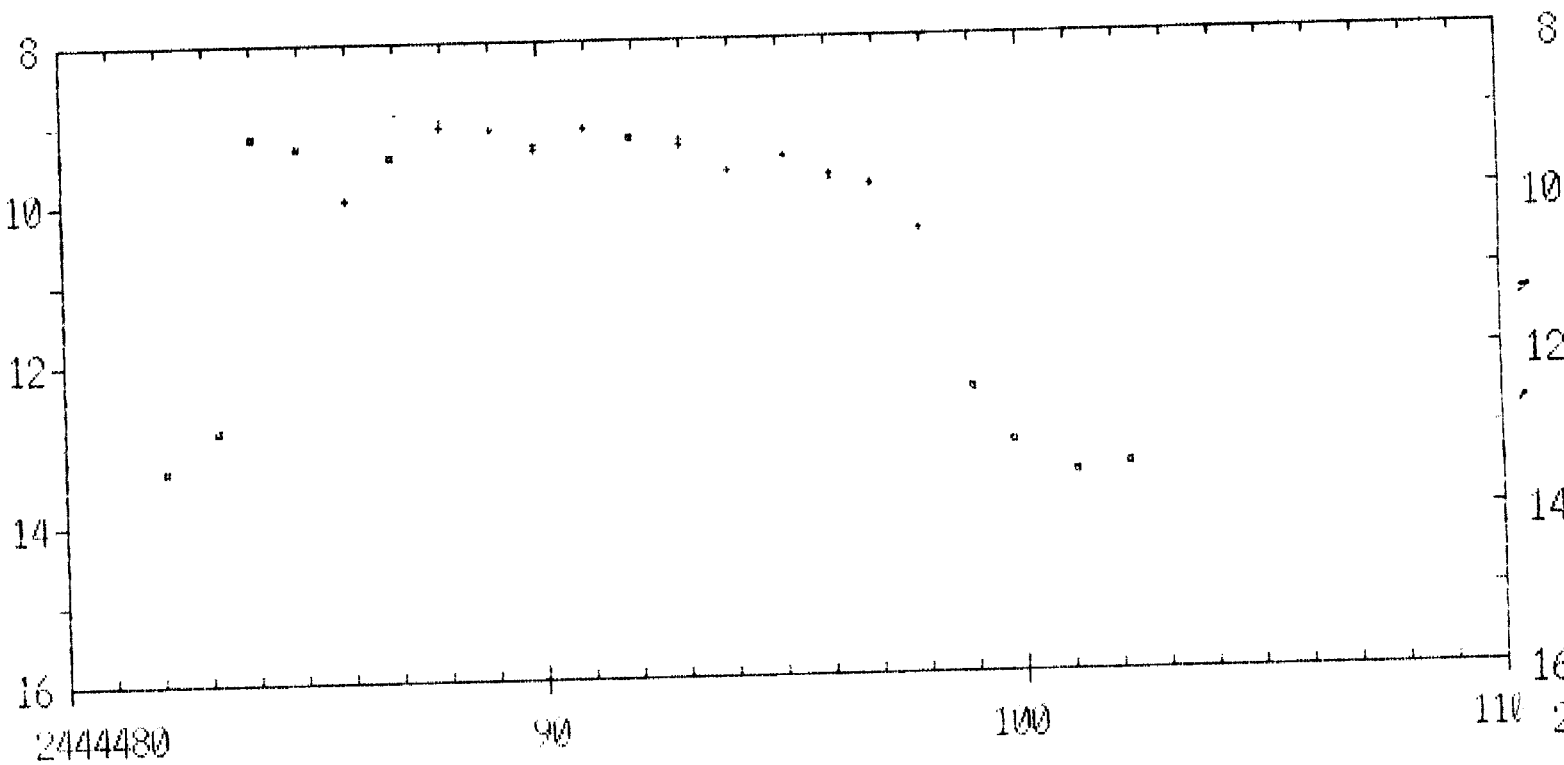


Fig. 29. VW Hydri. Outburst 364 plotted from daily means.

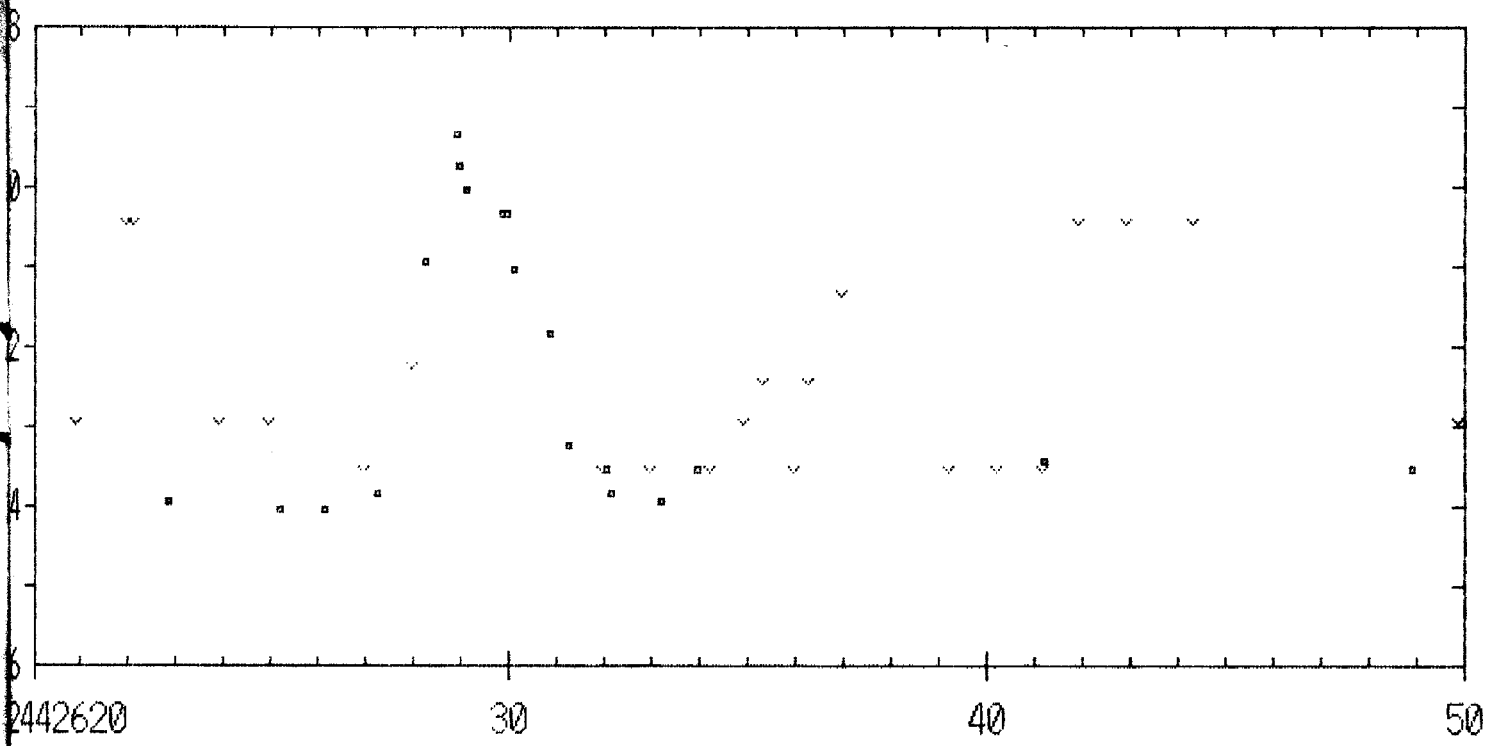


Fig. 30. VW Hydri. Normal outburst 294 plotted from individual observations.

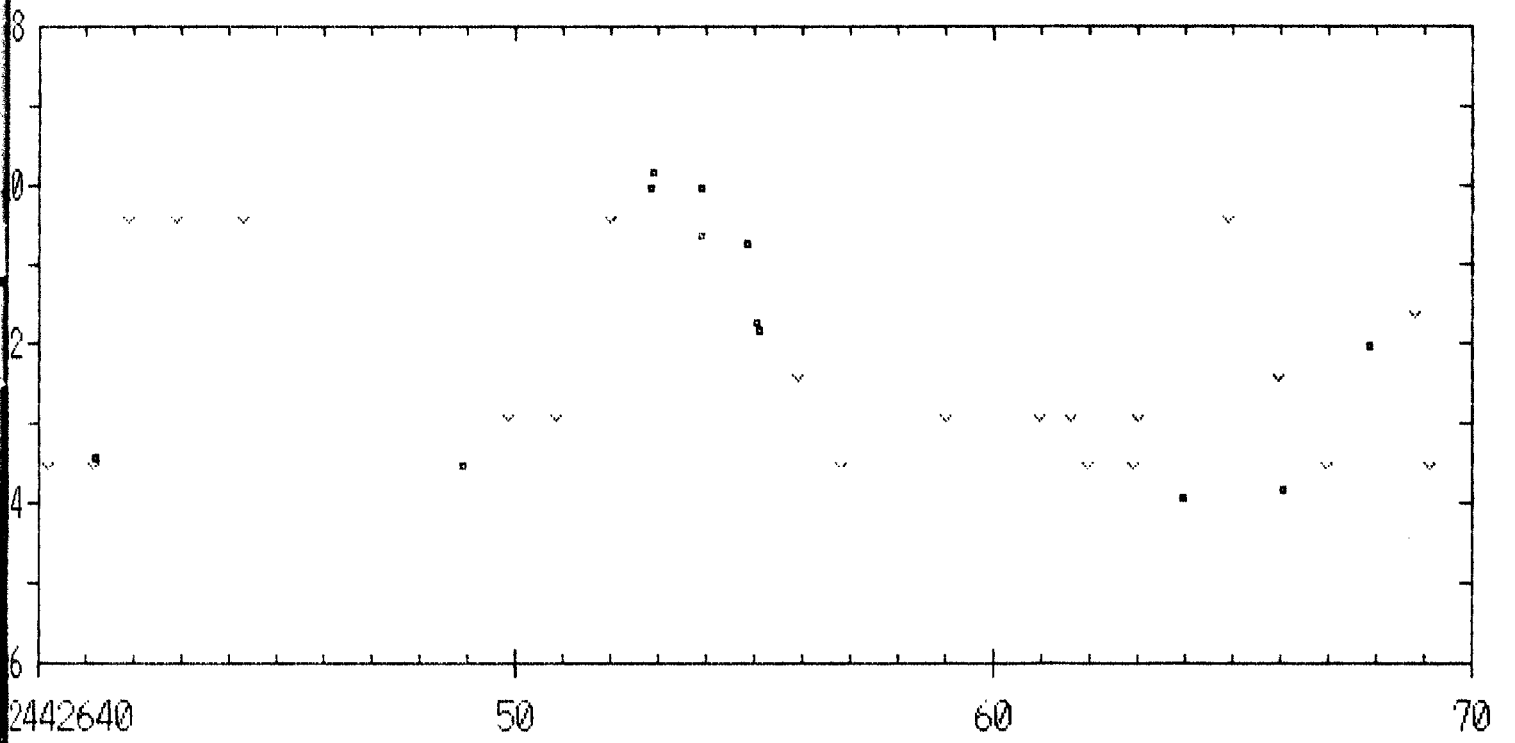


Fig. 31. VW Hydri. Normal outburst 295 plotte. from individual observations.

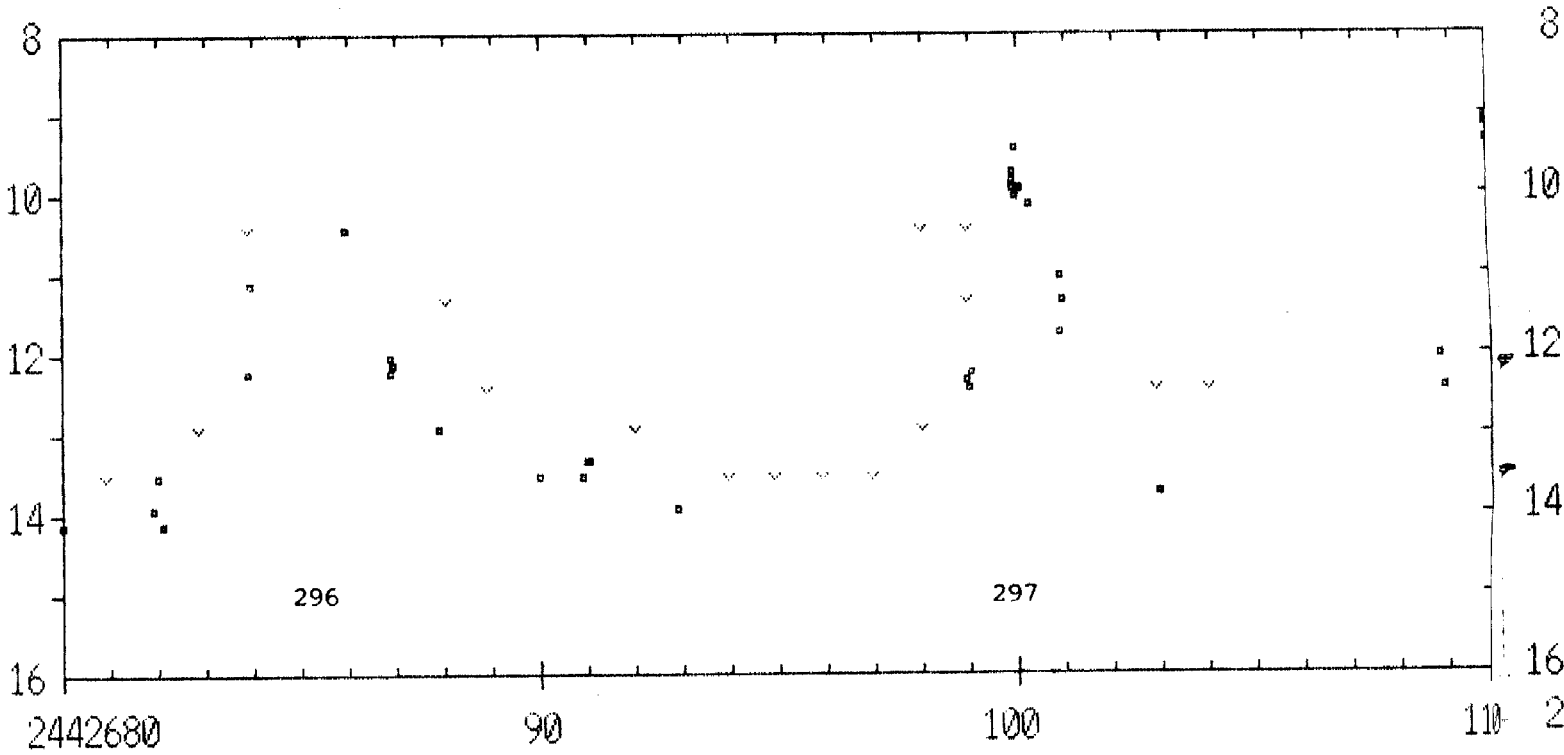


Fig 32. VW Hydri. Normal outbursts 296 & 297 plotted from individual observations.

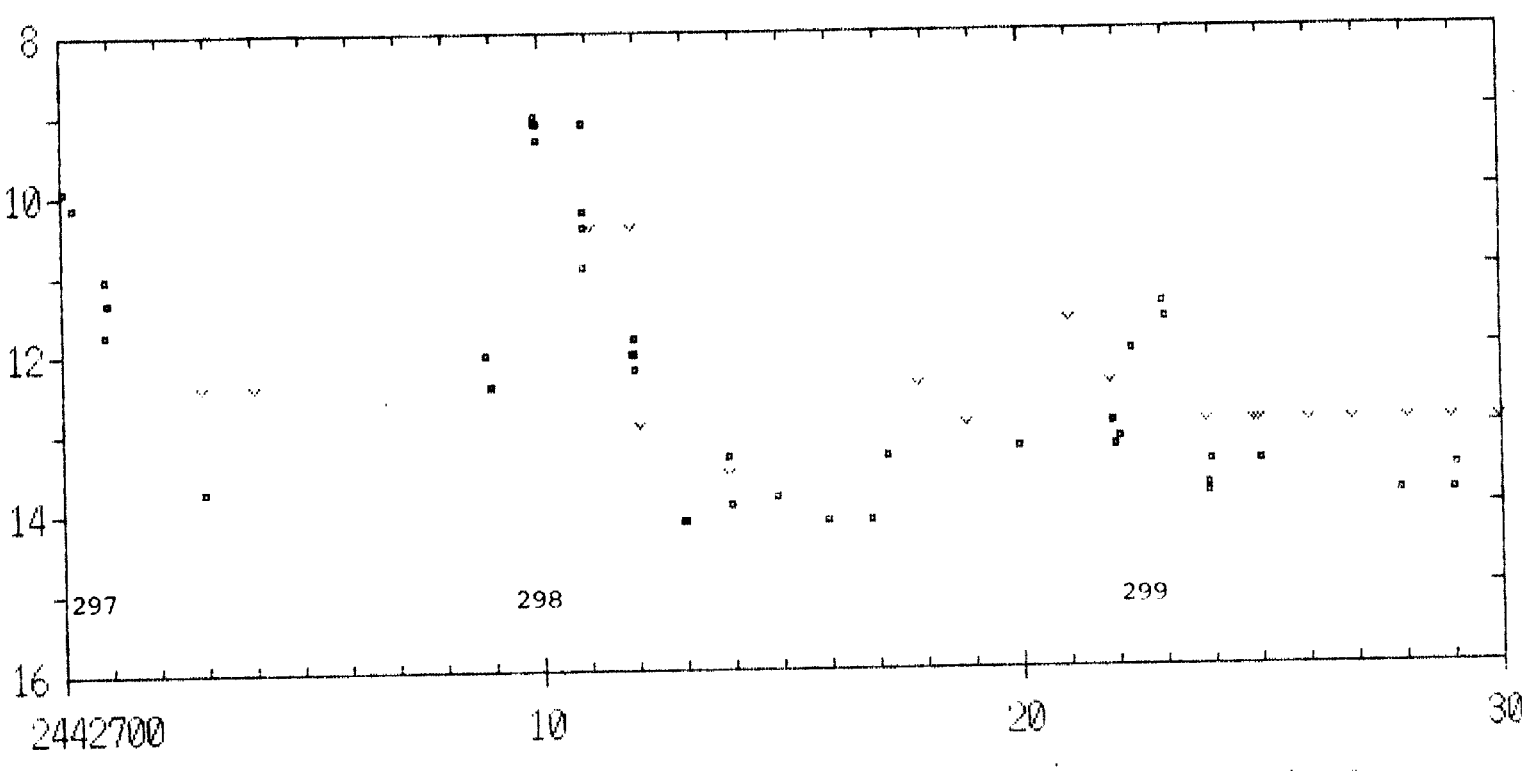


Fig. 33. VW Hydri. Normal outbursts 297, 298 & 299 plotted from individual observations.

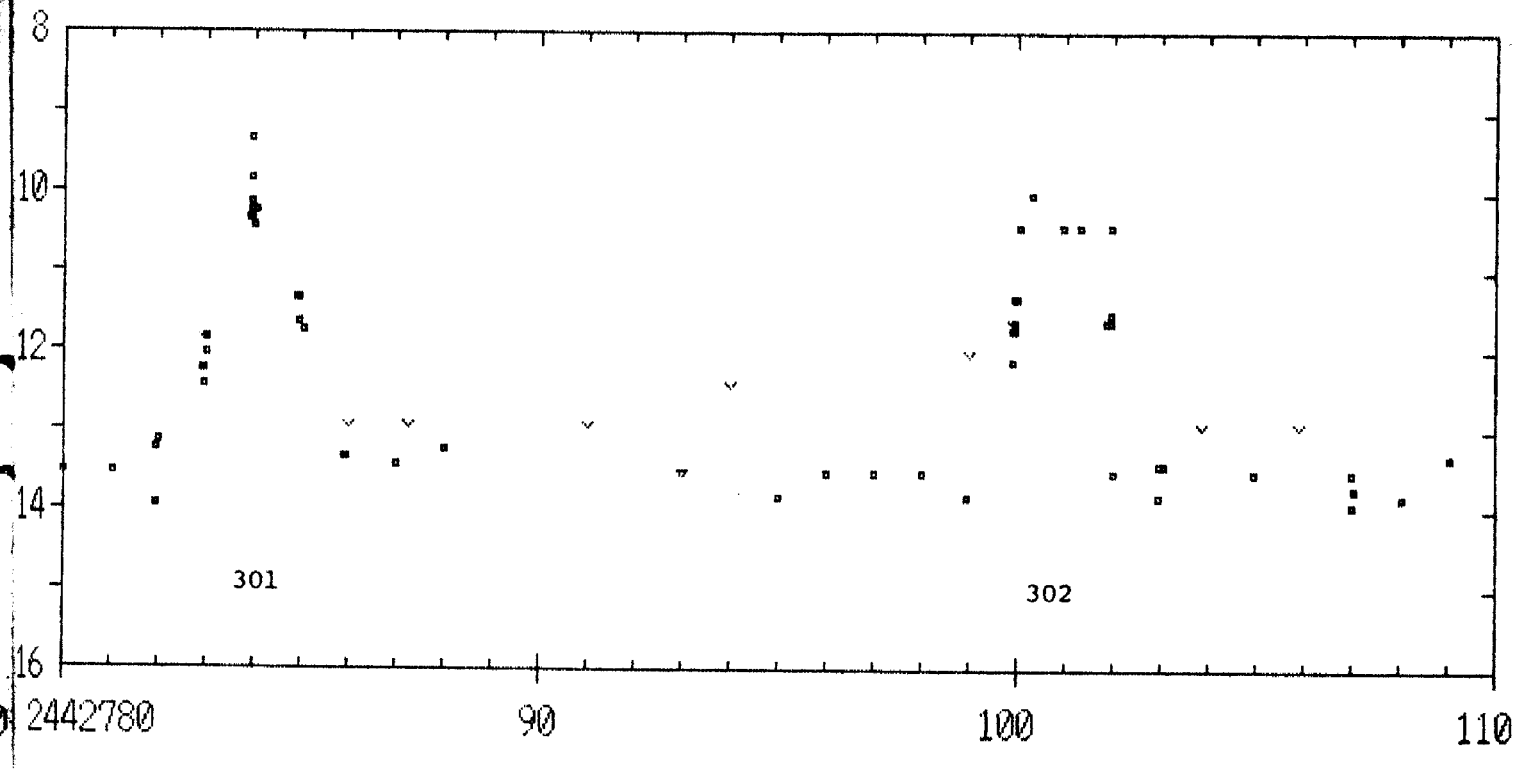


Fig. 34. VW Hydri. Normal outbursts 301 & 302 plotted from individual observations.

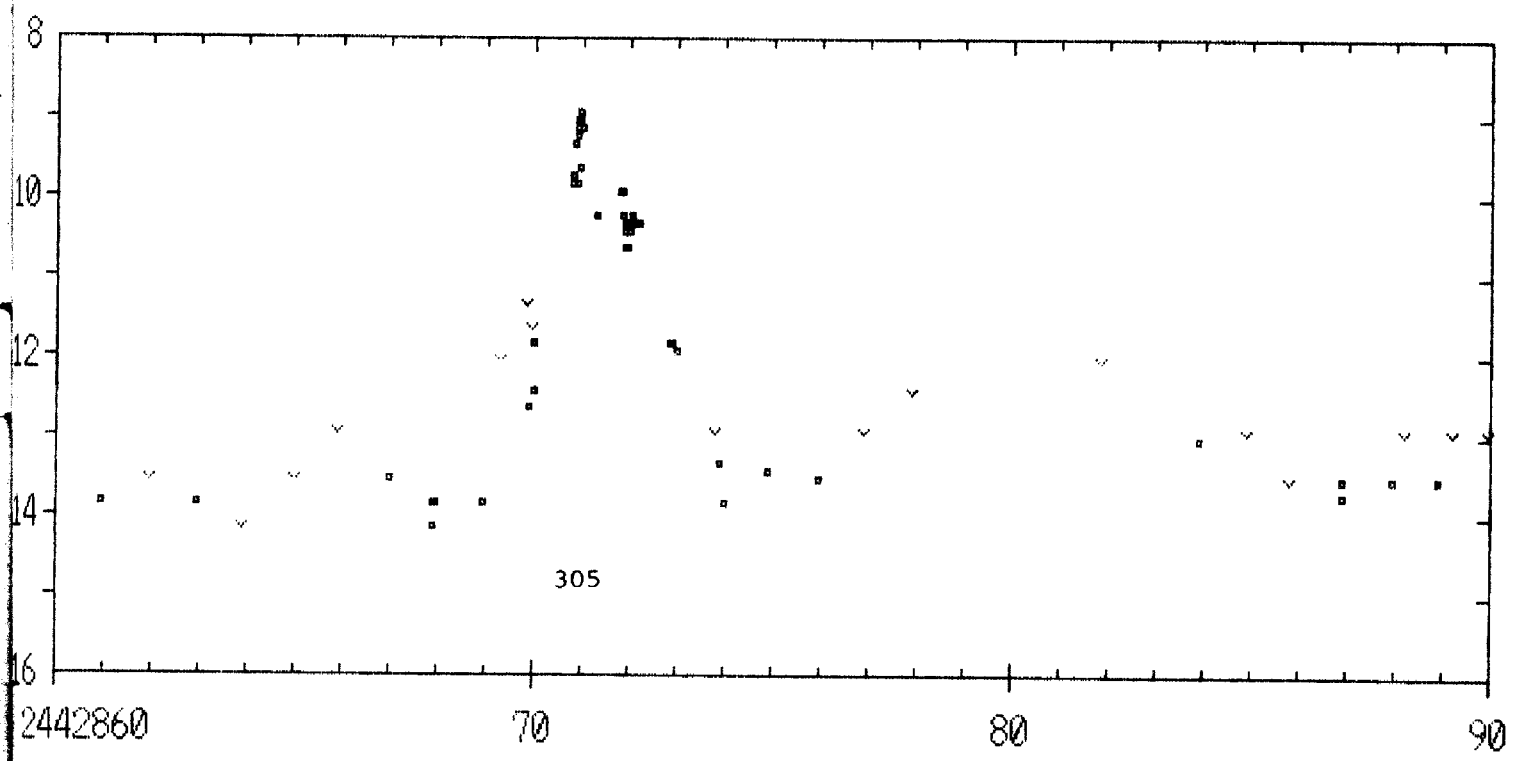


Fig. 35. VW Hydri. Normal outburst 305 plott from individual observations.

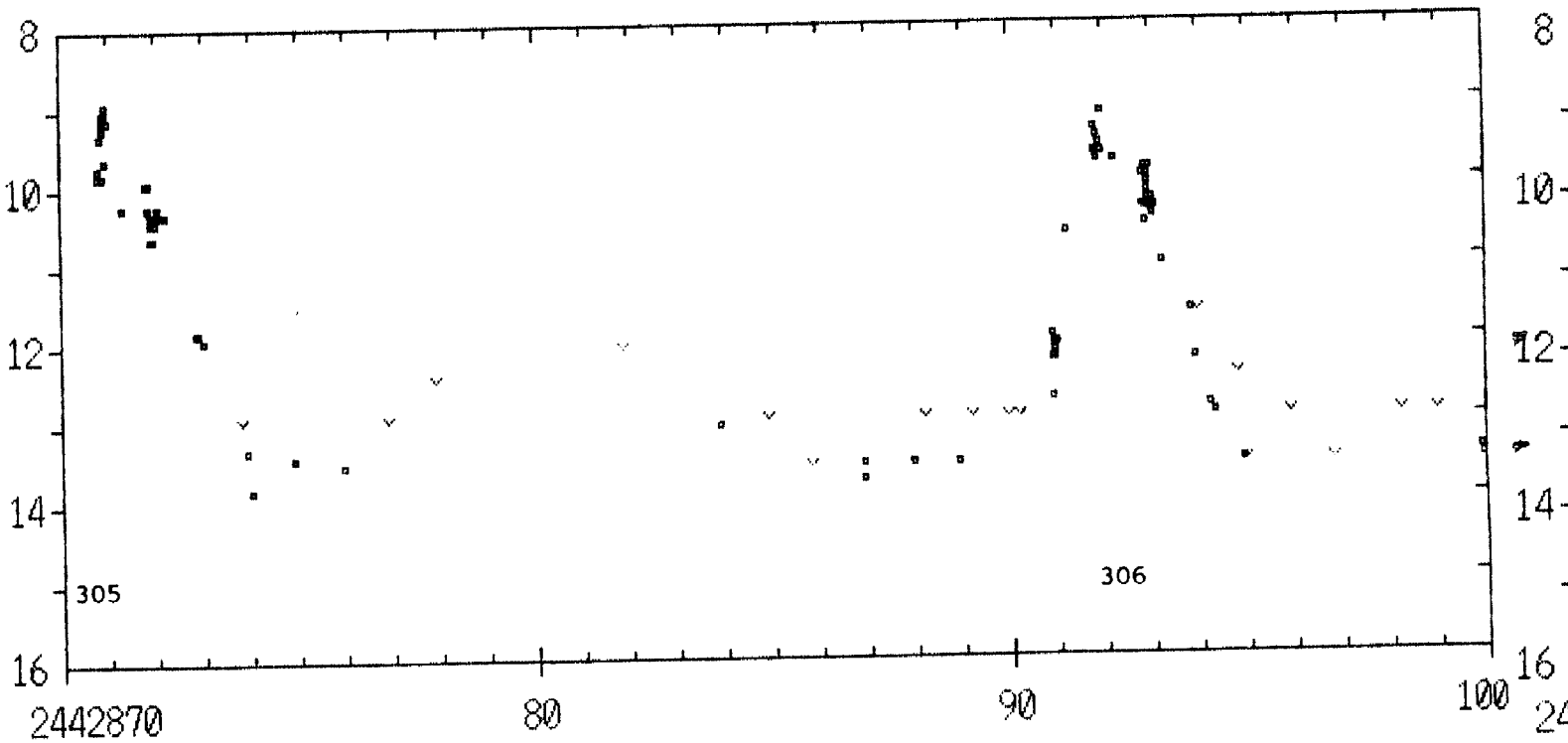


Fig. 36. VW Hydri. Normal outbursts 305 & 306 plotted from individual observations.

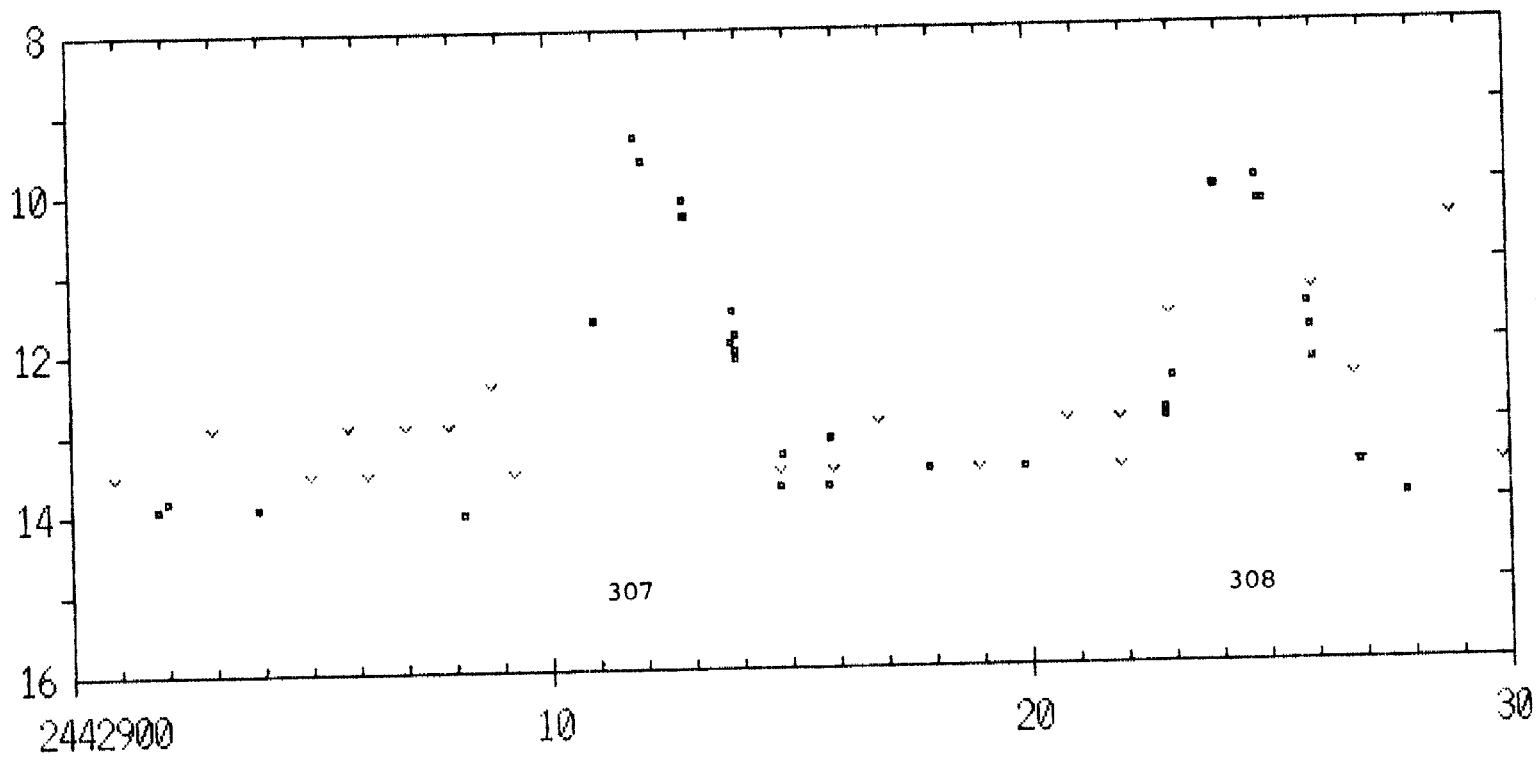


Fig. 37. VW Hydri. Normal outbursts 307 & 308 plotted from individual observations.

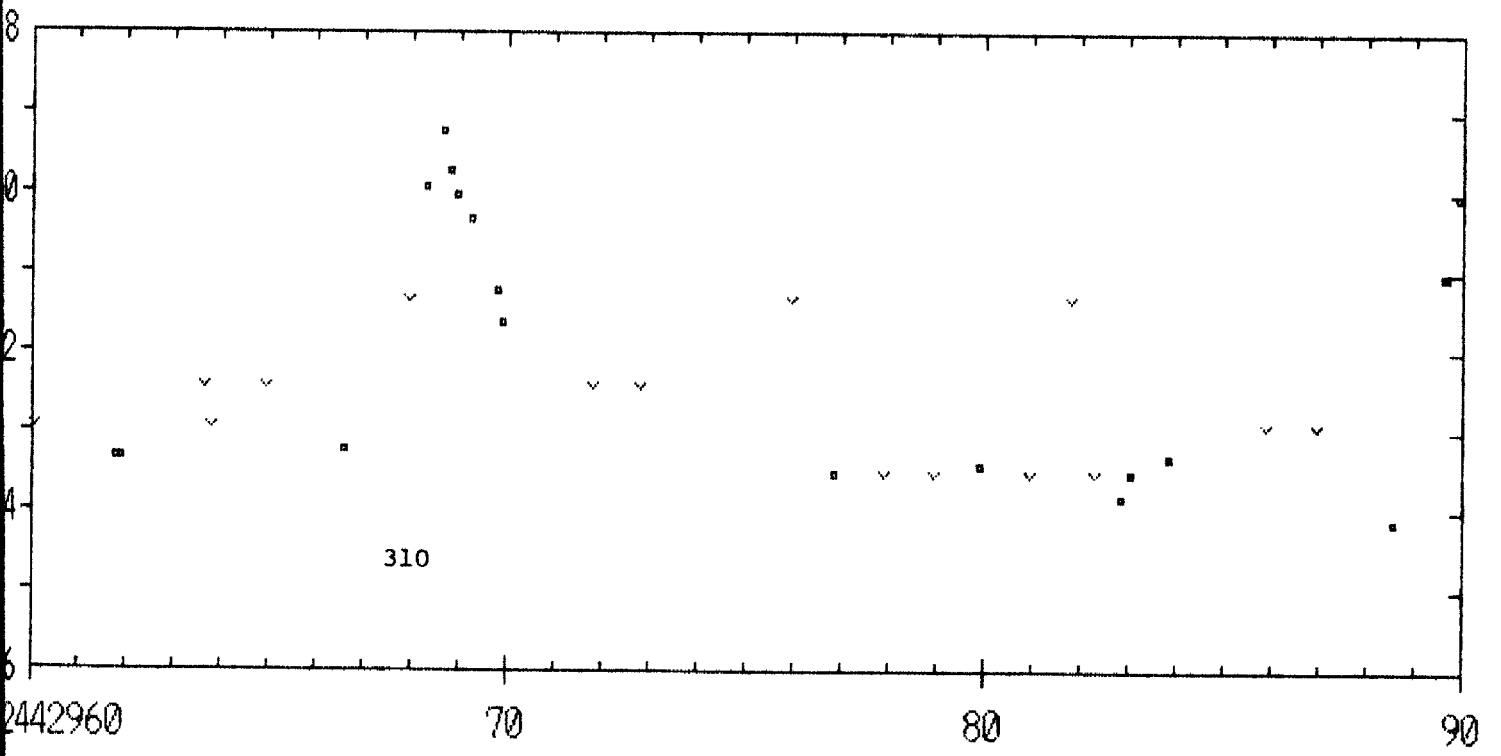


Fig. 38. VW Hydri. Normal outburst 310 plotted from individual observations.

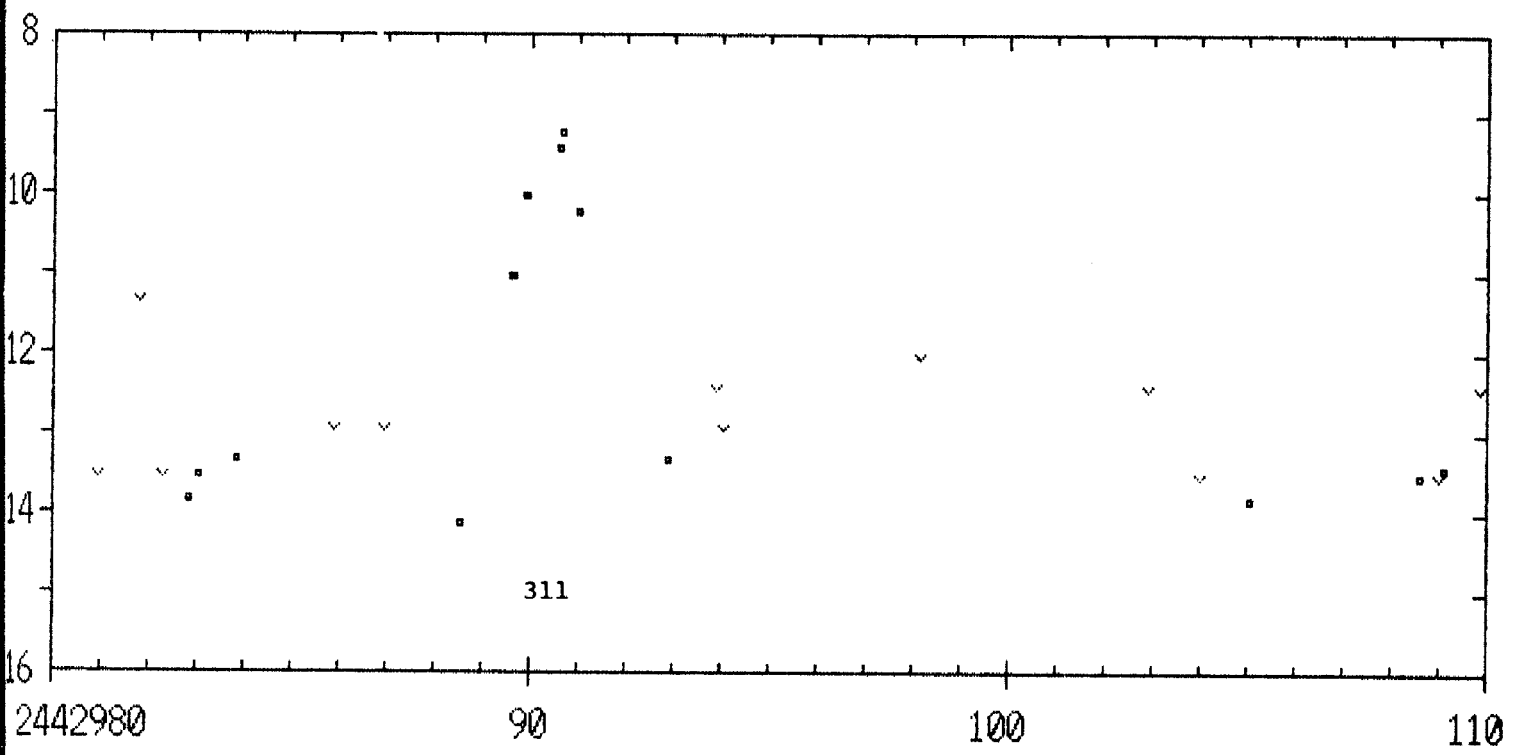


Fig. 39. VW Hydri. Normal outburst 311 plotted from individual observations.

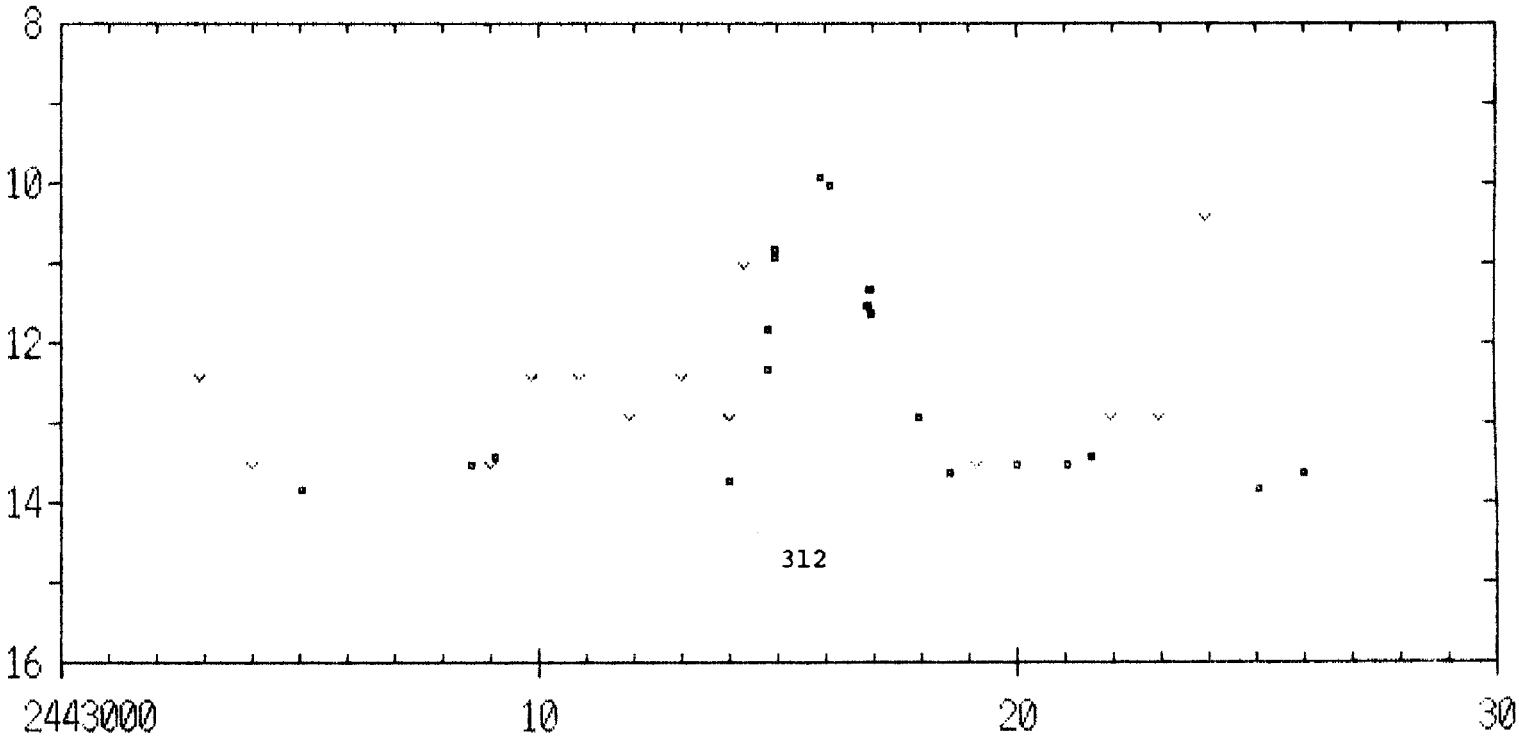


Fig. 40. VW Hydri. Normal outburst 312 plotted from individual observations.

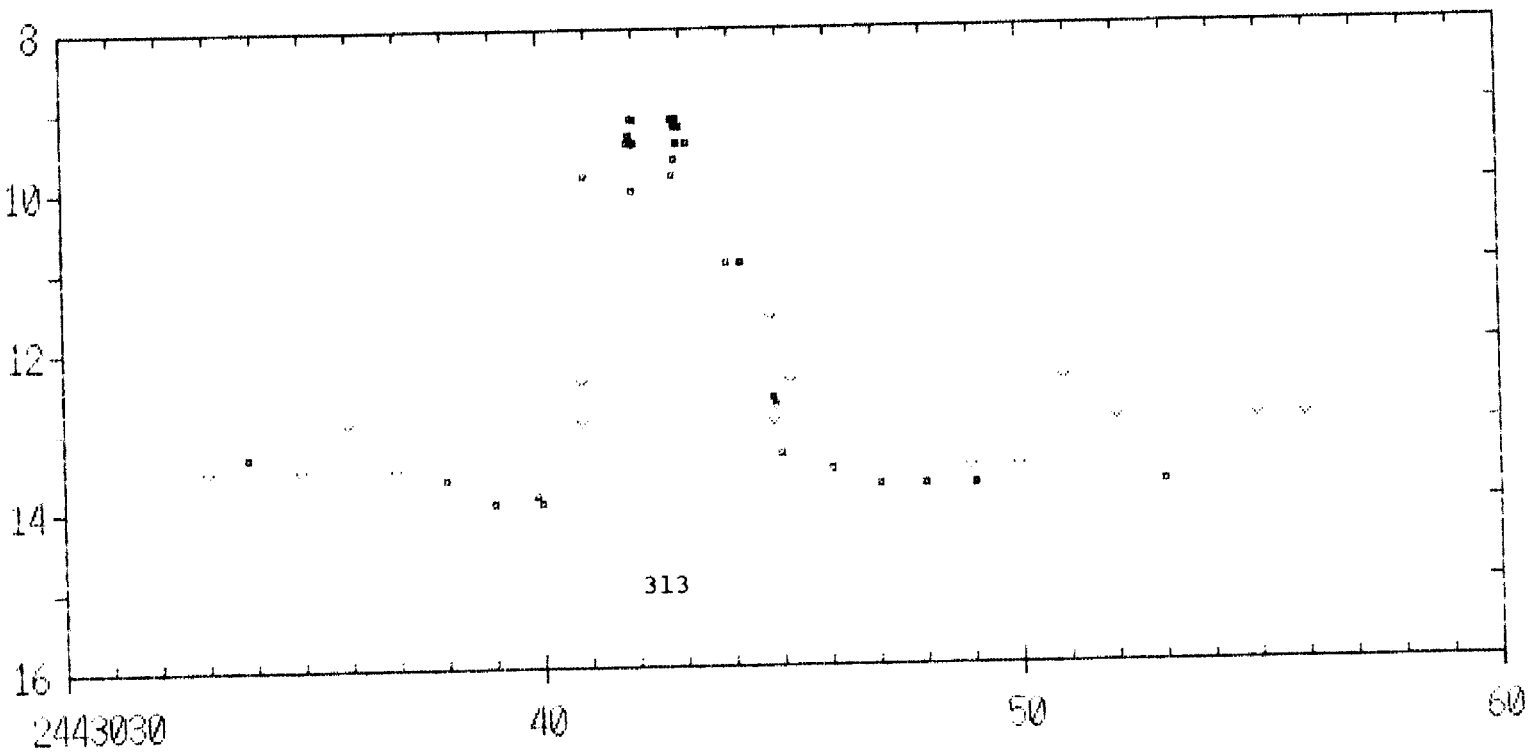


Fig. 41. VW Hydri. Normal outburst 313 plotted from individual observations.

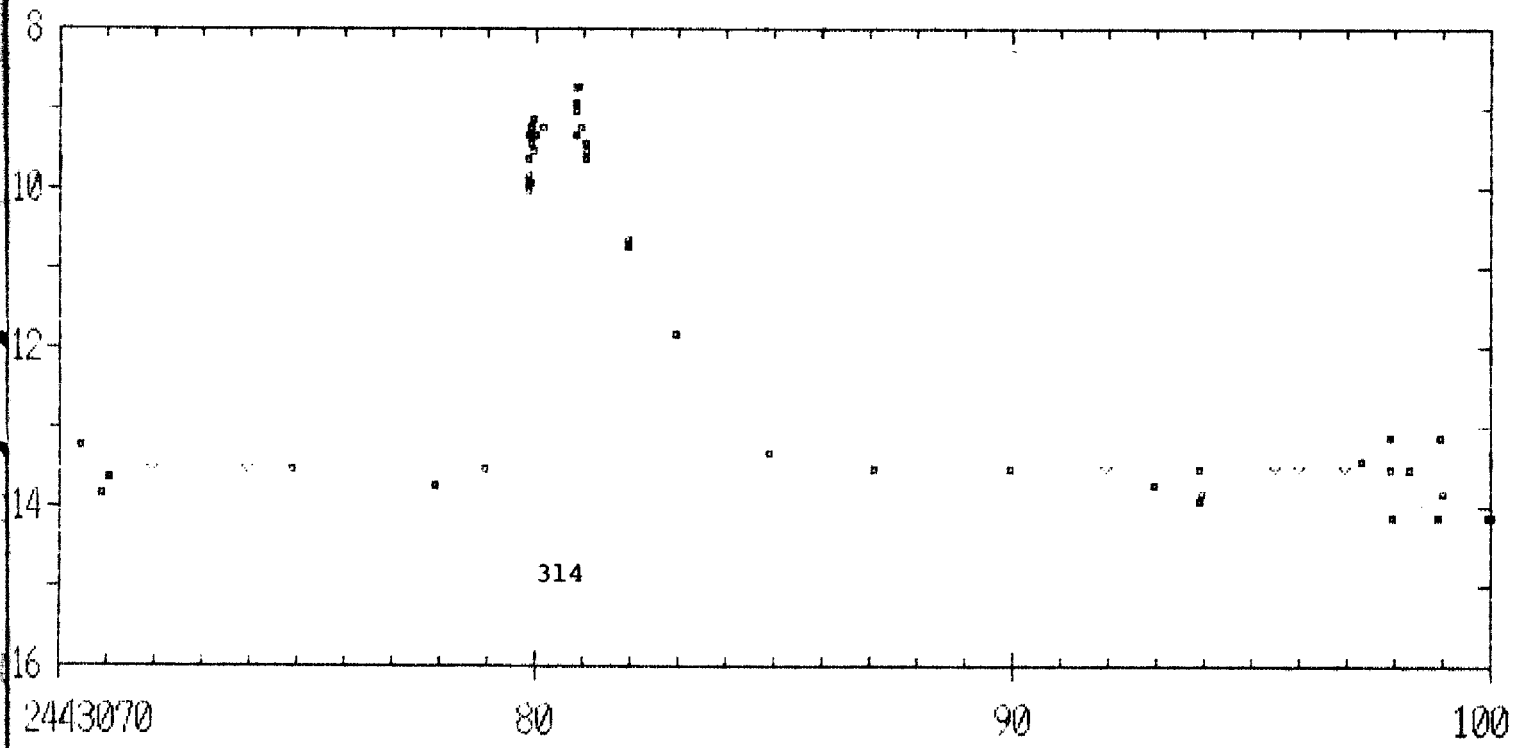


Fig. 42. VW Hydri. Normal outburst 314 plotted from individual observations.

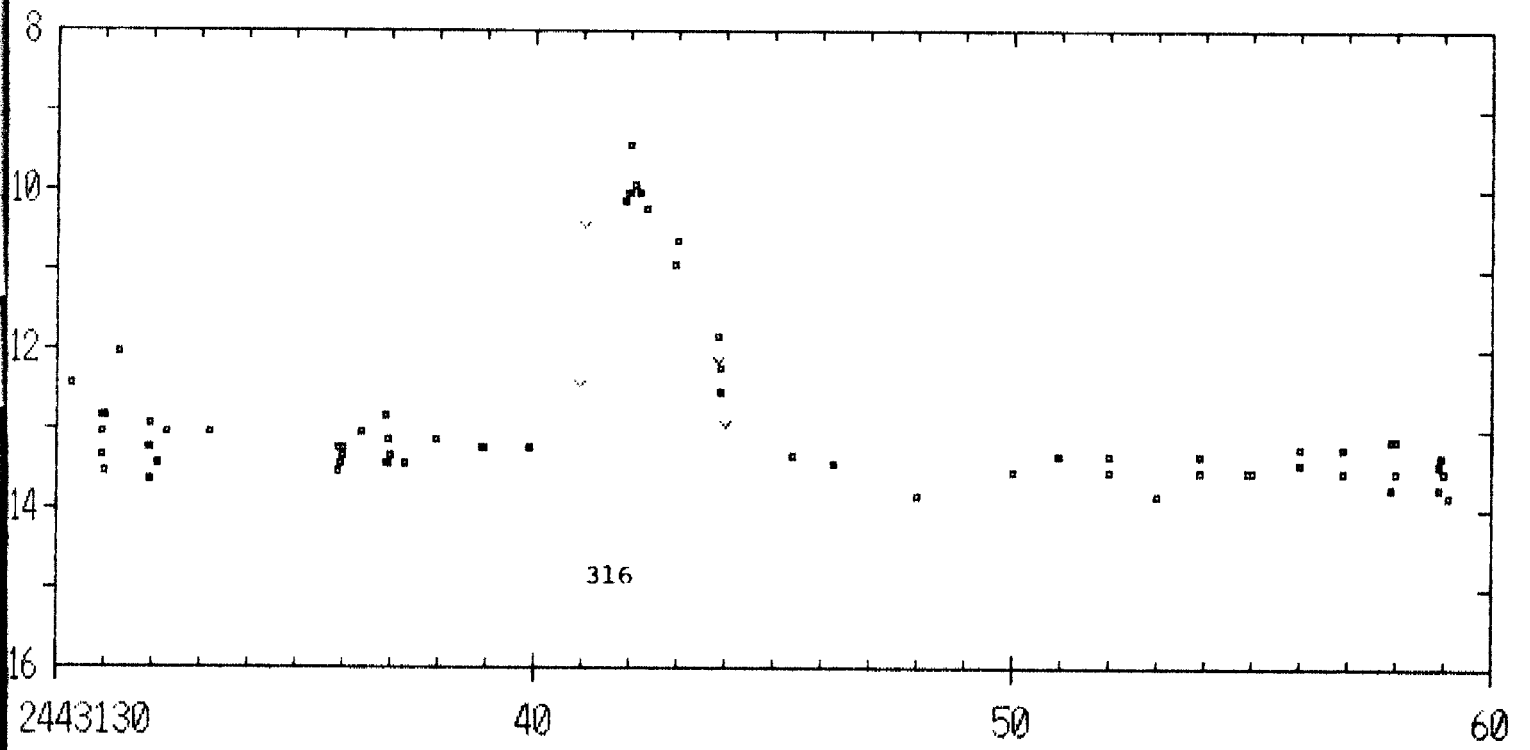


Fig.43. VW Hydri. Normal outburst 316 plotted from individual observations.

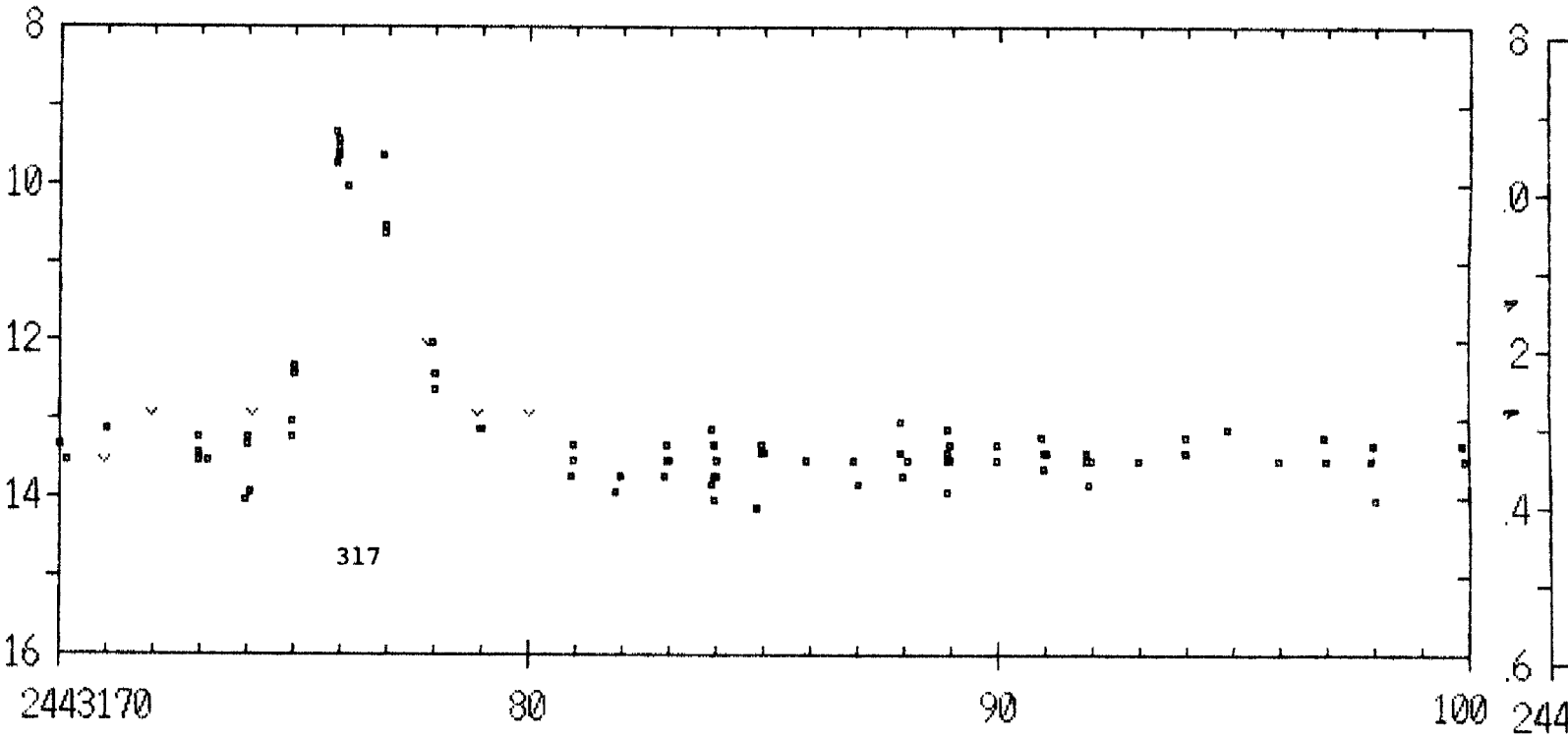


Fig.44. VW Hydri. Normal outburst 317 plotted from individual observations.

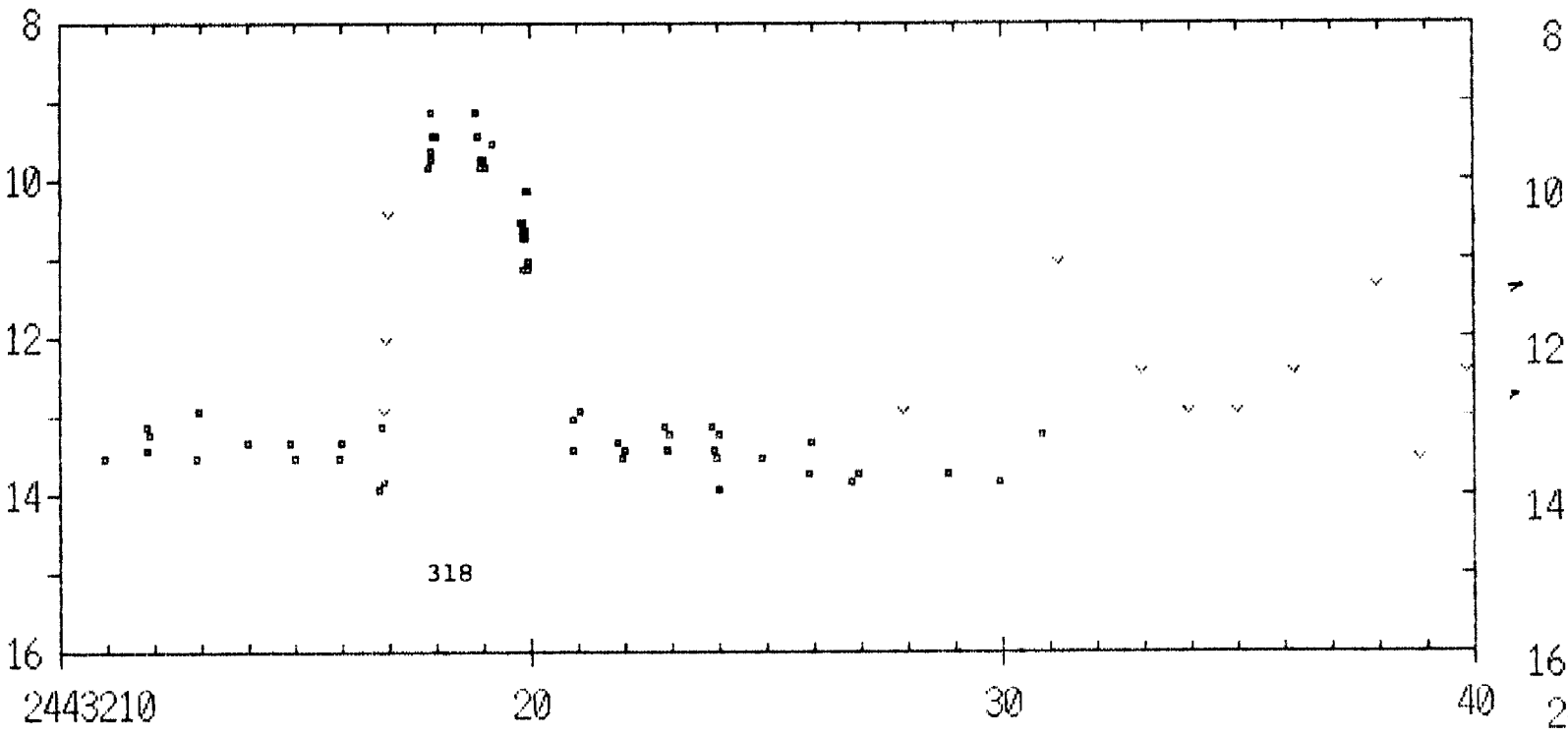


Fig. 45. VW Hydri. Normal outburst 318 plotted from individual observations.

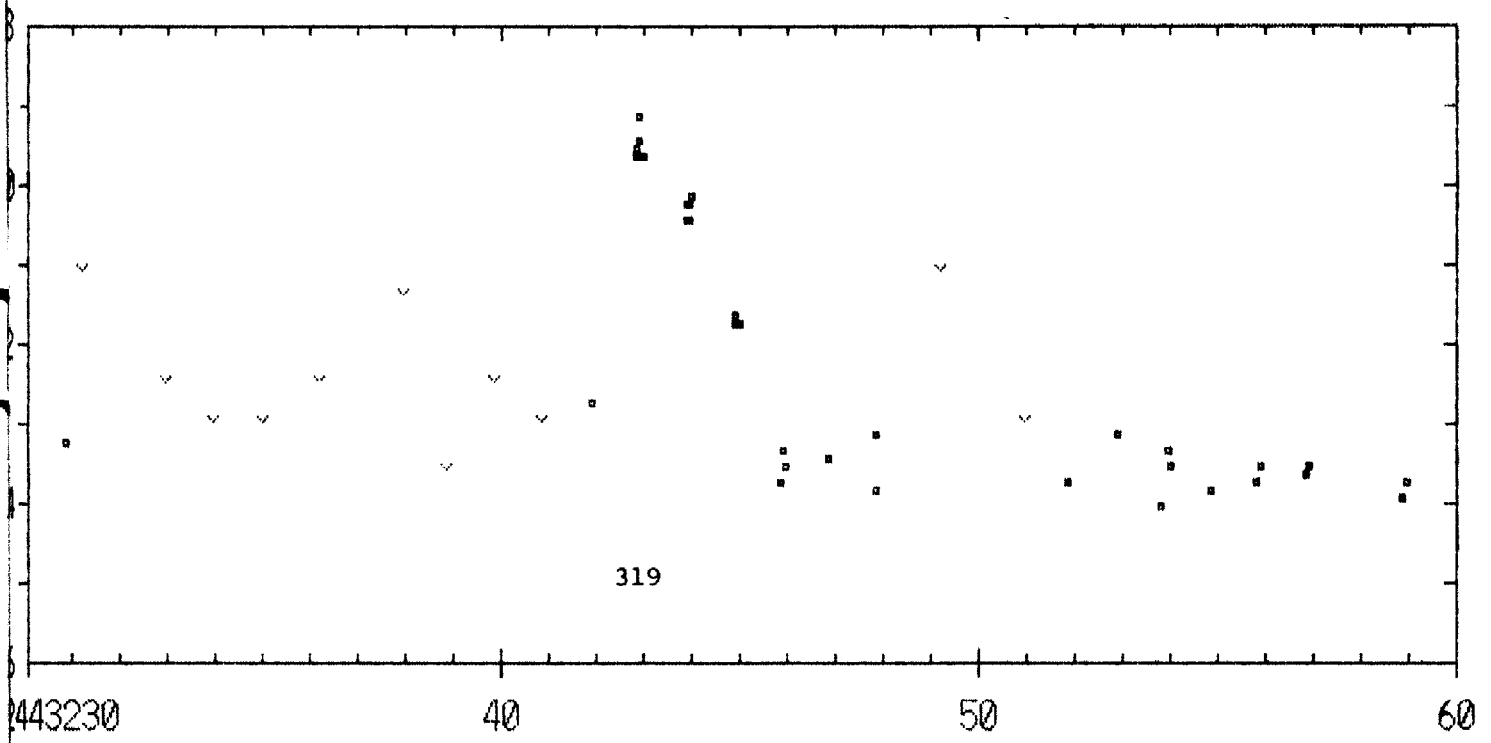


Fig. 46. VW Hydri. Normal outburst 319 plotted from individual observations.

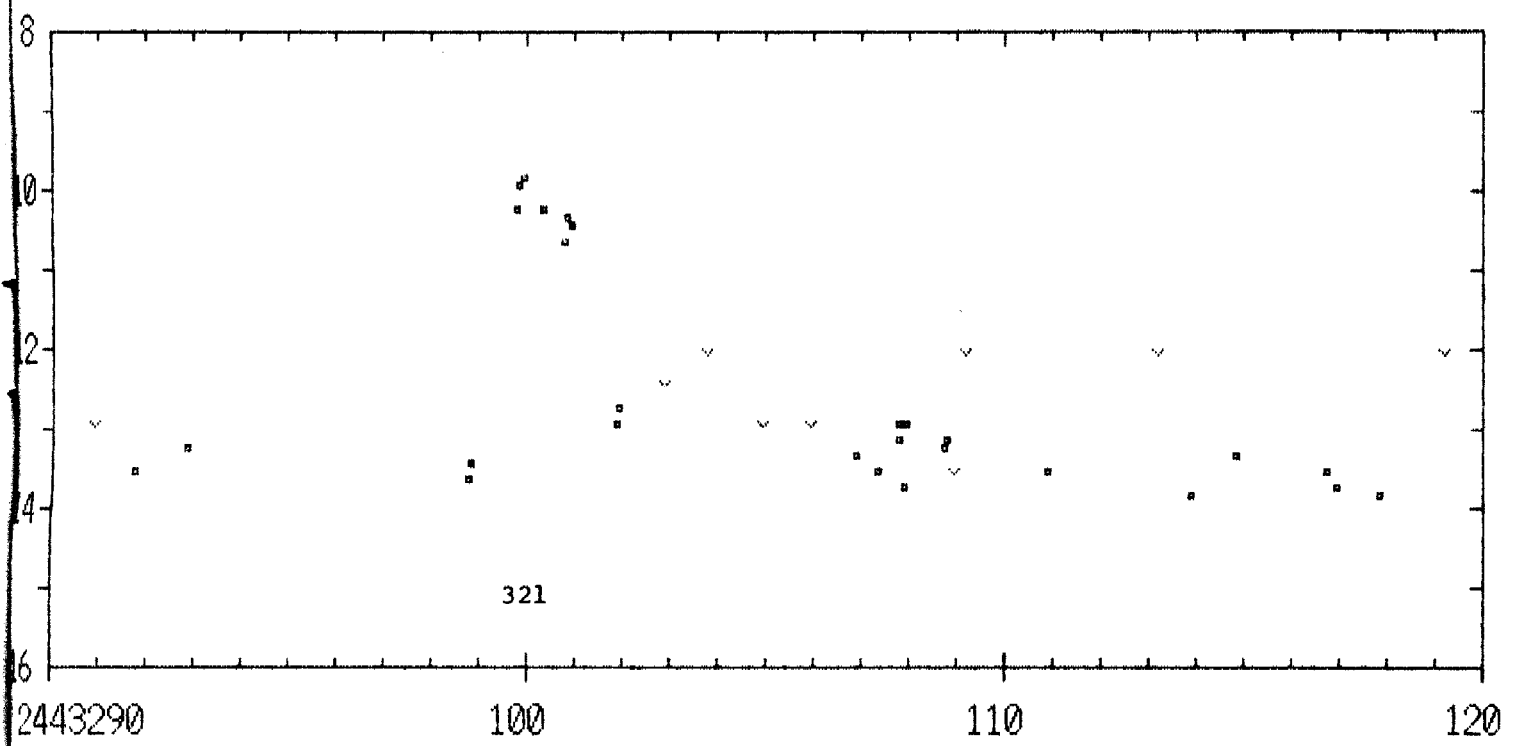


Fig.47. VW Hydri. Normal outburst 321 plotted from individual observations.

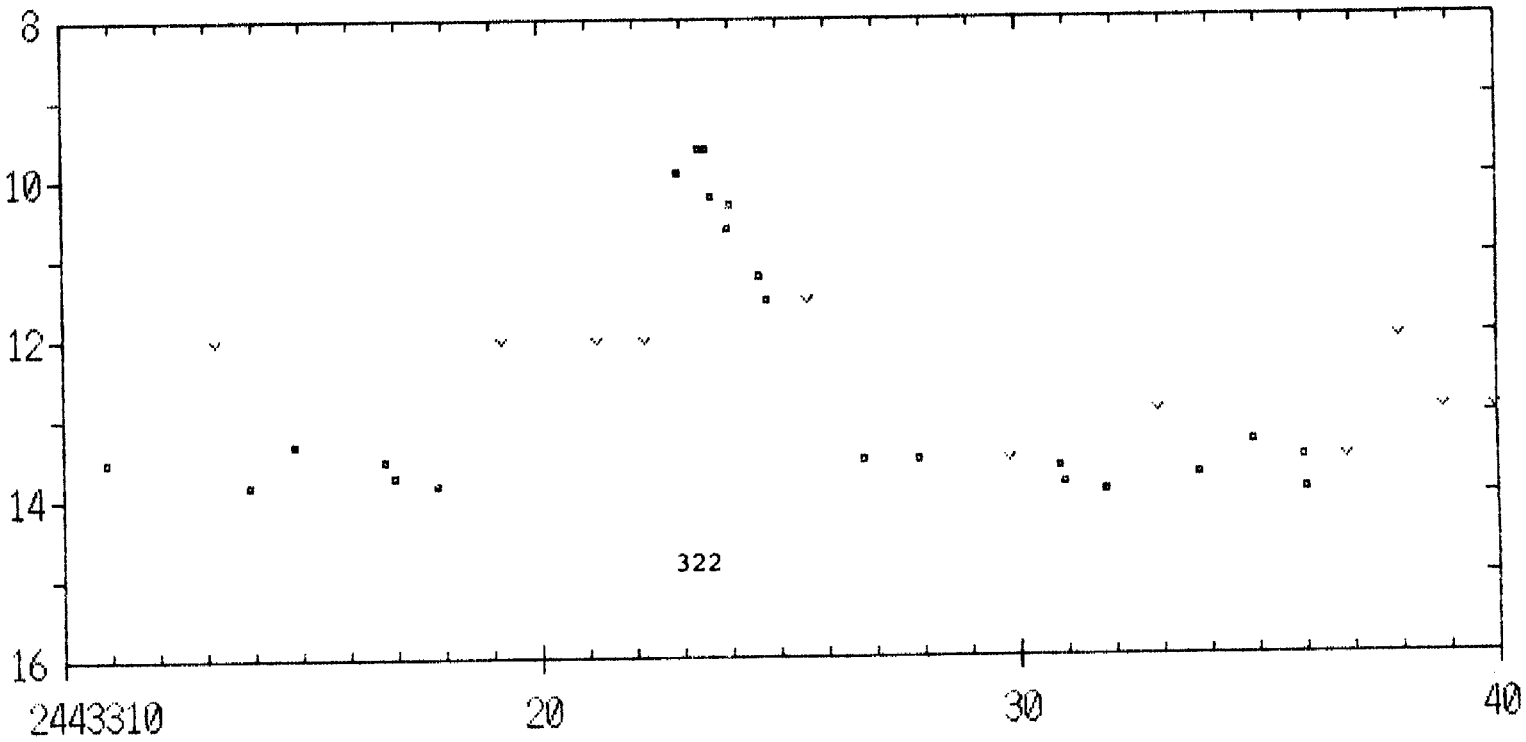


Fig.48. VW Hydri. Normal outburst 322 plotted from individual observations.

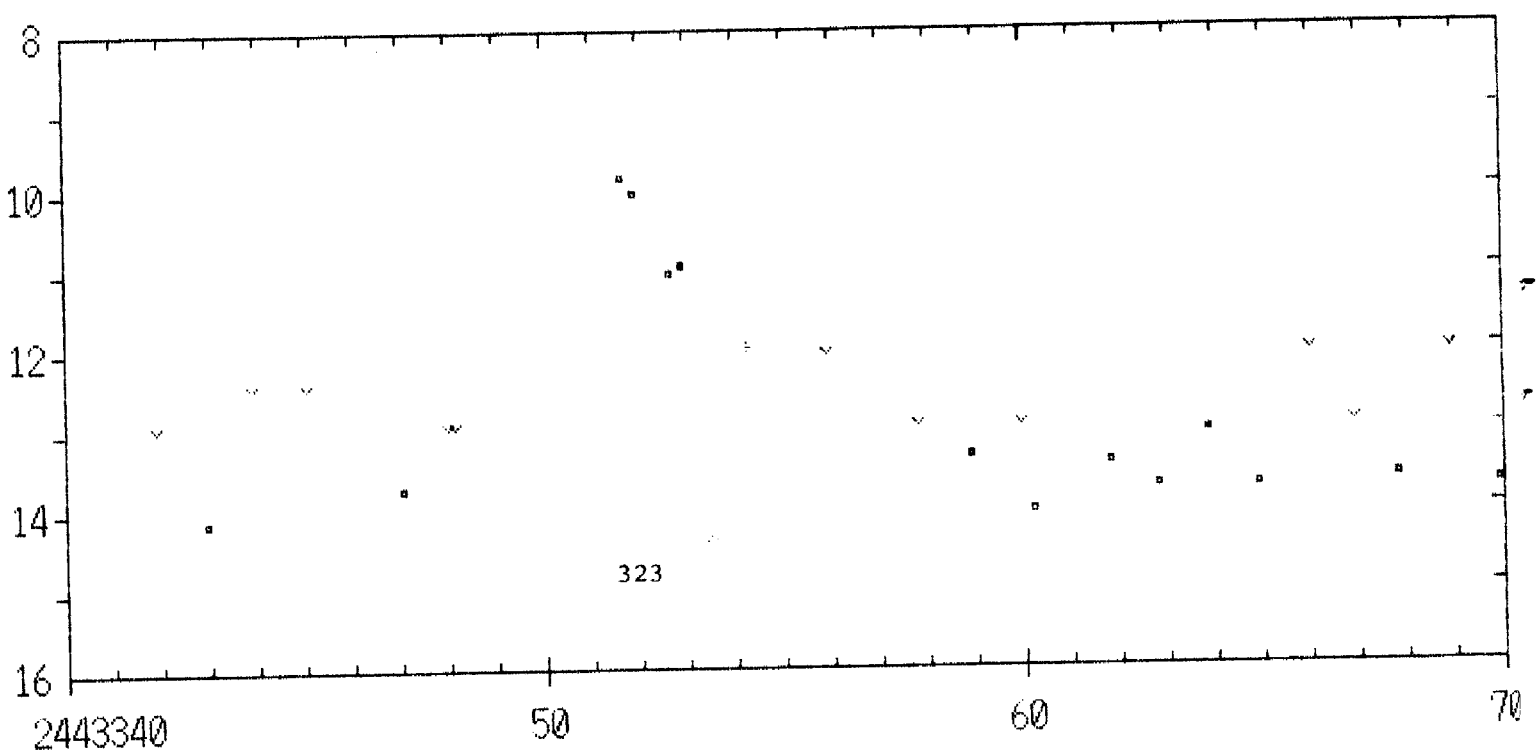


Fig. 49. VW Hydri. Normal outburst 323 plotted from individual observations.

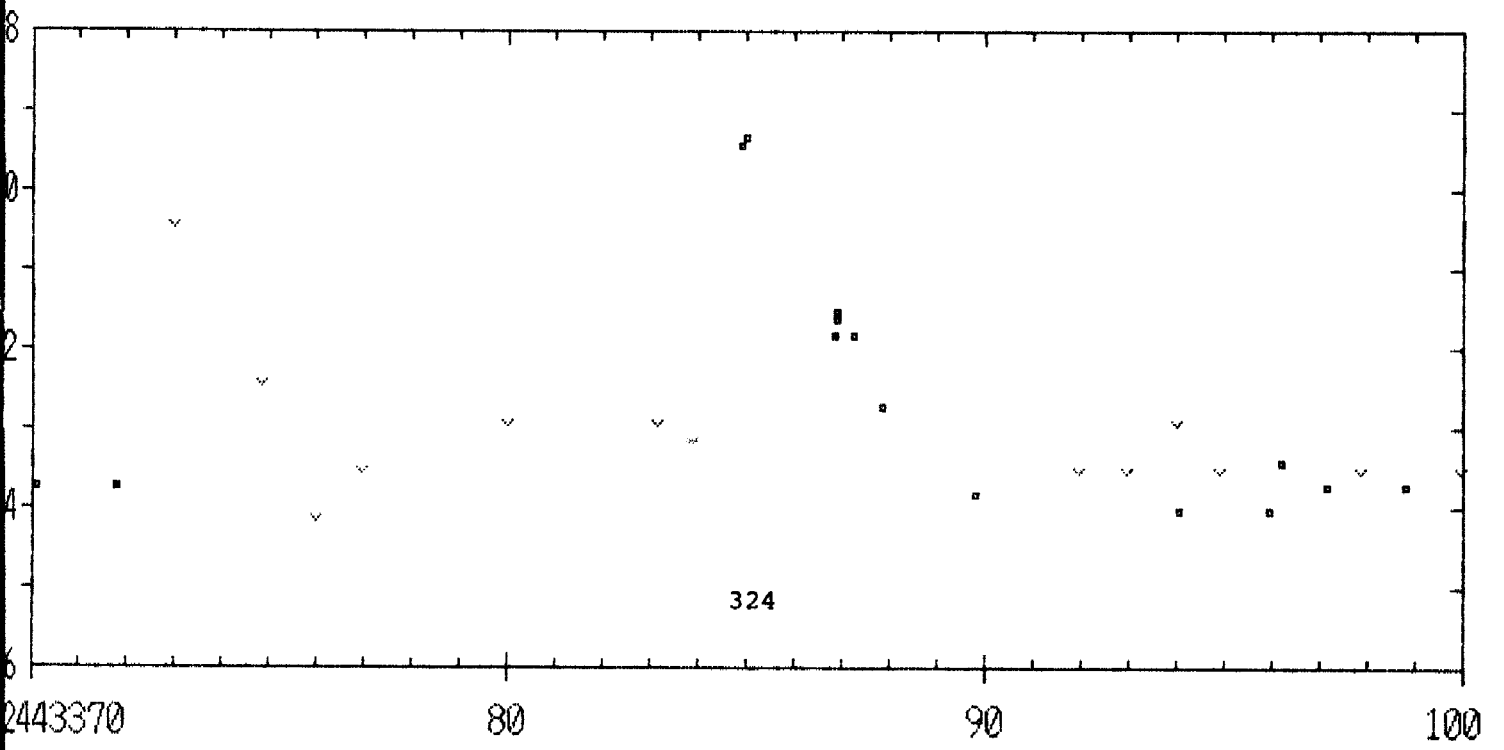


Fig.50. VW Hydri. Normal outburst 324 plotted from individual observations.

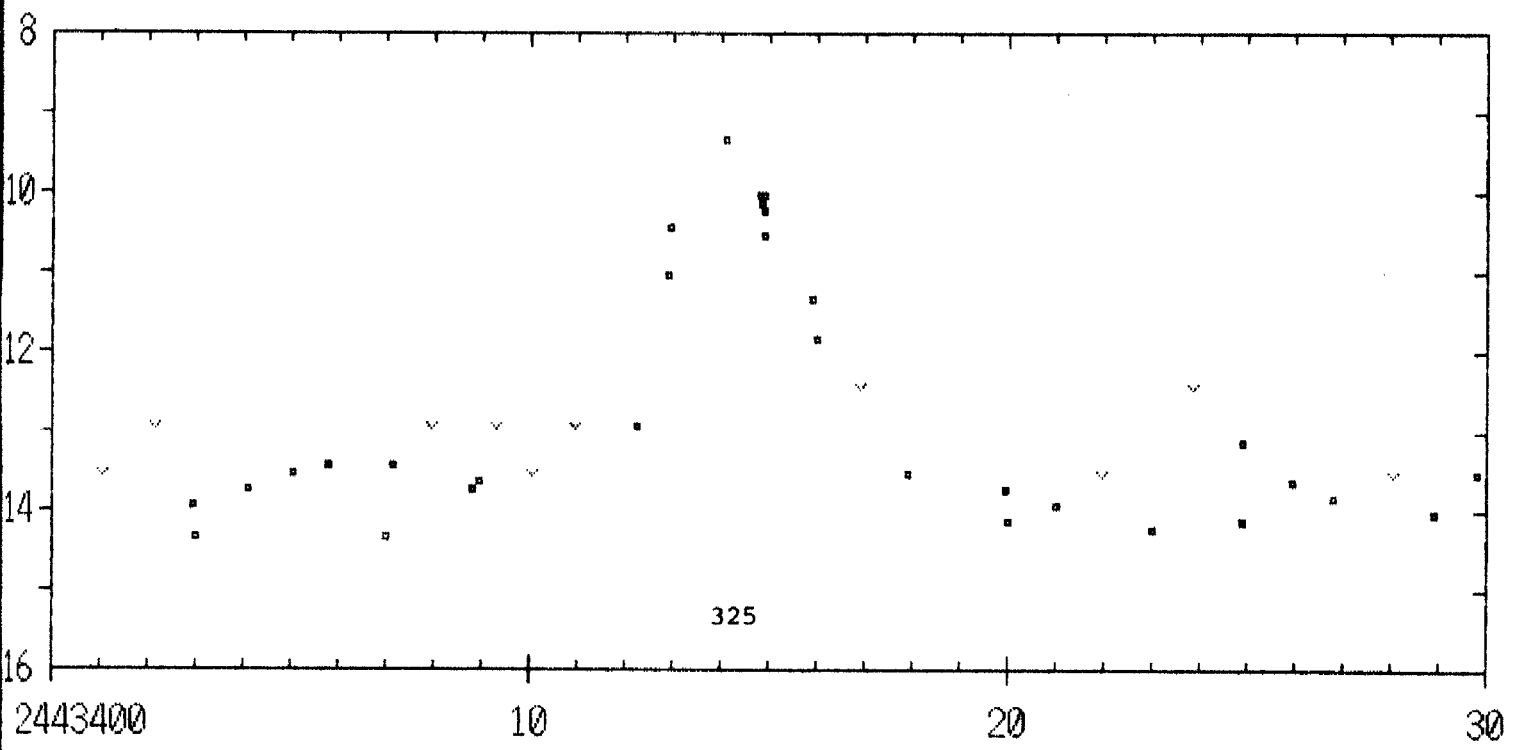


Fig. 51. VW Hydri. Normal outburst 325 plotted from individual observations.

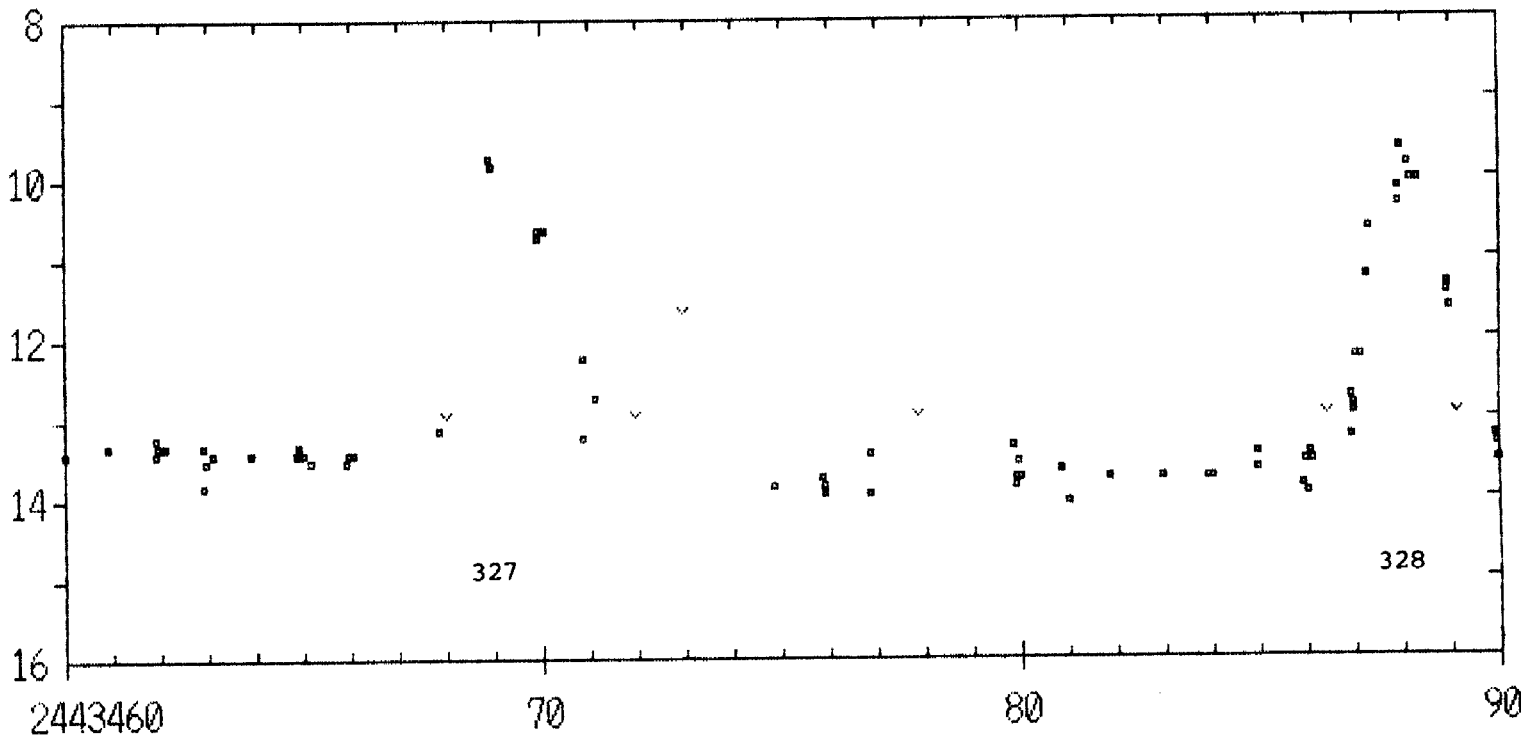


Fig. 52. VW Hydri. Normal outbursts 327 & 328 plotted from individual observations. For 328 see also Fig. 53.

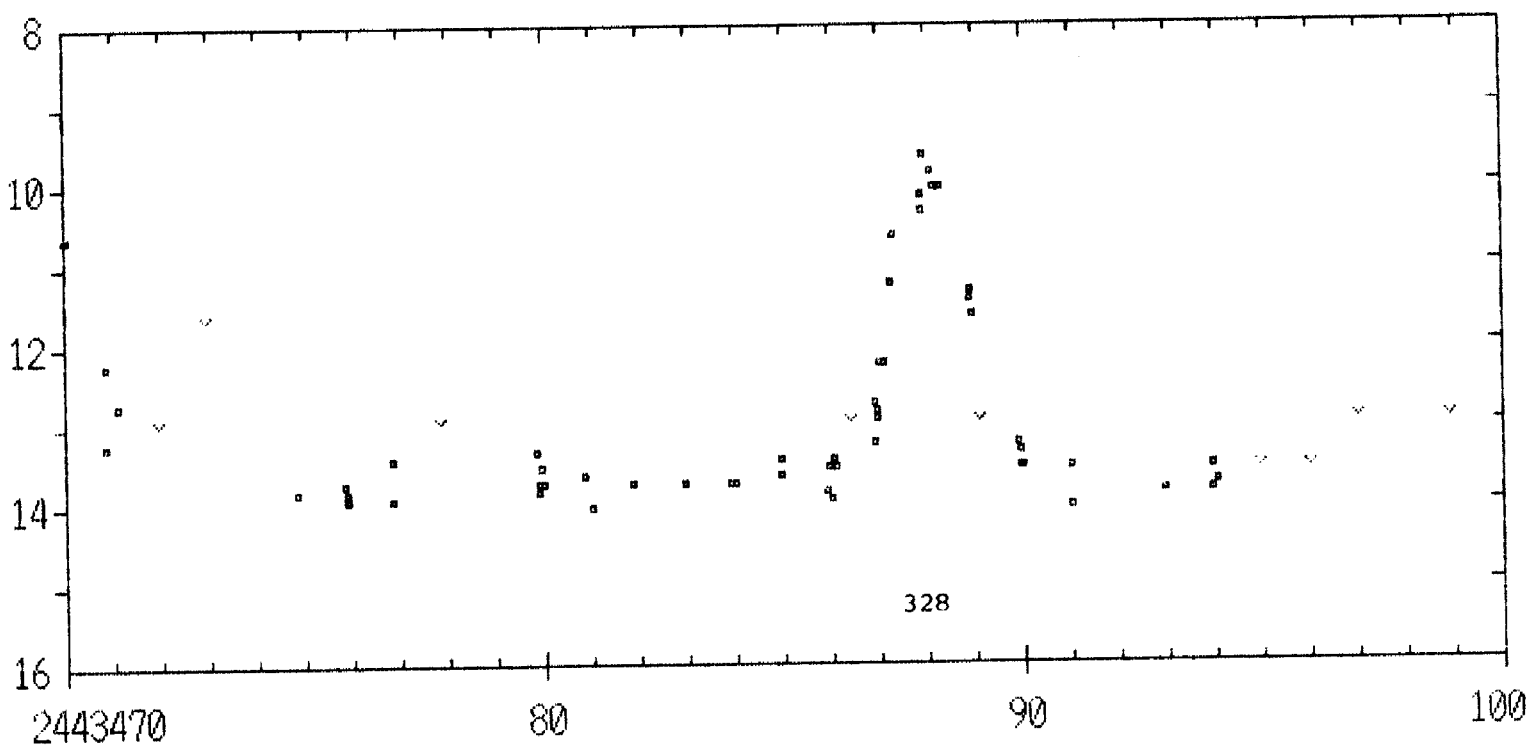


Fig. 53. VW Hydri. Normal outburst 328 plotted from individual observations.

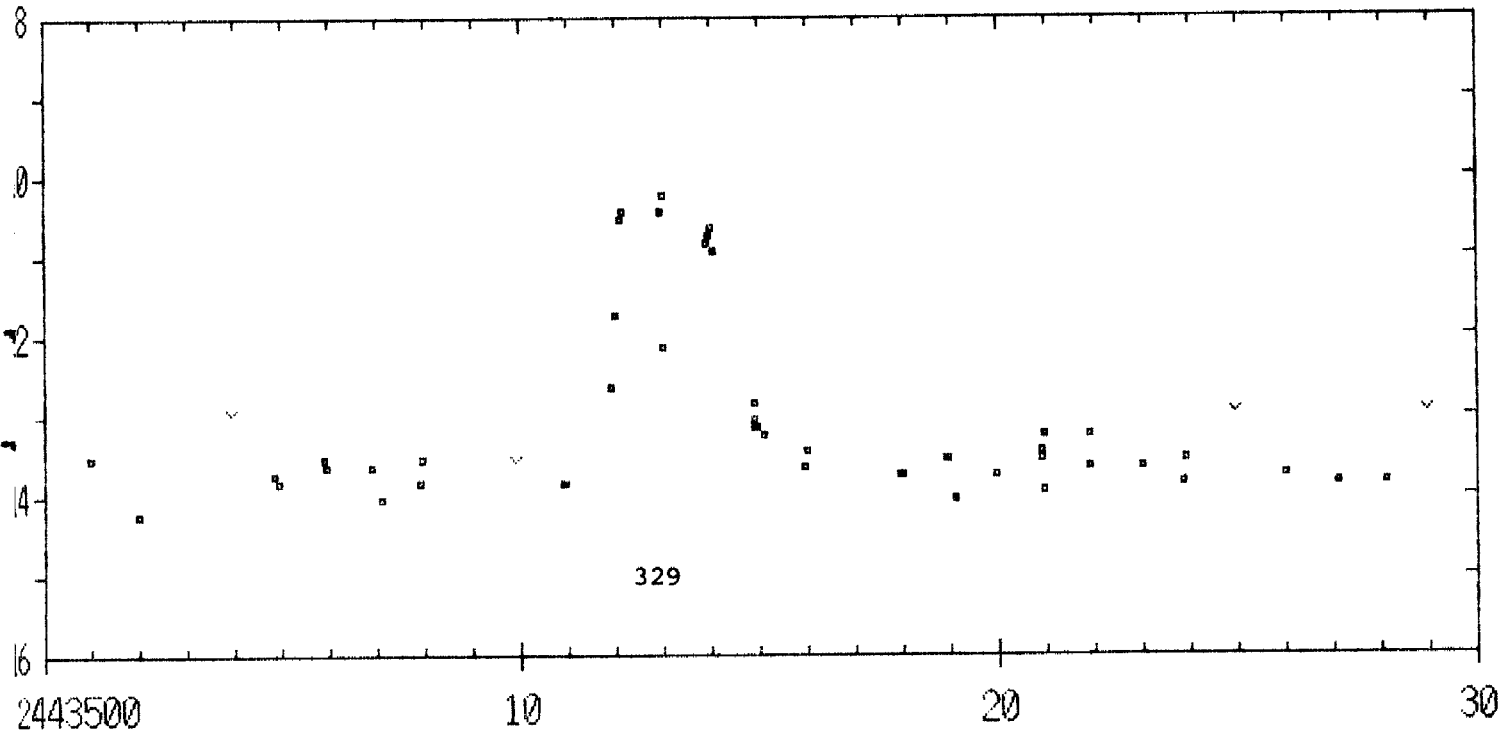


Fig. 54. VW Hydri. Normal outburst 329 plotted from individual observations.

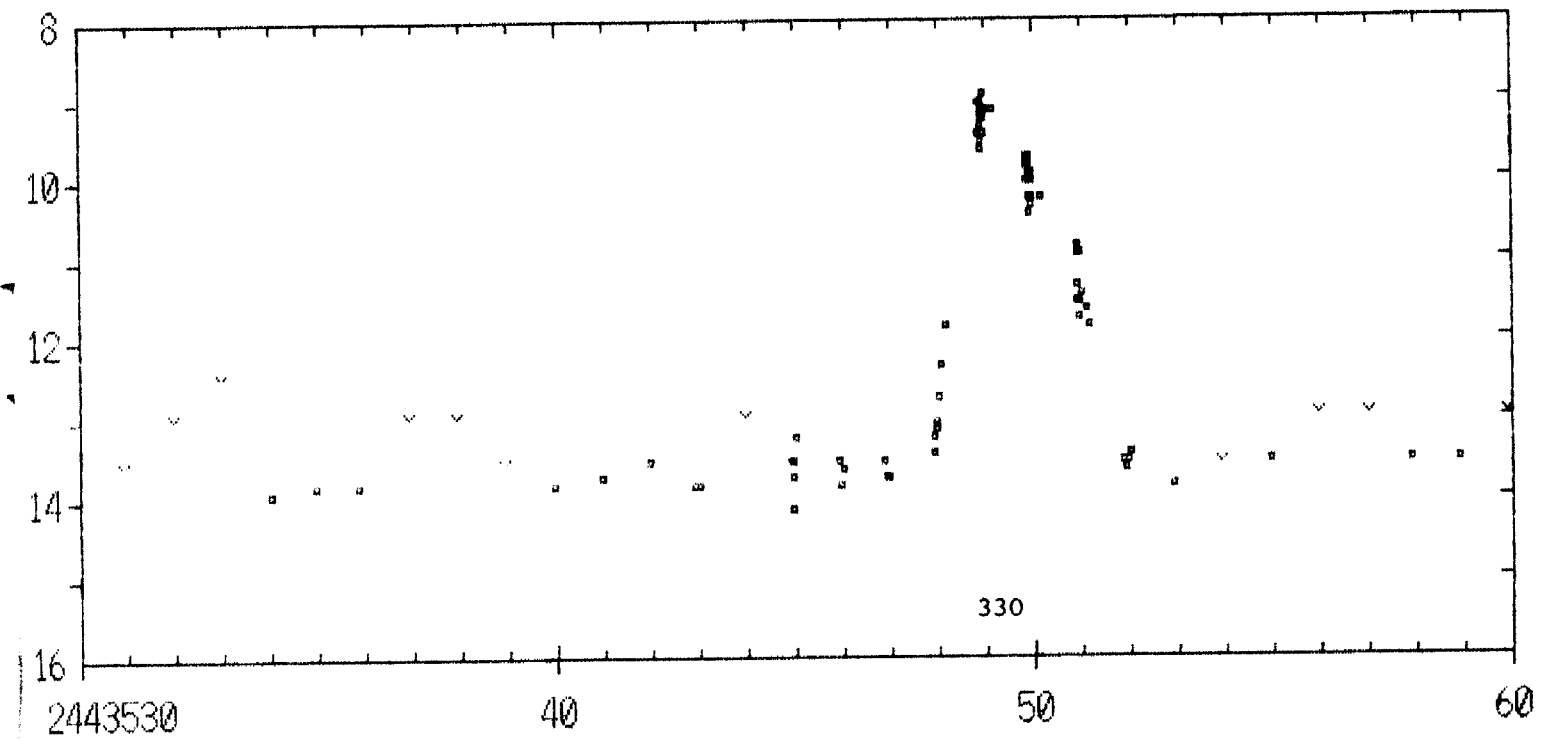


Fig. 55. VW Hydri. Normal outburst 330 plotted from individual observations.

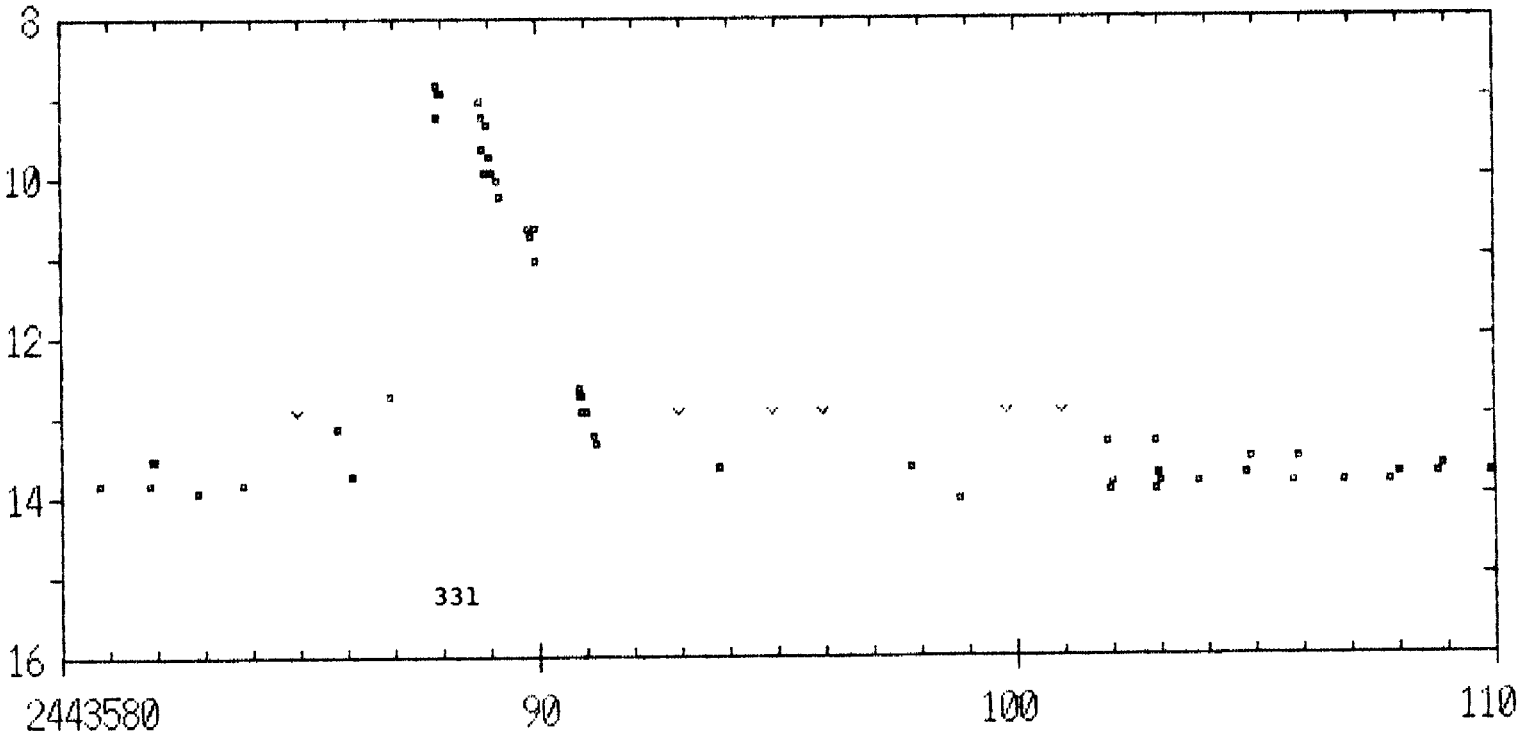


Fig. 56. VW Hydri. Normal outburst 331 plotted from individual observations.

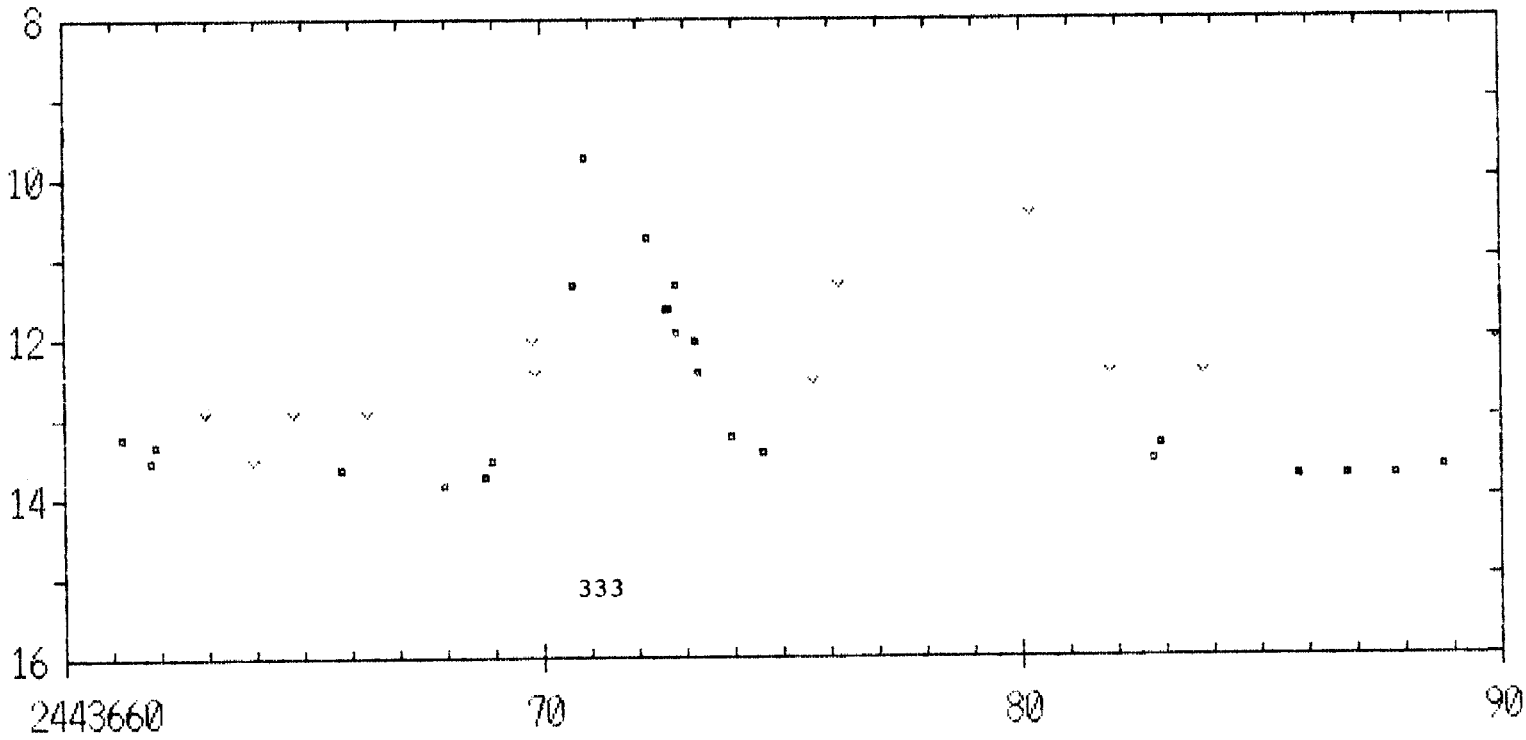


Fig. 57. VW Hydri. Normal outburst 333 plotted from individual observations.

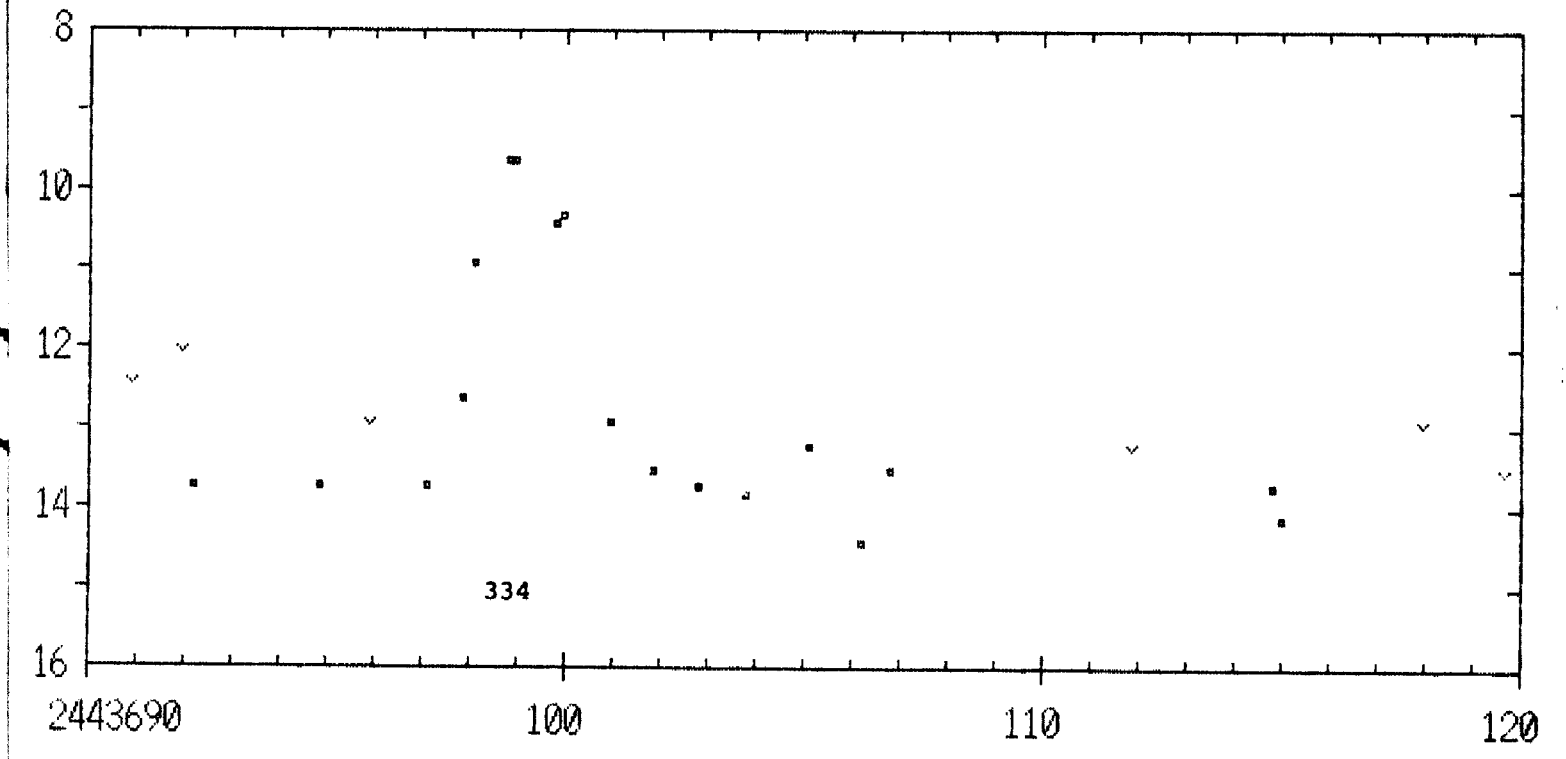


Fig. 58. VW Hydri. Normal outburst 334 plotted from individual observations.

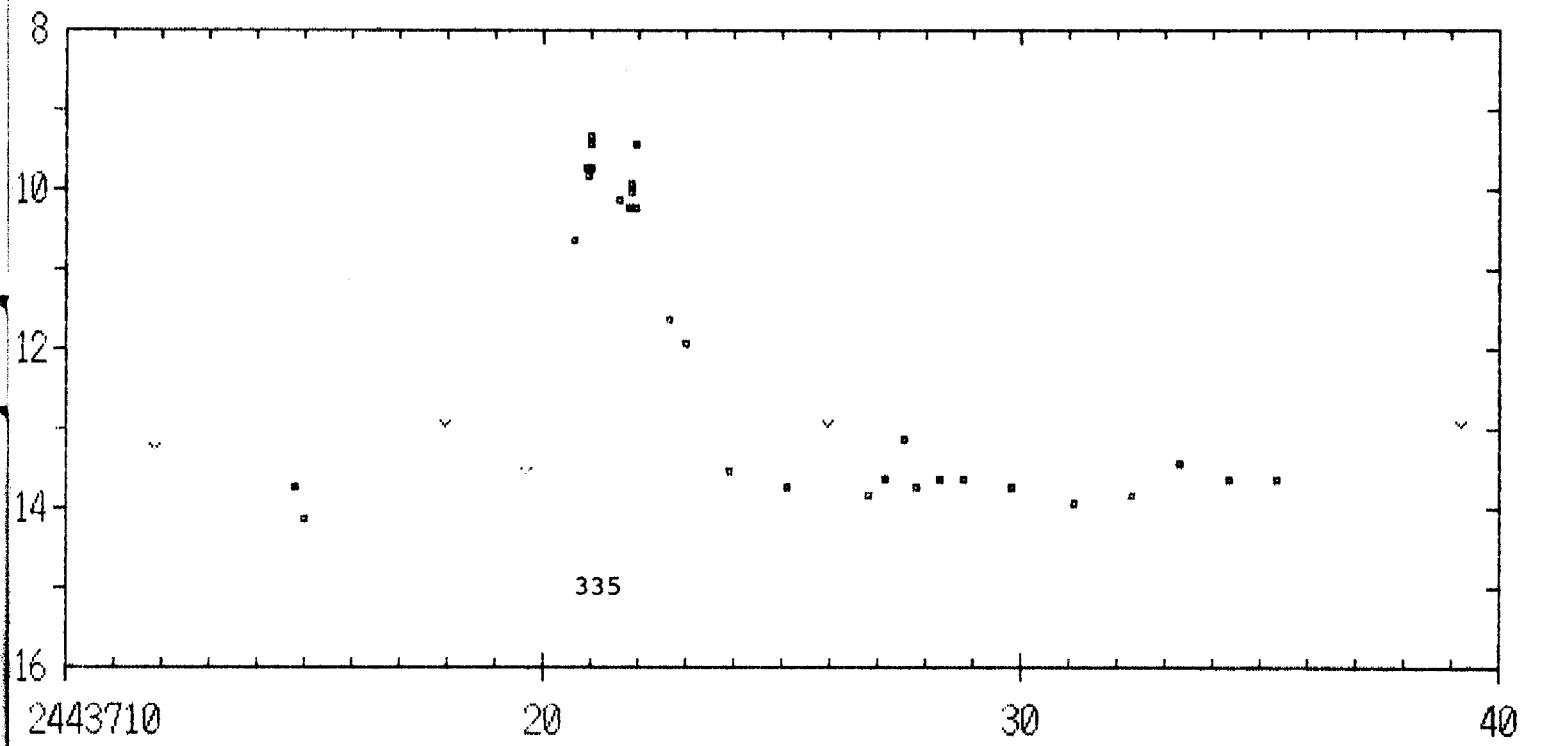


Fig. 59. VW Hydri. Normal outburst 335 plotted from individual observations.

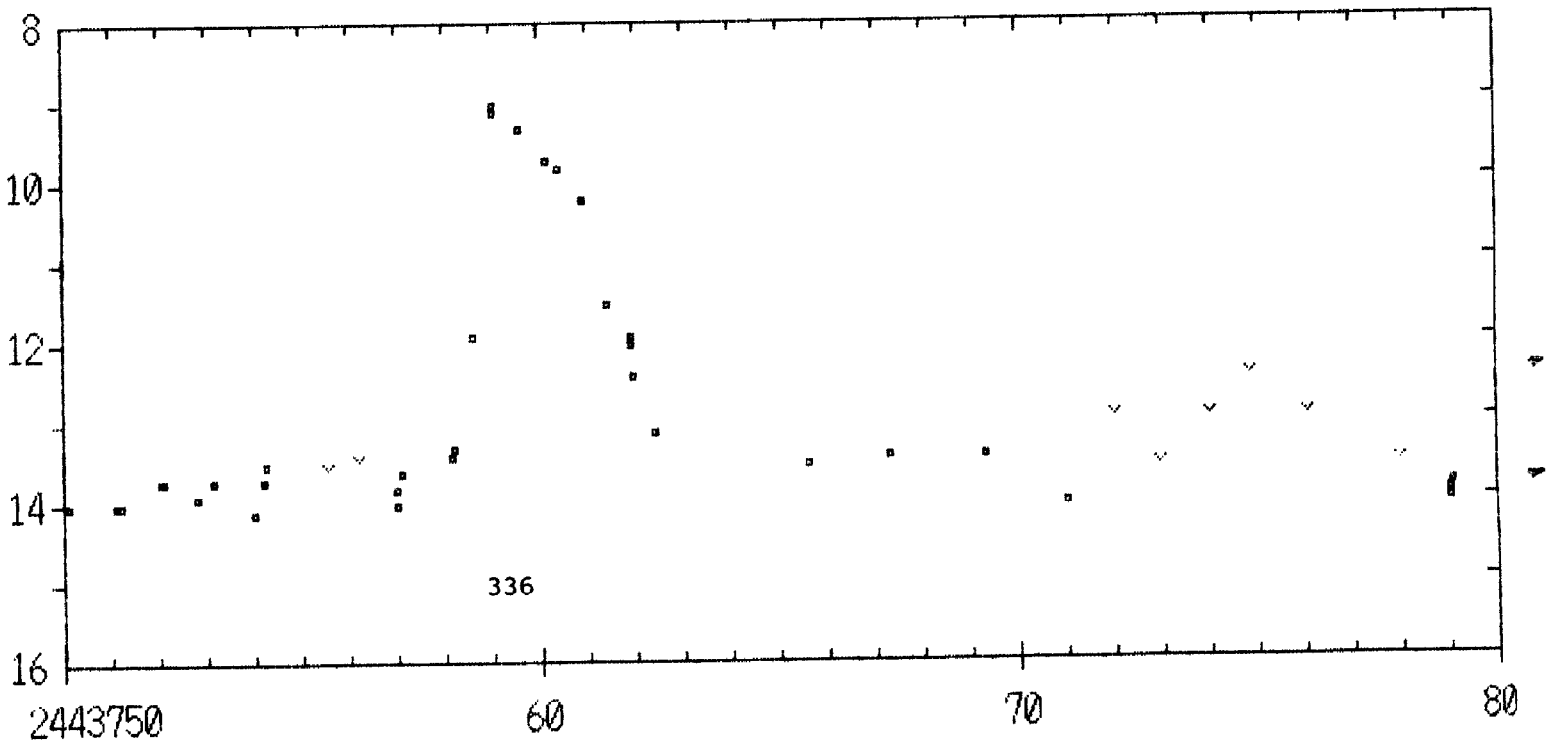


Fig. 60. VW Hydri. Normal outburst 336 plotted from individual observations.

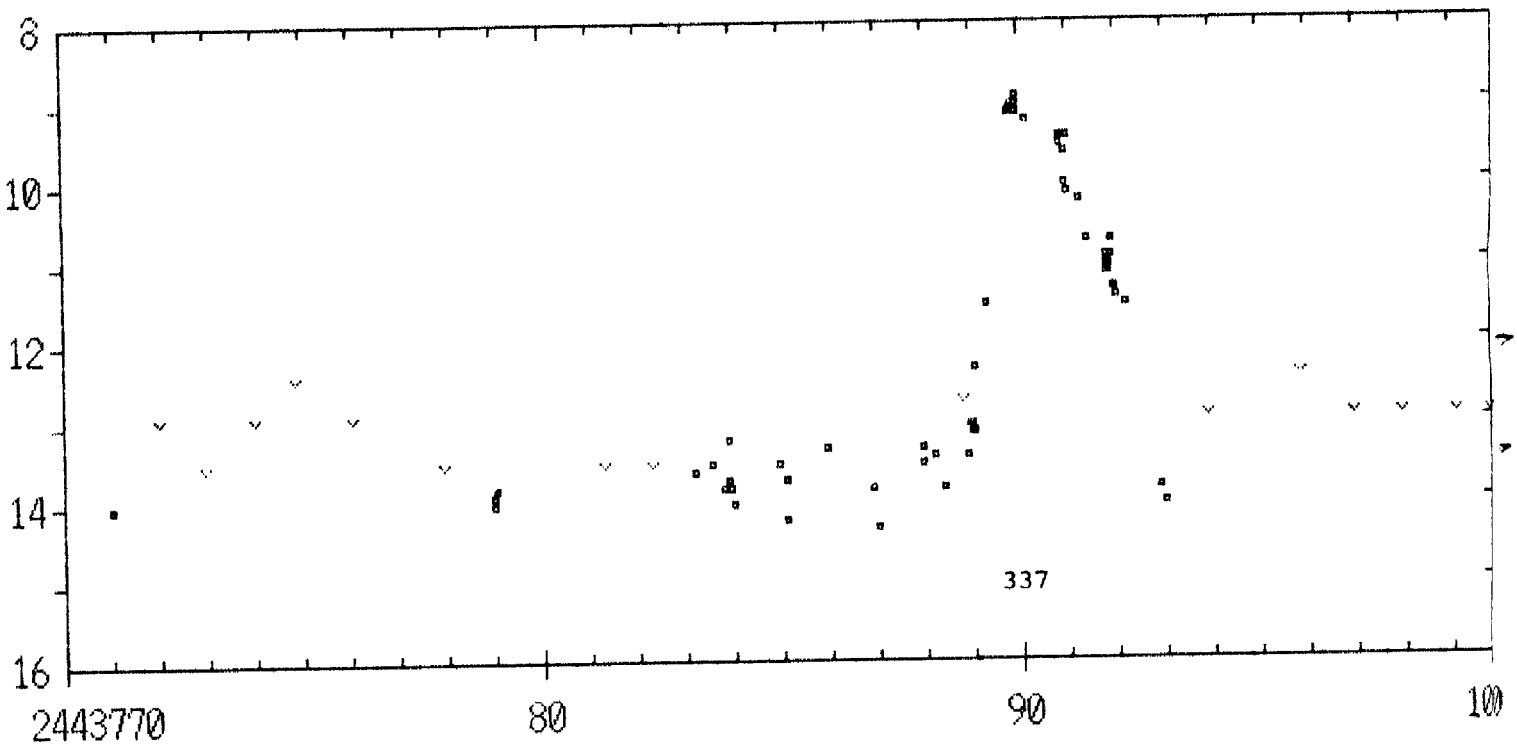


Fig. 61. VW Hydri. Normal outburst 337 plotted from individual observations.

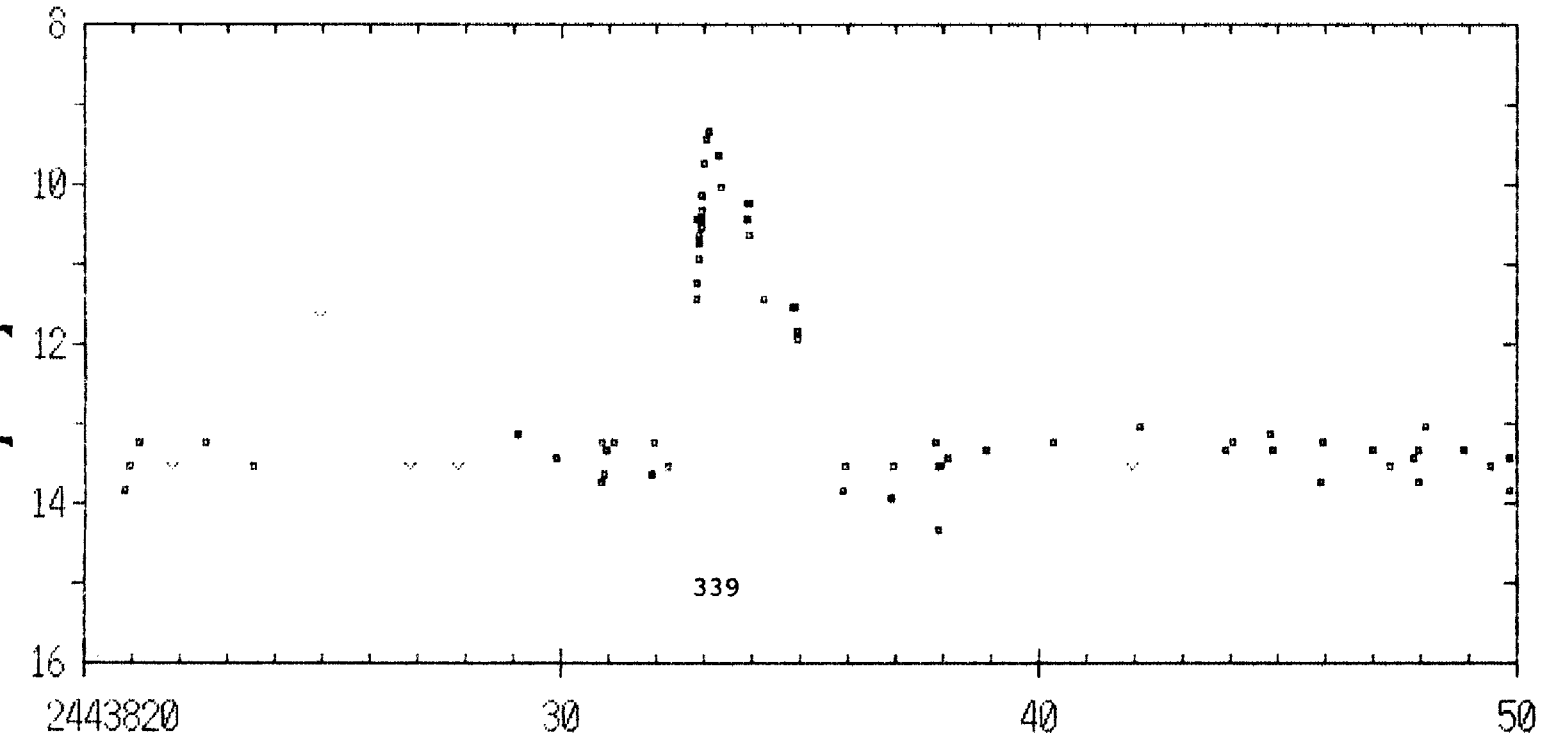


Fig. 62. VW Hydri. Normal outburst 339 plotted from individual observations.

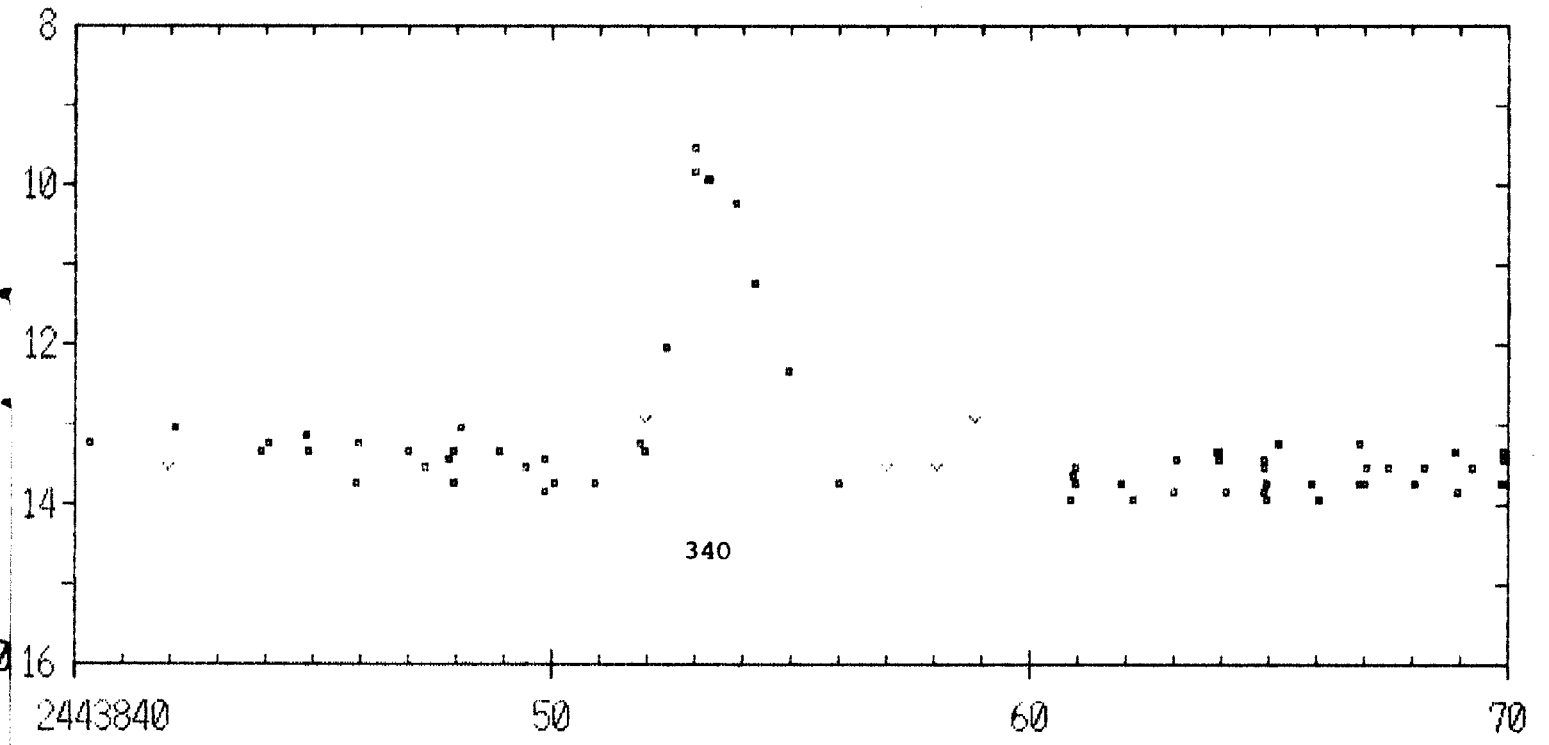


Fig. 63. VW Hydri. Normal outburst 340 plotted from individual observations.

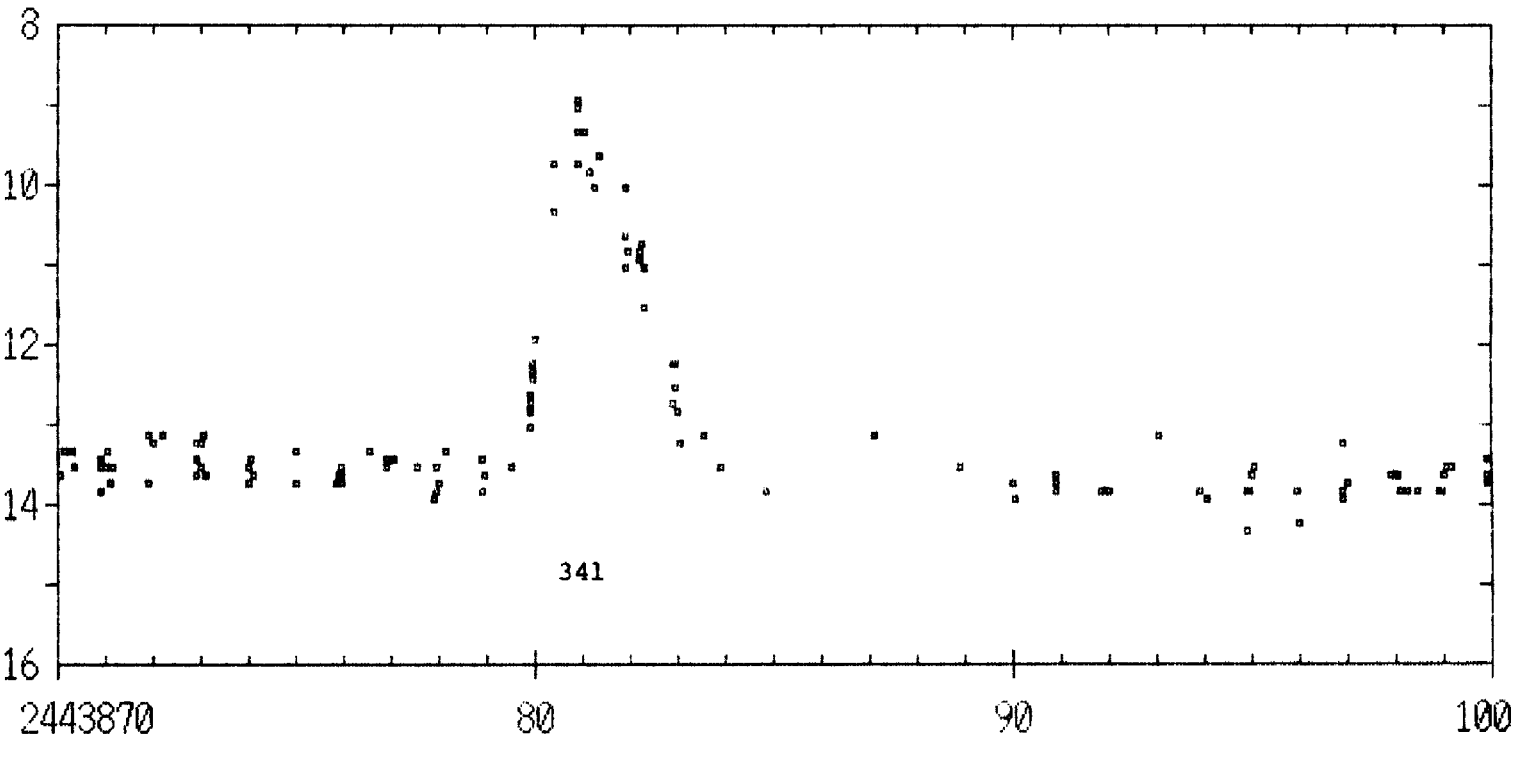


Fig. 64. VW Hydri. Normal outburst 341 plotted from individual observations.

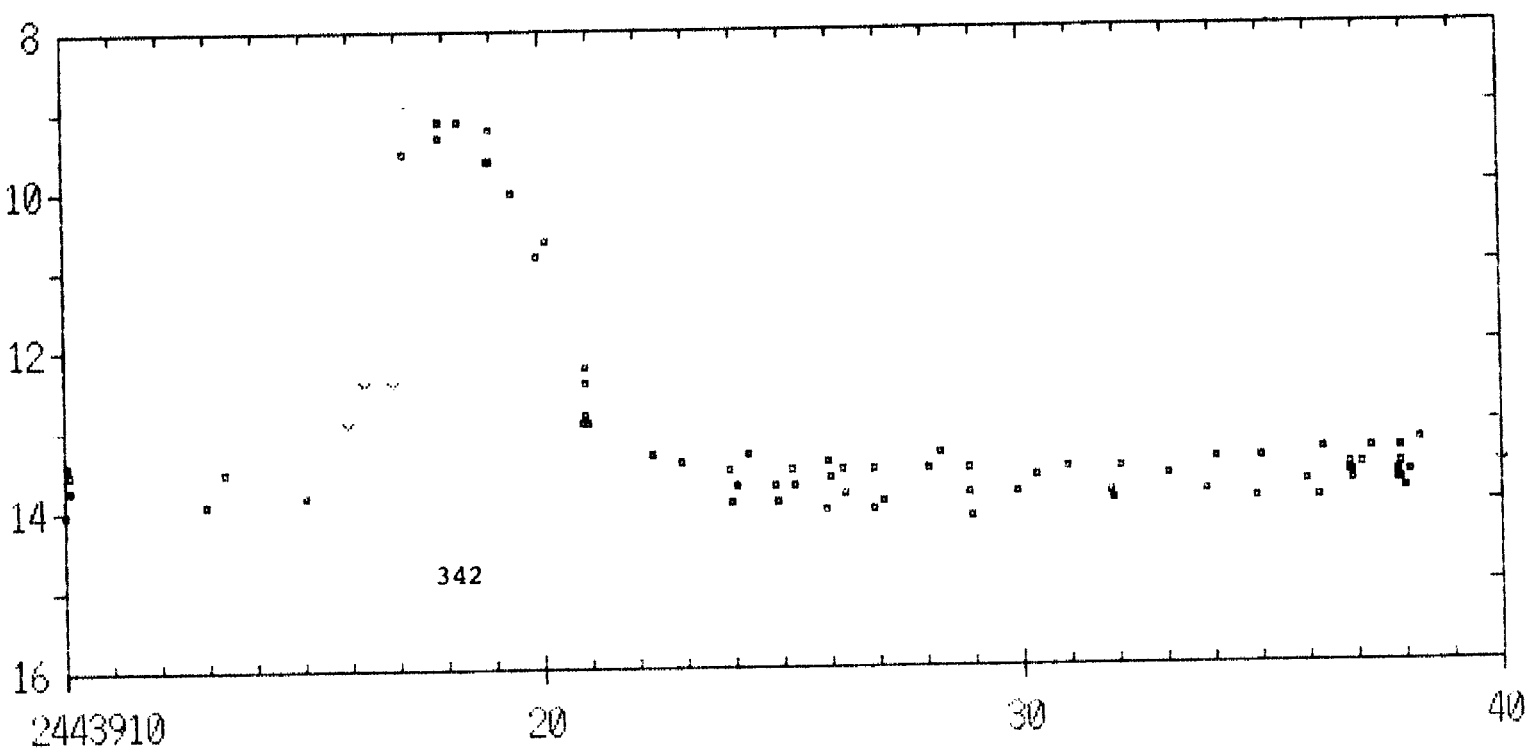


Fig. 65. VW Hydri. Normal outburst 342 plotted from individual observations.

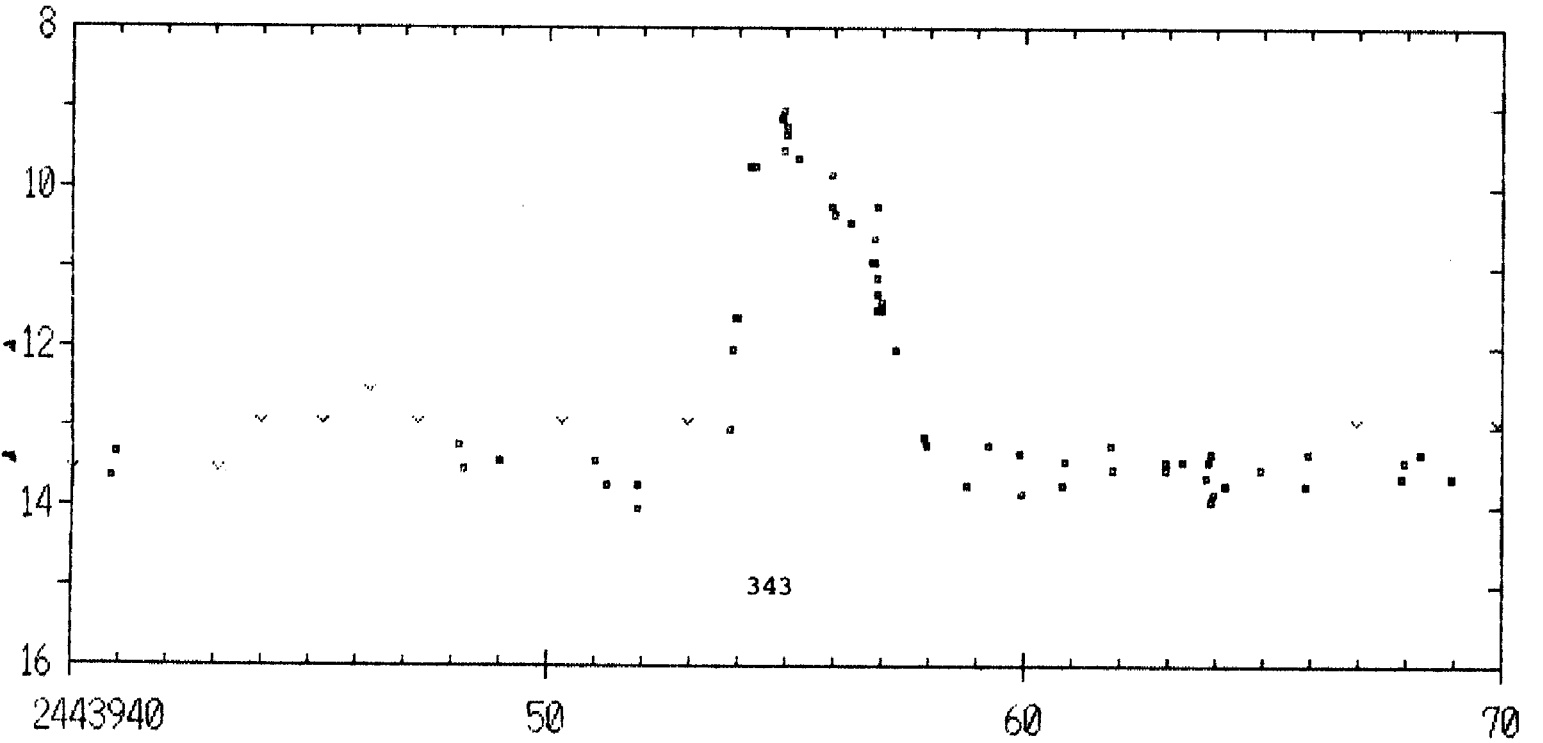


Fig. 66. VW Hydri. Normal outburst 343 plotted from individual observations.

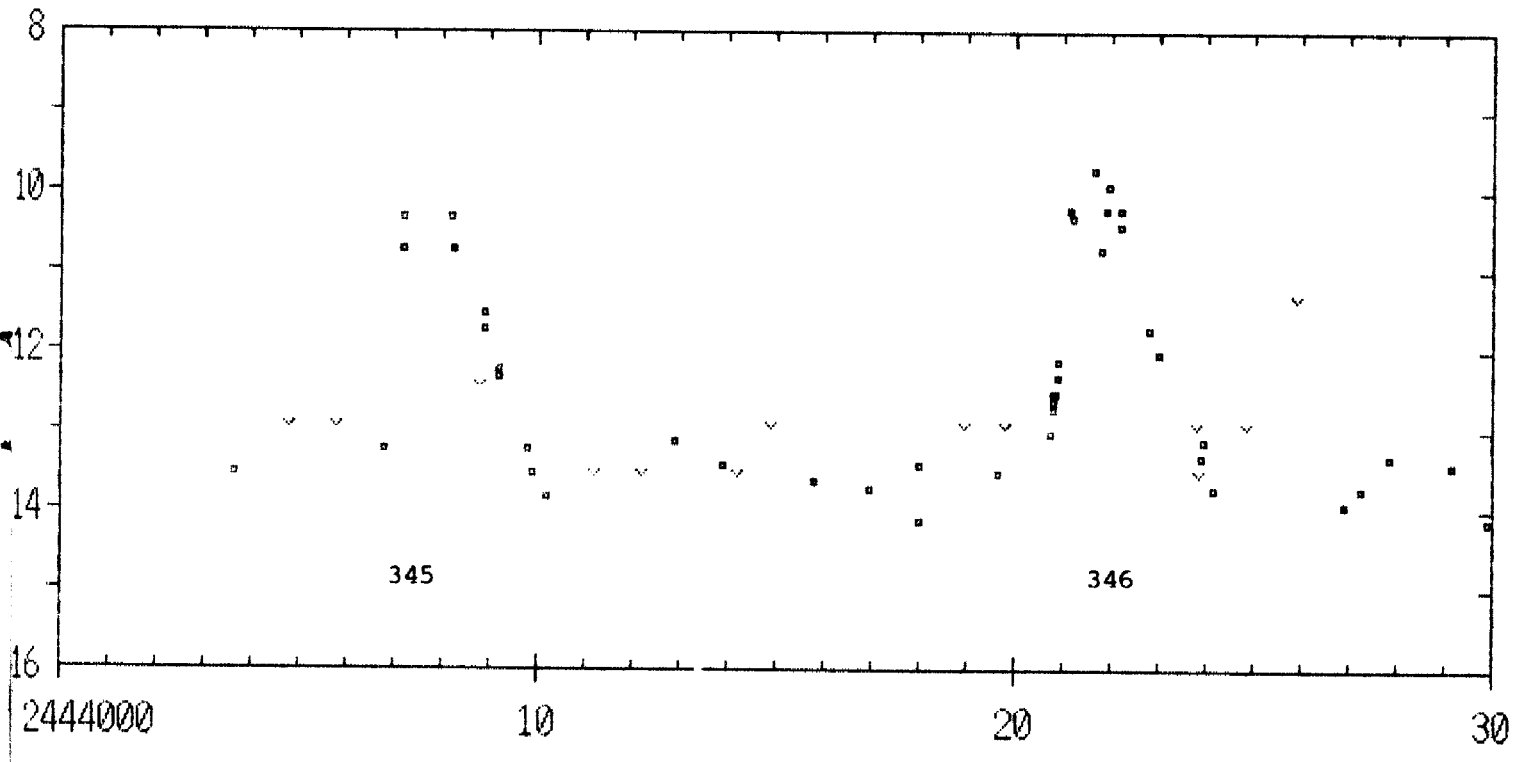


Fig. 67. VW Hydri. Normal outbursts 345 & 346 plotted from individual observations.

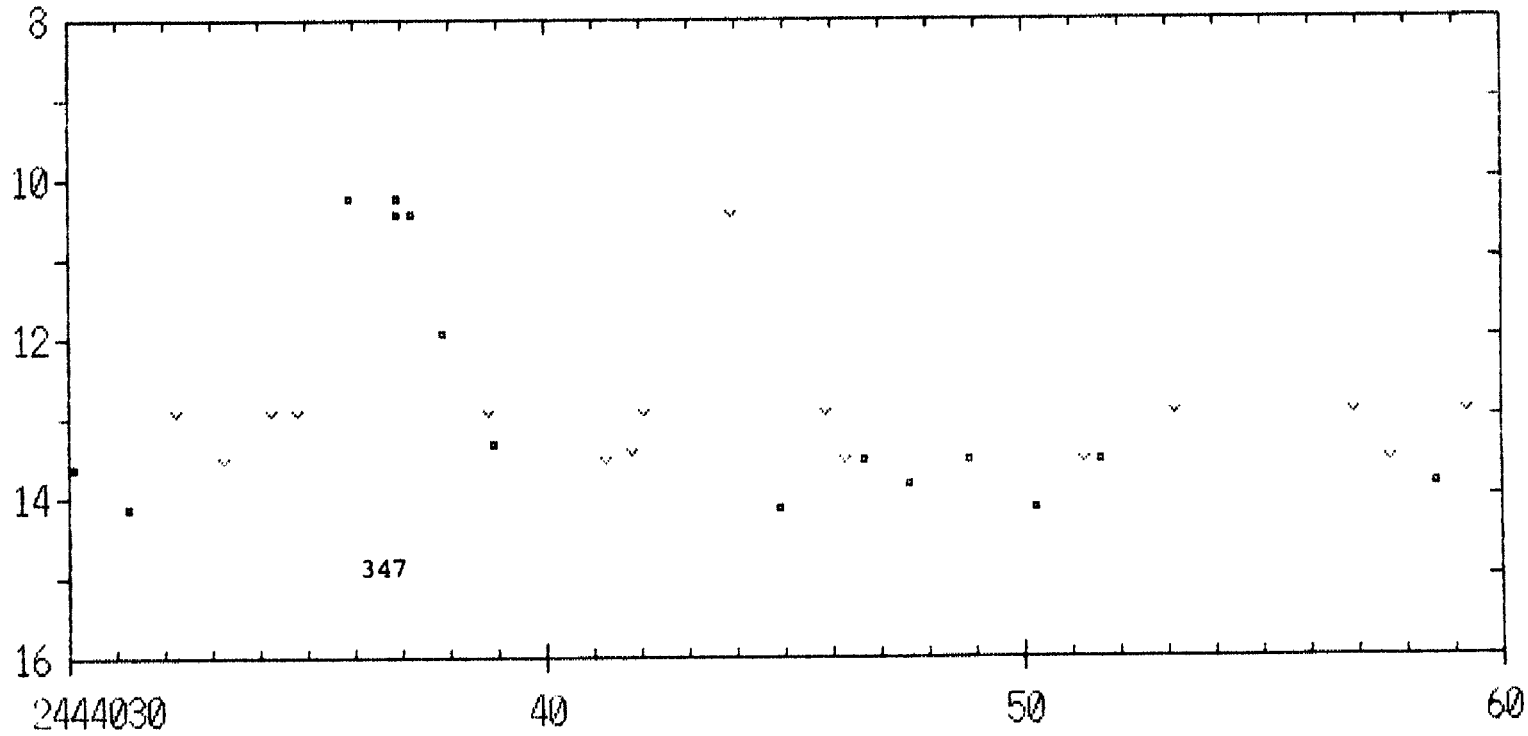


Fig. 68. VW Hydri. Normal outburst 347 plotted from individual observations.

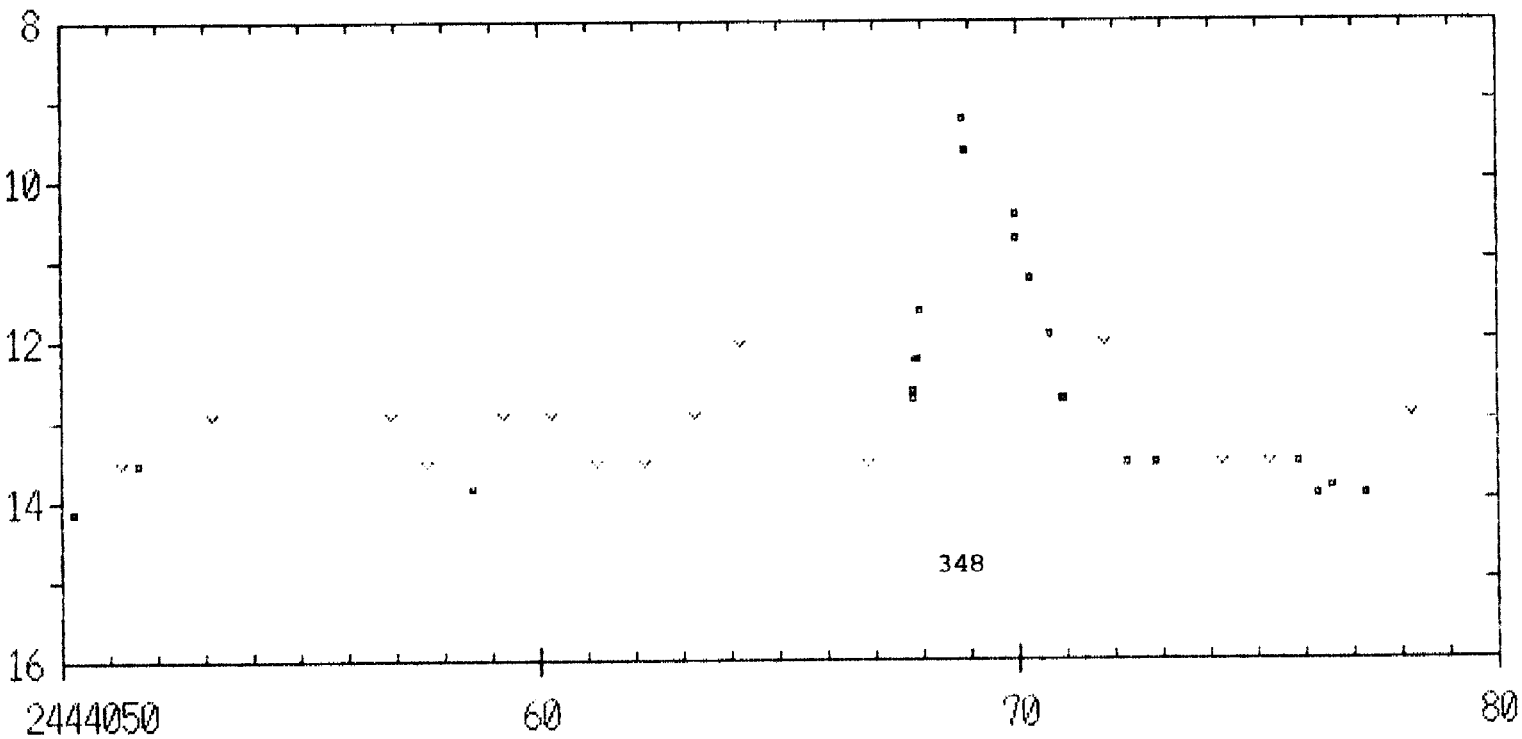


Fig. 69. VW Hydri. Normal outburst 348 plotted from individual observations.

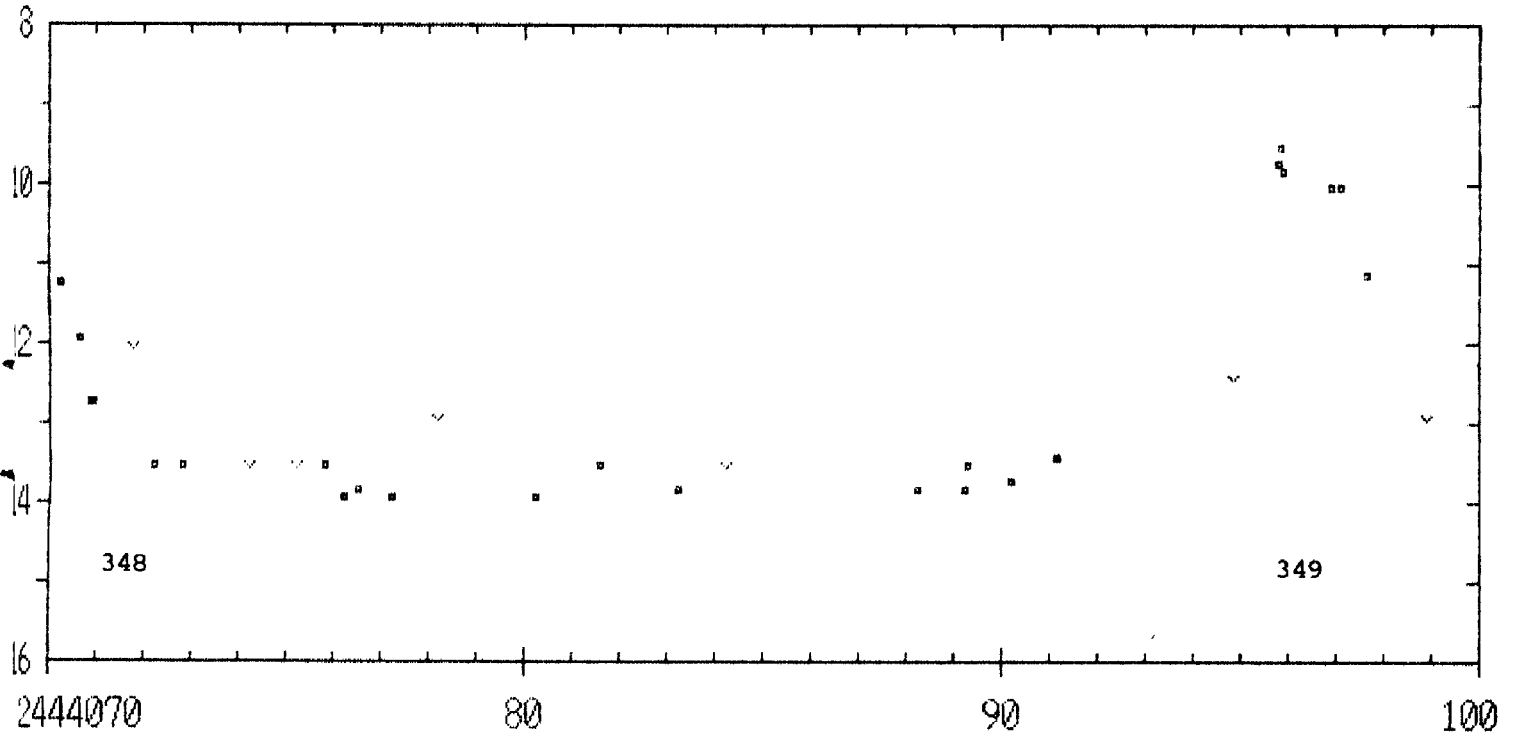


Fig. 70. VW Hydri. Normal outbursts 348 & 349 plotted from individual observations. For 348 see Fig. 69.

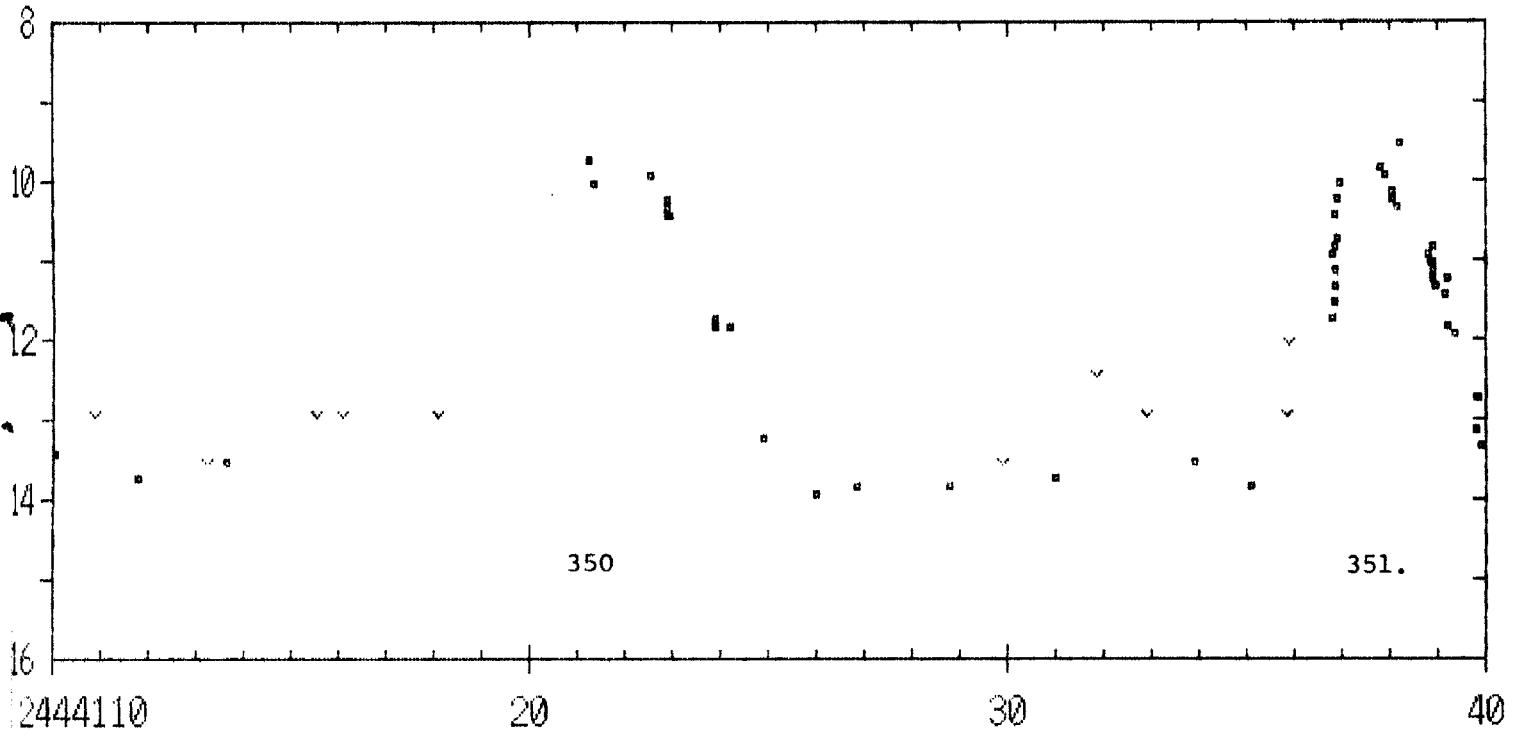


Fig. 71. VW Hydri. Normal outbursts 350 & 351 plotted from individual observations. See also Fig. 72.

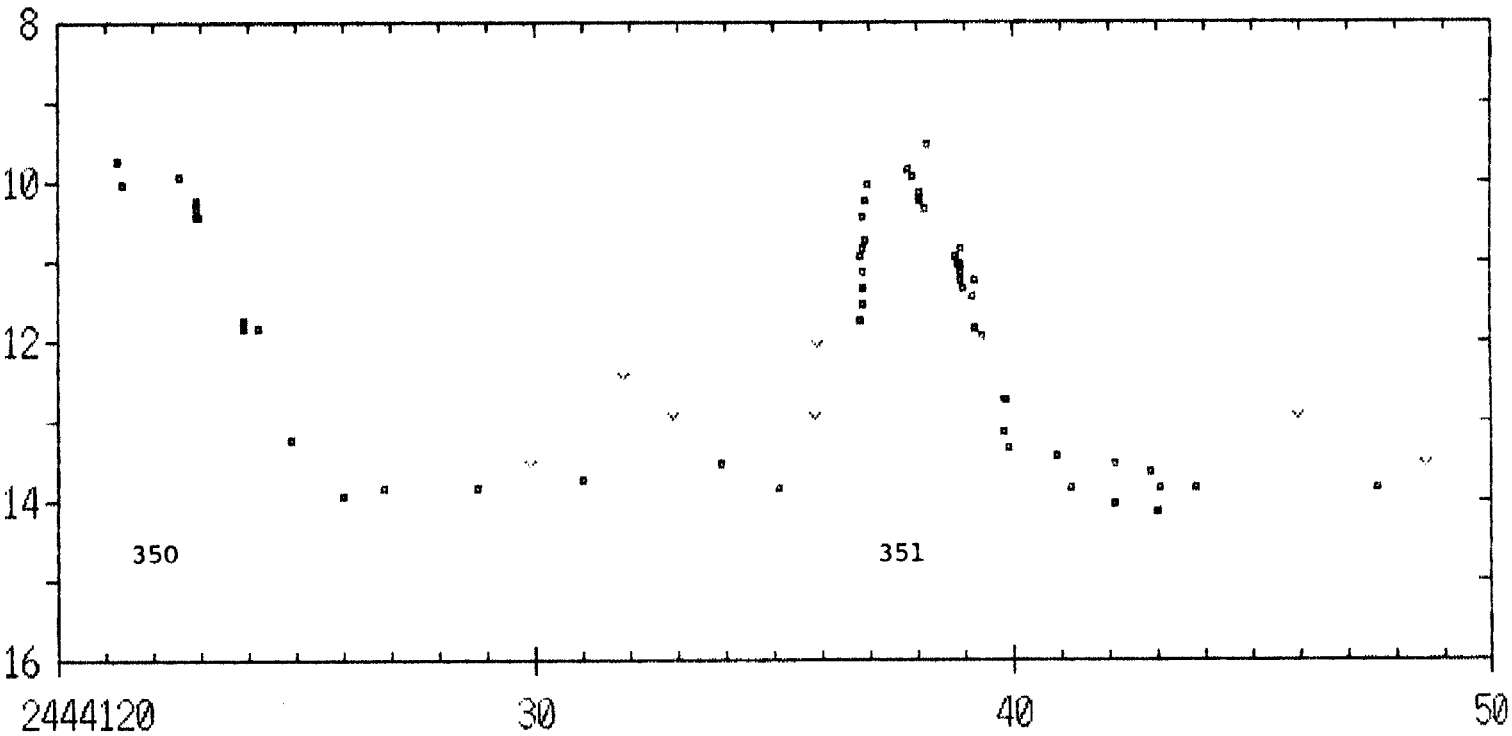


Fig. 72. VW Hydri. Normal outbursts 350 & 351 plotted from individual observations. See also Fig. 71.

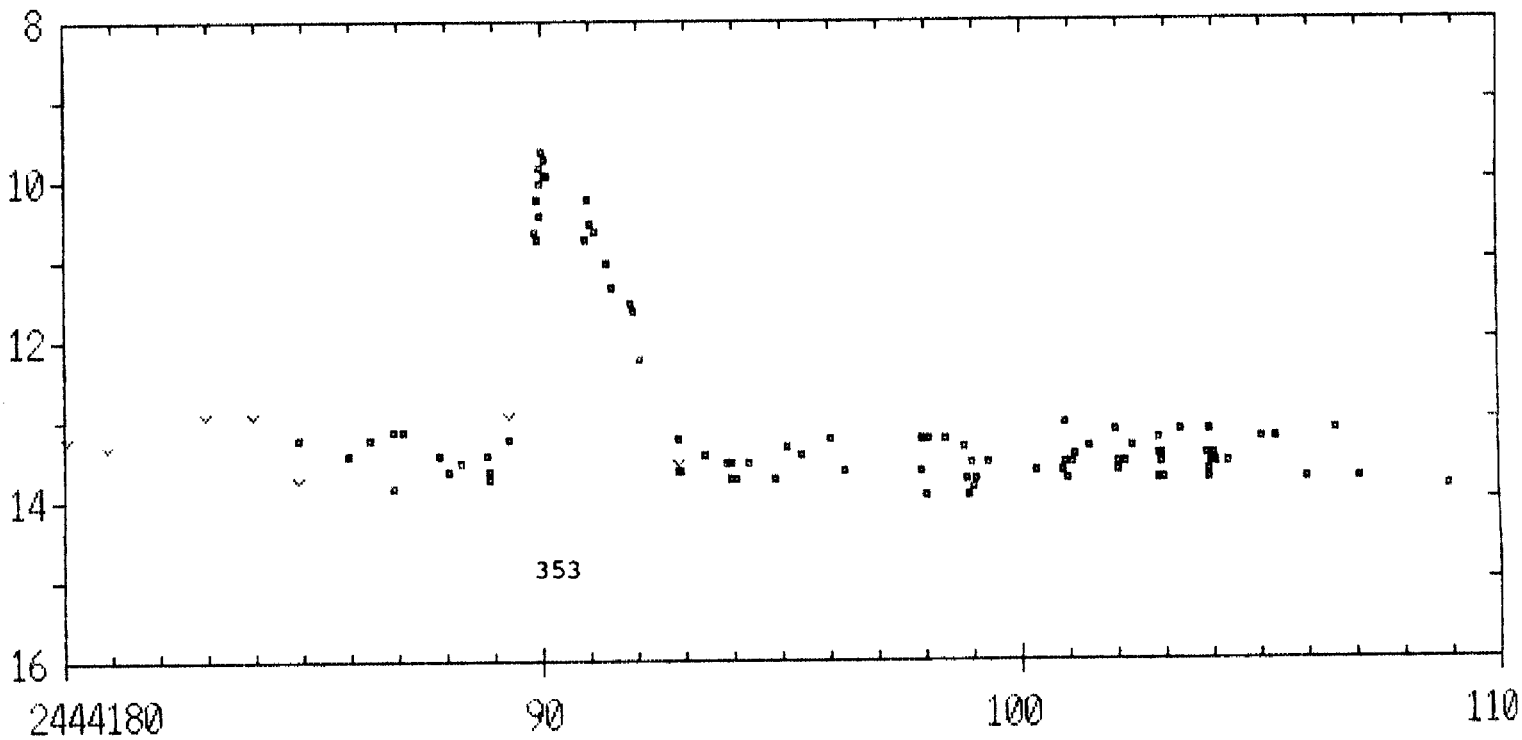


Fig. 73. VW Hydri. Normal outburst 353 plotted from individual observations.

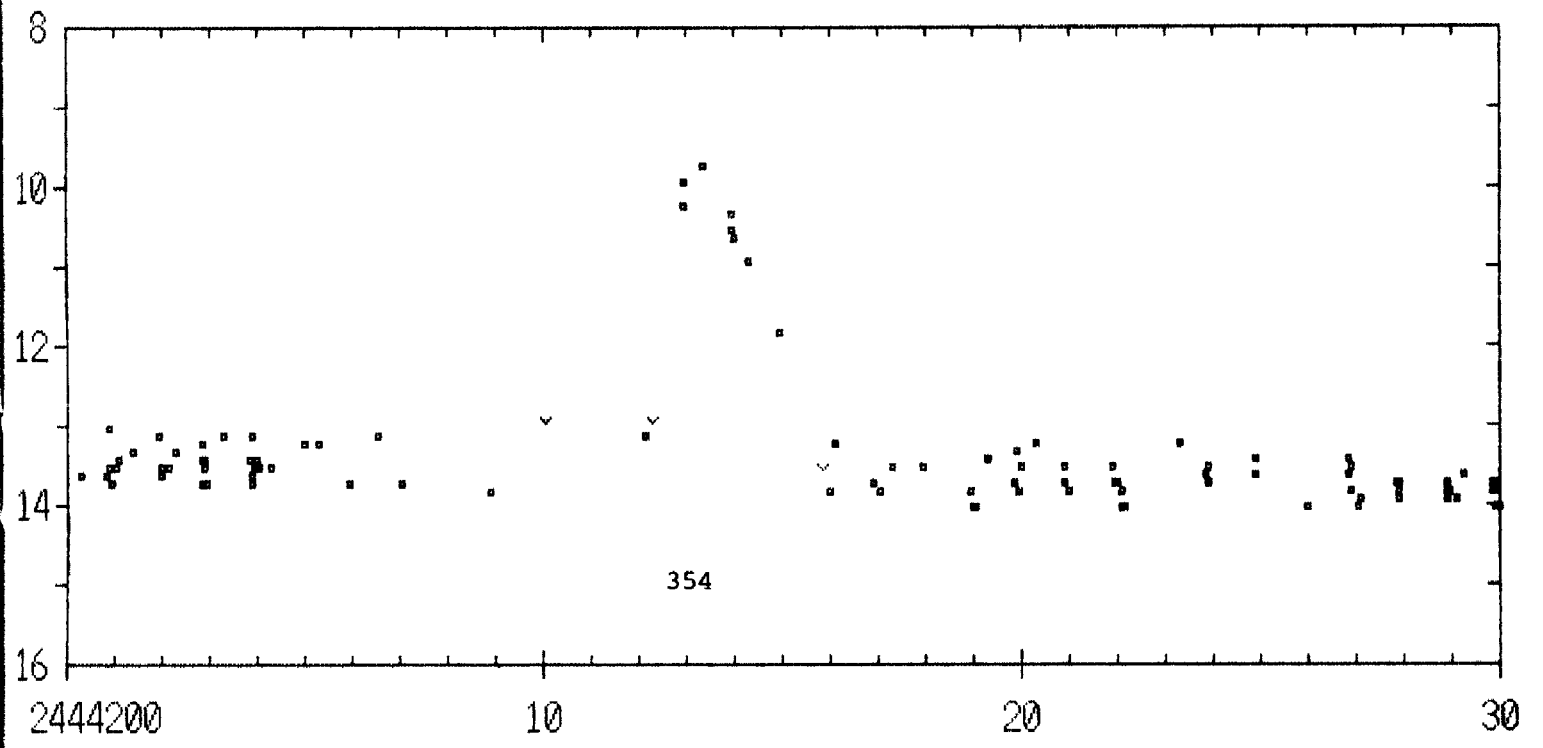


Fig. 74. VW Hydri. Normal outburst 354 plotted from individual observations.

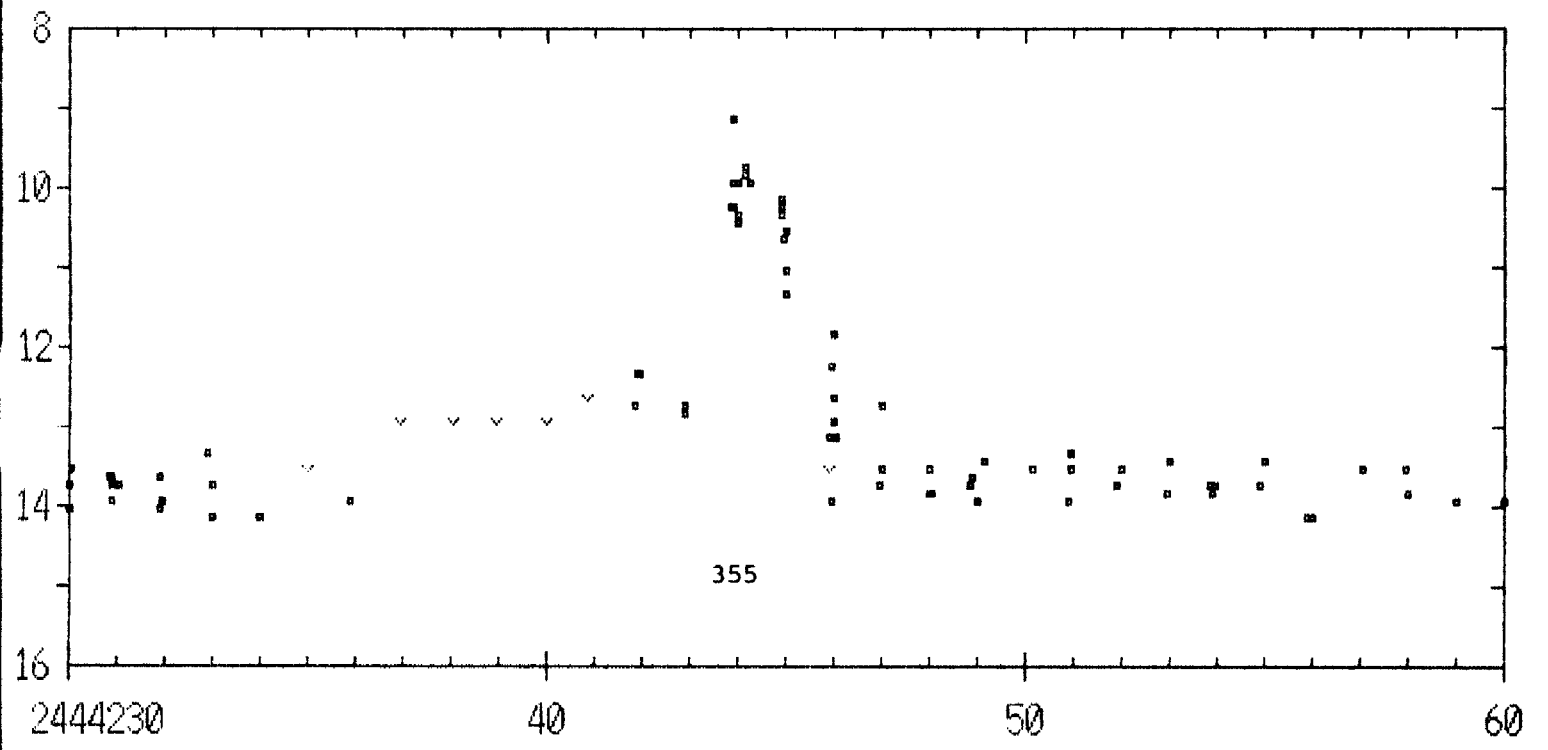


Fig. 75. VW Hydri. Normal outburst 355 plotted from individual observations.

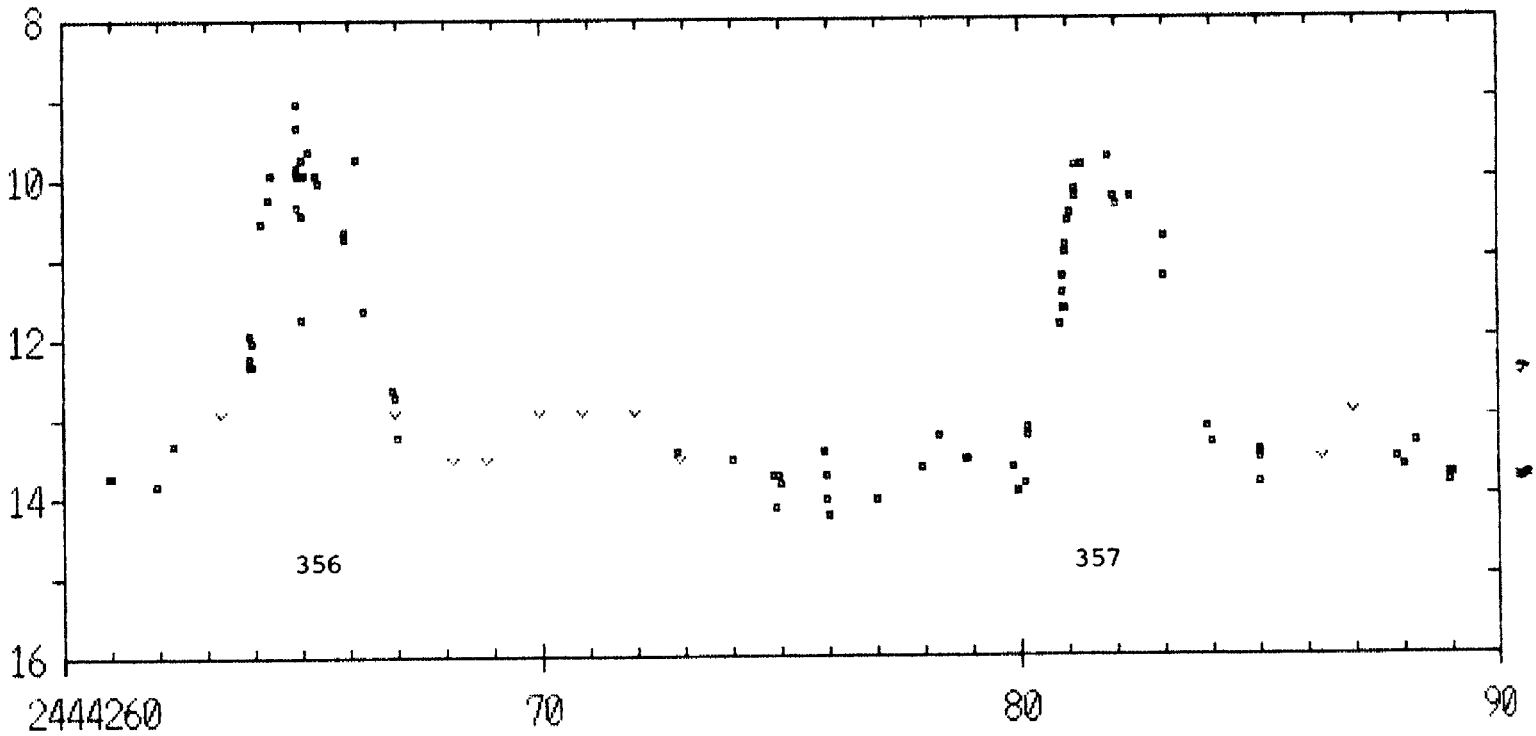


Fig. 76. VW Hydri. Normal outbursts 356 & 357 plotted from individual observations.

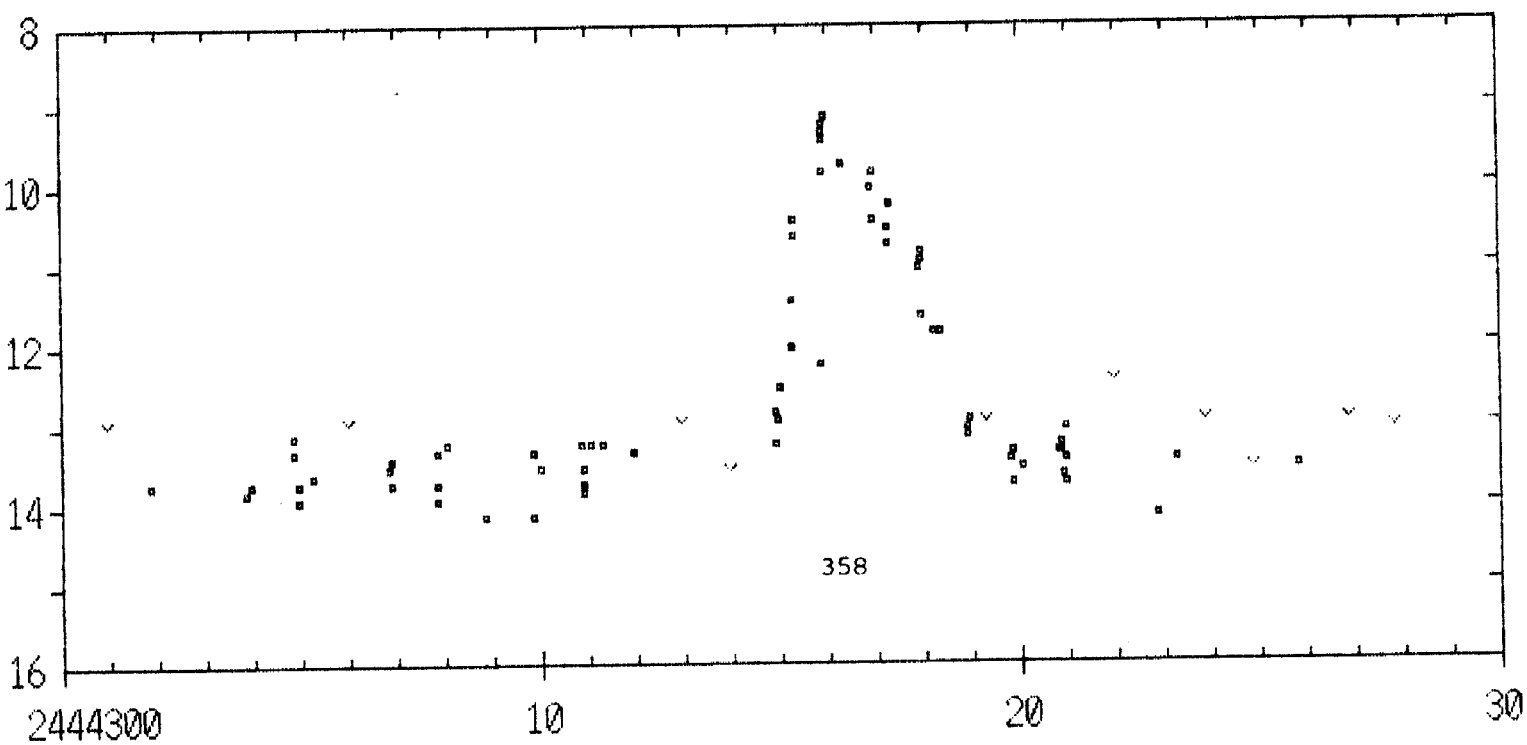


Fig.77. VW Hydri. Normal outburst 358 plotted from individual observations.

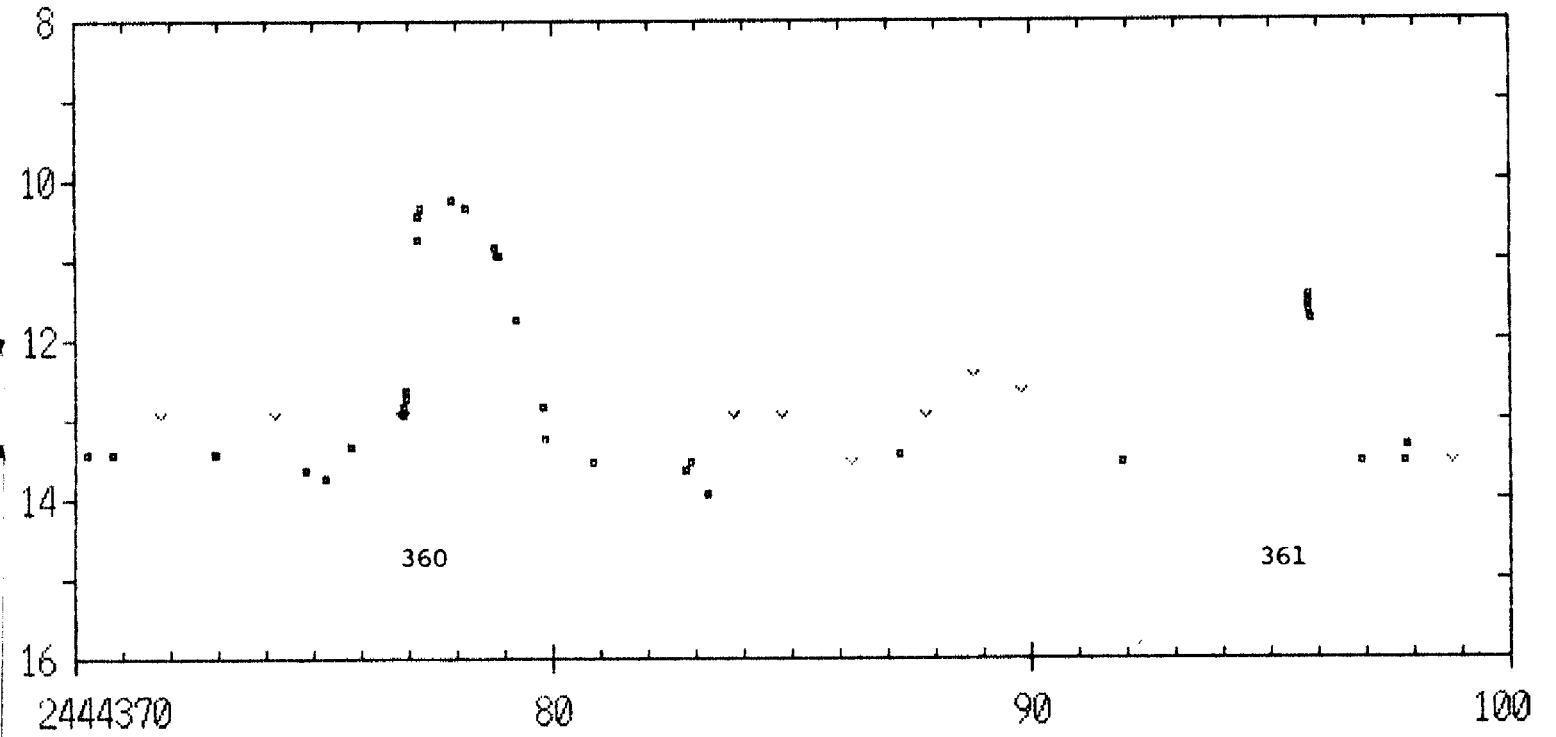


Fig. 78. VW Hydri. Normal outbursts 360 & 361 plotted from individual observations.

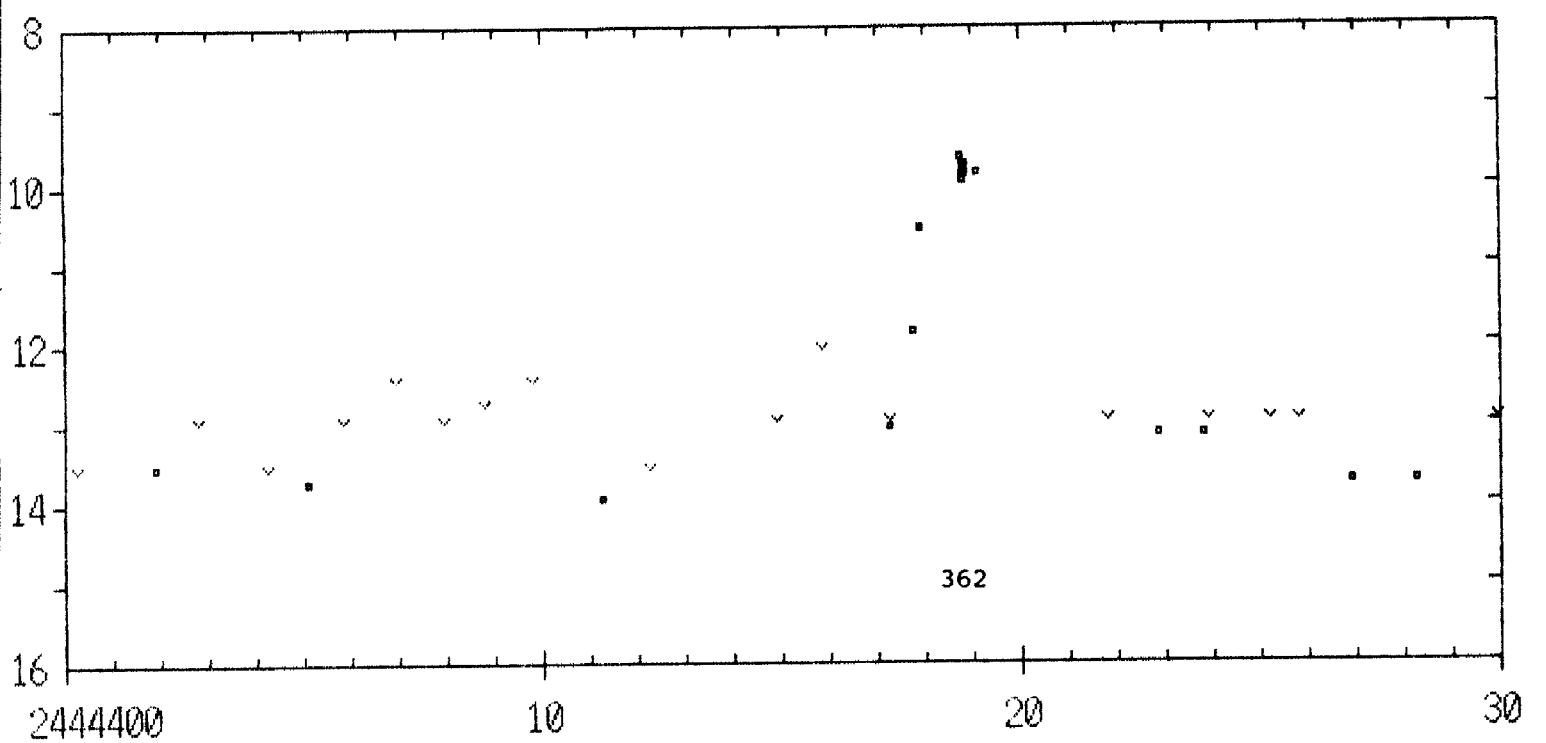


Fig. 79. VW Hydri. Normal outburst 362 plotted from individual observations.

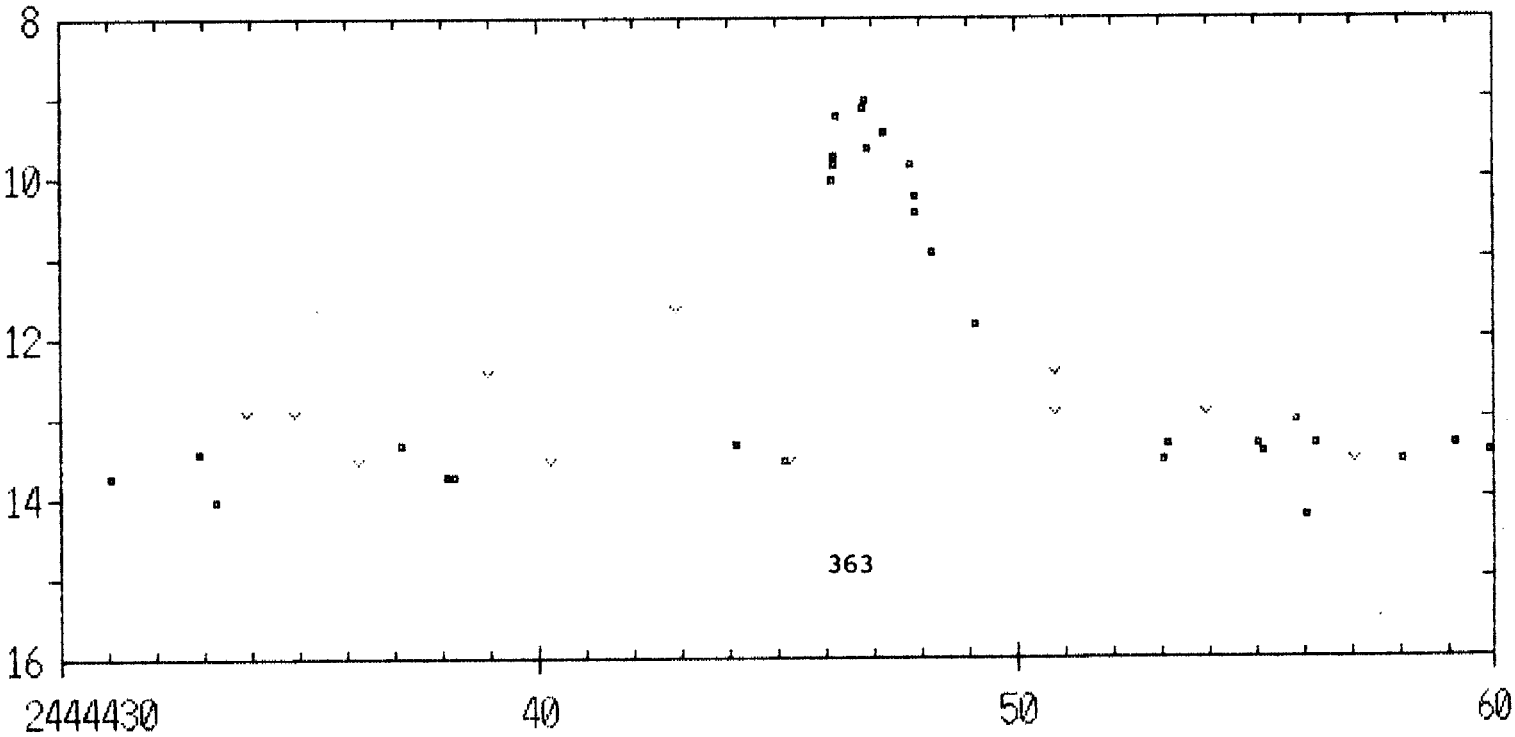


Fig. 80. VW Hydri. Normal outburst 363 plotted from individual observations.

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6. DISCUSSION

(a) GENERAL. In Paper 1 all observations were published, together with a detailed summary of all maxima and their sub-division into various classes. The computer light curves in the present paper makes a similar presentation unnecessary because the curves provide all the information at a glance.

There can be disagreement as to the exact point that should be regarded as the maximum of an outburst. The results presented here and in Paper 1 provide a uniform treatment of all data by the same person (FMB) who has handled all the observations.

It is hoped that the observers will realise from the results in this paper that it is essential for them to (i) include all negative observations in their monthly reports, and (ii) to accurately time all positive observations reporting them to at least three decimals of a day and preferably to four decimals.

(b) FREQUENCY OF OUTBURSTS.

The mean interval between successive maxima listed in Tabl 2, irrespective of their type, is $26^{d}.59$ compared to $27^{d}.33$ in Paper 1. The mean interval between successive super maxima is $174^{d}.90$ against $179^{d}.35$ in Paper 1.

The intervals between successive maxima of all types, excluding those intervals in which an outburst probably was missed, in Paper 1 ranged from $7^{d}.8$ to $76^{d}.4$' and, in the present paper, from $9^{d}.9$ to $56^{d}.1$. An inspection of Figs. 1-7 suggests that no outbursts have been missed. However, a closer inspection of the observations and enlarged light curves show four short intervals during which a normal outburst may have occurred and passed unobserved. These are:

2,443,055.95	2,443,060.94	between outbursts 313 and 314.
735.33	739.20	335 qnd 336
4053.13	4,056.90	347 and 348
4327.82	4,330.05	358 and 359

We think the first two examples above are possible but unlikely, whilst the other two are very unlikely. It is impossible to be certain but we suggest that in the present observations no outburst has gone unobserved.

The intervals between successive super maxima, in Paper 1, ranged from $146^{d}.3$ to $206^{d}.1$ against $132^{d}.9$ to $201^{d}.1$ in the present paper. The interval between super maxima Nos. 359 and 364, in Table 1, is the shortest super maximum interval in the 9,860 days during which VW Hyi has been observed.

*c) MINOR VARIATIONS AT SUPER MAXIMA.

The appearance of super humps is obvious in Figs. 8 to 18. Their amplitude is about $0^{m}.4$ at their onset, diminishing as the outburst progresses. Deriving a period is complicated by the normal scatter present in visual observations. We used the observations of the most experienced observers, who had also accurately timed their observations, and found that a period of $0^{d}.077$ satisfied them. Attempts to fit the remaining observations to this period failed since some appeared to agree, whilst others did not. This we concluded was due entirely to the normal scatter.

We concluded that visual observations are capable of indicating whether super humps are present or not, butit is impossible to determine a reliable period and epoch if all observations are used.

Figs. 19 to 29, from daily means, illustrate the main features of super maxima are (i) steep rise; (ii)a slight decrease about two days after maximum light; (iii)the comparatively broad plateau that follows with the variable just below maximum brightness, and (iv) the more rapid decline that marks the return to minimum brightness. When observations on the rising branch are numerous it appears that the onset of an outburst is preceded by a decrease in minimum light prior to the commencement of the rise and that brief standstills around magnitude 12 are present. The decrease in brightness after VW Hyi has reached the top of its initial rise which was a marked feature of the super maxima types S6 to S8 in Paper 1 are almost absent in the present observations. There is only evidence for a type S 6 maximum.

(d) VARIATIONS AT MINIMUM

VW Hyi does not remain at a constant magnitude when at minimum. It shows a series of sharp peaks with mean amplitudes of $0^{m}.4$. The best observations yield a period of $0^{d}.074$ for these peaks. Scatter in the observations is even more apparent at minimum than at maximum because a number of the instruments used have thresholds of about the minimum brightness of VW Hyi. These peaks probably represent the orbital period of the hot spot and correspond to the humps found in photoelectric observations (See references in Paper 1).

(e) MAGNITUDES AT MAXIMUM

The mean magnitude at maximum, excluding doubtful ones in Table 1, are:

SUPER MAXIMA: $8^{m}.75$. Range $8^{m}.4$ to $9^{m}.1$.
Normal " 9.44. Range 8.7 to 10.2

Table 2 gives details for normal maxima in order of their occurrence after a super outburst. This shows that normal maxima increase in brightness until the fourth and fifth events. The same result was found in Paper 1.

(f) RELATIONSHIPS

A super outburst is always followed by at least four, and usually five, normal outbursts before the next super outburst. Occasionally there are 6, 7 or 8 normal outbursts between super outbursts.

The first normal outburst after a super outburst always occurs within a day or two of the mean interval of $28^{d}.78$, irrespective of the number of normal outbursts that follow before the next super-outburst. The intervals between subsequent normal maxima in any cycle vary within wide limits although in the few cases where there are 7 or 8 normal outbursts in a cycle these tend to occur at short intervals before the onset of the next super maximum. There appears to be no relationship between normal maxima and the preceding super outburst.

A cycle is regarded as the interval between consecutive super maxima. There is a general tendency for there to be more normal outbursts in the longer cycles, but this does not always hold. For example the longest cycle of $201^{d}.1$ days had only five normal outbursts.

The number of super outbursts was too small to establish any firm relationships between normal maxima and the following super maximum.

CONCLUSIONS

A total of 72 outbursts were observed during the interval covered in this paper, of which 11 were super outbursts and 61 normal outbursts. We believe that no outbursts passed unobserved.

The mean interval between outbursts of all types was $26^{d}.59$ and between consecutive super outbursts $174^{d}.90$. The respective mean magnitudes at maxima were Normal $9^{m}.44$ and super $8^{m}.75$.

We found that it is possible from visual observations to show whether super humps and variations at minima are present. Approximate periods for both these can be obtained from the records of the most experienced observers, but the usual scatter inherent in visual observing means that not all observations can be fitted to these periods. Their determination is best left to the photo-electric observers.

There has been no change in the general behaviour of VW Hyi compared to the earlier paper.

ACKNOWLEDGMENTS
Our thanks are due to all observers for their consistent monitoring of this interesting variable.

REFERENCES

(1) Bateson, F.M. 1977. N.Z. J. of Sci, 20, pp. 73-122.
(2) Smak, J. 1986. Preprint.

A LIGHT CURVE FOR R RETICULI, A MIRA VARIABLE

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SUMMARY: A light curve based on ten day means from 50 years of visual observations of R Reticuli has been plotted with the aid of a micro-computer. A table of observed maxima and minima is presented. The determined period is $278^{d}.0$ with root mean square deviation of $8^{d}.7$. A plot of O-C residuals suggests there is a second order effect operating and the period is steadily increasing. The light curve is somewhat asymmetric with time from minimum to maximum light equal to $124^{d}.2$ ($12^{d}.5$).

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1. INTRODUCTION

The work reported here represents an extension of the project recently documented by Bateson (1) in which the observations of Mira variables made by members of the Variable Star Section, Royal Astronomical Society of New Zealand are to be presented as computer generated plots.

The fully integrated original programme by Ranald McIntosh has been restructured and adapted to operate as a series of programs on an Hitachi MB6890 personal computer (Basic Master Level 3) to circumvent the limited memory of the latter machine. These programs are available for distribution and enquiries concerning them should be made to the author.

2. OBSERVATIONS

The observations discussed cover the interval J.D. 2,425,264 (1928 January 1) to J.D. 2,443,629 (1978 May 1). The full data set is provided although eleven maxima in a total of 67 were either incompletely or not observed. Observers who contributed results are listed in Table 1.

TABLE 1.

CONTRIBUTING OBSERVERS.

BATESON, F.M.	330	MATCHETT, V.L.	34
CROMPTON, A.	36	MOREL, M.	37
DREW, W.A.H.	52	OVERBEEK, M.D.	63
ELDER, J.	70	PHILPOTT, D.A.	126
FREW, A.	107	SMITH, G.S.	369
HULL, O.R.	123	SHINKFIELD, R.C.	184
JONES, M.V.	124	TAYLOR, N.W.	73
JONES, A.F.	1028	VENIMORE, *Rev).C	125
MENZIES, B.	55		
46 observers with less than 30 observations each			446

TOTAL OBSERVATIONS 3382

3. RESULTS

The light curve is plotted in Figures 1a - 1g with each point a ten day mean. The symbols have the following meaning:

The observed dates of maxima and minima are listed in Table 2. Columns are respectively---Cycle number counted from J.D. 2,435,028 as zero; J.D. of maximum; Maximum visual magnitude; interval, in days, between consecutive maxima; the interval, in days, between the previous minimum and current maximum; difference, in days, between observed and calculated dates of maximum according to the elements given below; J.D. of minima; minimum visual magnitude; interval, in days, between consecutive minima; interval, in days, between previous maximum and current minimum.

The respective maxima and minima were estimated from the light curvesin conjunction with a listing of the individual ten day means. The period derived is based on the maxima only as they appear to be more reliably estimated both as to number and frequency. The quoted estimated errors are root mean square deviations.

4. DISCUSSION

The mean light curve exhibits a more rapid rise to maximum followed by a slower decline to minimum. The intervals are respectively $124^{d}.2$ ($\pm 12^{d}.5$) and $153^{d}.8$ ($\pm 12^{d}.4$). The amplitudes at maxima range from $6^{m}.7$ to $9^{m}.6$ with a mean of $7^{m}.80$. Minima magnitudes range from $12^{m}.2$ to $14^{m}.6$, with a mean of $13^{m}.47$. There appears to be a definite relationship between the magnitude at minimum and the magnitude of the following maximum. Bright minima (magnitude 13.0 or brighter) are in 90% of cases followed by a maximum brighter than the mean maximum magnitude. Faint minima ($13^{m}.8$ or fainter) tend to be followed by maximum fainter than the mean (76%), Bright minima also tend to be preceded by bright maxima (75%) whilst faint minima have a slight tendency (59%) to be preceded by maxima of average mean brightness.

Periods assigned to R Ret range from $273^{d}.4$ (2) to $279^{d}.141$ (3). The latest catalogued value is $278^{d}.28$ (4).

The elements derived from the observations reported in this paper are:

PERIOD: J.D. Max. 2,435,028 + $278^{d}.0$.
MAX. MAGNITUDE: Mean 7.80 (S.D. $+0^{m}.45$) from 56 maxima.
Range: 6.7 - 9.6
MIN. MAGNITUDE: Mean 13.47 (S.D. $+0^{m}.44$) from 46 minima.
Range: 12.2 - 14.6.

An independent estimate of the period using the "string" method of Dworetsky (5) and 1000 day intervals yielded a similar result.

A plot of the O-C residuals is shown in Figure 2. No attempt has been made to quantitatively analyse the data but the second order variation in the period is clearly

ACKNOWLEDGEMENTS

I am very grateful for the kind assistance and advice of Dr. F.M. Bateson and to those who provided the numerical data.

REFERENCES

(1) Bateson, F.M. 1985. Publ. 12, V.S.S., R.A.S.N.Z.
(2) Cannon, A. & Pickering, E.C. 1907. Harvard Ann. 55, part 1.
(3) Campbell, L. 1926. Harvard Bull. 841.
(4) Kukarkin, B.V. et al. General Catalogue of Variable Stars, 3rd ed., 3rd Suppl. 1976. Nauka, Moscow.
(5) Dworetsky, M.M. 1983. Mon. Not. R. astr. Soc. 203, 917.

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TABLE 2.

R Reticuli-----OBSERVED MAXIMA AND MINIMA.

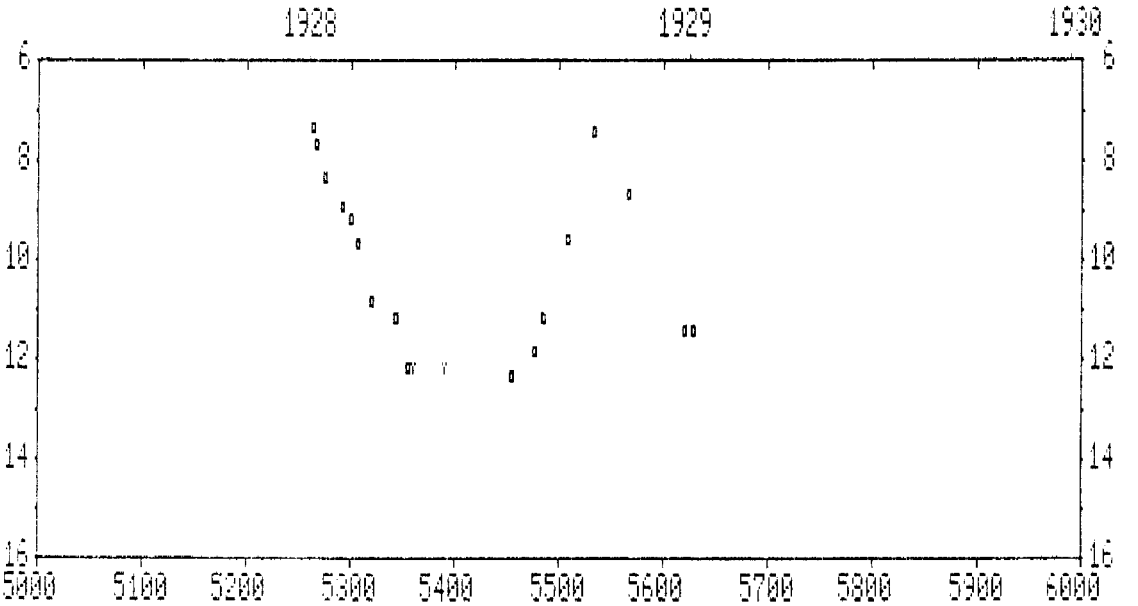
	MAXIMA					MINIMA			
No	J.D.MAX. 2400,000+	MAX M_v	INT d	m-M d	O-C d	J.D.Min. 2,400,000+	Min M_v	INT d	M-m d
-35	.....	...	...	...	...	25406	13	...	...
-34	25540	7.6	...	134	+12.2	.....	...	...	...
-30	26653	7.2	...	...	+14.0	26802	13	...	149
-29	930	8.0	277	128	+ 5.7	27090	13.5	288	160
-28	27215	7.4	285	125	+ 9.4	380	13.0	290	165
-27	495	7.5	280	115	+ 8.1	650	13.2	270	155
-26	767	7.9	272	117	+14.8	920	13.5	270	153
-25	28072	7.5	305	152	-11.5	28212	13	292	140
-24	340	8.6	268	128	- 0.8	.....	...	...	...
-19	29726	7.2	...	...	+ 6.7	28875	13	...	149
-18	997	7.5	271	122	+14.4	.....	...	...	...
-14	31120	7.2	...	...	+ 6.2	31280	13.0	...	160
-13	393	8.0	273	113	- 2.1	540	13	260	147
-12	681	8.3	288	141	+ 2.6	815	13.1	275	134
-11	950	6.9	269	135	+12.3	32110	13.0	295	160
-10	32230	7.5	280	120	+11.0	385	13.0	275	155
- 9	505	7.5	275	120	+14.7	670	13.9	285	165
- 8	803	8.3	298	133	- 4.6	950	13.6	280	147
- 7	33079	7.6	276	129	- 1.9	33237	14.2	287	158
- 6	355	8.1	276	118	+ 0.8	495	12.6	258	140
- 5	635	7.2	280	140	- 0.5	805	14.2	310	170
- 4	910	8.7	275	105	+ 3.2	34035	13.5	230	125
- 3	34200	7.4	290	165	- 8.1	360	13.8	325	160
-2	475	9.1	275	115	- 4.4	630	13.7	270	155
- 1	745	8.1	270	115	+ 4.3	910	13.4	280	165
+ 0	35028	7.6	283	118	0.0	35180	12.7	270	152
+ 1	300	7.1	272	120	+ 6.7	460	14.0	280	160
+ 2	592	9.6	292	132	- 6.6	735	14	275	143
+ 3	870	8.5	278	135	- 5.9	36010	14	275	140
+ 4	36140	9.2	270	130	+ 2.8	285	13.7	275	145
+ 5	425	7.5	285	140	- 3.5	586	14.0	301	161
+ 6	702	8.1	277	116	- 1.8	846	14.0	260	144
+ 7	985	7.6	283	139	- 6.1	37130	13.8	284	145
+ 8	37250	7.5	265	120	+ 7.6	405	13.8	275	155
+ 9	524	8.0	274	119	+12.3	690	13.9	285	166
+10	815	7.8	291	125	0.0	963	14.0	273	148
+11	38075	7.7	260	112	+18.7	38240	13.7	277	165
+12	370	7.3	295	130	+ 2.4	523	13.6	283	153
+13	652	8.1	282	129	- 0.9	810	14.1	287	158
+14	921	8.2	269	111	+ 8.8	39095	13.6	285	174
+15	39200	7.3	279	105	+ 8.5	375	13.9	280	175
+16	491	8.5	291	116	- 3.8	630	13.9	255	139

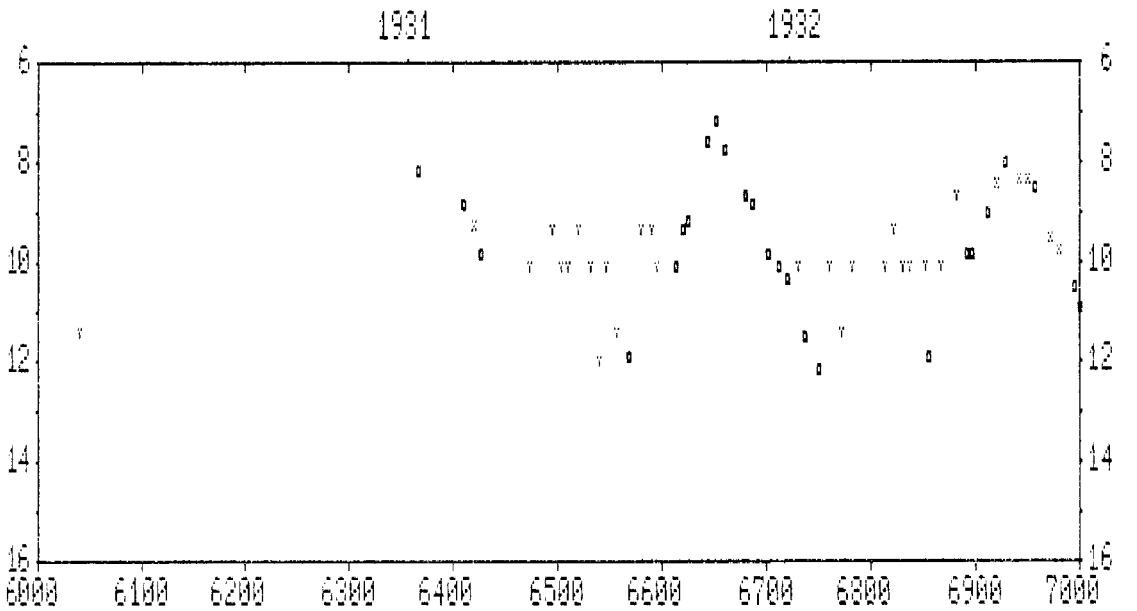
TABLE 2 (cont)

No	J.D.MAX 2400,000+	MAX M_v	INT d	m-M d	O-C d	J.D. Min. 2400,000+	Min M_v	INT d	M-m d
*17	39760	8.6	269	130	+ 5.9	39918	14.6	288	158
+18	40030	8.0	270	112	+14.6	40170	12.8	252	140
+19	307	6.7	277	137	+16.3	460	12.5	290	153
+20	585	7.7	278	125	+17.0	740	12.2	280	155
*21	870	7.8	285	130	+10.7	41000	13.0	260	130
+22	41140	7.2	270	140	+19.4	300	14.0	300	160
+23	430	7.9	290	130	+ 8.1	575	14.0	275	145
+24	700	7.9	270	125	+16.8	853	13.0	278	153
+25	970	7.1	270	117	+25.5	42143	12.7	290	173
+26	42247	7.1	277	104	+27.2	406	13.0	263	159
+27	532	7.3	285	126	+20.9	714	13.4	308	182
+28	810	8.1	278	96	+21.6	980	13.1	266	170
+29	43100	7.9	290	120	+10.3	43235	13.1	255	135
+30	375	8.1	275	140	+14.0	517	13.6	282	142
+31	645	7.5	270	128	+22.7	.....	...	...	...

FIGURE 1a

R Reticuli - Light Curve JD 2425000 - 2428000





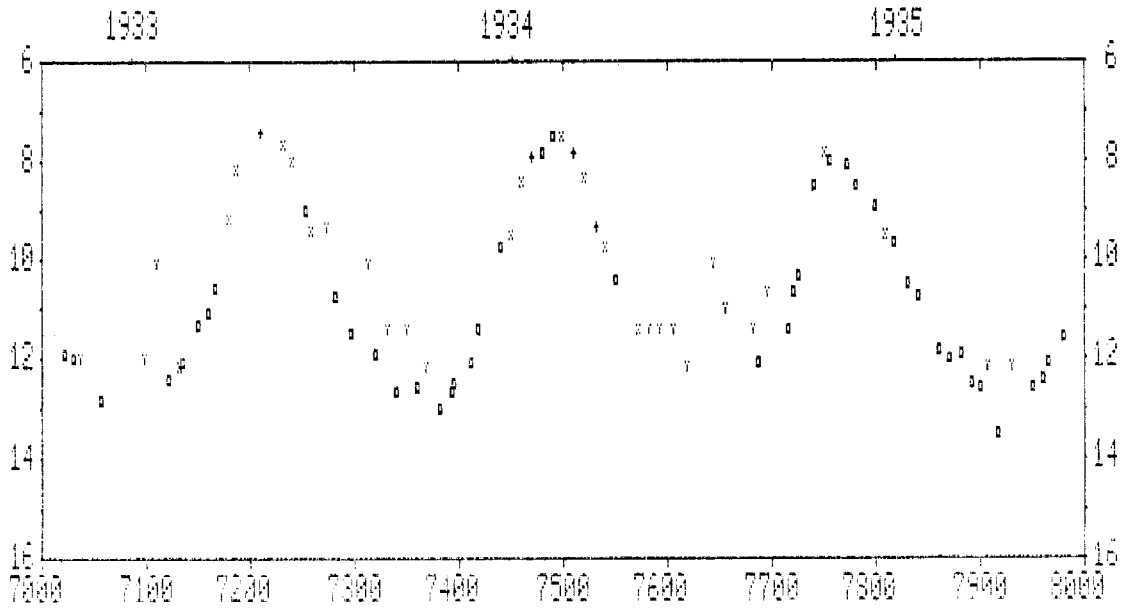
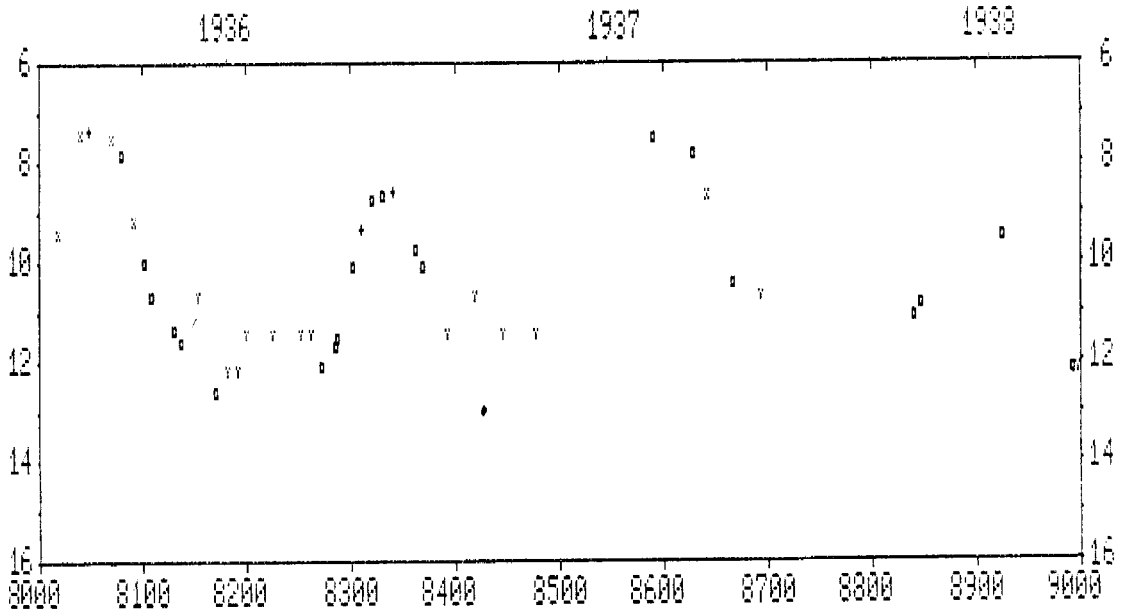
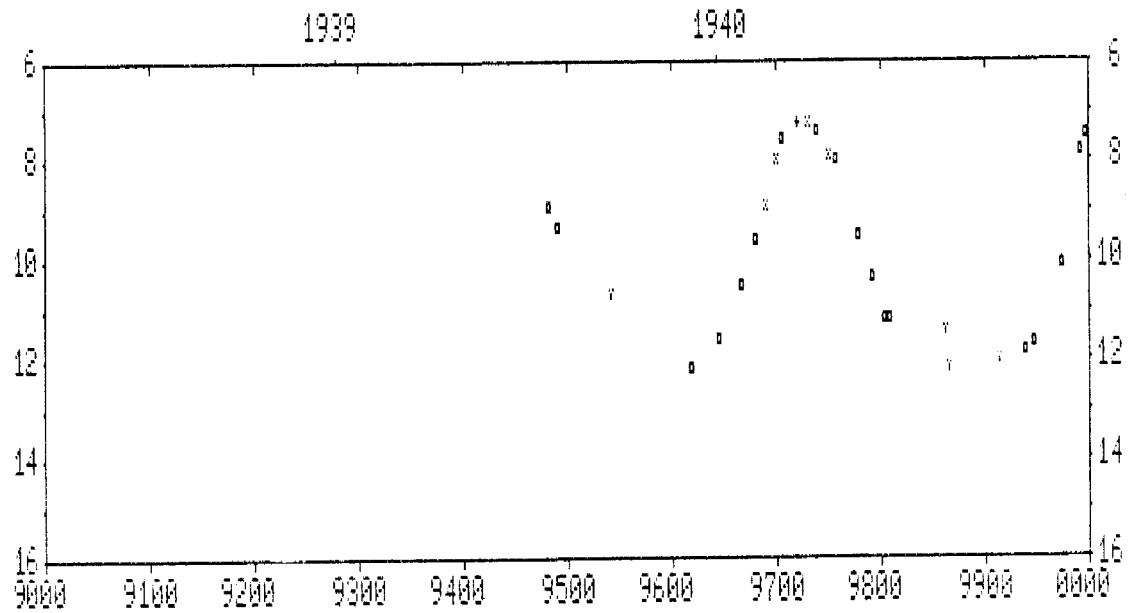


FIGURE 1b

R Reticuli - Light Curve JD 2428000 - 2431000





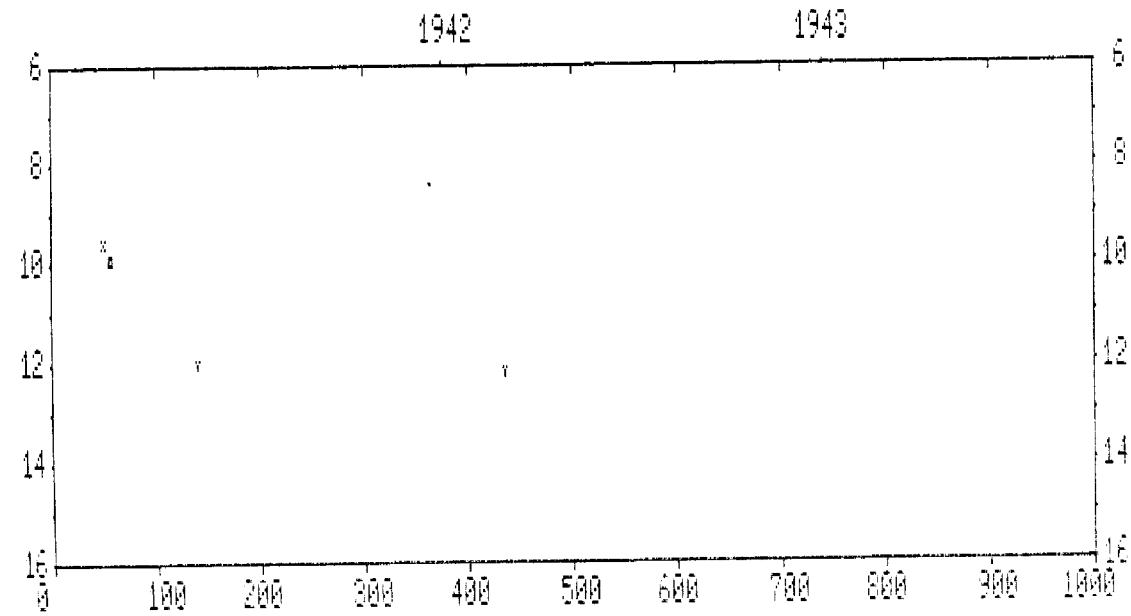
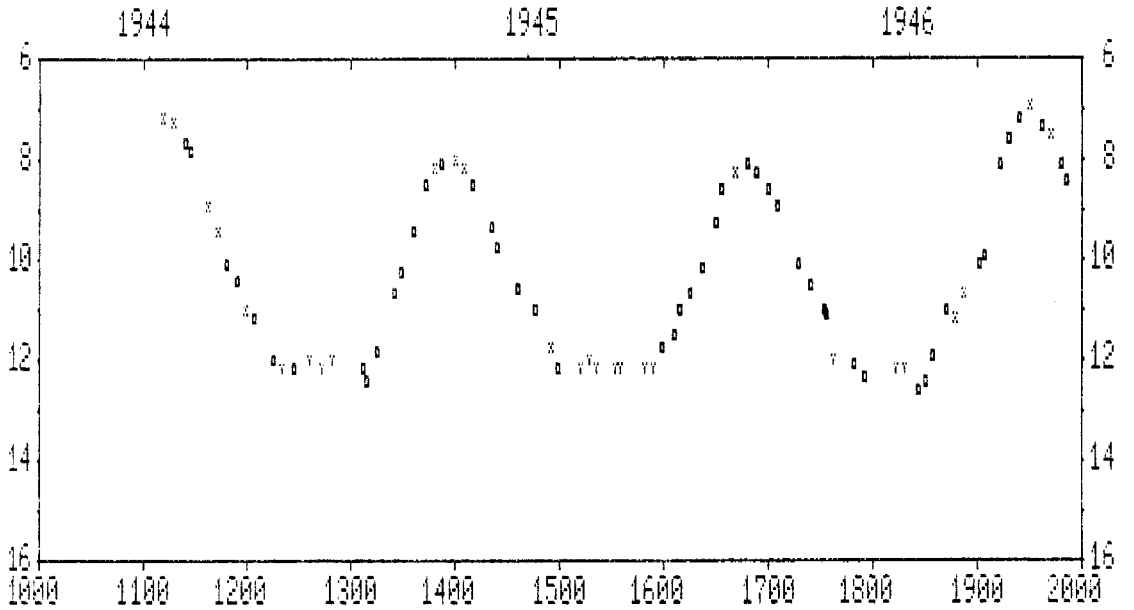
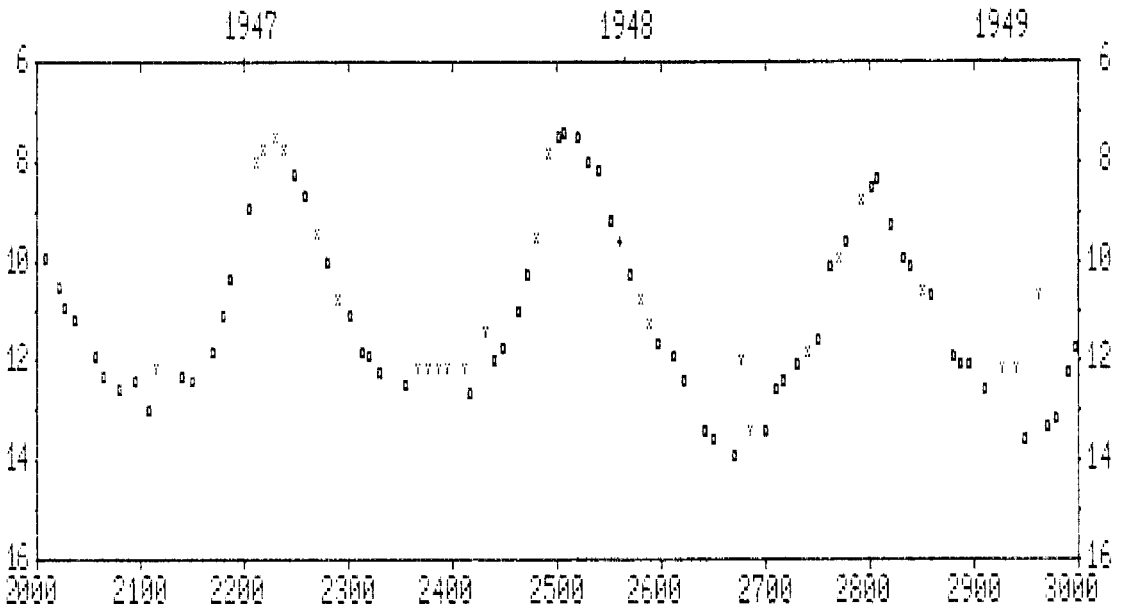


FIGURE 1c

R Reticuli - Light Curve JD 2431000 - 2434000





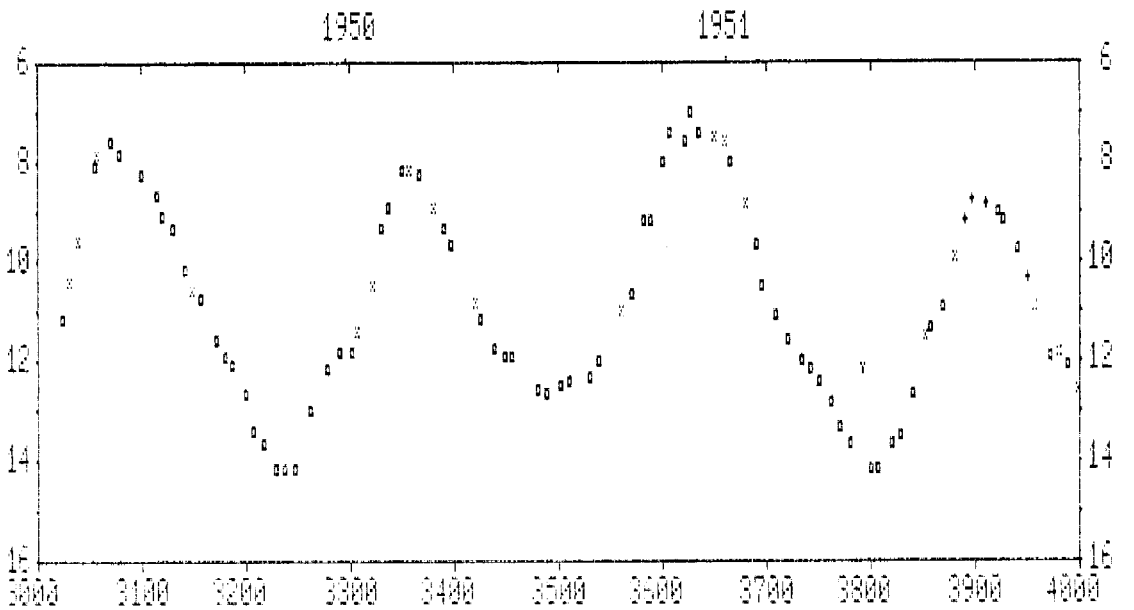
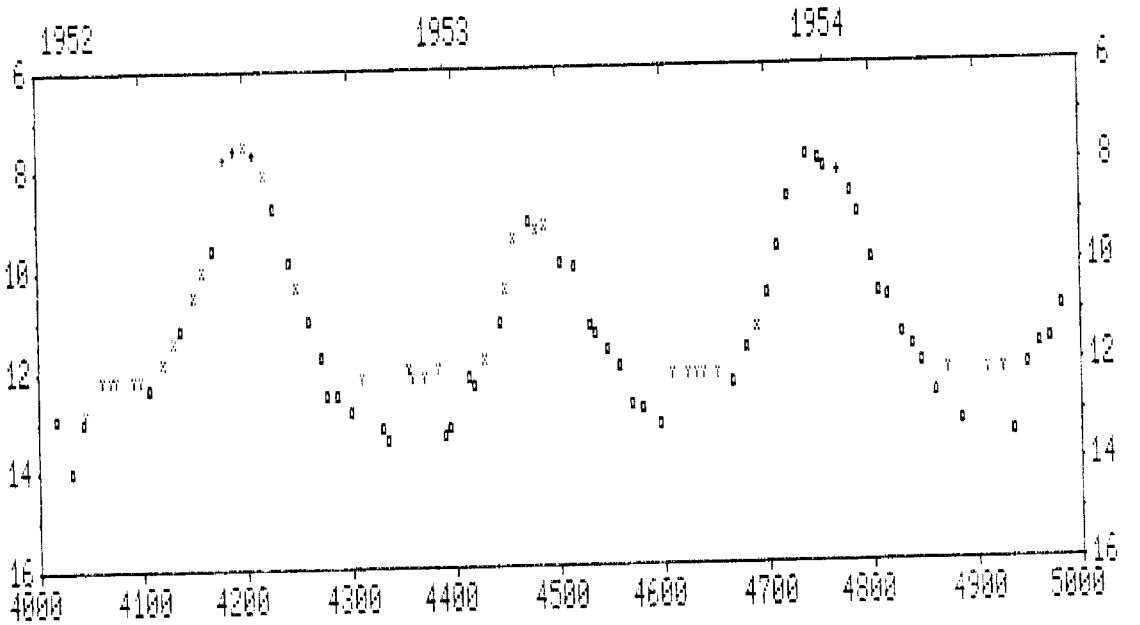
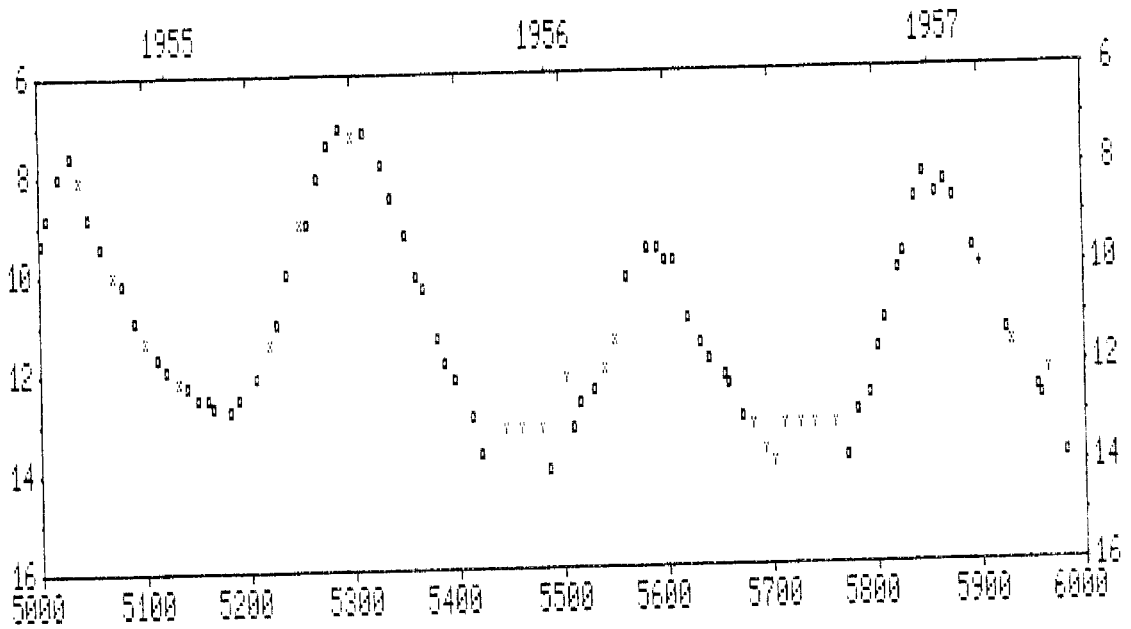


FIGURE 1d

R Reticuli - Light Curve JD 2434000 - 2437000





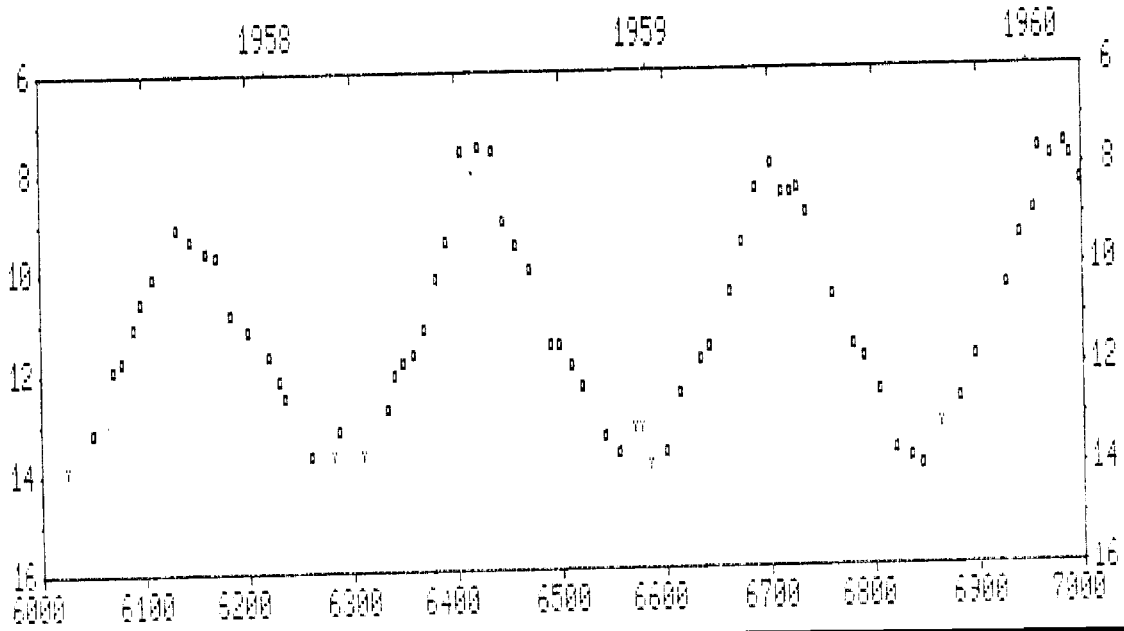
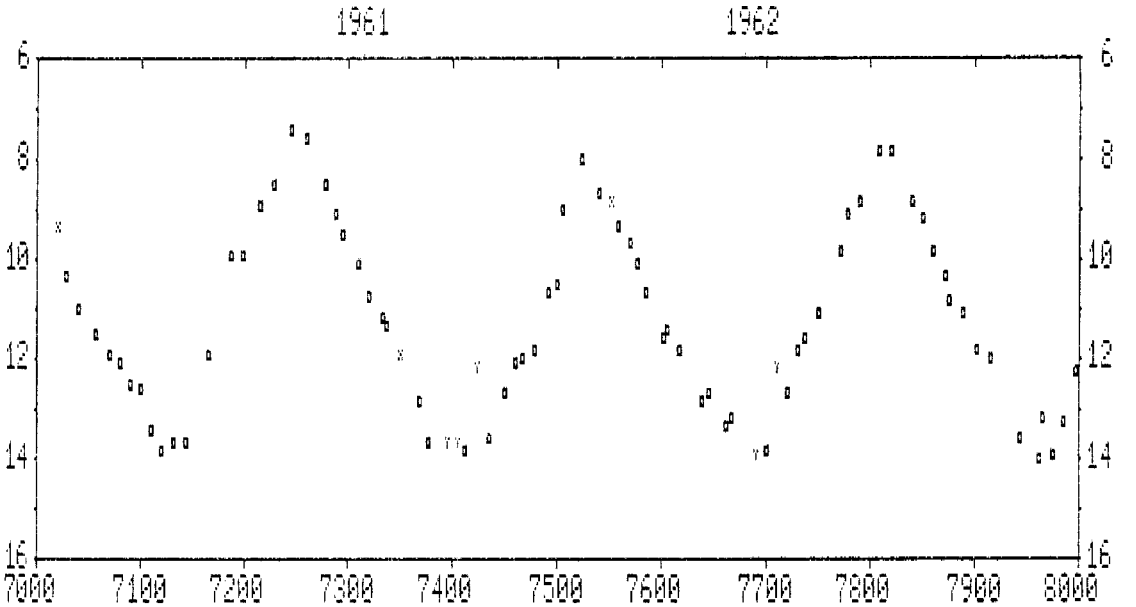
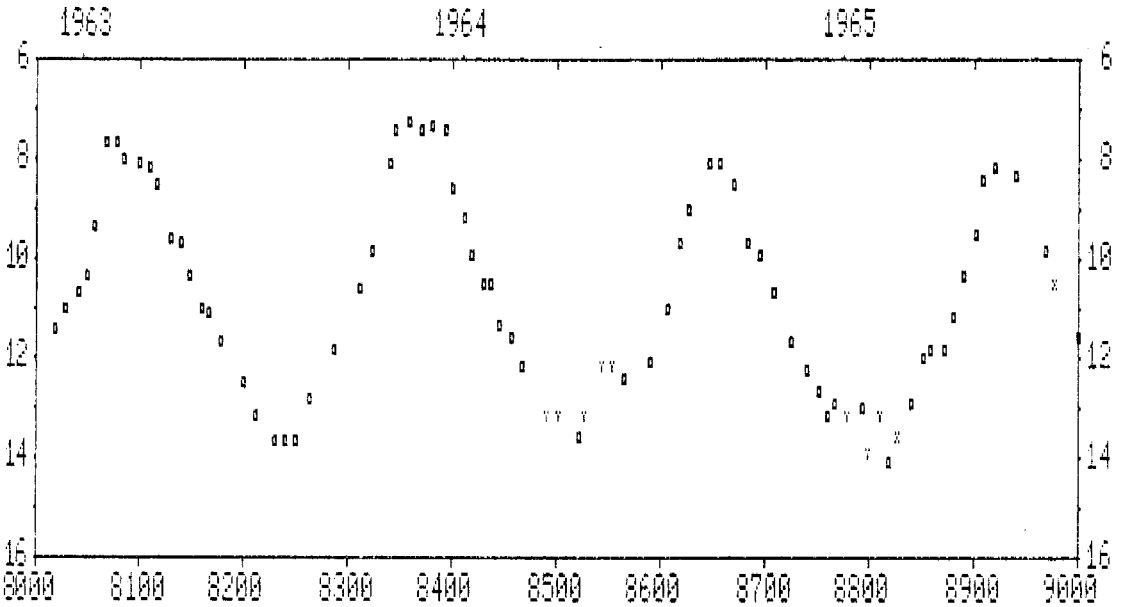


FIGURE 1e

R Reticuli - Light Curve JD 2437000 - 2440000





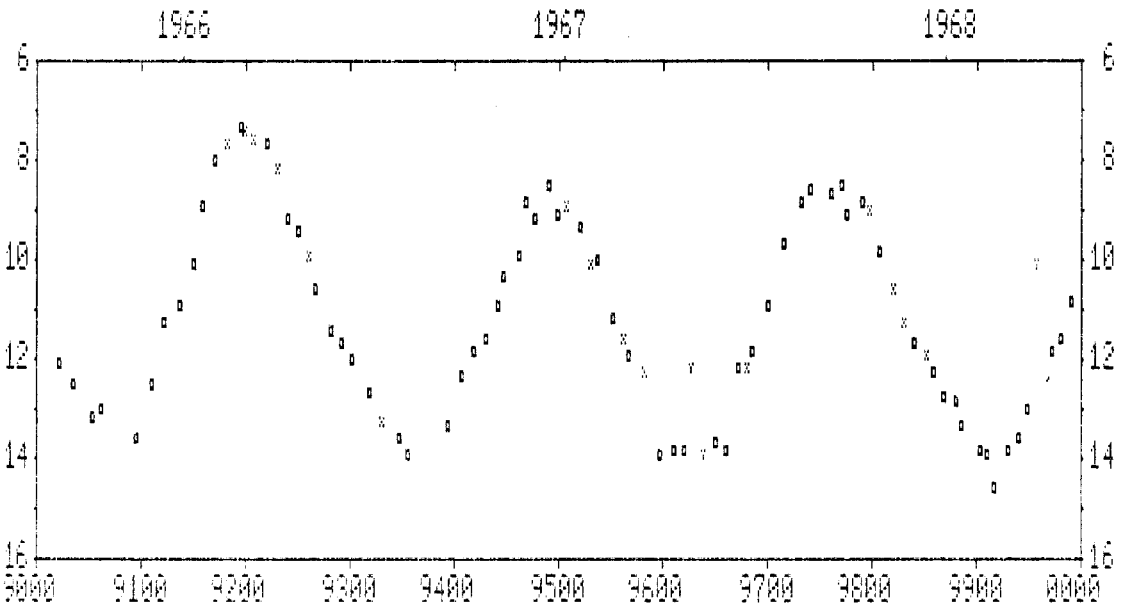
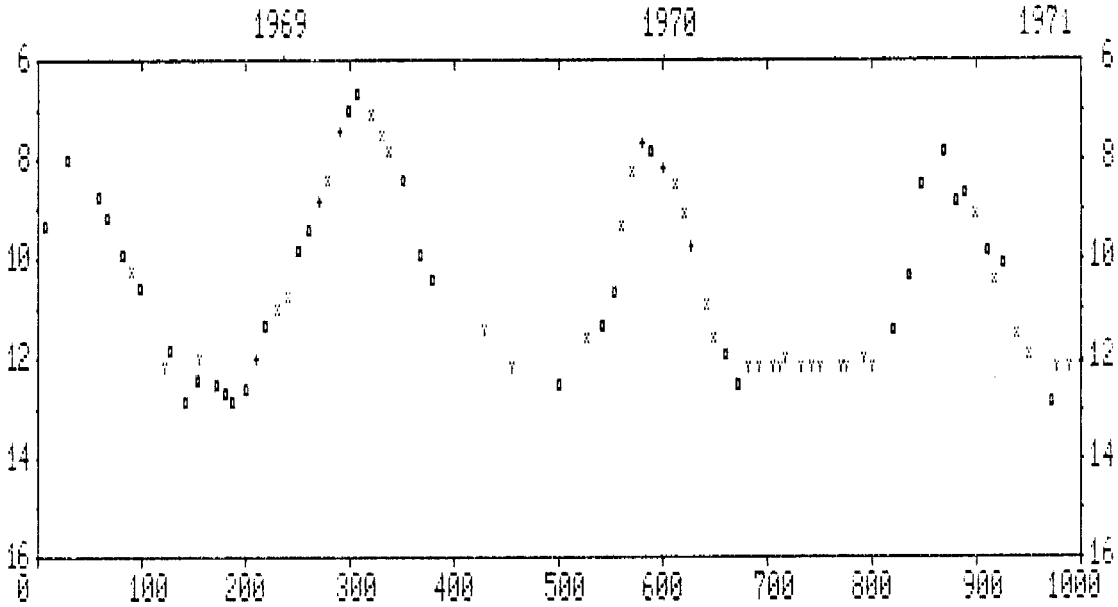
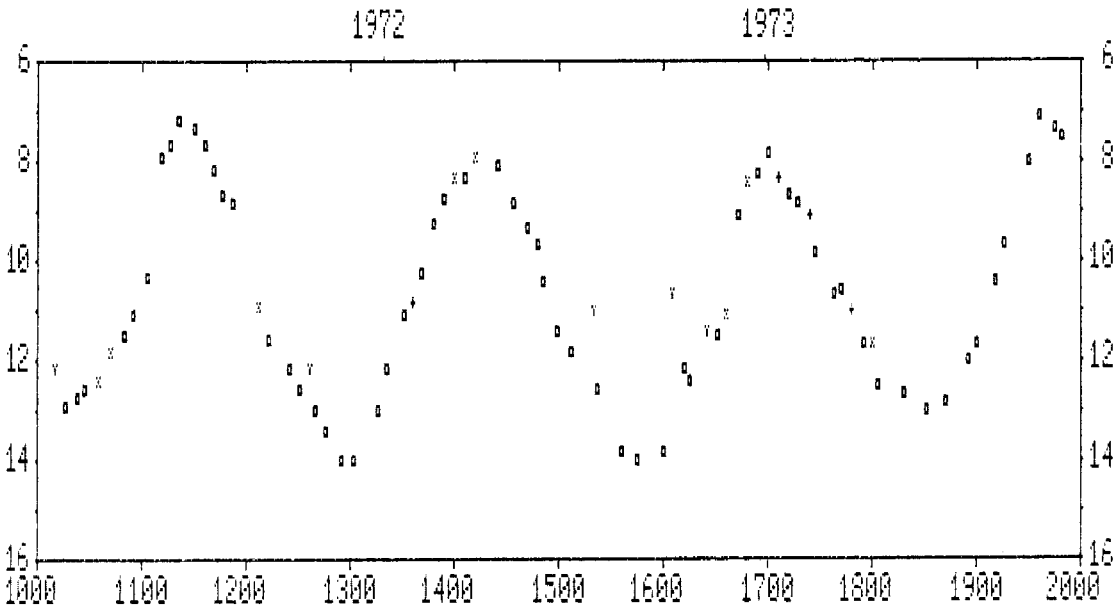


FIGURE 1f

R Reticuli - Light Curve JD 2440000 - 2443000





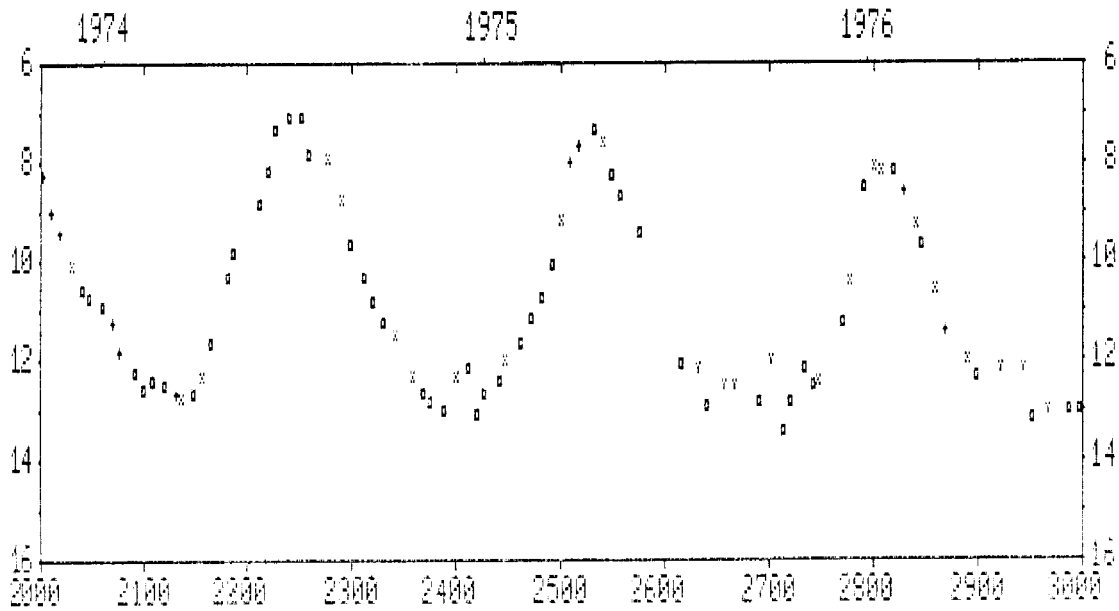


FIGURE 1g

R Reticuli - Light Curve JD 2443000 - 2444000

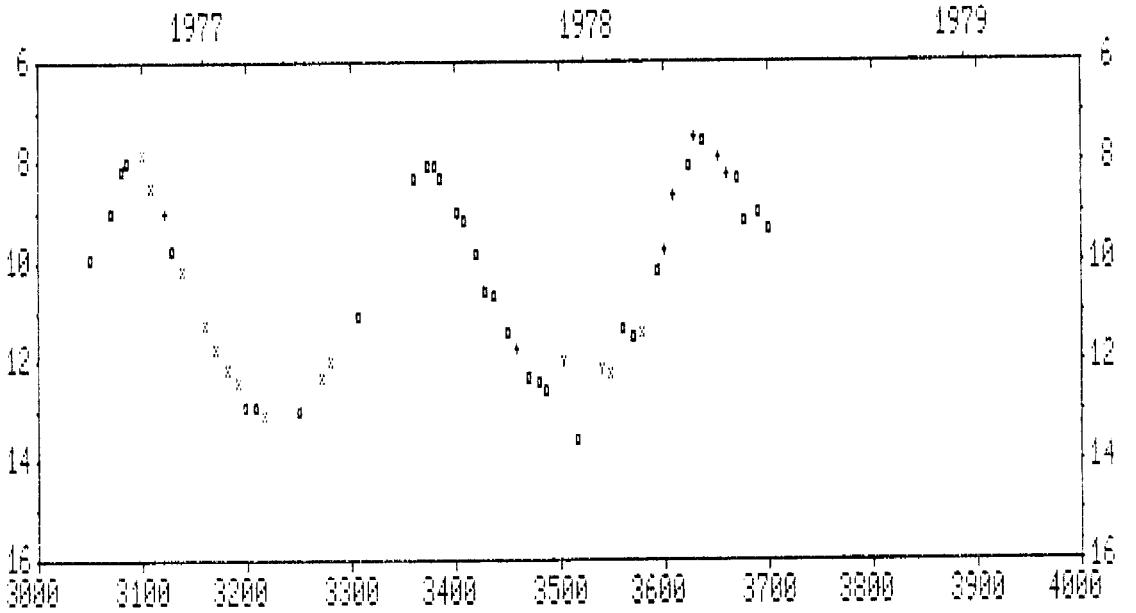
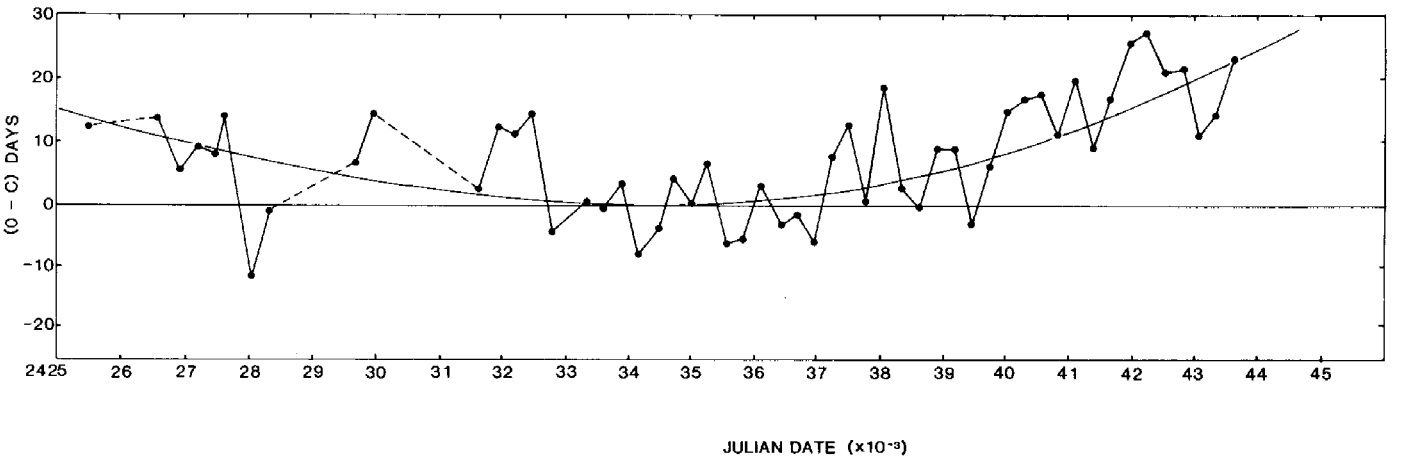


FIGURE 2.

R Reticuli - (O-C) residuals for Period J.D. Max. 2,435,028 ± [illegible]



LIGHT CURVE AND PERIOD OF AA TUCANAE

A.W. Dodson
Variable Star Section, R.A.S.N.Z.

SUMMARY: A light curve, from three decades of visual observations, is presented for the Mira variable, AA Tuc. A period from the observed maxima is given and it is shown that most minima were fainter than the threshold of most instruments used.

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1. INTRODUCTION

Chart 28 was published (1) with the comparison stars denoted by letters. V magnitudes (2) were determined for these comparison stars and these values, rounded off to tenths of a magnitude, have been used to reduce all observations.

Comparison star "n" (=CoD $-61^{\circ}6700$=NSV 14136)was found to be possibly variable with a range of 11.16 to 11.30V. This small range had no effect on the visual observations.

2. OBSERVATIONS

The observations cover the interval J.D. 2,435,463 to 2,446,163 (1955 Dec. 20 to 1985 April 7). The contributions from individual observers are listed in Table 2. All observations were made visually. Coverage was uneven and in the years 1979-1985 AA Tuc was not well observed because observers were engaged on other programmes.

3. LIGHT CURVE

The light curve, plotted from ten day means, are shown in Figs. 1a-1e. Symbols on Fig. 1e indicate the number of observations in each mean, which ranged from 1 to 11. Julian Dates are shown at the foot of the light curve and black triangular marks along the top of the curve show the end and beginning of each calendar year. The curve is on the scales of 10mm= 1 magnitude and 20mm=100 days.

Dashed lines indicate the possible light curve below the faintest magnitudes recorded to give continuity to the curve. Little value can be placed on these except for a very few minima, because for most minima there are very few, or no, observations fainter than magnitude 13.

4. DISCUSSION

Details of observed maxima are given in Table 1, in which a cycle number is shown in the first column with the next two columns giving respectively the J.D. of observed maxima and the magnitude at maximum. The fourth column gives the O-C residuals in accordance with the elements given below. The fifth column assigns a weight to each observed J.D. on the basis of 1 = poor and 5=good.

The O-C values are plotted in Fig. 2. It should be noted that, due to the few and scattered observations from cycle No. +16, little value can be placed on the observed dates of maxima from this cycle onwards. The apparent increase in the differences between observed and calculated dates towards the end of Table 1 is not considered to reflect any change in period but merely due to the lack of observations making the determination of dates of maxima uncertain.

Observed dates of maxima were determined by using the individual observations with due weight being given to the reliability of each observer. Thus the dates in Table 1 often differ slightly from those which are indicated by Figs. 1a-1e.

It is tempting to list possible dates of minima, but this is not justified owing to the lack of observations at fainter limits. All that can be stated about minima is that they appear to range in magnitudes from 13.7 to fainter than 15.0.

The following elements have been derived from the observed maxima:

EPOCH MAXIMUM J.D. 2,440,530 $\pm$ $216^{d}.957$
MEAN MAXIMUM MAGNITUDE 10.30
RANGE IN MAGNITUDES AT MAXIMA 9.7 - 11.4
MEAN O-Cfor 39 maxima (Nos. -23 to +16) $\pm$ $5^{d}.33$.

5. CONCLUSIONS

AA Tuc is a typical Mira type variable with a maximum brightness that varies from one cycle to another by almost two magnitudes. Brightness at maximum occurs in a random manner, and a particularly bright, or faint, maximum is not followed by one that is unusually faint, or bright. There is little evidence that the depth of minima bears any relationship to the brightness of either the preceding or following maximum. Almost no definite statement can be made about minima because of the lack of observations for most minima. It does appear, however, that minima vary in magnitude from 13.7 to fainter than 15.0.

There is no evidence for a change in period during the interval covered by the observations, which are satisfied by a period of $216^{d}.957$.

ACKNOWLEDGEMENTS

I wish to thank all observers for their records. I am also indebted to Dr. Frank Bateson for his encouragement, guidance and assistance.

REFERENCES

(1). Bateson, F.M. & Jones, A.F. 1960. Charts for Southern Variables, Series 2. Publ. by F.M. Bateson.
(2) Bateson, F.M., Gordon, P.J. & Menzies, B. 1971.Circ. No. 177, VSS, RASNZ.

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TABLE 1

AA TUCANAE---OBSERVED MAXIMA

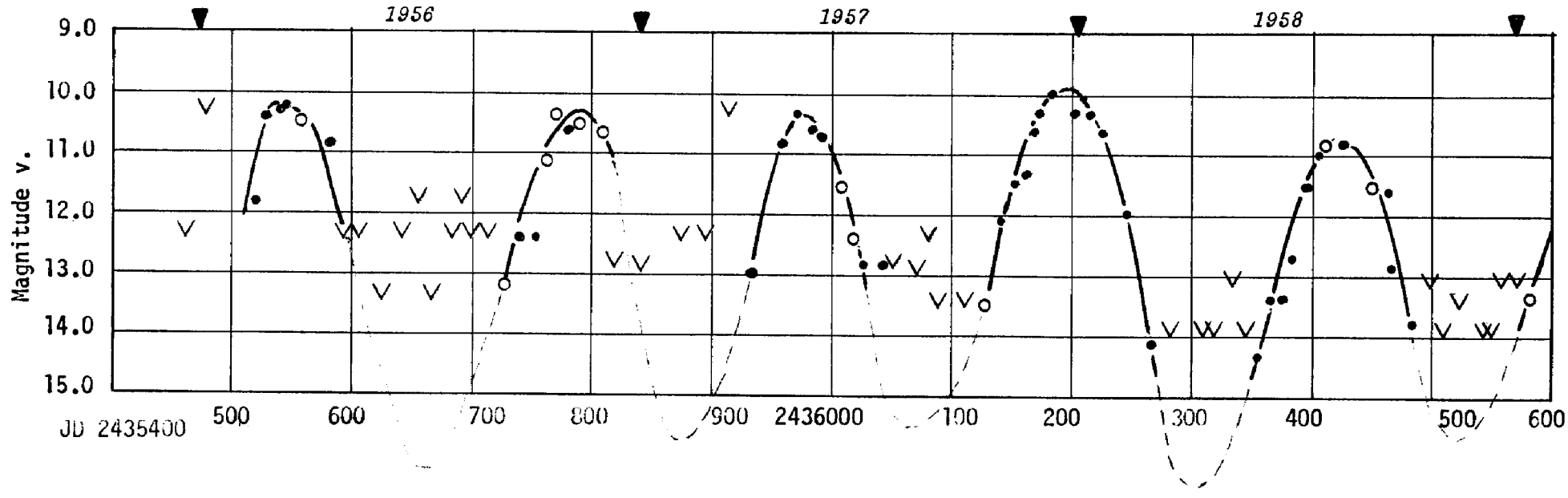
MAX. No.	MAX. J.D.	MAX. M_v	O-C days	Wt.	MAX No.	MAX. J.D.	MAX. M_v	O-C days	Wt.
-23	2,435,545	10.2	+5	4	+ 1	2,440,750	10.0	+3	3
-22	771	10.3	+14	4	+ 2	972	11.1	+8	4
-21	971	10.3	-3	4	+ 3	2,441,179	10.1	-2	4
-20	2,436,187	10.0	-4	3	+ 4	405	11.2	+7	1
-19	415	10.7	+7	4	+ 5	612	10.1	-3	5
-18	643	10.2	+18	3	+ 6	835	10.2	+3	4
-17	855	11.0	+13	3	+ 7	2,442,039	10.6	-10	5
-16	2,437,058	10.3	-1	2	+ 8	267	10.2	+1	5
-15	276	11.4	+0	3	+ 9	485	10.5	+2	1
-14	492	10.3	-1	2	+10	704	10.7	+4	5
-13	706?	11.3	-4	1	+11	919	10.2	+2	2
-12	930	9.7	+3	3	+12	2,443,145	9.7	+12	4
-11	2,438,148	11.3	+5	3	+13	360	10.1	+10	2
-10	359	9.9	-1	4	+14	575	10.2	+8	1
- 9	580	10.3	+3	3	+15	793	10.2	+9	3
- 8	792	10.0	-2	3	+16	2,444,007	10.1	+6	1
- 7	2,439,010	9.7	-1	4	+17	222	10.1	+4	5
- 6	235	10.5	+7	4	+18	449	10.1	+14	3
- 5	444	9.8	-1	5	+19	?	10.5	...	1
- 4	675	10.2	+13	4	+20	876	9.7	+7	3
- 3	888	10.4	+9	5	+21	2,445, ?	11.2	...	1
- 2	2,440,090	9.8	-6	4	+22	323	10.3	+20	1
-1	310	10.0	-3	2	+23	535?	10.0	+15	1
± 0	2,440,530	10.2	±0	5	+24	752?	10.2	+15	1
					+25	977?	10.0	+23	1

TABLE 2

OBSERVERS TOTALS.

BATESON, F.M.	35	LAUDER, C.S.	106
CRAGG, T.A.	30	MATCHETT, V.L.	28
CROMPTON, A	24	MENZIES, B.	34
DODSON, A.W.	107	OVERBEEK, M.D.	39
EMMERSON, R.	28	ROWE, G.	24
GILLER, R.H.	35	TAYLOR, N.W.	54
HARRIES-HARRIS, E	57	TREGASKIS, T.B.	32
JONES, A.F.	391	VENIMORE, (Rev). C.W	112
JONES, M.V.	178	WILLIAMS, P.	61
50 OBSERVERS WITH LESS THAN 20 OBSERVATIONS EACH			211

TOTAL 1,586.



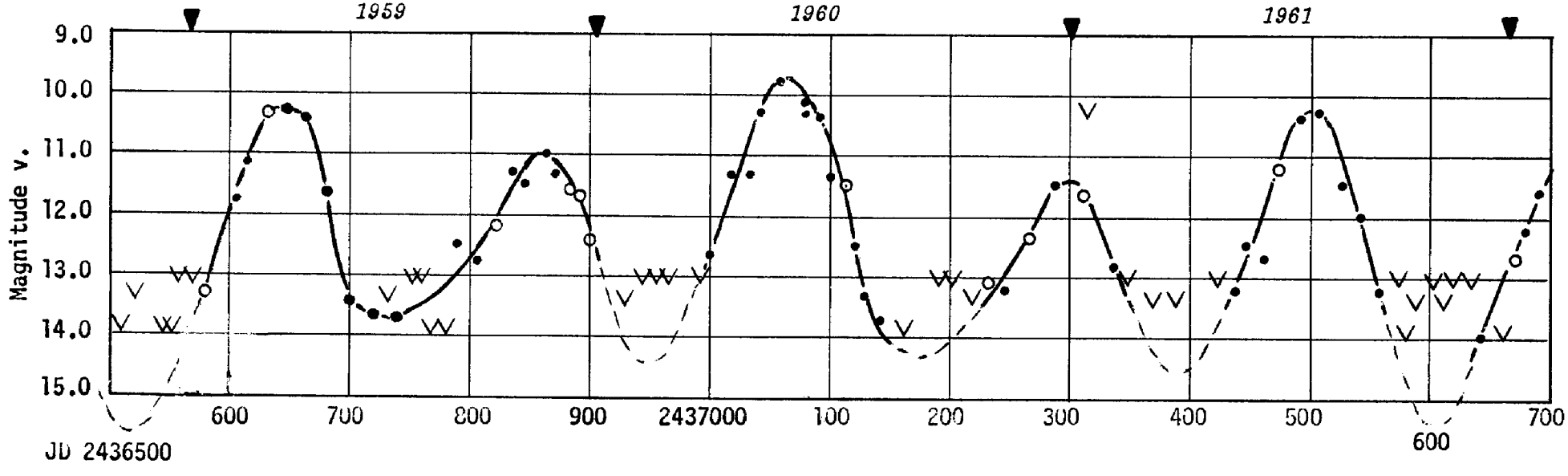


Fig. 1a 221460 AA Tucanae Light Curve

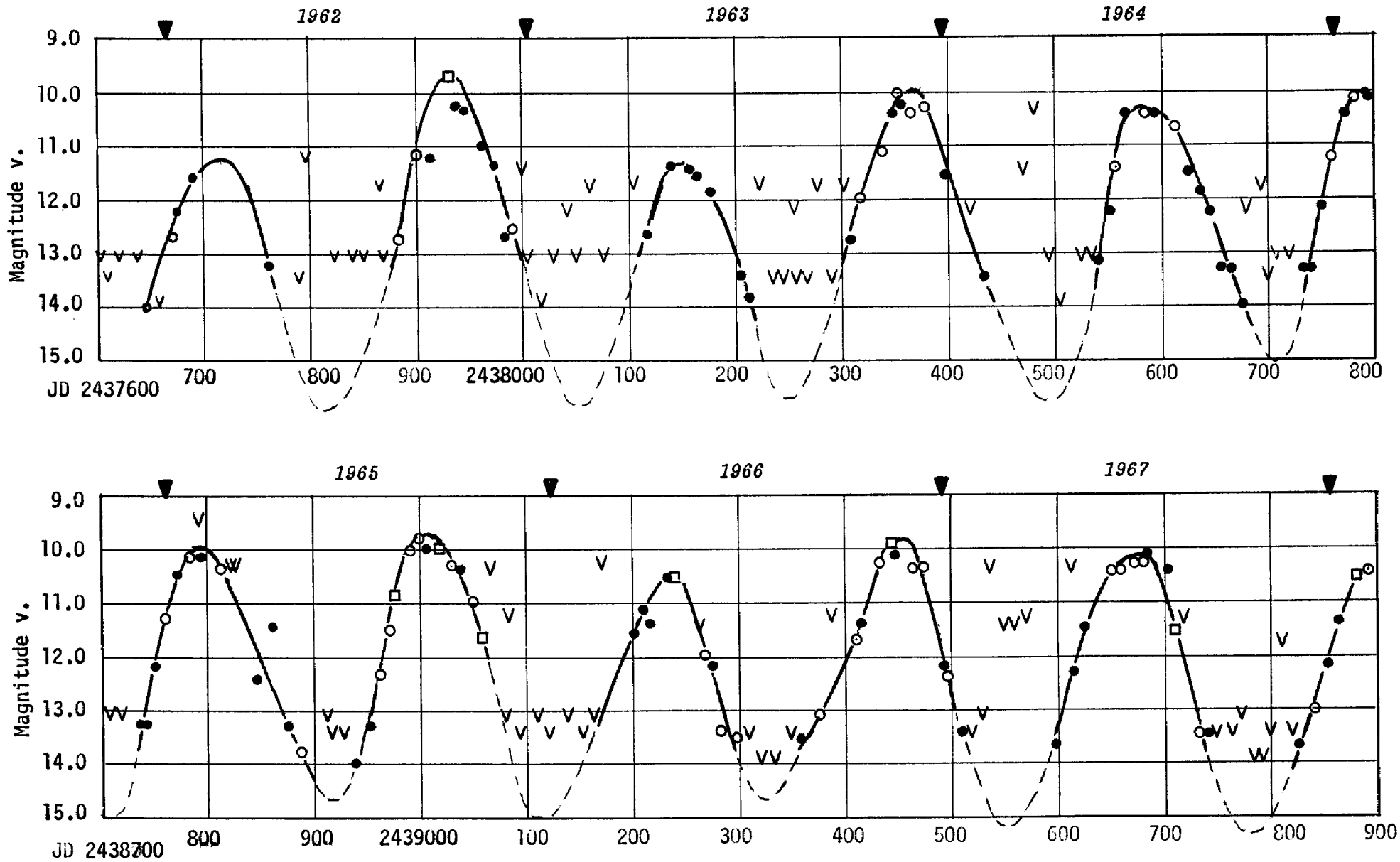
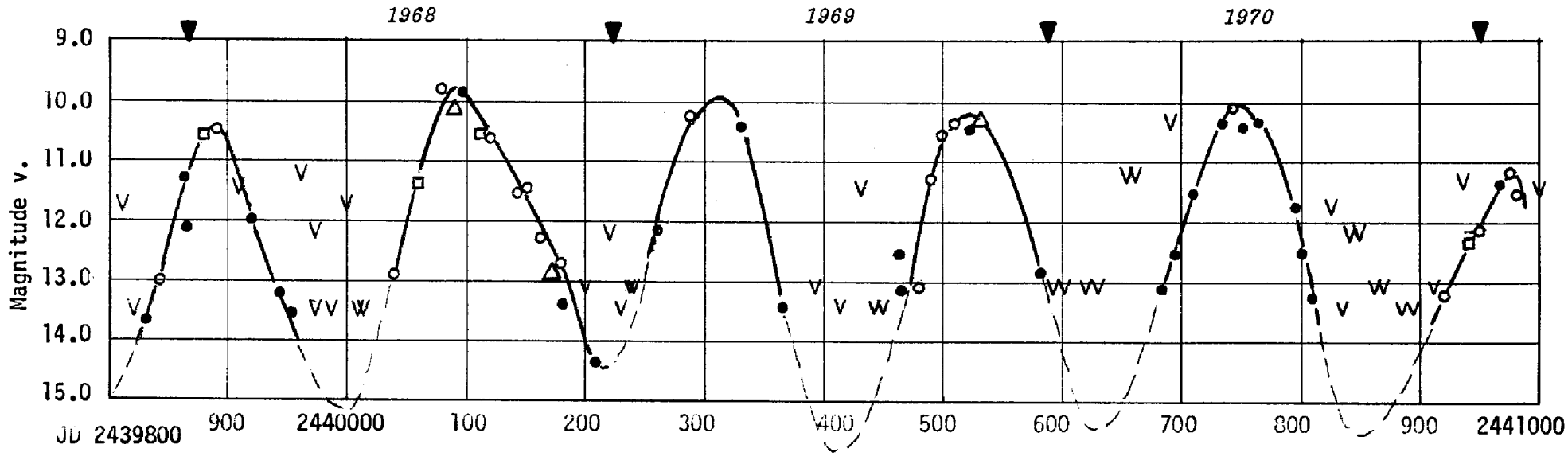


Fig. 1b 221460 AA Tucanae Light Curve



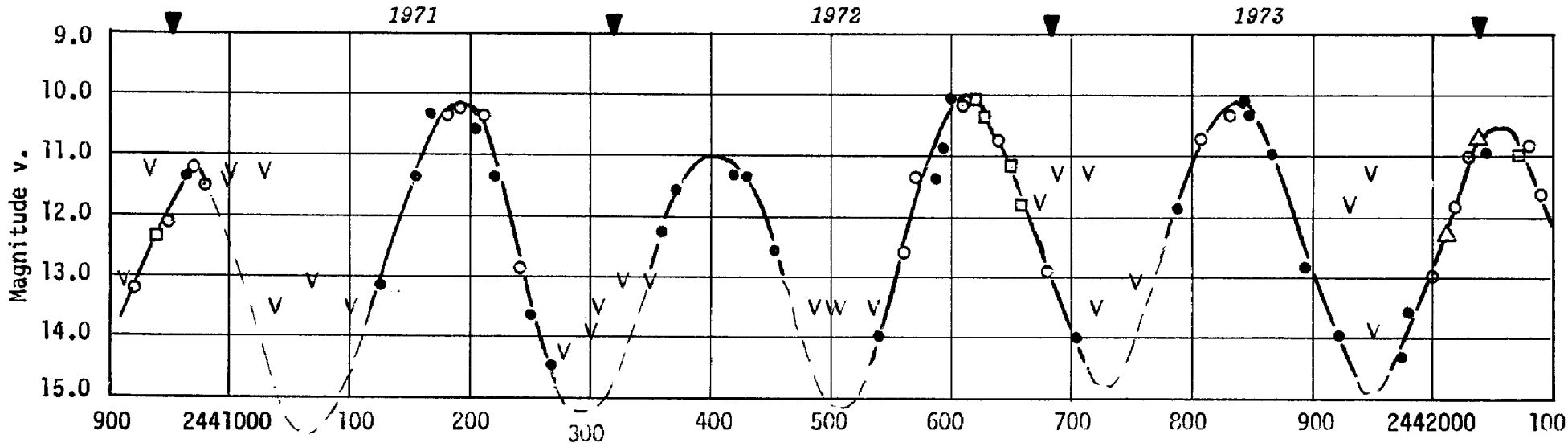


Fig. 1c 221460 AA Tucanae Light Curve

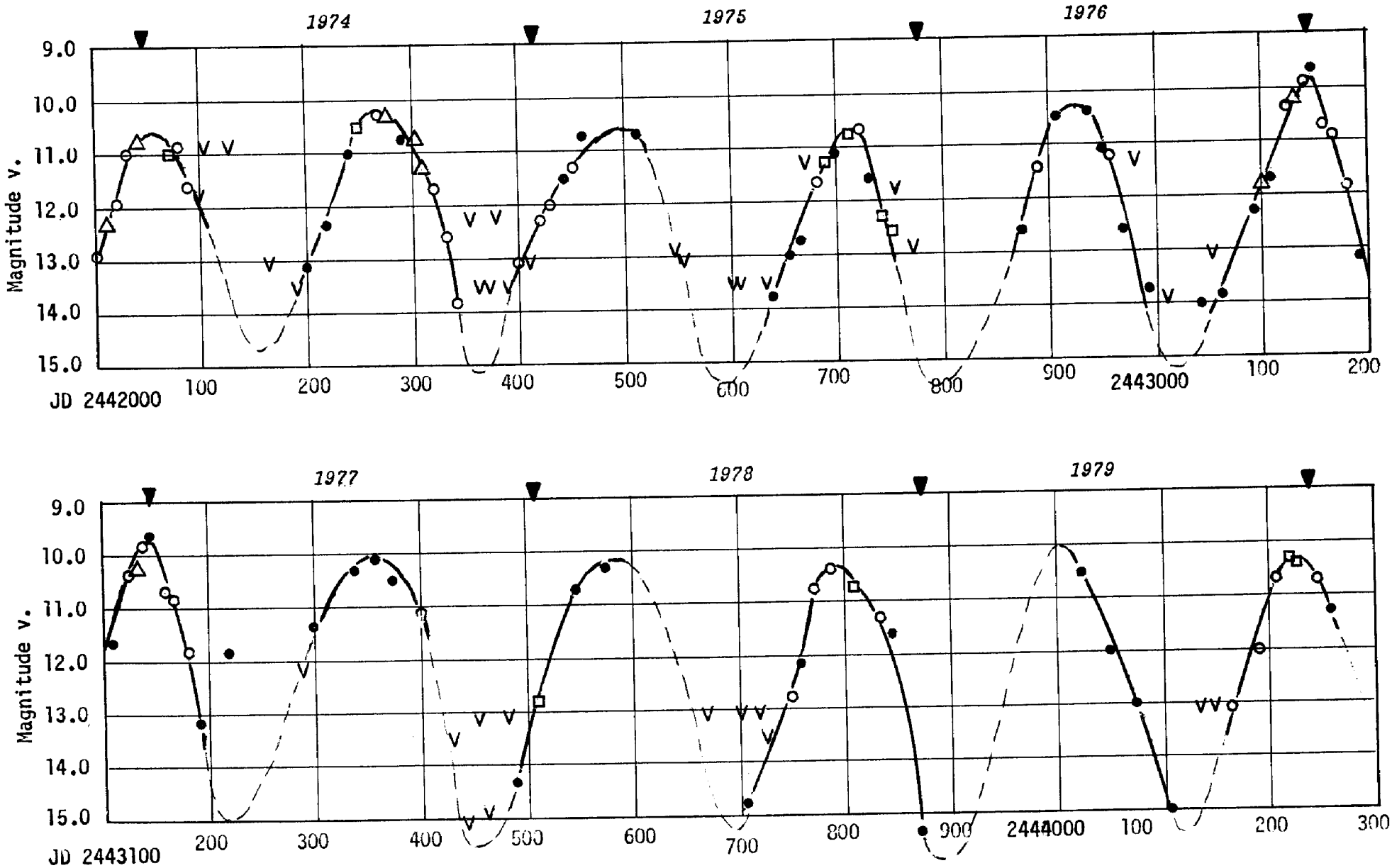


Fig. 1d 221460 AA Tucanae Light Curve

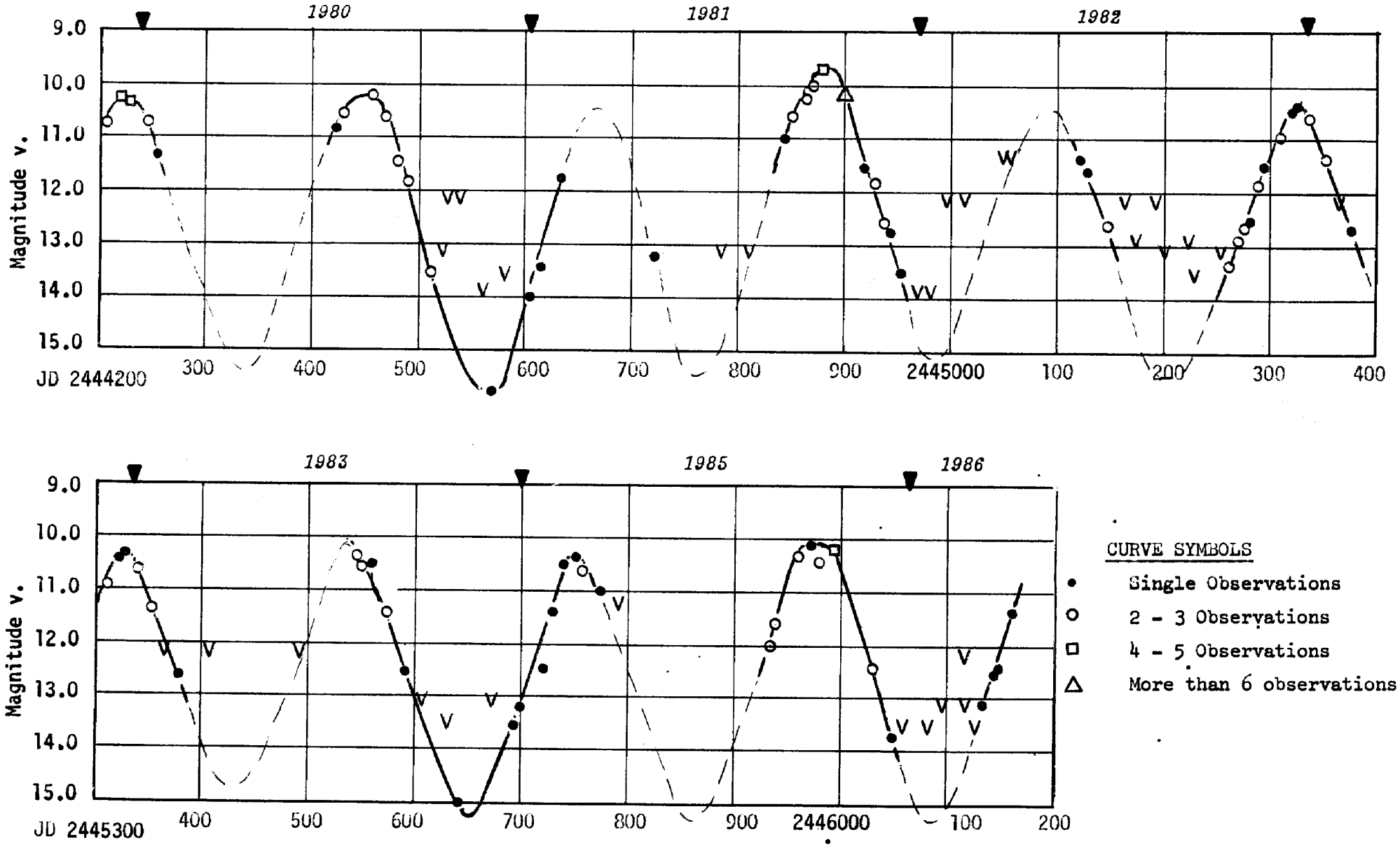


Fig. 1e **221460 AA Tucanae - Light Curve**

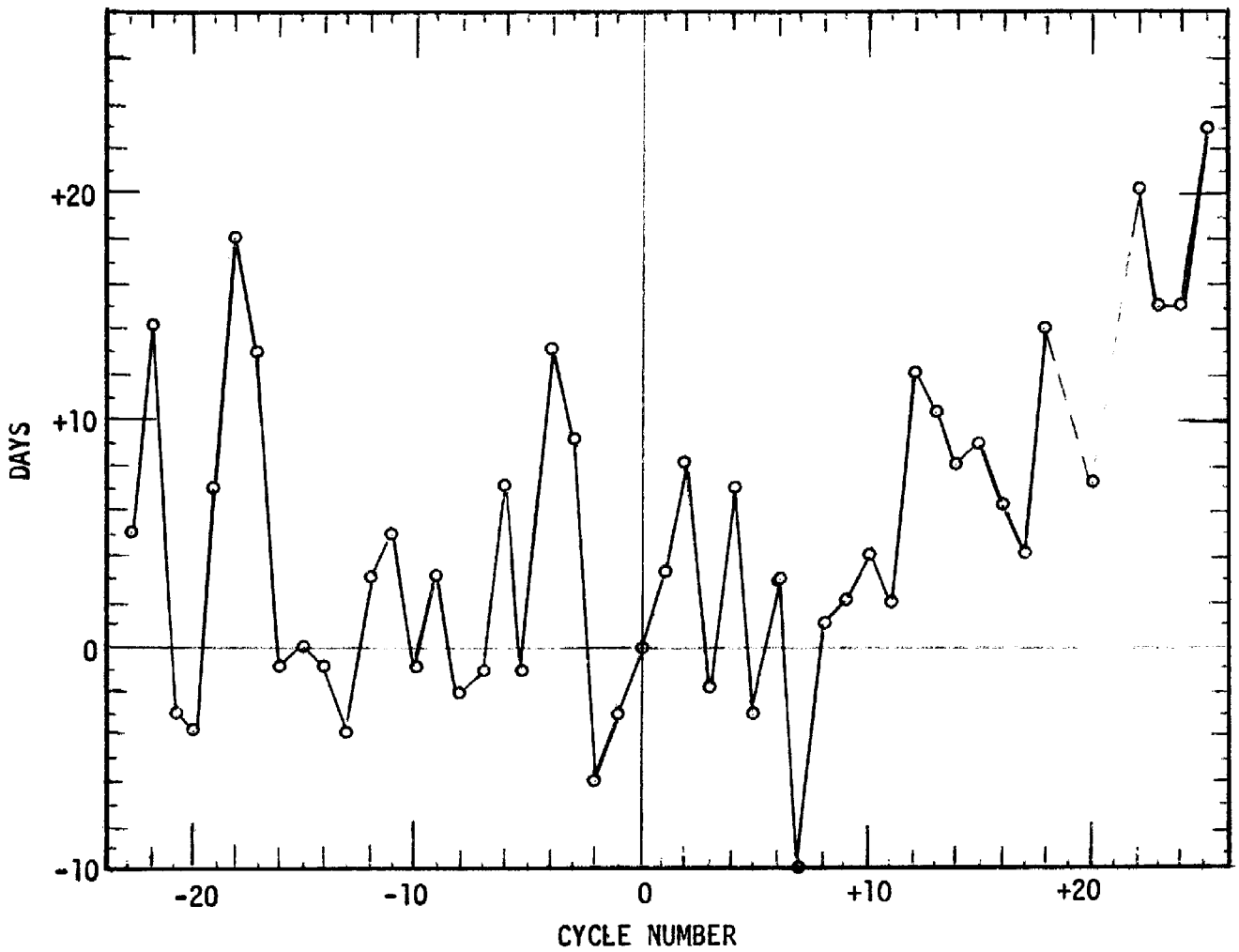
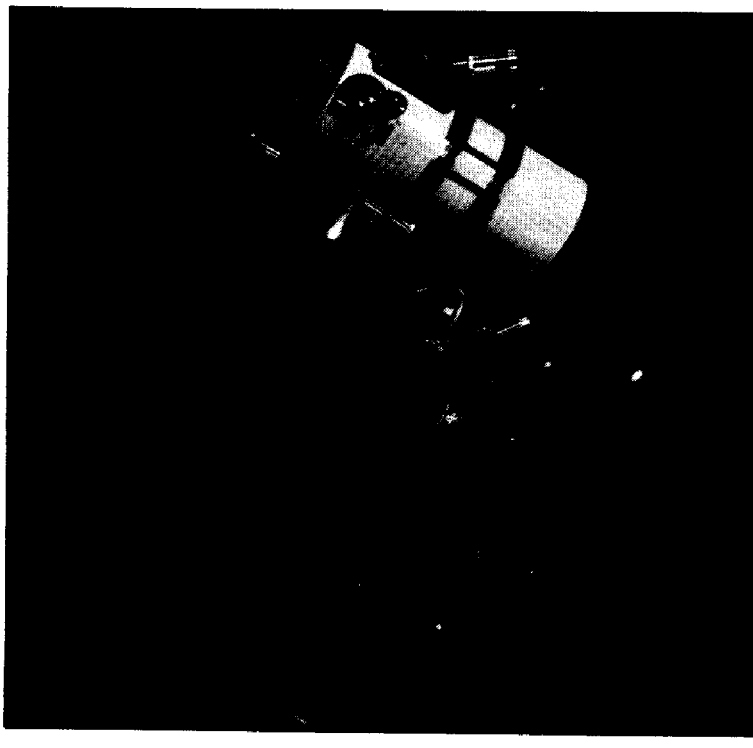


Figure 2. AA TUCANAE. O-C VALUES.

Little importance can be attached to values from cycle number 16+ onwards (see text).

COMET CATCHERS



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IDENTIFICATIONS FOR SOME NEGLECTED SOUTHERN VARIABLES

M. Morel (1) and R.H. McNaught (2)

(1) Member, Variable Star Section, R.A.S.N.Z.
(2) UKSTU, Siding Spring Observatory, Coonabarabran, N.S.W.

SUMMARY: Improved identification charts are presented for 27 southern variables, mainly of the Mira type, whose precise positions have been ascertained at the UK Schmidt Telescope Unit (UKSTU), Siding Spring. The results of research into the plate records is also presented in the form of notes. Accurately determined equatorial coordinates are also given for three additional variables.

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1. INTRODUCTION.

In issues of CHARTS FOR SOUTHERN VARIABLES, Series 14 - 18)1), charts are published for a number of neglected Mira variables, as well as a few neglected members of other types. In a significant number of cases the identification of the variable was subjected to uncertainty as a result of:-

(a) Approximate coordinates
(b) finder charts which were of inadequate accuracy and detail, or simply unavailable.

Accordingly a list of stars of doubtful identification was prepared. R.McNaught kindly agreed to check these stars on the chart and plate records of the UKSTU, to determine their correct positions. Table 1 lists 27 variables for which finder charts are reproduced in Figures 1a, 1b and 1c. Table 2 lists three stars for which accurate coordinates only are given. Charts for these stars will appear in a future issue of Charts for Southern Variables.

2. OBSERVATIONS

At the UKSTU there exists an extensive library of Schmidt plate film copies, exposed in the following spectral regions:-

B - blue
R - red
I - Infra red
SR - short range red
J - blue/green plates on hypersensitized Eastman Kodak IIIaJ emulsion.

The following photographic atlases were also checked:-

'True Visual Photographic Star Atlas' (C. Papadopolous, 1979)
'Canterbury Sky Atlas (Australis)'; blue. 1973
'Atlas Stellarum,' (H. Vehrenberg); blue.

Of thirty stars in Tables 1 and 2, all but two are classified as Mira (M) or Semi-regular (SR) by Kukarkin et al (2). The identification procedure assumed that these stars are of late apectral type with, therefore, an excess in I or R. The search involved, initially, looking for a candidate star with such an excess at or near the published position. Different plates and charts were then examined to confirm the variability of the candidate star. In cases where no candidate star could be found at the published position it was necessary to examine other stars in the immediate vicinity, This usually revealed a suitable candidate, and we must presume that the published coordinates for at least two or three variables are significantly in error.

3. RESULTS

R. McNaught was responsible for checking the plate records and his notes are reproduced below. Finder charts are reproduced for all stars listed in Table 1, although sometimes there is only a slight improvement on the previously published identification charts. The charts in Figures 1a to 1c have been prepared from a variety of sources, ranging from field sketches from R.McNaught and T.A. Cragg to reproductions of earlier charts with appropriate amendments. The scales vary considerably, and, for some variables, two charts ('a' and 'b') are employed to clearly separate the variable from companion stars. Where there are nearby lettered comparison stars, these are indicated to assist in locating the field on the appropriate chart in "CHARTS FOR SOUTHERN VARIABLES."

NOTES TO STARS IN TABLE 1.

RU Oct: Identified by red excess. No other red stars in vicinity.

SW Hor: Identified by R excess (no I plate); bright on Papadopolous map 40. Not on map 39.

RT Hor: Bright on Papadopolous map 40.

Z Pic: Very bright on J; faint on B plate. Published position is OK. T.A. Cragg makes same identification.

IZ Car: No variable near published position, but a star with I excess lies some 3 minutes south. Brighter on B than J, and presumed to be IZ Car.

MN Car: Identified from position; I excess; variable on J91/J126 plate overlap and I91/I126 overlap.

KR Car: Identified from position; I excess; variable on I and J plates overlap (91/126). Two small, faint galaxies lie near the variable.

NT Car: Identified by position; I excess (very bright); variable on overlapping J, I and SR plates.

KL Car: Identified by J, B comparison. Bright on J, faint on B.

NSV 04673: Identified from I excess. Normal brightness on R/SR comparison (plates 91/92); bright on B91/92; faint on J91;medium bright on J92 (very notable variation).

V663 Cen: Identified from being significantly brighter in J than B, and variable on overlapping J plates. Confirmed by T. Cragg. Note faint galaxy MCG 05-32-058. V663 Cen is apparently identical with CoD $-30^{\circ}10784$.

V664 Cen: Identified from position; about 2 magnitudes brighter on B than J.

DO, DT & HN TrA: All identified by R. McNaught. No notes available.

EQ Sco: Candidate star shown in Fig. 1b is the reddest star in the region, but is not very red, and there is no evidence of variability on four plates - I, SR, J and B.

TU Sco: Identified on UKSTU R and J plates. Bright image on R6891, field 454.

Z Oct: Nothing obvious on B or J. No I plate. It is star "e" (chart 747), as it is bright on Papadopolous map 6 (1973 Sept. 16), and faint on Papadopolous map 5 (1973 July 31).

PQ Ara: The variable is plotted as a field star on chart 667.Comparison with plates J229, J181 and R229 show the candidate star to be faint, fainter than the two stars that flank it. It is bright on J182 and B229. No I plate. No other obvious variable appears in the vicinity

WW Sgr: Variable is the eastern (left) of the close pair; based on brighter on I than SR, and brightest on B, but still very faint. J is crowded.

VV Oct: Not Identifiable from B or J, Canterbury Atlas or Atlas Stellarum No I plate, but star "o" on chart 732 shows an R excess and is presumably VV Oct.

TY Oct: Star within circle on chart 736 is TY Oct. No I plate, but

identified from overlapping J plates. Very bright on J25,faint on J24. Brighter on B25 than B24.

RT CrA: Identified from I excess and variability on Canterbury Sky Atlas.

UU Oct: South-following of pair. About five magnitudes brighter on J than B.

X Tuc: Nothing obvious on B or J. No I plate. Canterbury map 26shows a faint image (confirmed on two copies of Canterbury), which is perhaps slightly brighter than on ESO B, and which could possibly be X Tuc.

Y Tuc: Identified from variability on Canterbury maps 12 and 26. Identity confirmed by T. Cragg. Plotted as field star on chart 798. Confirmed by A.F. Jones by direct observations and from estimates on the following charts. Not shown on Johannesburg chart $-64^{\circ}78$ (1934 Sept. 27); visible on Franklin Adams 25 (1910 Aug.4) and 11 (1910 Aug.10). About $11^{m}.0$ on Papadopolous 19 (1974 May 26) and 36 (1973 Aug.20); variable between Vehrenberg 405 ((1966 July 24) and 419 (1964 June15)

RR Phe: Identified by being noticeably brighter on J than B. No I plate.

NOTES TO STARS IN TABLE 2.

RY Pav: Identified from variability on J plate overlap and very bright image on R plate.

AZ Tel: Identified solely from magnitude difference on comparison of ESO B and UKSTU J plates. No R or I plates exist. No maxima found on examining other charts.

VV Tel: Identification was assumed from published chart, although no material available suggested variability of it or nearby stars. Only one B and one J plate available.

3. CONCLUSIONS

The majority of the variables in this paper have been satisfactorilyidentified. Due to the limitations of the available material the variability of several candidates was not detected. It is urged that observers with suitable means should investigate the following stars in particular to confirm their identification: IZ Car; EQ Sco; VV Oct and X Tuc.

ACKNOWLEDGEMENTS

The cooperation of Robert McNaught in examining the plate records is gratefully acknowledged. His willing assistance has made this paper possible. We are also indebted to Tom Cragg whose field sketches and observations have been useful in identifying several variables. We also thank Albert Jones for his observations and sketch of Y Tuc.
We are indebted to the Director, UKSTU for permission to examine plate records.

REFERENCES

1. Bateson, F.M. et al. 1982-1985. 'Charts for Southern Variables', Series 14 - 18. Published by Astronomical Research Ltd., Tauranga, N.Z.

2. Kukarkin,B.V. et al. 1969-1970. General Catalogue of Variable Stars,3rd ed. Nauka, Moscow.

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TABLE 1. IDENTIFIED VARIABLE STARS

No.	Short Coordinate	Name	Type	VSS, RASNZ Chart No.	Remarks
1	0004-86	RU Oct	M		Plotted position on 475
2	0235-54	SW Hor	M	796	
3	0326-56	RT Hor	M	800	
4	0532-55	Z Pic	M?	715	
5	0829-59	IZ Car	M	749	
6	0925-62	MN Car	M		Plotted position on 398
7	0927-61	KR Car	M		Plotted position on 398
8	0940-62	NT Car	M		Plotted position on 398
9	0940-63	KL Car	M		Plotted position on 398
10	0951-62	NSV 04673			Near KM Car
11	1333-30	V663 Cen	M	722	
12	1336-30	V664 Cen	M	722	
13	1626-64	DO TrA	M	843	
14	1626-64	HN TrA	M	843	
15	1628-64	DT TrA	M	843	
16	1648-30	EQ ~~TrA~~ Sco	SR	624	
17	1701-31	TU Sco	M		
18	1703-86	Z Oct	M	747	
19	1748-51	PQ Ara	M	667	
20	1816-27	WW Sgr	M	673,674	
21	1817-76	VV Oct	M	732	
22	1833-81	TY Oct	SR?	736	
23	1838-38	RT CrA	M	795	
24	1948-77	UU Oct	M	734	
25	2243-65	X Tuc	?	775	
26	2311-64	Y Tuc	?	798	
27	2353-40	RR Phe	M	763	

TABLE 2. ACCURATE COORDINATES FOR THREE VARIABLES

Name	Type	R.A. (1950)		DECL. (1950)	
AZ Tel	M	$18^h11^m37^s.835$	± 0".32	-56°30'03".93	± 0".21
VV Tel	SR	18 14 33 .627	± 0.32	-56 15 09.82	± 0.21
RY Pav	M	19 57 20.787	± 0.16	-56 58 19.72	± 0.32

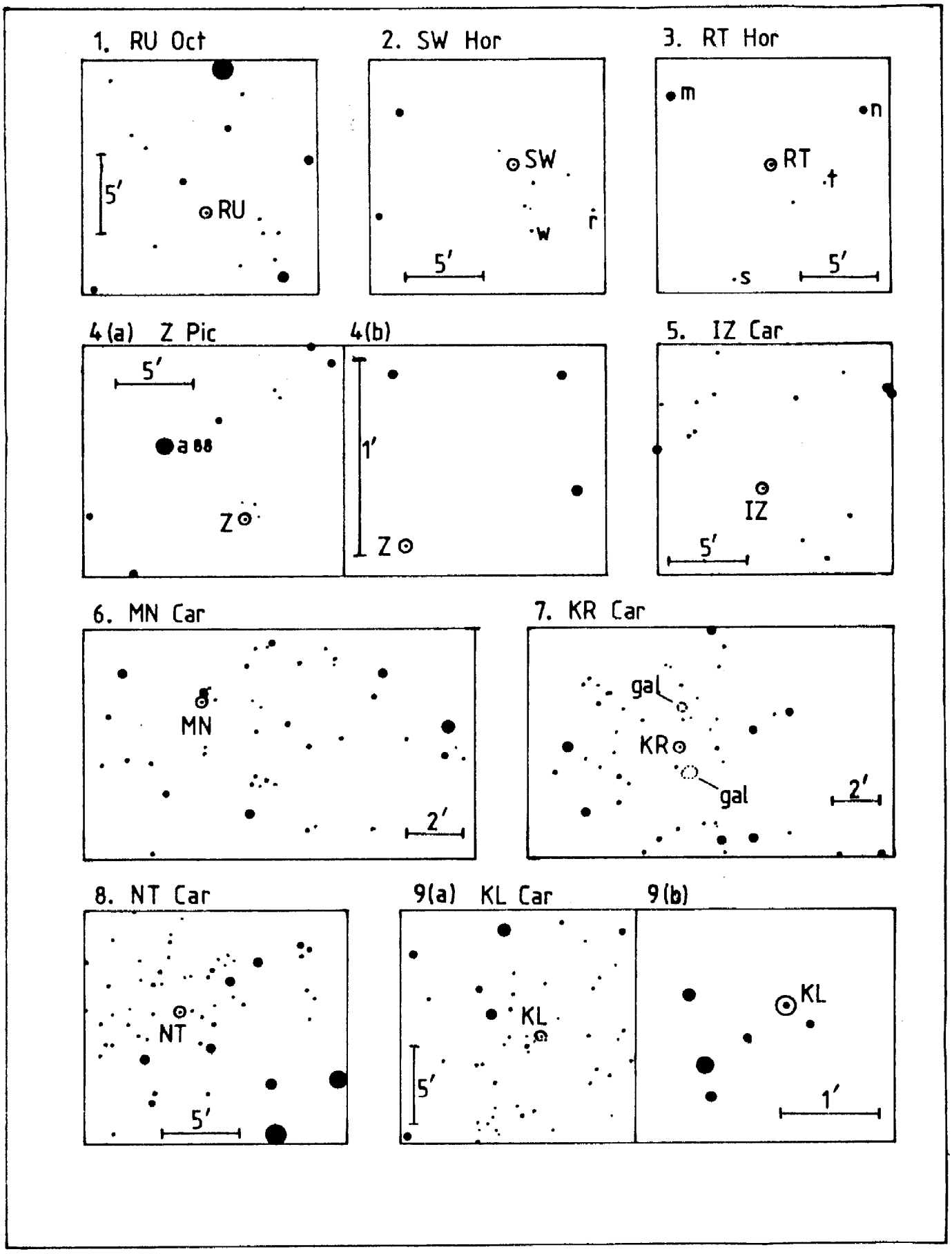

Fig. 1a. Identification charts for stars 1 - 9 (Table 1). North is top, East is left. Scale is given for each chart.

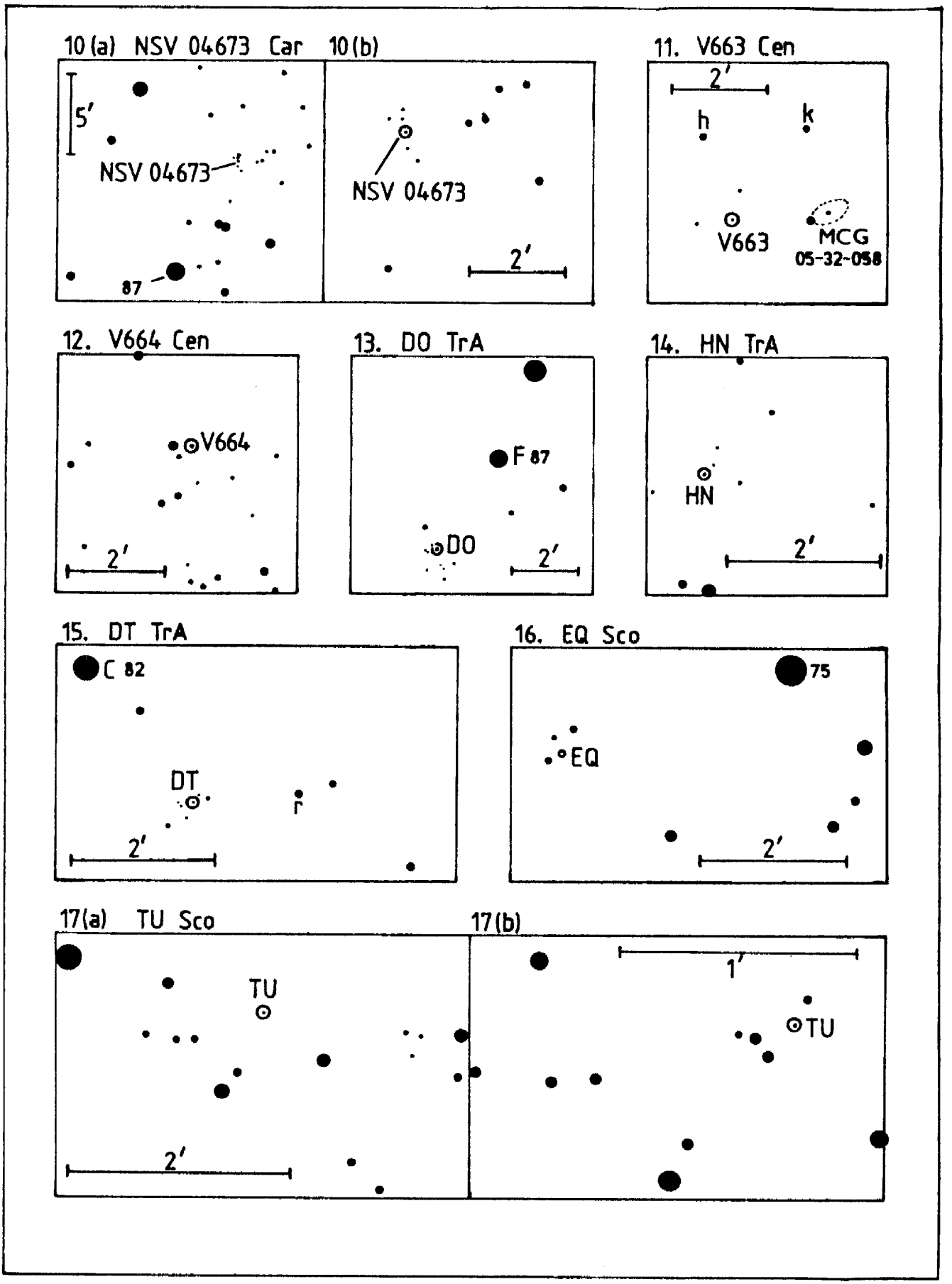

Fig. 1b. Identification charts for stars 10 - 17 (Table 1). North is top, East is left. Scale is given for each chart.

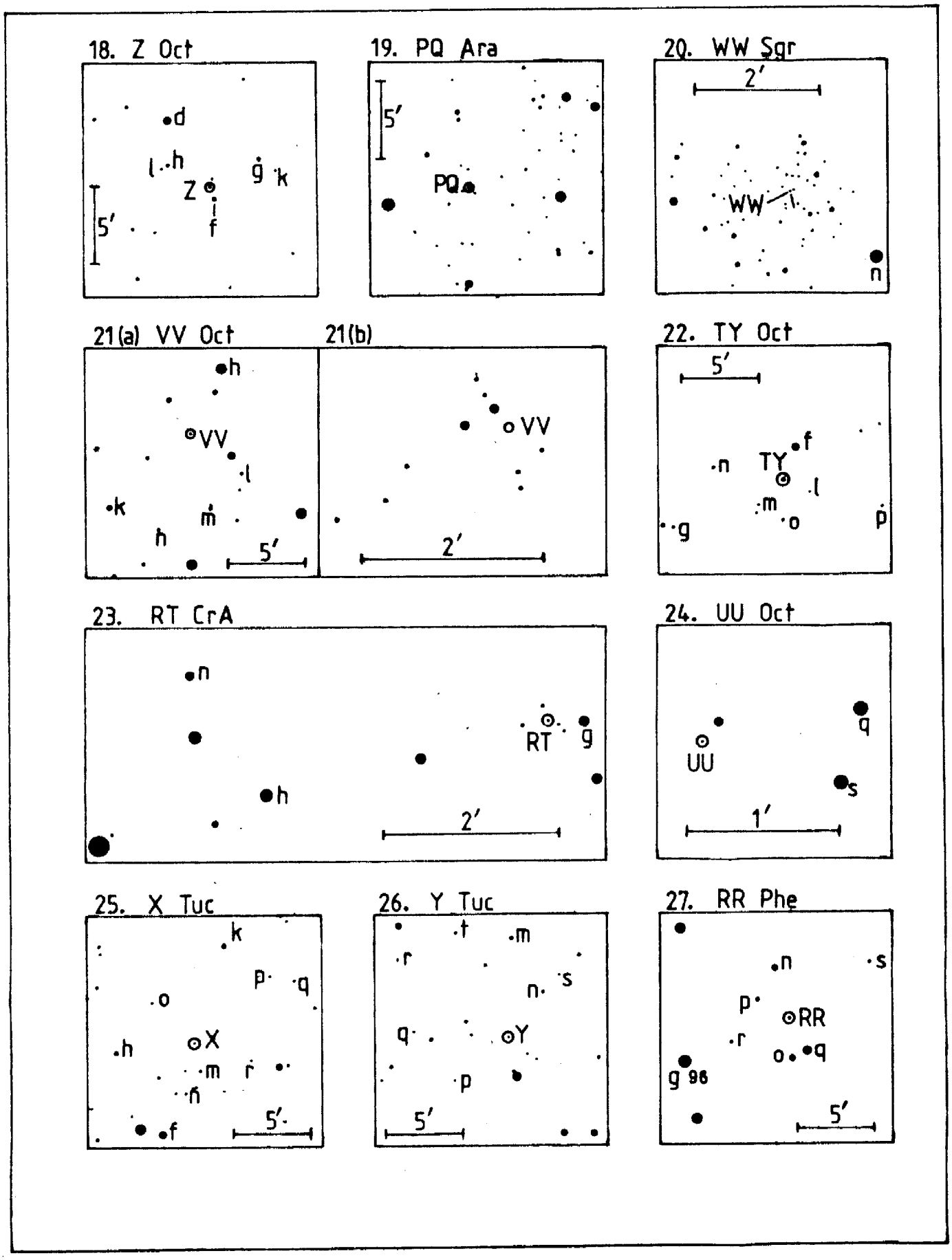

Fig. 1c. Identification charts for stars 18- 27 (Table 1). North is top, East is left. Scale is given for each chart.

PHOTOELECTRIC OBSERVATIONS OF VARIABLE & SUSPECTED VARIABLE STARS.

L.J. Williamson
Variable Star Section, R.A.S.N.Z.

SUMMARY: Presented are photoelectric observations of a number of variables and suspected variables made with the 76 cm Reynolds reflector at the Mount Stromlo Observatory.

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1. INTRODUCTION

Table 2 lists the data for known variable stars whilst that for suspected variables appears in Table 3. The stars reported fall into two classes. Firstly, those stars currently of interest e.g. CPD -69°427, RT Car. Secondly, observations made during the course of measuring sequence stars for use by visual observers in their estimates of variable stars. All stars observed appear on charts published by Astronomical Research Ltd., Tauranga, New Zealand, in their series of "Charts for Southern Variables."

2. OBSERVATIONS

All observations were made with the 76 cm Reynolds Reflector at the Mount Stromlo Observatory, Canberra, Australia using standard reduction procedures in use at that observatory. The majority of measurements were made with the IP21 phototube, but a Gallium Arsenide phototube was used in those nights for which V-R and V-I data is listed in the Tables. The standard stars used were in the Harvard E-Regions, and occasionally the F regions, using data from A.W.J. Cousins.

3. DISCUSSION

Using 18 observations of HR6000, the comparison star to V856 Sco (Chart 750), taken over 162 days (J.D. 2,446,179 - 341)the IP21 gave the following results:

TABLE 1.

	NEAN	MEDIAN	STANDARD ERROR (SE)
V	6.636	6.641	0.007
B-V	-0.045	-0.050	0.011
U-B	-0.428	-0.430	0.020

If HR6000 is non-variable then these results can be used to derive the eroor in the techniques used,

Bessell & Eggen (1) in 1972 reported V=6.60, B-V= -0.07, U-B= -0.42, for this star. Whilst it is possible there has been a change in the value of B-V it is sufficently small for the statistics to be valid.

When the number of counts (from an integration of an object) approaches the sky background the SE rises. In general when this ratio is greater than 2 the SE is similar or lower than the values given in Table 1. At lower ratios SE rises. Longer integration time will, of course, increase the number of counts with little change in the star/sky ratio with some increase in accuracy, but there are practical limits to this procedure. In addition it is not so easy to detect stray light contamination as with short integration times. In the latter case the contamination is readily detected and a reading can be immediately made. Replication of the integrations is the method normally used to better estimate population means. However, should the total time of the whole operation become unduly prolonged then new sources may arise.

Stromlo (780m above Sea Level) is close to the rapidly expanding city of Canberra and the base light level can change over several plateau during a night as a result of local ground mists. Also with the recent inclement weather over Eastern Australia rapid changes in sky transparency can occur. Under good conditions a sky count of about 4000 with V filter will vary by up to 1%. At the same integration time the sky count with the U filter would be about 700 with only a slightly higher variance. On some nights, however, the U counts vary by 3% and higher. Under these conditions the measurement at Stromlo of the U flux of the cool stars becomes particularly troublesome. It is known to astronomers at this site that the U transparency of the sky is variable and unpredictable. Possibly this phenomenon is a function of dust or unseen mist with their effect on the U extinction coefficient.

In the case of RT Car an effort was made to determine if the U flux of this star was variable in the short term. For RT Car the ratio of counts with the U filter to the sky background was 1.2 for the IP21 and 1.12 for the GaAs phototube. On some nights it was not possible by any technique to sarisfactory separate the star counts from the background since the S.E. rose to 0.5-even higher values were recorded. It was therefore not possible to decide if the U flux of RT Car had fallen. At our request M. Bessell kindly carried out a check on RT Car at Siding Spring on the 102 cm using a double beam photometer with sky/star chopper. On J.D. 2,446,242.872 he found V=8.41, B-V 2.87. U-B 2.02, V-R 1.54 and V-I 3.09. As can be seen in Table 2 the 76 cm at Stromlo also gave U-B 2.026on J.D. 2,446,443.083 with S.E. = 0.15. Variation in the U flux of RT Car cannot be ruled out, but the Stromlo site is unsuitable for accurate measurement. In Table 2 some values of S.E. are given under notes.

The GaAs phototube was generally more satisfactory for the faint sequence stars than the IP21 since its greater sensitivity allowed shorter integration times. This tube is at its maximum sensitivity in the red and the recorded values of V-R and V-I were typically of S.E. = 0.01, or less.

ACKNOWLEDGEMENTS

I wish to thank the Director, Mount Stromlo Observatory, for allocating telescope time on the 76 cm Reynolds Reflector for this programme, and for other facilities at his observatory. Also to Dr. Ken Freeman for the use of his data reduction programmes and to discussions on the arts of photonetry.

REFERENCES

(1) Bessell, M.S. & Eggen,O.J. 1972. Ap.J. 177, 209.

TABLE 2.

PHOTOELECTRIC OBSERVATIONS OF VARIABLE STARS.

DESG	STAR	J.D. 2446,000+	V	B-V	U-B	V-R	V-I	NOTES
003050	U Phe	368.069	10.184	1.363	0.802	.....	.....	
		370.054	10.222	1.354	0.725	.....	.....	
041854	RZ Dor	359.219	9.818	1.599	1.198	.....	.....	
054169	CPD-69°427	120.958	9.988	0.108	-0.959	.....	.....	
		125.016	10.020	0.047	-0.950	.....	.....	
		126.028	10.014	0.194	-0.900	.....	.....	
		178,922	9,959	.....	.....	0.021	.....	=HDE269858
		178.936	9.876	.....	.....	-o.012	.....	
		206.880	9.836	0.074	-0.770	.....	.....	
		330.178	10.526	-0.021	.....	.....	.....	
		336.238	9.440	0.123	-0.832	.....	.....	
		359.197	9.467	0.155	-0.846	.....	.....	
		370.115	9.490	0.141	-0.779	.....	.....	
		379.210	9.436	0.225	-0.857	.....	.....	
		382.173	9.395	.....	-0.811	.....	.....	
		437.176	9.360	0.123	-0.780	.....	.....	
		441.191	9.354	0.123	-0.718	0.207	0.390	
092229	RW Pyx	439.104	11,192	1.714	.....	.....	.....	
		441.210	11.288	1.728	0.559	1.707	3.550	
092463	IW Car	121.188	8.270	0.914	0.718	.....	.....	
		128.186	8.380	0.950	.....	.....	.....	
		176.074	8.036	.....	.....	0.730	.....	
		198.045	7.867	.....	.....	.....	.....	
		201.997	7.952	.....	0.737	.....	.....	
		205.907	8.060	0.878	0.736	.....	.....	
		208.982	8.044	0.862	0.747	.....	.....	
104058	RT Car	121.138	8.390	2.629	.....	.....	.....	
		127.189	8.651	2.437	.....	.....	.....	
		176.137	8.341	.....	.....	1.729	.....	
		178.989	8.245	.....	.....	1.720	.....	
		196.934	8.519	2.609	.....	.....	.....	
		198.040	8.360	3.707	.....	.....	.....	
		201.984	8.465	2.649	3.308	.....	.....	SE (U-B) =0.308
		203.884	8.424	2.498	.....	.....	.....	
		205.896	8.471	2.550	.....	.....	.....	
		206.055	8.518	2.436	.....	.....	.....	
		206.797	8.532	2.458	3.667	.....	.....	SE (U-B)=0.215
		207.056	8.543	2.481	.....	.....	.....	
		208.510	8.426	2.937	.....	.....	.....	
		230.924	8.475	2.483	.....	.....	.....	
		232.905	8.459	2.566	.....	.....	.....	
		239.910	8.486	2.516	.....	.....	.....	
		379.231	8.933	2.294	3.304	.....	.....	
		382.208	8.876	2.400	2.464	.....	.....	
		415.097	8.512	2.348	2.879	.....	.....	
		437.122	8.250	2.525	3.001	.....	.....	
		439.080	8.225	2.319	2.686	.....	.....	SE (U-B)=0.18
		441.118	8.179	2.511	3.091	1.520	2.975	SE (U-B)=0.062
		442.131	8.196	2.446	2.852	1.555	2.992	SE (U-B)=0.495
		443.083	8.294	2.987	2.026	2.020	3.193	SE (U-B)=0.15
104158	BO Car	230.934	7.454	1.813			.....	
		232.917	7.462	1.872	1.787 1.795	.....	.....	

TABLE 2 (cont)

DESG	STAR	J.F. 2446,000+	V	B-V	U-B	V-R	V-I	NOTES
104159	Eta Car	439.198	5.847	0.610	-0.425	.....	.....	
160138	V856 Sco	176.167	6.663	.....	.....	0.085	.....	
		179.188	6.645	.....	.....	0.097	.....	
		202.138	7.014	0.417	.....	.....	.....	
		205.998	7.243	0.415	0.344	.....	.....	
		207.022	7.272	0.388	0.329	.....	.....	
		209.039	7.219	0.399	0.284	.....	.....	
		231.030	7.066	0.421	0.310	.....	.....	
		232.990	7.094	0.399	0.294	.....	.....	
		239.098	6.961	0.377	0.254	.....	.....	
		239.960	6.989	0.373	0.285	.....	.....	
		248.934	6.912	0.400	0.292	.....	.....	
		255.904	6.853	0.359	0.215	.....	.....	
		257.938	6.809	0.362	0.222	.....	.....	
		260.019	6.929	0.351	0.174	.....	.....	
		266.032	6.918	0.385	0.253	.....	.....	
		266.975	7.052	0.353	0.260	.....	.....	
		269.932	7.190	0.372	0.293	.....	.....	
		273.089	7.316	0.356	0.391	.....	.....	
		340.831	8.397	0.488	0.261	.....	.....	
163059	Y Ara	258.006	10.468	1.549	0.687	.....	.....	
		265.979	10.893	1.564	0.821	.....	.....	
		269.951	10.979	1.515	0.669	.....	.....	
		273.109	11.350	1.400	0.203	.....	.....	
163259	YY Ara	258.021	10.606	.....	1.723	.....	.....	
		259.937	10.573	1.427	1.721	.....	.....	
		266.033	9.847	1.636	1.423	.....	.....	
		267.044	9.759	1.582	1.454	.....	.....	
		269.980	9.504	1.594	1.454	.....	.....	
163967	V TrA	175.240	7.919	.....	.....	1.335	.....	
		175.246	7.957	.....	.....	1.330	.....	
		179.228	8.047	.....	.....	1.255	.....	
		202.190	8.211	2.152	.....	.....	.....	
		206.071	8.273	2.161	3.387	.....	.....	
		209.026	8.287	2.178	3.442	.....	.....	
		233.136	8.358	2.302	3.538	.....	.....	
		239.140	8.348	2.294	3.262	.....	.....	
		248.128	8.300	2.225	4.105	.....	.....	
164167	W TrA	237.146	9.563	1.248	0.875	.....	.....	
173457	V Pav	207.159	6.971	3.402	9.954?	.....	.....	S.E. 0.092
		209.195	6.984	3.383	.....	.....	.....	
		239.125	6.938	3.500	.....	.....	.....	
212354	X Ind	330.149	7.768	1.597	.....	.....	.....	
		330.906	7.776	1.613	.....	.....	.....	
213753	Y Ind	331.071	12.611	1.436	.....	.....	.....	
232330	VY Scl	038.03	12.985	0.573	0.14	.....	.....	

TABLE 2 (cont)

DESG	STAR	J.D. 2446,000+	V	B-V	U-B	V-R	V-I	NOTES
234716	Z Aqr	338.088	8.867	1.577	1.454	.....	.....	
		340.887	8.646	1.586	1.028	.....	.....	
181066	AR Pav	258.088	11.302	0.556	-0.041	.....	.....	
		260.098	11.366	0.607	-0.361	.....	.....	
		270.098	11.307	0.611	-0.313	.....	.....	
OMITTED FROM PAGE 77								
092463	IW Car	437.176	8/468	0.963	0.754	.....	.....	
		441.131	8.528	1.011	0.758	0.632	1.298	

TABLE 3.

PHOTOELECTRIC OBSERVATIONS OF SUSPECTED VARIABLE STARS.

J.D. 2446,000+	V	B-V	U-B
CPD -69°420. CHART 779, Series 17.			
120.976	10.860	0.230	-1.01
125.027	10.900	0.170	-0.95
126.042	10.990	0.320	-0.93
206.895	10.900	0.160	-0.851
359.199	10.958	0.172	-1.037
371.188	10.911	0.192	-0.872
382.181	10.955	0.195	-0.913
SUSPECTED VARIABLE MARKED "VAR?" ON CHART 752, Series 17 for R Nor.			
231.082	10.421	1.449	1.546
233.063	10.330	1.437	1.421
240.068	10.065	1.122	1.219
257.937	10.215	1.425	.....
269.922	10.108	1.474	1.327
NSV 7853 IN Y ARA FIELD, CHARTS 753 & 754, Series 17.			
267.058	9.481	1.835	2.566
NSV 13692 = Gamma Indi CHART 757, Series 17.			
330.191	6.023	0.323	.....
331.025	6.045	0.376	.....
336.117	6.093	0.366	0.111
338.074	6.007	0.382	0.122
340.850	5.936	0.383	.....

BOOK REVIEW

"GENERAL CATALOGUE OF VARIABLE STARS" 4th edition. Vols. 1 & 2. 1985.
Publ. by Nauka, Moscow, Editor-in-Chief P.N. Kholopov.

These volumes contain information on Variable Stars discovered and designated till 1982. Volume 1 covers from Andromeda to Crux, together with a detailed Introduction, which includes a complete explanation of the method of classification used in these volumes. Volume 2 covers the constellations from Cygnus to Orion, and includes a shorter introduction in which some new classes of variable stars are defined,

This fourth edition of the GCVS will untimately comprise five volumes with data on about 28,450 objects, mainly variable stars in our Galaxy, discovered and named by 1982. Variable Stars in globular clusters in our Galaxy are excluded as these are given in another publication.

The page size in these volumes is much larger than that used in the earlier editions, but the arrangement is the same with the left hand page listing all the data on co-ordinates, references and types of variability. All the data on the light variations and physical properties of each star appear on the right hand pages. An useful innovation is the repeating of the designations twice on both pages making certain that one is scanning the right line easier. The larger format also makes the volumes easier to stay flat on the desk when in use. This was a defect of Volume 2 of the third edition. The equatorial co-ordinates are for the equinox 1950.0. Those who use the GCVS frequently are well aware that many of the positions of some variable stars are inaccurate. Readers who use these volumes only occasionally should bear in mind the statement on positions given in the introduction to volume 1.

The present volumes have been computer produced. This has resulted in some rather uneven reproduction, especially in Volume 1 in which some pages are somewhat indistinct. This defect does not apply to Volume 2 in which all pages are clear and distinct.

References are given in the usual manner by two four digit numbers, the first of which refers to the best source of data on the light variations and the second to the best chart published. Volume 1 contains the full list of these references Where it is necessary to supplement the catalogued data by additional remarks these appear at the back of each volume in the same order as the stars appear in the catalogue. Such remarks are given both in Russian and English thus avoiding the necessity of publishing a separate English version as has sometimes been necessary with earlier editions.

Classification of variability is under six main types, i.e. eruptive, pulsating, rotating cataclysnic (explosive and nova-like), eclipsing binary systems and X-ray sources. Each type has, of course, a number of sub-types and some stars have variability of a number of types. All types are now given in capital letters because of the form of the computer read-out. Members will have noticed that, as the volumes have appeared, the same capital letters are now being used in the Monthly Circulars. A few additional definitions of types of variability are given in Volume 2.

It is interesting to note how better information has enabled some stars to be reclassified. For example Rt Car, which has been given various classifications in past editions, is now classed as of type LC which agrees with our observations; Z CMa is now classed as INA, after being given type SD in the second supplement to the 3rd edition and type Ina in the first volume of the 3rd edition. Stars of the eruptive class are now designated by their sub-types as well as their main class, thus VW Hyi is class UGSU; BV Cen is shown as UGSS+E/WD;

EX Hya is UGSU+E and so on.

Members will also appreciate from a glance at this catalogue why currently Astronomical Research Ltd is publishing charts for neglected southern stars, mainly of the Mira type since it is readily seen that so many of these stars have very little known about them. That lack is why we urge all members to observe such stars. It is also even possible that a few of them have been wrongly classified and may be of a more important type.

No serious researcher of variable stars can work without these volumes which contain a wealth of information and the references that are so necessary to published papers. Members, will also note from the extensive references how their observations have contributed to the data in these volumes.

F.M.B.

NEW CATALOGUE OF SUSPECTED VARIABLE STARS. 1982. Editor-in-Chief P.N.Kholopov. Publ. by Nauka, Moscow.

This edition contains information of 14,810 suspected variables which had not been given a final designation by 1980. It includes 2475 objects for which the discovery of variability is doubtful or erroneous. This catalogue replaces the previous editions of 1951 and 1965.

This edition appears in a larger format that provides data for 80 stars on each page. In using the numbers by which the stars are designated NSV should be added in front of the numbers to clearly show that this new edition is being used instead of the previous editions in which the numbers were preceded by either CSV or SVS.

The catalogue contains a short introduction which is in both Russian and English, explaining clearly the layout. This follows the style of previous editions. Co-ordinates are for the equinox 1950.0. The suggested maximum and minimum magnitudes for each star are given, or the amplitude shown together with the system of magnitudes used. If the class of suspected variability has been given in the original paper this is listed. References are given as six figure digits, of which the first two correspond to the last two figures of the year (in the 20th century) when the discovery of variability was published. These two figures are omitted for disoveries announced in the 19th century. The remaining four digits refer to the publication in which the discovery was published and the corresponding list of such references appear towards the end of the volume. The letter "K" is added if the original paper contained a chart or photograph of the field.

A table at the end of the volume provides a handy cross reference to designations in other catalogues and preliminary designations assigned to a star such as its HV or BV number.

This volume has been computer produced. The printing is clear and distinct. The larger format, and better binding than in earlier editions, makes this work easier to handle and keep open flat on the desk at the desired page. For all engaged in variable star research this volume is an essential tool to be used in conjunction with the GCVS.

F.M.B.

N.B. A limited number of copies of both works reviewed are avaiable from Headquarters.

PHOTOELECTRIC SEQUENCES IN VARIABLE STAR FIELDS

L.J. Williamson
Variable Star Section, R.A.S.N.Z.

SUMMARY: Photoelectric magnitudes are listed for some of the sequence stars in ten southern variable star fields.

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1. INTRODUCTION

Reliable magnitudes are often not available for comparison stars in many variable star fields. This defect often causes problems in the reduction and publication of visual estimates. Frank Bateson, Director, V.S.S., R.A.S.N.Z.. suggested that it would greatly assist his work if I could determine at least some of the magnitudes required, and he kindly supplied the necessary charts.

2. OBSERVATIONS

The results are listed below and on the following pages under the variable field in which the sequence stars are situated. Stars are identified by their chart letters as they appear on the charts given for each field.

All measurements were made with the 76 cm Reynolds reflector at the Mount Stromlo Observatory using an IP21 phototube and standard procedures for the reductions. For a discussion of the errors of the results see this journal pages 75 & 76.

ACKNOWLEDGEMENTS

I am most grateful to the Director, Mount Stromlo Observatory, for permitting my use of the 76 cm Reynolds reflector and for allocating telescope time for the purpose of this programme.

REFERENCES

(1) Bateson, F.M., Morel, M., et al. 1979. Charts for Southern Variables, Series 11. Publ. by Astronomical Research Ltd., Tauranga, N.Z.
(2) Bateson, F.M. & Morel. M. 1984. Charts for Southern Variables, Series 17. Publ. by Astronomical Research Ltd., Tauranga, N.Z.

003050 U Phe. Chart 765 (2).

CHART LETTER	V	B-V	U-B
e	9.135	0.989	0.739
f	9.880	1.050	0.760
p	10.960	1.093	1.037
k	10.970	0.556	0.094
q	11.448	0.546	0.589
u	11.476	0.484	0.117 — wrong star [illegible]
r	11.990	0.517	0.310
t	11.995	0.932	1.086

041854 RZ Dor. Charts 770 & 771 (2)

CHART LETTER	V	B-V	U-B	NOTES
a	6.944	0.117	0.014	
k	9.964	0.494	-0.032	
l	10.362	0.488	-0.094	
m	11.182	0.423	-0.129	
n	11.902	0.903	.....	
q	12.052	0.511	-0.016	
s	12.795	0.969	1.086	
t	12.717	0.541	0.054	
u	13.133	0.656	0.196	
w	13.307	0.569	0.164	V-R = 0.377; V-I = 0.687

091428 Y Pyx. Charts 785 & 787 (2)

k	11.039	1.289	1.487	V-R = 0.646; V-I = 1.255 Misidentified NOT star k

092229 RW Pyx. Charts 783 & 784 (2)

h	11.789	?	0.543	See Editor's note below
n	12.291	1.177	0.680	V-R = 0.710; V-I = 1.410
m	12.496	1.223	0.686	V-R = 0.615; V-I = 1.298
o	13.552	1.060	0.602	V-R = 0.578; V-I = 1.152

EDITOR"S NOTE: The B-V value for star "h" appears so excessive that it is not published pending confirmation. It would appear that this star is far too red to be used by visual observers for comparison purposes.

163059 Y Ara. Charts 753 & 754 (2)

f	8.944	0.238	0.196	
h	9.176	0.320	0.080	
n	9.926	0.087	-0.081	
k	10.001	0.529	0.155	
s	11.941	1.256	1.176	
o	12.315	0.466	0.088	
r	12.699	0.884	0.489	
-	9.653	1.153	0.904	On chart 754 3mm E. & 1mm N. of Y Ara.

163967 V TrA & 164167 W TrA. Charts 755 & 756 (2)

a	6.311	1.280	1.564	
d	8.178	1.162	.....	Double. Combined magnitudes.
b	8.443	1.171	.....	
g	9.100	1.071	.....	
c	9.177	-0.018	.....	
e	9.369	0.304	.....	
f	9.833	0.335	0.054	
k	10.582	0.689	.....	
m	11.480	0.419	.....	
n	11.522	0.318	0.217	
o	11.610	0.560	0.122	
q	12.134	0.824	.....	
p	12.293	0.417	.....	
h	VAR?	.....	.....	See note

NOTE. "h" appears to be variable. Measurements were

2446,000+			
206	9.108	1.526	.....
206	9.046	1.625	2.030

cont. on page 84

CHART LETTER	V	B-V	U-B	NOTES
Measurements of "h" (cont)				
2446,000+				
231	9.659	1.686	2.075	Good photometric night.
240	8.986	1.597	1.809	
248	8.966	1.678	1.835	

212354 X Ind. Charts 757 & 758 (2)

a	6.353	1.140	.....	
d	8.589	0.420	.....	
g	9.242	0.085	.....	
k	10.116	0.433	.....	
n	11.495	0.668	.....	32mm E. & 5mm N. of X Ind.

NOTE: There are two stars marked "n" on chart 758. Directions to the one measured are shown above.

232330 VY Scl. Chart 458 (1)

E	10.25	0.447	-0.019	CoD −30° 19569
G	11.025	0.544	-0.003	−30 19571
H	11.336	0.648	0.044	−30 19567
K	11.926	0.573	0.14	−30 19578

234716 Z Aqr, Chart 761 (2)

a	7.552	0.869	.....
b^1	9.287	1.126	.....
d	9.943	1.422	.....
c	10.037	0.705	.....
h	13,030	1.204	.....

NOTE: For Z Aqr visual observers should use the visual magnitudes shown on chart 761 and not the above V magnitudes.

235340 RR Phe, Charts 762 & 763 (2).

g	9.637	0.647	0.111
n	11.923	0.884	0.990
o	12.270	0.849	0.135

NOTE FOR VISUAL OBSERVERS.

The V magnitudes, rounded off to tenths, should be used in making estimates for all variables listed in this paper except for Z Aqr for which visual magnitudes are shown on the chart.
The variables for which sequence magnitudes are given in this paper are neglected stars and all observers are requested to place them on their observing lists for observing every ten days. Such observations will enable their elements to be better determined.

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

FOR THE YEAR ENDED 1985 DECEMBER 31.

This report marks the 58th year of activity of the Section. In the previous report I outlined various changes in direction that were being made in order to stream-line the work of the Section. Unfortunately, as most members are aware these plans could not be implemented as fast as had been expected, because of the long illness and subsequent death of my wife. Despite this a great deal has been accomplished as this report shows.

DATA REDUCTION

This issue contains a paper by Bateson and McIntosh on VW Hydri in the format in which results on dwarf novae will be presented in future. I am deeply grateful to Ranald McIntosh for writing the necessary computer programme and producing the light curves in the desired format. He has kindly agreed to process data on other dwarf novae. It is proposed in mid-1986 to engage the services of a full time typiste to tabulate the observations of all dwarf novae in a form suitable for the number punching necessary.

Another paper in this issue, by Bruce Poppleton, has also resulted from the data reduction proposals mentioned in the previous report. W. Goltz is also working on similar results for other Mira variables.

C.W. Venimore, A.W. Dodson and W. Goltz have greatly aided the production of computer light curves by their work on tabulating the ten day means from the permanent ledger sheets.

I shall be overseas for three months in mid-1986, and, during my visits to a number of centres I shall be checking on computers with a view to installing our own set-up at Headquarters as finances permit in accordance with the forecast made last year.

The first aim in the current programme of data reduction is to publish all the unpublished observations of dwarf novae in the form of computer drawn light curves in the same format as the paper on VW Hydri referred to above. The reason for this is the continual professional demand for such material. Once that work has been completed attention will be given to other classes of variables. Meanwhile A.W. Dodson continues to produce hand drawn light curves for some Miras.

ARCHIVAL DATA

Several packets of old records of observations have, during the year, been sent to the A.A.V.S.O. These were for Mira variables that had been processed for computer programmes. The reasons for maintaining one centre for archival records was pointed out in last year's report.

COOPERATION WITH OTHER VARIABLE STAR ORGANISATIONS

The inter-change of observations with the A.A.V.S.O. and the Variiable Star Section, British Astronomical Association, has continued on a very satisfactory basis for all concerned. This has provided free use of all records by the three organisations as they deem fit. Our Recorder, Gordon Smith, has again compiled the lists of observations made by members for both the foregoing organisations.

The various National Variable Star Organisations in Australia, South Africa and Argentine have continued their very close cooperation with us. We wish to extend to their respective Directors our appreciation for this happy state of affairs. We have continued also to exchange publications with Association Francaise des Observateurs d'Etoiles Variables (A.F.O.E.V.) and

other Northern Hemisphere societies.

SPECIAL PROGRAMMES

Members will be well aware of the special programmes carried out during the year, especially those on dwarf novae and R CrB variables. Details of such programmes were notified to observers either in the Monthly Circulars or by Special Circulars. There is therefore no need to list them in this report.

Several points about such programmes should be mentioned. First the visual monitoring of cataclysmic and R CrB variables provides the best method of providing prompt notice of the outbursts, or declines, which enable the stars to be immediately observed at other wavelengths. Secondly, despite the fact that such observations are carried out from space or with large ground-based instruments at X-ray, U.V. and I.R. bands there is a continual request for the optical light curves. Thirdly, a number of papers are now appearing as a result of these cooperative programmes for which to date only preprints have come to hand. However, they all show the essential part that visual observations play in the continuous monitoring of these stars.

It is no doubt the success of these programmes and the reputation that the Section has established that has brought increasing requests for the Section to closely follow variables of diverse types. To mention a few typical examples of these requests are those for close monitoring of AR Pav; V841 Oph; W Cru; W Ser; RU Lup.

PUBLICATIONS

Twelve issues of the Monthly Circulars have been published. I am still concerned at the length of time many reports from observers take to reach me. There is probably little that can be done about this but it does mean that the Circulars cannot be published as promptly as I would like. I urge all members to mail their reports so that they reach Headquarters by the tenth of the following month.

Special Circulars were issued as necessary, and the Newsletter,"Changing Trends" has appeared at irregular intervals. Once again I have to stress to members that the Newsletter can only be published quarterly if they send in items for publication. It is intended as a method of bringing observers closer together through the exchange of experiences, methods of observing and details of instruments, etc., so I plead with all members to write items for the Newsletter.

Publication No. 12 was distributed early in the year. No. 13 was under preparation at the time this report was written. This number will be a little short of the total pages aimed at mainly because of pressure of work and due to the fact that some papers have not yet been returned from the referees. It is expected that these missing papers will be included in No. 14 which it is hoped will be a larger edition.

Once the full effect of the production of computer light curves becomes apparent it is hoped that the suggestion by Stan Walker mentioned in the last report can be put into action by more frequent publication.

OBSERVATIONS

The observations contributed by members are listed on page 88. As usual the totals are for the year ended on 31 August 1985 in order that there is a strict comparison with previous years before the Society changed its financial year to 31 December.

SEQUENCES

We are indebted to the Director, Mount Stromlo Observatory, for allocating telescope time of the 76 cm Reynolds reflector for the purpose of obtaining photoelectric magnitudes for sequence stars. L.J. Williamson has used this instrument and associated equipment to make a most valuable contribution in this field. Some of his results appear in this issue..

CHARTS

Charts for Southern Variables, Series 18 was published and distributed by Astronomical Research Ltd. Series 19 and 20 are under preparation but are unlikely to appear until late 1986. Once Series 20 has been published a comprehensive index to all charts published will be compiled.

HEADQUARTERS

Work at Headquarters was badly upset for the reason given at the start of this report. This has resulted in much delay in dealing with correspondence and other matters. That is gradually being rectified at the time this report was written.

ACKNOWLEDGEMENTS

I would like to thank all members for their understanding during what has been for me a very sad year.

It is a real pleasure to thank all members for their observations, be their contribution large or small. As I have remarked in many reports without the splendid work of all observers there would be no section. It is the accuracy and care with which the observations have been made that has given the Section its high reputation.

I also wish to thank all those who have assisted in the production of papers or by shouldering some of the desk work. A number have already been given mention in this report but I must once again paid a special tribute to our Recorder, Gordon Smith, who has continued to maintain the Section's records in such a highly efficient manner, which is a hallmark of everything he does. I am also indebted to him for assistance in many other matters. The very close cooperation of Alvert Jones has also been a great help. I wish to thank all the Directors and Leaders of the various Variable Star Groups for their help in submitting the observations of their members and in encouraging variable star observations. In particular I wish to mention Jim Park, Jan Hers, Juan Carlos Marioni and Dick Hull. The latter has also once again supplied the Julian Date Calendar that was distributed to all members.

Our thanks are extended to the subscribers to the various publications for their financial support. We are indebted to many professional colleagues for their interest in our work and for supporting our activities. We hope that all those who have requested data are satisifed with the results supplied. We also have to thank so many who have given small grants or paid for the costs of providing extensive lists of data.

My personal thanks are extended to Dr. Janet Mattei, Director, A.A.V.S.O. and to Doug Saw, Director, V.S.S., B.A.A. for the continual inter-change of observations.

1986 March 10

Frank M. Bateson
DIRECTOR

OBSERVATIONS RECEIVED FOR YEAR ENDED 31 AUGUST 1985.

OBSERVER	TOTAL OBS.	STARS	OBSERVER	TOTAL OBS.	STARS
AIELLO, S.	9	2	LESLIE, A.	327	13
ALBRECHT, W.	3045	204	LUMLEY, E.	206	31
BEGG, D.	15	6	MARIONI, J.	157	8
BLANE, D.	420	21	MARTIN, D.	15	9
BRADBROOK, A.	97	15	MARTIN, R.	3	1
BRYANT, K.	12	3	MENZIES, B.	1430	31
CARRIZO, J.	1	1	MEYERS, P.	249	24
CASTINEIRAS,R.	26	5	NOREL, M.	15	2
COOPER, I.	14	2	MUNFORD, N.	26	2
COOPER, T.	649	30	McNAUGHT, R.	43	6
COULING, G.	253	21	NELSON, P.	163	23
CRAGG, T.	1538	551	O'KANE, J.	132	40
DeBONO, I.	2	2	ORCHISTON, W.	723	51
DIETERS, S.	14	9	OVERBEEK, D.	12204	320
DINGLEY, A.	239	23	PARK, J.	318	19
DODSON, A.	254	38	PAZZI, L.	273	57
DREDGE, A.	8	4	PROSSER,G.	160	43
DUCOTY, R.	490	70	REMESTVENSKY, G.	4	2
DURHAM, D.	196	50	ROBERTSON, P.	88	9
EVANS, R.	206	15	ROST, F.	15	1
FIADONE, R.	131	9	ROWE, G.	44	28
FRASER, B.	198	60	ROWLANDS, S.	3	3
FUCCI, F.	17	5	SALUDAS, M.	9	4
GIRAUDI, J.	14	4	SAUNDERS, S.	167	39
GOLTZ, W.	1296	148	SEYMOUR, J.	23	1
HARRIES-HARRIS,E.	1174	53	SRINIVASAN, S.	248	10
HENSHAW, C.	85	31	STABENOW, R.	1314	49
HERDMAN, G.	36	10	STEPHANOPOULOS, G.	553	106
HERS, J.	767	46	SUTTON, G.	3	1
HOVELL,S,	279	55	TAYLOR, N.	1513	118
HULL, O.A.	16	7	THOMSEN, R.	182	18
HULL, O.R.	4021	286	TIMZ, P.	12	5
IVES, F.	760	108	TREGASKIS, T.	870	105
IZZO, J.	6	5	VARELA, P.	14	4
JONES, A.F.	4054	122	VENIMORE, (Rev).C.	802	41
JONES, C.	2	2	VINCENT, J.	65	5
JONES, K.L.	81	31	WILLIAMS, P.	897	95
JOZSA, A.	543	46	WILLIAMSON, L.	334	40
KURTZ, C.	197	12	WINNETT, R.	253	35
LANGHAM, L.	37	2	ZANETTE, D.	11	2

TOTAL OBSERVATIONS 45,070.

Compared to the previous twelve months there was an increase of 6,270 observations. There was also an increase in the number of observers.

The above totals, as mentioned in the Annual Report, do not include the observations from the B.A.A. Also those who contribute to the A.A.V.S.O. are not marked, because to keep track of the observations they make for the V.S.S. and those specially made for the A.A.V.S.O. would place an extra load on our overworked Recorder. In any case there is such a close inter-change of observations between the A.A.V.S.O. and the V.S.S. that there is really no point in separating the records.

Ten observers made more than 1,000 observations and their contributions accounted for just over 70% of the total.

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