

VARIABLE STAR SECTION.

CIRCULAR No. 192.

RT APODIS

Frank M. Bateson.

SUMMARY: Seventeen maxima of RT Aps are listed, derived from visual observations from J.D. 2,435,925 to 2,440,847. The elements that best satisfy the observations in the interval covered by the observations are:-

EPOCH (Max) 2,426,432 + 245 days.

Range:- Mean Max. 12.6 \bar{v} to <14.0 \bar{v}

It is suggested that RT Aps is a Mira variable subject to changes in period, which are possibly related to changes in the nature of its maxima.

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INTRODUCTION:

RT Aps (HV 5066) was discovered by Swope in MWF 169 (1). The elements she derived were:- Epoch (Max) 2,425,345 + 252 days from 24 epochs. The photographic range is 12.6 - <16.5. A footnote to her list states that a change in period occurred between J.D. 2,418,500 and 2,420,000. The elements from 31 epochs prior to these dates gave a period of 242 days with the Epoch 2,415,880.

Swope remarked that MWF 181 is remarkable for the large number of semi-regular and long period variables with changing periods. She was unable to determine whether such changes were sudden, secular or sinuous because the observations were too scattered.

CHARTS & SEQUENCE.

An identification chart appeared in HB 885 (2). Bateson & Jones published chart No. 41 (3). V and B-V magnitudes for the comparison stars appeared in Cir. 187 (4) determined by Menzies & Gordon at the Auckland Observatory.

OBSERVATIONS.

Between J.D. 2,435,925 (1957 March 26) and 2,440,847 (1970 Sept. 17) five hundred visual observations have been made by members of the Variable Star Section, R.A.S.N.Z. Each year there are few observations in the interval mid-September to early January. Outside these months RT Aps has been observed regularly. Many of the observations are negative as the variable is generally invisible at fainter than magnitude 14.0.

MAXIMA.

The observed maxima are listed in Table 1, in the usual form. The first column contains the observed dates of maxima. This is followed by the visual magnitude for each maximum and the interval, in days, between successive maxima. On two occasions maximum was unobserved and the interval, representing two cycles, is enclosed in brackets. The fourth column gives the weight attached to the data given. This is on the usual scale used in these Circulars.

The fifth column (O-C¹) gives the O-C residuals according to Swope's elements 2,415,880 + 242 days. The sixth column (O-C)² gives the O-C residuals for Swope's period of 252 days with Epoch 2,425,345

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The next two columns (O-C)³ and (O-C)⁴ give respectively the O-C residuals for Epoch 2,436.432 ± 244 days and ± 245 days. This Epoch represents the earliest of the best determined maxima in the present series. The period 244 days is the simple mean of the successive intervals between maxima; the period 245 days appears to satisfy the observations better. The final column gives the days RT Aps was magnitude 13.0, or brighter, for each maximum.

TABLE 1.

OBSERVED MAXIMA OF RT APODIS.

<u>J.D.</u>	<u>MAG.</u>	<u>INT.</u> d	<u>Wt.</u>	<u>O-C</u> ¹ d	<u>O-C</u> ² d	<u>O-C</u> ³ d	<u>O-C</u> ⁴ d	<u>At 13.0 or Brighter</u> d
2,435,954	12.5	-	4	-12	+25	+10	+12	35
2,436,180	12.7	226	3	-28	- 1	- 8	- 7	44
432	12.6	252	5	-18	- 1	± 0	± 0	45
673	12.6	241	4	-19	-12	- 3	- 4	53
934?	12.5	261	1	± 0	- 3	+14	+12	45
2,437,165	12.7	231	3	-11	-24	+ 1	- 2	50
420	12.7	255	5	+ 2	-21	+12	+ 8	42
660	12.7	240	1	± 0	-33	+ 8	+ 3	33
888	12.5	228	2	-14	-57	- 8	-14	62
2,438,134	12.7	246	4	-10	-63	- 6	-13	52
380	12.6	246	3	- 6	-69	- 4	-12	60
623?	12.7	243	1	- 5	-78	- 5	-14	?
877	12.3	254	3	+ 7	-76	+ 5	- 5	40
2,439,152	12.5	275	2	+40	-53	+36	+25	40+
620	12.6(468)	4	+24	-89	+16	+ 3		100
2,440,121	12.6(501)	1	+41	-92	+29	+14		40
348	12.8	227	2	+26	-117	+12	- 4	50

DISCUSSION.

The elements which best represent the present observations are:-

EPOCH (Max) 2,436,432 ± 245 days.

The mean O-C residuals for the above are ± 8.9 days. For the first 13 maxima the mean O-C is 8.1 days and for the last four maxima 11.5 days. A period of 244 days gives O-C residuals of + 6.5 days for the first thirteen maxima and +23,2 days for the last four.

Both of Swope's periods coincide with the observed maxima for a limited period. The progressive differences with her elements of 2,425,345 + 252 days clearly indicates that there has been a change in period at some time prior to the present observations. The change has been in a shortening of the period.

At the maximum of 2,439,152 RT Aps was 12.8 when first observed on 2,439,130 after a gap of 74 days without observations. There was no doubt, from the observations, that the star was brightening when first observed. The following maximum at 2,439,620 was unusual inasmuch as the variable remained brighter than magnitude 13.0 for 100 days; twice the normal time. This maximum was well observed, especially by the three most reliable observers--A.F. Jones; M.V. Jones and F.M. Bateson, All previous maxima had steep rises, relatively brief stays at maximum and declines less steep than the rise. Such curves are typical of a

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number of Mira Cet variables with periods around 245 days. It is possible that such an abnormal maximum may precede a lengthening in period.

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18 POOLES ROAD,
GREERTON.
TAURANGA.
NEW ZEALAND.

REFERENCES:-:

- (1) Swope, H.H. 1931 H.B. 883
- (2) Shapley, H. & Swope, H.H. 1931 H.N. 885.
- (3) Bateson, F.M. & Jones, A.F. 1960. "Charts for Southern Variables Series 11." Published by F.M. Bateson
- (4) Bateson, F.M., Gordon, P.J. & Menzies, B. Circ. 187, VSS, RASNZ 1972.

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