A RECENT LIGHT CURVE OF TW CAPRICORNI

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Abstract

Sixty-five visual observations of the W Virginis type cepheid TW Capricorni obtained during 1978-1979 are reduced to a common cycle and the time of maximum light determined. Characteristics of the light curve are discussed, and a compilation of the historical times of maximum is presented, indicating changes of period.

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1. Introduction

TW Capricorni is a halo population cepheid. Kukarkin et al. (1969) state that the star has a variable period, a probable variability of its light curve, and a probable M-m variability of 0.14 to 0.40 period.

2. Light Curve

Sixty-five visual observations were made by the author for the AAVSO cepheid program using the AAVSO "b" chart for R Capricorni. The observations cover the interval JD 2443707 - 2444225, with the mean date being JD 2443938. The estimates were reduced to the elements in Kukarkin et al. (1969):

$$JD_{max} = 2435664.8 + 28.5578 \text{ E,} \tag{1}$$

and are plotted in Figure 1. An O-C value of +10.8 days and an M-m value of 4 days, or 0.14 period, is indicated. The characteristic declining branch hump is not evident. Solov'ev (1952), in a comprehensive treatise on this star, presents 11 different light curves that cover the interval JD 2423608 - 2433894. Four show a prominent declining branch hump while seven do not. A mean M-m value of 7.1 days or 0.25 period is given with the range being from approximately 0.31 to approximately 0.19 period.

The difference between Solov'ev's mean M-m value and the value of 0.14 period from this paper is significant.

3. Period

Thirty-three maxima were found in the literature. One additional date was determined by adding two days to a rising branch epoch given by Kwee (1967). Another date was found by producing a mean light curve from the published observations in Morgenroth (1933), and a final date from the author's light curve (see Table I). All the maxima were reduced to the elements given in equation (1). These maxima, along with three instantaneous periods given by Gaposchkin (1952), are plotted in Figure 2. A period change has recently occurred, as indicated by the slope change between the points at cycle 144 and cycle 290. This portion of the O-C diagram is not well covered, but the current period is probably less than or equal to 28.5814 days. The mean period covering all the period information is near 28.586 days, determined by a "best fit" line drawn through the points.

4. Conclusion

TW Capricorni needs coverage for period determinations, as the most recent period change is not well covered.

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TABLE I O-C Residuals for TW Capricorni

| Julian Date (2400000 +)	Cycle	O-C	Reference
21407.96	−499	− 6.4978	Tsesevich 1948
24353.20	−396	− 2.7110	Tsesevich 1948
25869.76	−343	+ 0.2856	Solov'ev 1952
26183.31	−332	− 0.3001	Tsesevich 1948
26211.90	−331	− 0.2682	Tsesevich 1948
26212.17	−331	+ 0.0020	Tsesevich 1948
26254.	−330	+ 0.25	Morgenroth 1933
26297.84	−328	− 0.0014	Solov'ev 1952
26526.26	−320	− 0.0440	Tsesevich 1948
27982.58	−269	− 0.1716	Tsesevich 1948
28039.72	−267	− 0.1474	Gur'ev 1937
28068.40	−266	− 0.0251	Solov'ev 1952
28382.82	−255	+ 0.2590	Solov'ev 1952
28782.33	−241	− 0.0400	Tsesevich 1948
28782.62	−241	+ 0.02499	Solov'ev 1952
29039.34	−232	− 0.0485	Tsesevich 1948
29096.75	−230	+ 0.2442	Solov'ev 1952
29467.85	−217	+ 0.0928	Solov'ev 1952
30381.63	−185	+ 0.0231	Tsesevich 1948
30952.74	−165	− 0.0228	Tsesevich 1948
30981.25	−164	− 0.0705	Solov'ev 1952
31295.39	−153	− 0.0665	Solov'ev 1952
31295.59	−153	+ 0.1337	Tsesevich 1948
32409.12	−144	− 0.0905	Tsesevich 1948
32437.68	−113	− 0.0885	Solov'ev 1952
35007.85	− 23	− 0.1206	Vasil'yanovskaya 1970
35664.67	0	− 0.1300	Vasil'yanovskaya 1970
35664.8	0	0	Kukarkin et al. 1969
35721.79	+ 2	− 0.1256	Vasil'yanovskaya 1970
37263.89	+ 56	− 0.1468	Vasil'yanovskaya 1970
37350.648	+ 59	+ 0.9378	Kukarkin et al. 1974
37893.87	+ 78	+ 1.5616	Kukarkin et al. 1971
38237.00	+ 90	+ 1.9980	Kwee 1967
38610.37	+103	+ 4.1163	Vasil'yanovskaya 1970
39784.487	+144	+ 7.3636	Cragg 1967
43938.	+290	+10.8	this paper
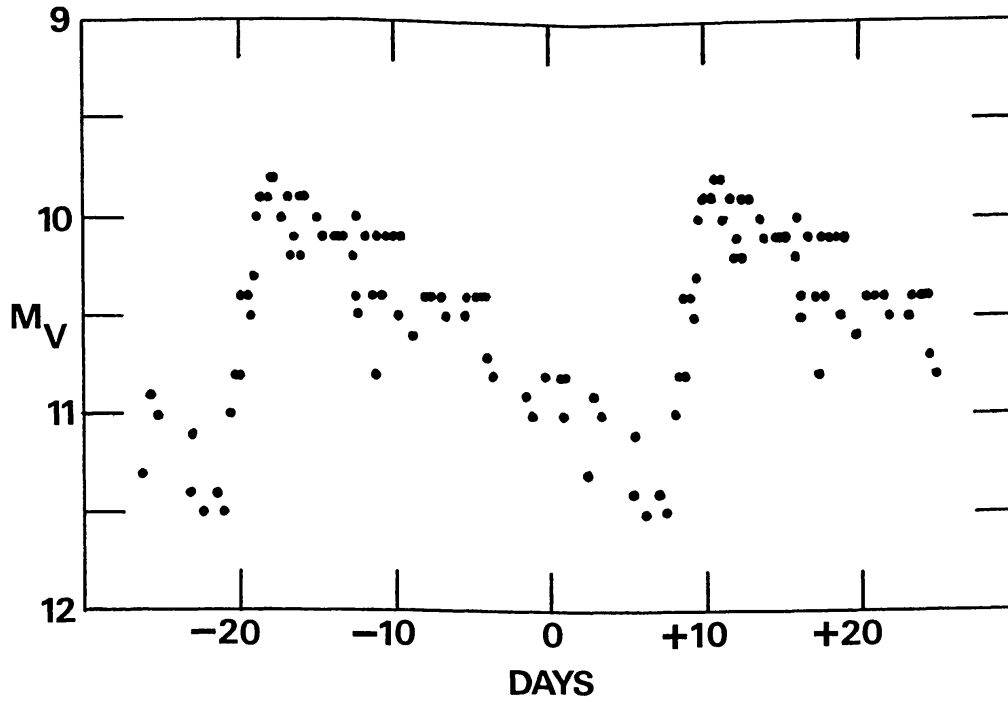
Figure 1. Visual estimates of TW Capricorni during the interval JD 2443707 - 2444225, reduced to phases given by equation (1).
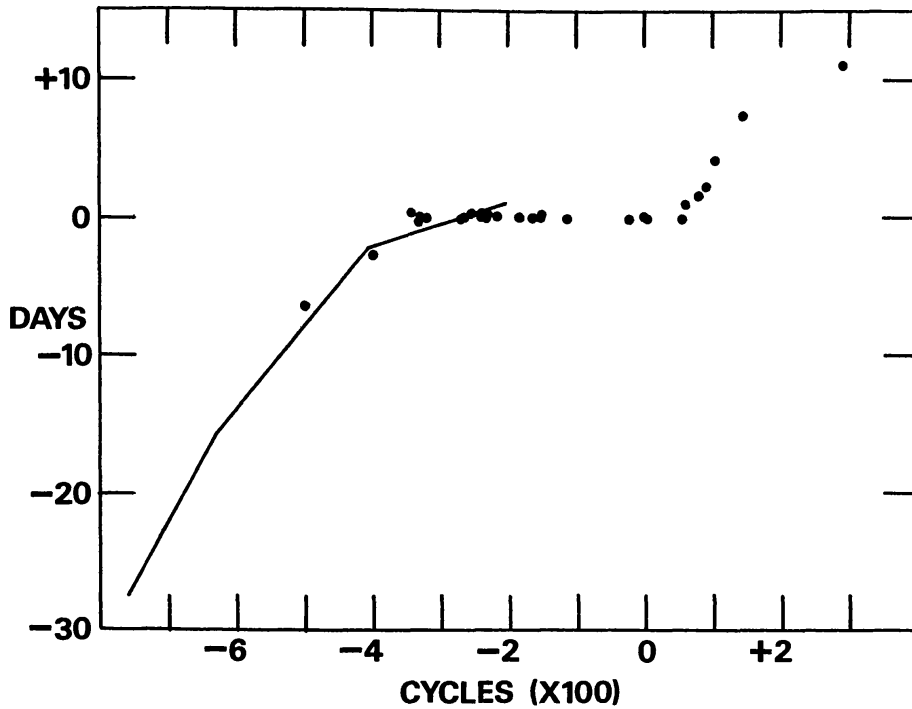

Figure 2. O-C diagram of TW Capricorni. The lines indicate three instantaneous periods, while the individual points indicate positions of maxima or element dates from the literature.

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