ON THE PERIOD OF DELTA CETI

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Abstract

A period analysis of δ Ceti has been carried out. It has been found that the period of δ Ceti has undergone a sudden decrease somewhere after 1976. The average period between 1976 and 1978 has been found to be $0^d.1611335$.

INTRODUCTION

The star δ Ceti was reported to be a β Canis Majoris star by Henroteau (1925) and was confirmed by McNamara (1955). Subsequently, the star has been studied by van Hoof (1968), Jerzykiewicz (1971), Tunaca (1977) and Lane (1977). From the radial velocity and photoelectric observations during the period 1901 to 1964, van Hoof (1968) established that the period of light variation of $0^d.1611366$ does not show any significant variation. Jerzykiewicz (1971) observed the star on seventeen nights during the period 1963 to 1965 and found the period of light variation to be $0^d.1611380$. Tunaca (1977) confirmed the period of light variation obtained by Jerzykiewicz (1971). A detailed analysis of all the observations during the period 1901 to 1976 has been carried out by Lane (1977). Lane (1977) also found the period of light variation to be $0^d.1611366$ during the period 1901 to 1960 and it has been suggested that either the period of light variation has abruptly increased during the period 1960 and 1970 or the period has been increasing smoothly at a rate of 1.58 sec/century since 1965.

This star was included in our observing programme to study the variations in its period and we present herein the light curves of the star and the period determined by us.

OBSERVATIONS

The star δ Ceti was observed on eight nights between October 1978 to December 1978 on the 38-cm reflector of the Uttar Pradesh State Observatory using a 1P21 photomultiplier tube cooled to -20°C and B filter of the Johnson and Morgan (1953) system. To start with, the stars γ Ceti and HR 732 were used as comparison stars, but later γ Ceti alone was used as comparison star, as it showed a better constancy than HR 732. The magnitudes were corrected for atmospheric extinction using nightly extinction coefficients. The differential magnitudes (comparison-variable) have been plotted against JD (Hel) in Fig. 1.

DISCUSSION OF THE PERIOD

From the individual light curves we have determined the times of maximum light. These alongwith all the photoelectric maxima available from JD 2438338 onwards, have been tabulated in Table 1. We did not use observations before JD 2438338 because van Hoof (1968) and Lane (1977) have analysed these observations and have found a constant period of $0^d.1611366$. We have calculated (O-C) values for all the photoelectric maxima after JD 2438338 using the ephemeris of Jerzykiewicz (1971) :

$$\text{Max. JD (Hel)} = 2438385.686 + 0^d.1611380\ E$$

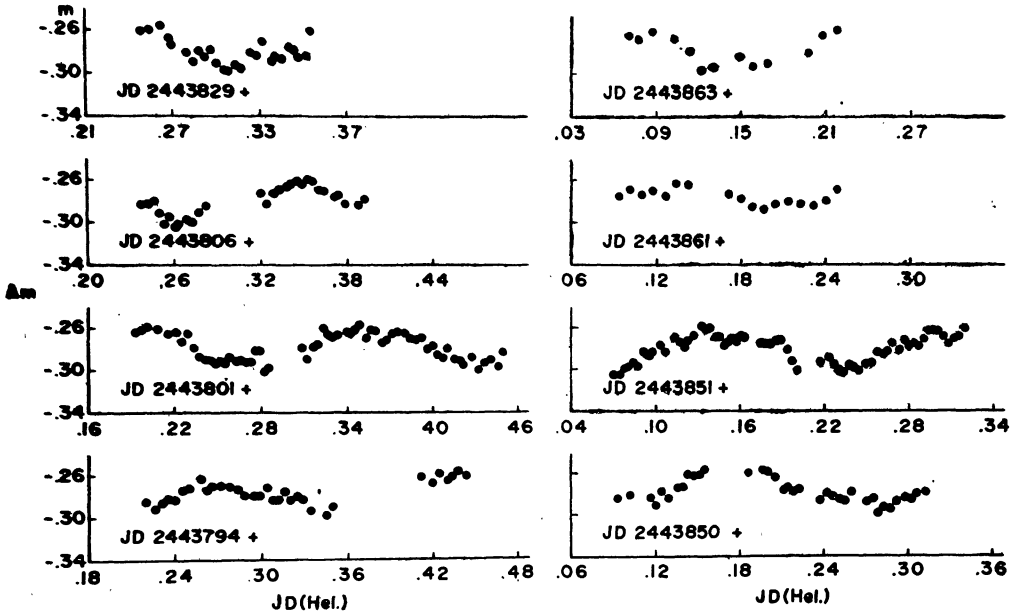

Fig. 1 : Light curves of δ Ceti.

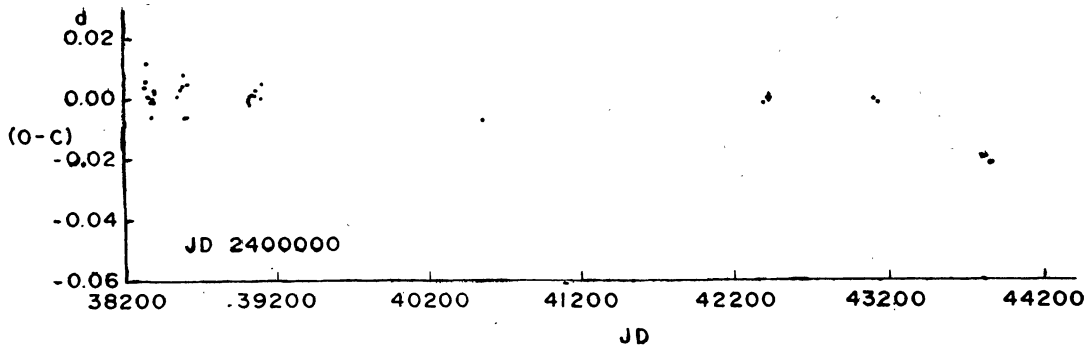

Fig. 2 : The plot of (O-C) values against JD.

where E is the number of cycles. The (O-C) values are given in column 3 of Table 1.

Table 1

Observed Time of Maxima JD (Hel)	Reference*	(O-C)
2438338.479	1	$+0^d.006$
339.443	1	+0.004
340.412	1	+0.006
358.305	1	0.012
358.455	1	+0.001
385.685	2	−0.001
386.325	1	−0.006
387.620	2	0.000
396.646	2	+0.003
397.290	1	+0.002
397.609	2	−0.001
656.560	1	+0.001
670.500	1	+0.003
689.435	1	+0.004
692.340	1	+0.008
696.515	1	+0.006
711.340	1	−0.006
2439013.962	2	−0.001
016.864	2	0.000
025.885	2	−0.002
026.855	2	+0.001
028.950	2	+0.001
052.798	2	+0.001
065.852	2	+0.003
066.815	2	−0.001
099.688	2	0.000
100.660	2	+0.005
2440560.075	3	−0.007
2442393.347	4	−0.002
419.292	4	0.000
428.315	4	−0.001
430.250	4	0.000
431.218	4	+0.001
2443101.389	4	−0.001
113.312	4	−0.002
794.263	5	−0.020
801.353	5	−0.020
806.348	5	−0.020
850.176	5	−0.022
851.143	5	−0.022
861.133	5	−0.022

* Numbers in second column refer to the following references :—
(1) van Hoof (1968); (2) Jerzykiewicz (1971); (3) Watson (1971); (4) Tunaca (1977); (5) Present observations.

In Fig. 2, we have plotted the (O-C) values against JD. From the (O-C) diagram, it is apparent that the period was almost constant between JD 2438338 to JD 2443113 but the period has decreased somewhat during the interval JD 2443113 to JD 2443863. Although the times of maxima are not very well determind, the (O-C) values are large for our observed maxima, which indicates that there has been a sudden decrease in the period after JD 2443113. The mean value of (O-C) for our observations comes out to be $-0^d.021$, which gives a mean value of the period of $0^d.1611335$ during JD 2443113 to JD 2443863. Further observations are needed for determining the new period and the time of its onset accurately.

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