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PERIOD VARIATION IN THE WHITE DWARF ECLIPSING BINARY V 471 TAURI

Since the discovery of eclipses in this peculiar binary V 471 Tauri at the end of December 1969 by Nelson and Young (1970) various photometric and spectroscopic studies have been published. It has a wave-like distortion in its light curve, H and K emissions and a variable orbital period.

The period variation was first discussed by Young and Lanning (1975) and the systematic variations in the period have been explained by active mass transfer. They noted that the period had increased and decreased over 3300 cycles following its discovery and current models were not adequate to account for such variations when one component is a white dwarf. The same material was interpreted by Herczeg (1975) and a light time effect in an eccentric orbit around a third body was suggested. He objected to the suggestion of Young and Lanning on the grounds that the system was a detached one and there was no other evidence for mass flow. Later, Rucinski and Oliver (1978) collected all the times of minima obtained until November 1976 and discussed the period changes. They separated the available O-C's into three groups and fitted three straight lines. In order to determine the decrease in the period a parabolic fitting was applied by Tunca et al. (1979). Their calculations indicated that the period of the system decreased by about one second per century.

The times of minima obtained between 1979 and 1983 by the authors are given in Table I. The O-C residuals are the deviations from the light elements given by Young and Lanning (1975) as

$$\text{Min. I} = \text{JD(Hel.)}\ 2440\ 610.0649 + 0^{d}.52118346\,E\ .$$

Table I

Min. (Hel.)	O-C (I)	E
2444 876.47018	$-0^{d}.00252$	8186
911.38954	.00246	8253
2445 284.55656	.00279	8969
612.38065	.00310	9598
614.46546	.00302	9602
695.24889	.00303	9757

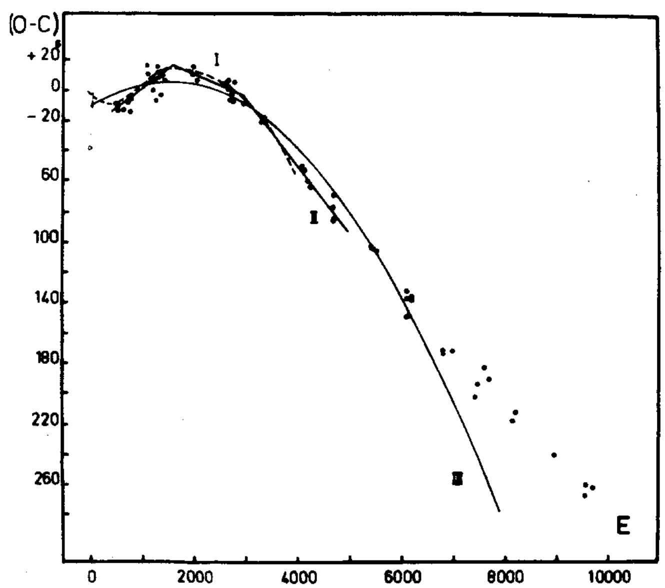

Figure 1.

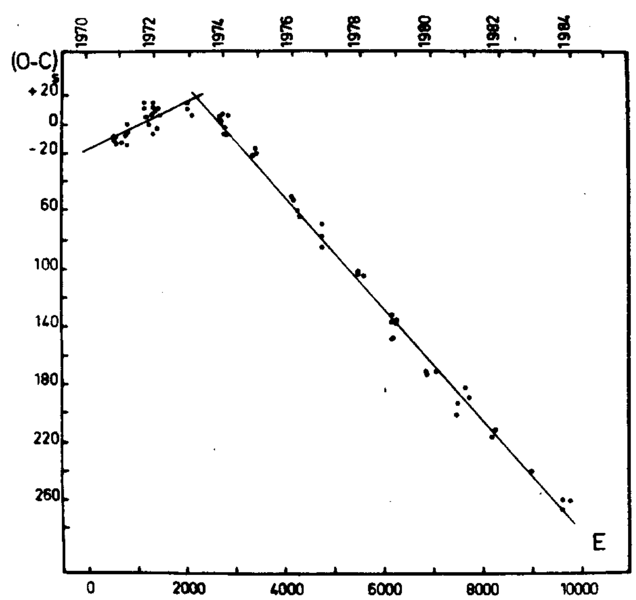

Figure 2.

All of the times of minima obtained so far have been collected and the deviations from the light elements given above have been computed. In Figure 1 the O–C values are compared with the light elements given by Young and Lanning (1975, curve I), Rucinski and Oliver (1978, line II) and Tunca et al. (1979, curve III). As it is seen the times of minima obtained in the last five years do not agree with those light elements. Therefore we have separated the O–C values into two groups, viz. $0 < E < 2400$ and $2700 < E < 10\,000$. In this case linear light elements agree well with the O–C values. An application of the least squares gave the following ephemeris:

for the first segment, $0 < E < 2400$

$$\mathrm{Min.I} = \mathrm{JDHel.}2440\ 610.06470 + 0\overset{d}{.}52118365\,E$$
$$\pm 4 \qquad\qquad \pm 3$$

for the second segment, $2700 < E < 10\,000$

$$\mathrm{Min.I} = \mathrm{JDHel.}2440\ 610.06614 + 0\overset{d}{.}52118301\,E \quad .$$
$$\pm 3 \qquad\qquad \pm 1$$

From Figure 2 it is seen that the linear segments join together in about 1973. This result indicates that a decrease in the period occurred suddenly in 1973. The second segment would be useful for prediction of the eclipses in the near future. For prediction of the first contact 0.017083 day should be subtracted from the computed time of mid-eclipse.

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