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NEW PHOTOELECTRIC MINIMA TIMES OF V566 OPHIUCHI AND ITS PERIOD STUDY

The binary system V566 Oph (HD163611, BD+5°3547, Sp:F2/4Vn) is a short period eclipsing variable of W UMa-type. It is one of the best observed W UMa-type systems with many light curve analyses and minima times.

V566 Oph has been observed photoelectrically with a two-beam, multi-mode, nebular-stellar photometer attached to the 48-inch Cassegrain reflector at the Kryonerion Astronomical Station, Greece.

The stars BD+4°3553 and BD+4°3556 were used for comparison and checking, respectively. Reduction of the observations has been made as usual (Hardie, 1962) and the passbands of the B and V filters used are in close accordance with the standard ones. From our observations of V566 Oph four new minima times were derived using Kwee and Van Woerden's (1956) method and these are the mean values of B and V. They are given in Table 1, the successive columns of which present: Hel. JD, $(O-C)_I$, E_I and $(O-C)_{II}$, E_{II}.

In the residuals $(O-C)_I$ and $(O-C)_{II}$ the C's have been calculated using the following ephemeris formulae, respectively.

$$\text{(I): MinI} = 2435245.5440 + 0\overset{d}{.}40964101 \times E \quad (1)$$
(due to Binnendijk, 1959)

$$\text{(II): MinI} = 2440047.3478 + 0\overset{d}{.}40964600 \times E \quad (2)$$
(due to Seeds & Dawson, 1985)

Table 1
New Photoelectric Minima Times of V566 Ophiuchi

Hel. JD.	$(O-C)_I$	E_I	$(O-C)_{II}$	E_{II}
2440000+				
7298.4876	0.0762	29423	−0.0040	17701
7299.5138	0.0783	29425.5	−0.0019	17703.5
7300.5383	0.0787	29428	−0.0015	17706
7301.5607	0.0770	29430.5	−0.0032	17708.5

From all minima times of V566 Oph found in the literature and our new ones given in Table 1 and for linear least squares fitting, formulae (1) and (2) become, respectively:

$$\text{MinI} = 2435245.2258 + 0\overset{d}{.}40964923 \times E \quad (3)$$
$$\pm 0.0028 \pm 0.00000004$$

and

$$\text{MinI} = 2440047.5348 + 0\overset{d}{.}40964183 \times E \quad (4)$$
$$\pm 0.0025 \pm 0.00000003$$

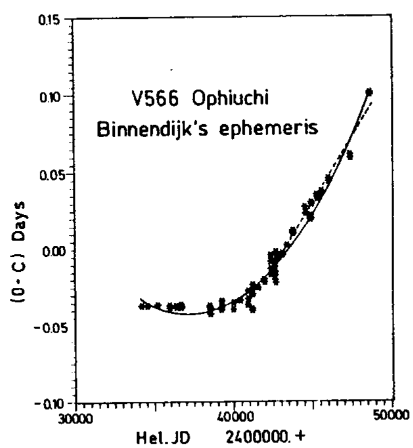

Figure 1. The O−C diagram of V566 Oph according to Binnendijk's (1959) ephemeris. Quadratic fitting has been applied to all minima times and linear (- - -) after Hel. JD 2442000.

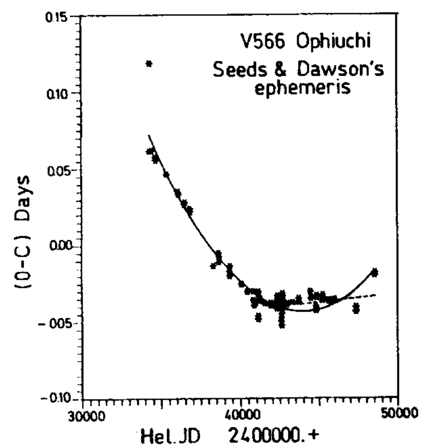

Figure 2. Same as a Fig. 1, but according to Seeds & Dawson's (1985) ephemeris formula.

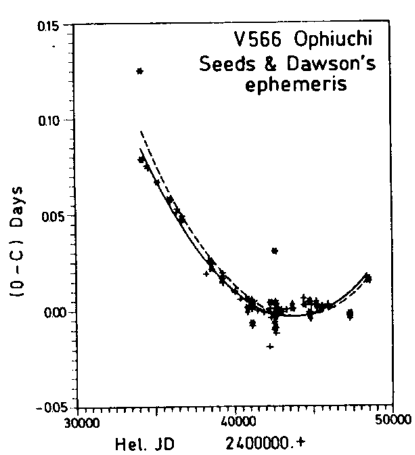

Figure 3. The O−C diagram of V566 Oph according to Seeds & Dawson's ephemeris. Quadratic fitting has been separately applied to primary (+) and secondary (⋆) photoelectric minima times only.

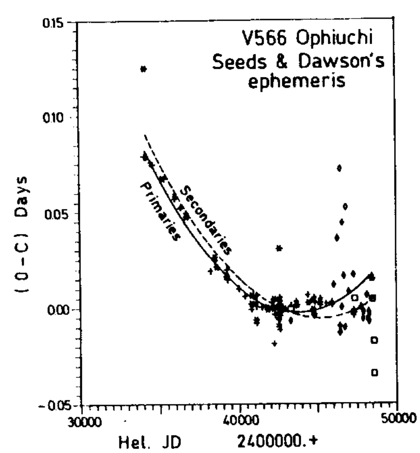

Figure 4. Same as Fig.3, but the visual minima are also included. Visual primaries are denoted by ◇, while secondaries by □.

while for quadratic least squares fitting we get:

$$\mathrm{Min\,I} = 2435246.6389 + 0\overset{d}{.}40958120 \times E + 8.13 \times 10^{-10} \times E^2 \qquad (5)$$

and

$$\mathrm{Min\,I} = 2440049.0395 + 0\overset{d}{.}40956939 \times E + 8.65 \times 10^{-10} \times E^2 \qquad (6)$$

respectively.

Moreover, if the visual minima times are not taken into account, formulae (1) and (2) for linear least squares fitting become, respectively:

$$\mathrm{Min\,I} = 2435245.2881 + 0\overset{d}{.}40964769 \times E \qquad (7)$$
$$\pm 0.0017 \pm 0.00000004$$

and

$$\mathrm{Min\,I} = 2440047.5986 + 0\overset{d}{.}40964025 \times E \qquad (8)$$
$$\pm 0.0013 \pm 0.00000003$$

while for quadratic one we get:

$$\mathrm{Min\,I} = 2435245.7911 + 0\overset{d}{.}40957370 \times E + 9.05 \times 10^{-10} \times E^2 \qquad (9)$$

and

$$\mathrm{Min\,I} = 2440049.2109 + 0\overset{d}{.}40956089 \times E + 9.70 \times 10^{-10} \times E^2 \qquad (10)$$

From the foregoing linear ephemeris formulae (3), (7) the period of V566 Oph given by Binnendijk ($P = 0\overset{d}{.}40964101$) seems to have increased with a rate which is greater if all minima times are considered. While formulae (4) and (8) indicate that the period given by Seeds and Dawson ($P = 0\overset{d}{.}40964600$) has decreased with a rate which is greater if the visual minima are not taken into account. Of course, neither the linear fitting, nor the quadratic one is suitable for all minima times of V566 Oph. (For a new method see Kalimeris et al., 1993).

In Figures 1 and 2 quadratic fitting has been applied to photoelectric minima times only using Binnendijk's (1959) and Seeds & Dawson's (1985) ephemeris formulae, respectively. From these, one can notice that after Hel. JD 2442000 the O$-$C values could be approached by a linear fitting. Doing so, formulae (1) and (2) are improved to:

$$\mathrm{Min\,I} = 2435244.9972 + 0\overset{d}{.}40965433 \times E \qquad (11)$$
$$\pm 0.0015 \pm 0.00000004$$

and

$$\mathrm{Min\,I} = 2440047.2991 + 0\overset{d}{.}40964711 \times E \qquad (12)$$
$$\pm 0.0010 \pm 0.00000003$$

respectively, which show that the period of V566 Oph continues increasing; but more data are needed to examine its future behaviour.

Moreover, since the number of both primary and secondary minima times was large enough, a separate O$-$C diagram has been drawn for each one of them. The results are presented in Figures 3 and 4, which are based on Seeds & Dawson's (1985) ephemeris.

The consistency of the two curves, corresponding to primary (+) and secondary minima ($\star$) respectively, is much better in Figure 3 than in Figure 4, where the visual minima ($\diamond$ for primaries and $\square$ for secondaries) are also included.

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