

PERIOD CORRECTIONS FOR EIGHT ECLIPSING BINARY STARS

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Abstract

AAVSO observations of eight eclipsing stars indicate a discrepancy when compared to the elements listed in the fourth edition of the *General Catalogue of Variable Stars* (GCVS) (Kholopov *et al.* 1985). New periods for XZ Aql, AL Cam, R CMa, U CrB, DK Cyg, V704 Cyg, RW Mon, and TX UMa have been calculated.

1. Introduction

While compiling *Observed Minima Timings of Eclipsing Binaries No. 2* (Baldwin and Samolyk 1995), the orbital periods of a number of stars were found to be discordant when compared to the GCVS. Eight of these stars were selected for this paper.

New elements were calculated using a linear regression method. A second order solution was also calculated for XZ Aql and DK Cyg. The O-C plots in Figures 1–8 are based on the elements from the GCVS, with the new elements shown. Error estimates are included for each set of elements.

2. XZ Aql

The period for this star has been continuously increasing since the first AAVSO observations were made. Equation (1) is the quadratic solution for these observations.

$$\begin{aligned} \text{JD}_{\min} = & 2440816.751 + 2.1391825 E + 5.39 \times 10^{-9} E^2 \\ & \pm 0.003 \pm 0.0000034 \quad \pm 0.78 \times 10^{-9} \end{aligned} \quad (1)$$

For the purpose of predicting eclipses for the near term, the following linear elements are being used for the AAVSO *Eclipsing Binary Ephemeris*:

$$\begin{aligned} \text{JD}_{\min} = & 2447469.659 + 2.1392229 E \\ & \pm 0.004 \pm 0.0000024 \end{aligned} \quad (2)$$

3. AL Cam

A period change occurred near JD 2442700. The new elements are given in equation (3). Prior to this date observations agreed well with the GCVS elements.

$$\begin{aligned} \text{JD}_{\min} = & 2442728.770 + 1.3283281 E \\ & \pm 0.004 \pm 0.0000007 \end{aligned} \quad (3)$$

4. R CMa

The period of this star began to deviate from the GCVS elements near JD 2445100. The linear elements in equation (4) best describe the most recent behavior of this star.

$$\begin{aligned} \text{JD}_{\min} = & 2445060.665 + 1.1359533 E \\ & \pm 0.009 \pm 0.0000016 \end{aligned} \quad (4)$$

5. U CrB

The observed minima matched the GCVS elements until JD 2442900. After that date equation (5) best fits the observed times of minima.

$$\begin{aligned} \text{JD}_{\min} &= 2442946.728 + 3.4522279 E \\ &\pm 0.012 \pm 0.0000030 \end{aligned} \quad (5)$$

6. DK Cyg

The best linear fit for the minima observed after JD 2445300 is given in equation (6). The quadratic solution shown in equation (7) is a slightly better fit; however, continued observation of this star will be required to determine if the period is continuously changing.

$$\begin{aligned} \text{JD}_{\min} &= 2445264.694 + 0.47069614 E \\ &\pm 0.010 \pm 0.00000073 \end{aligned} \quad (6)$$

$$\begin{aligned} \text{JD}_{\min} &= 2443013.850 + 0.4706906 E + 2.77 \times 10^{-10} E^2 \\ &\pm 0.004 \pm 0.0000013 \quad \pm 0.94 \times 10^{-10} \end{aligned} \quad (7)$$

7. V704 Cyg

The minima observed by the AAVSO (beginning JD 2443337) do not show a period change. These minima indicate that the actual period is longer than the one listed in the GCVS. Equation (8) is a better fit for the observed minima.

$$\begin{aligned} \text{JD}_{\min} &= 2443337.693 + 0.57070648 E \\ &\pm 0.007 \pm 0.00000036 \end{aligned} \quad (8)$$

8. RW Mon

A decrease in period took place near JD 2446400. The current elements are given in equation (9).

$$\begin{aligned} \text{JD}_{\min} &= 2446418.875 + 1.9060845 E \\ &\pm 0.003 \pm 0.0000012 \end{aligned} \quad (9)$$

9. TX UMa

This star underwent a significant period change near JD 2445300. Equation (10) best represents this star's current behavior.

$$\begin{aligned} \text{JD}_{\min} &= 2445325.906 + 3.0633230 E \\ &\pm 0.007 \pm 0.0000047 \end{aligned} \quad (10)$$

References

- Baldwin, M. E. and Samolyk, G. 1995, *Observed Minima Timings of Eclipsing Binaries No. 2*, AAVSO, Cambridge, MA.
Kholopov, P. N., *et al.* 1985, *General Catalogue of Variable Stars*, 4th ed., Moscow.

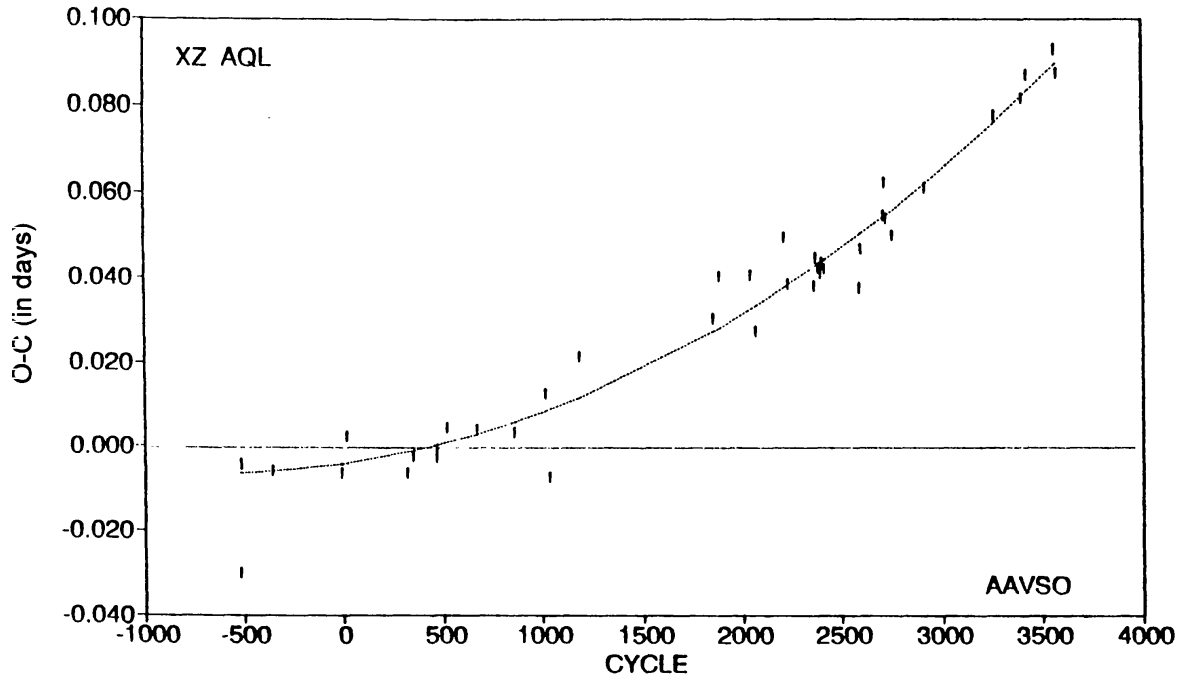


Figure 1. O-C plot of XZ Aql based on the GCVS elements. The curved line represents equation (1).

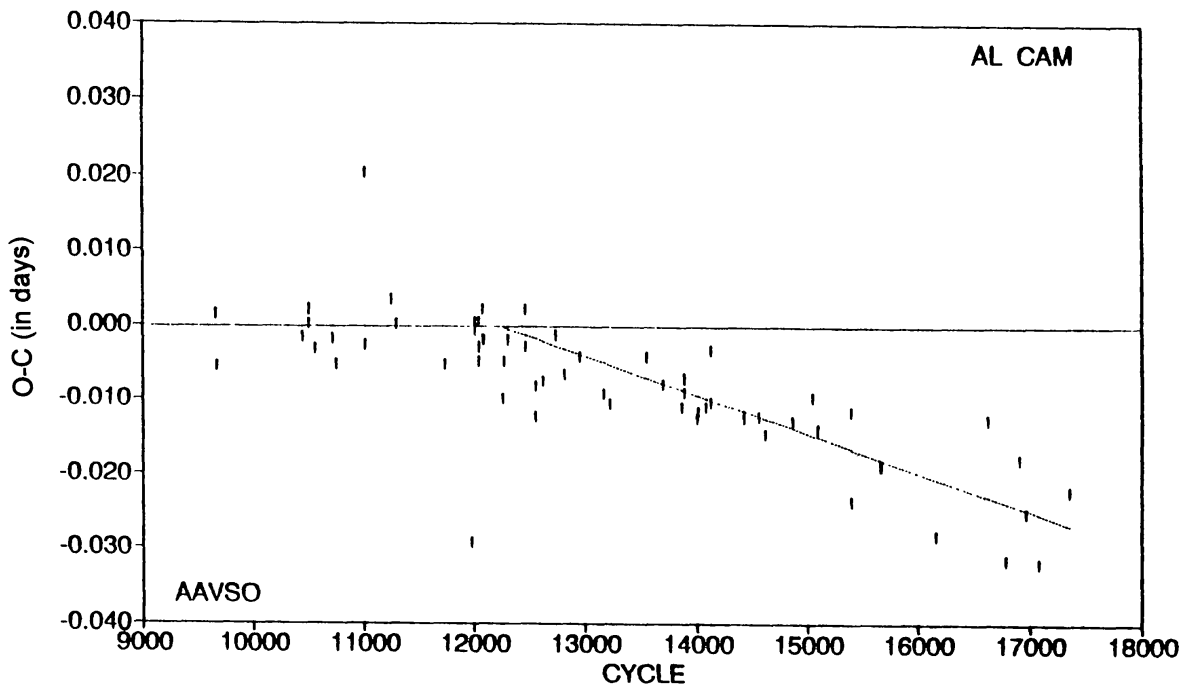


Figure 2. O-C plot of AL Cam based on the GCVS elements. The diagonal line represents equation (3).

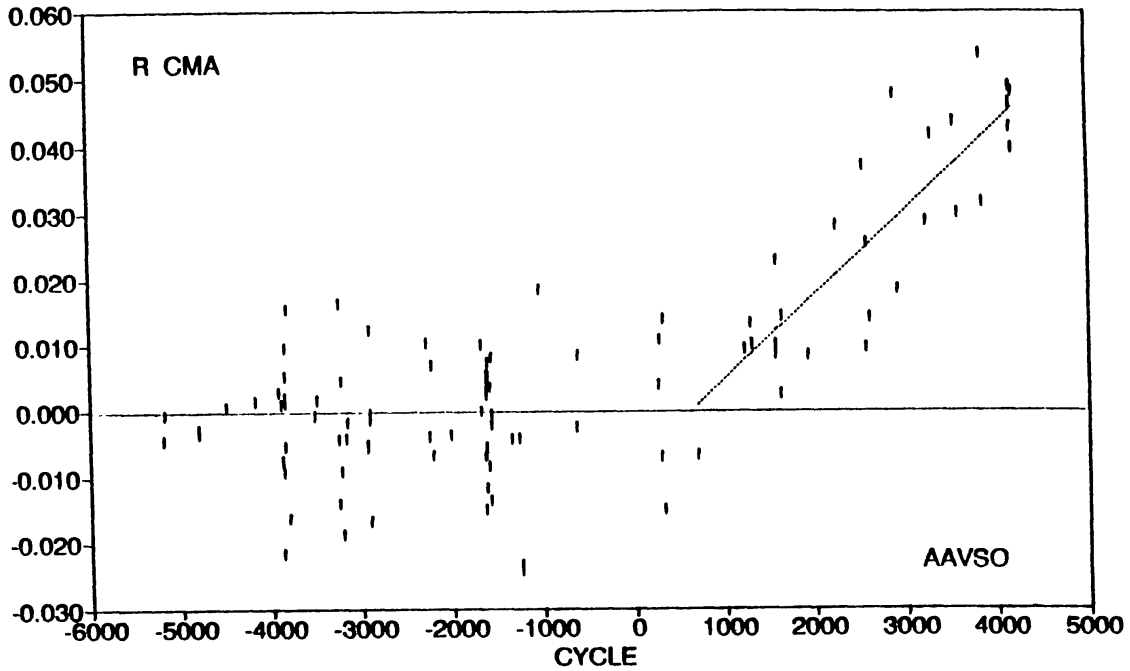


Figure 3. O-C plot of R CMA based on the GCVS elements. The diagonal line represents equation (4).

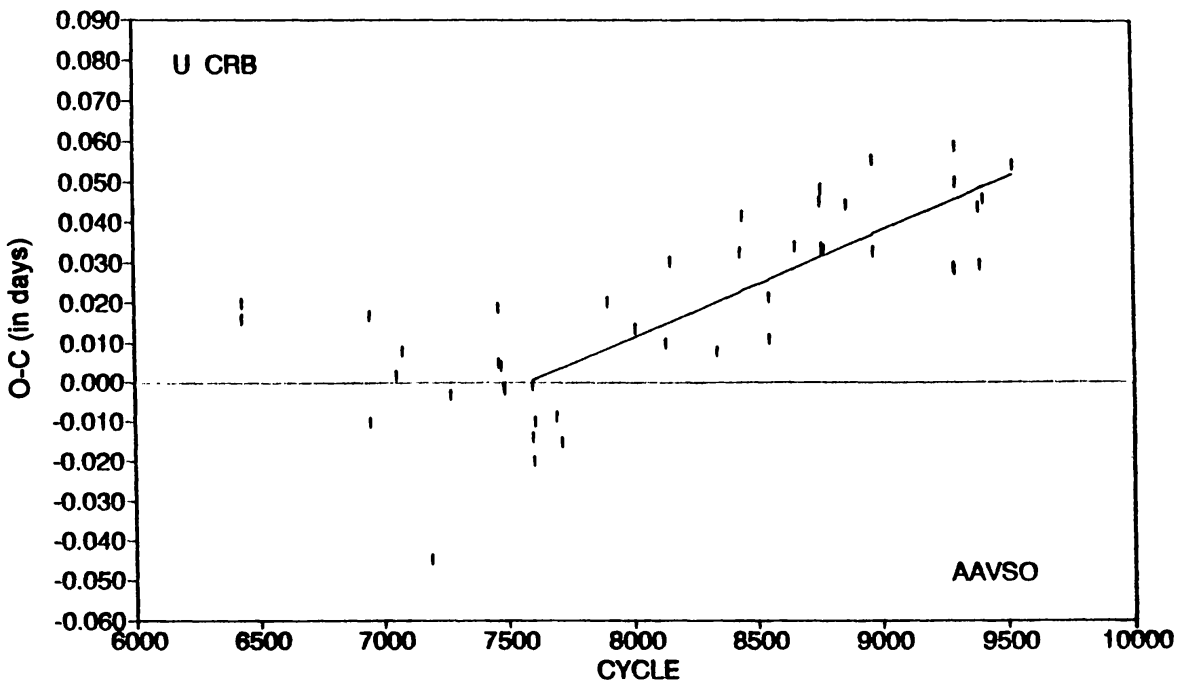


Figure 4. O-C plot of U CrB based on the GCVS elements. The diagonal line represents equation (5).

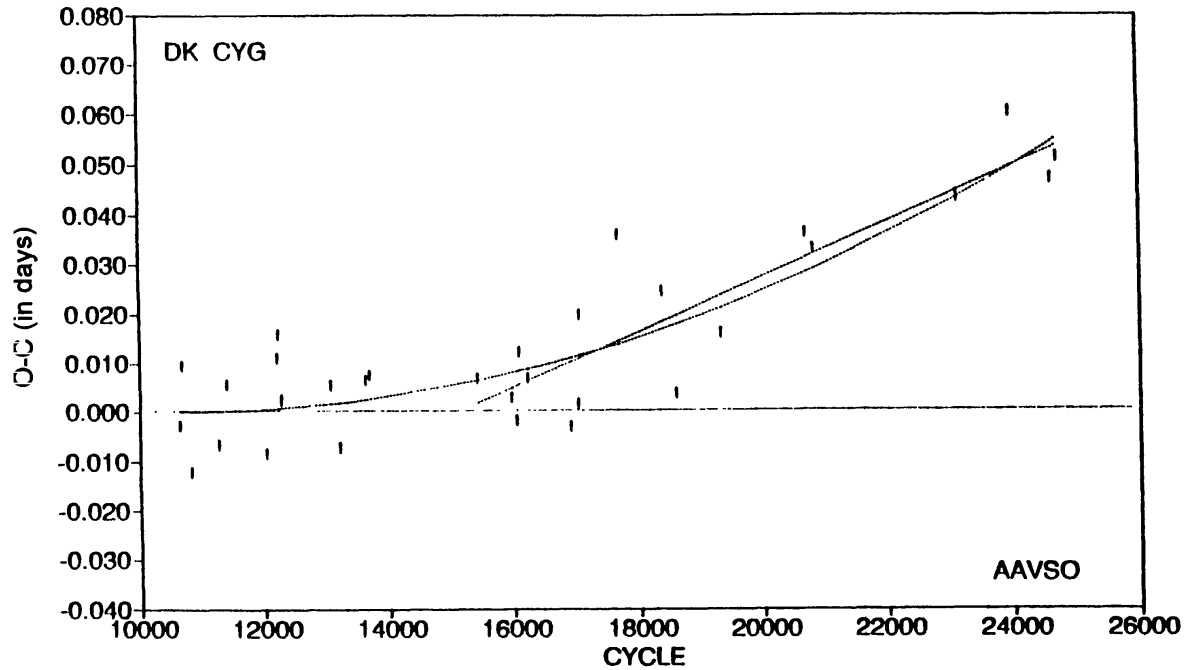


Figure 5. O-C plot of DK Cyg based on the GCVS elements. The diagonal line represents equation (6). The curved line represents equation (7).

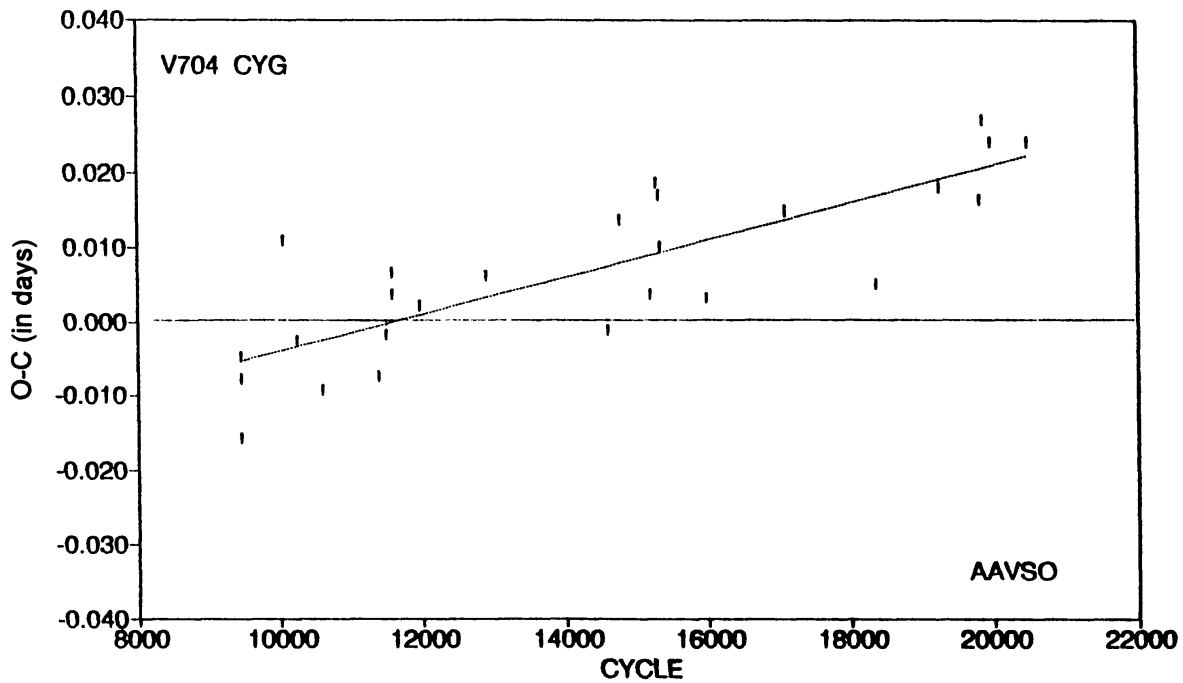


Figure 6. O-C plot of V704 Cyg based on the GCVS elements. The diagonal line represents equation (8).

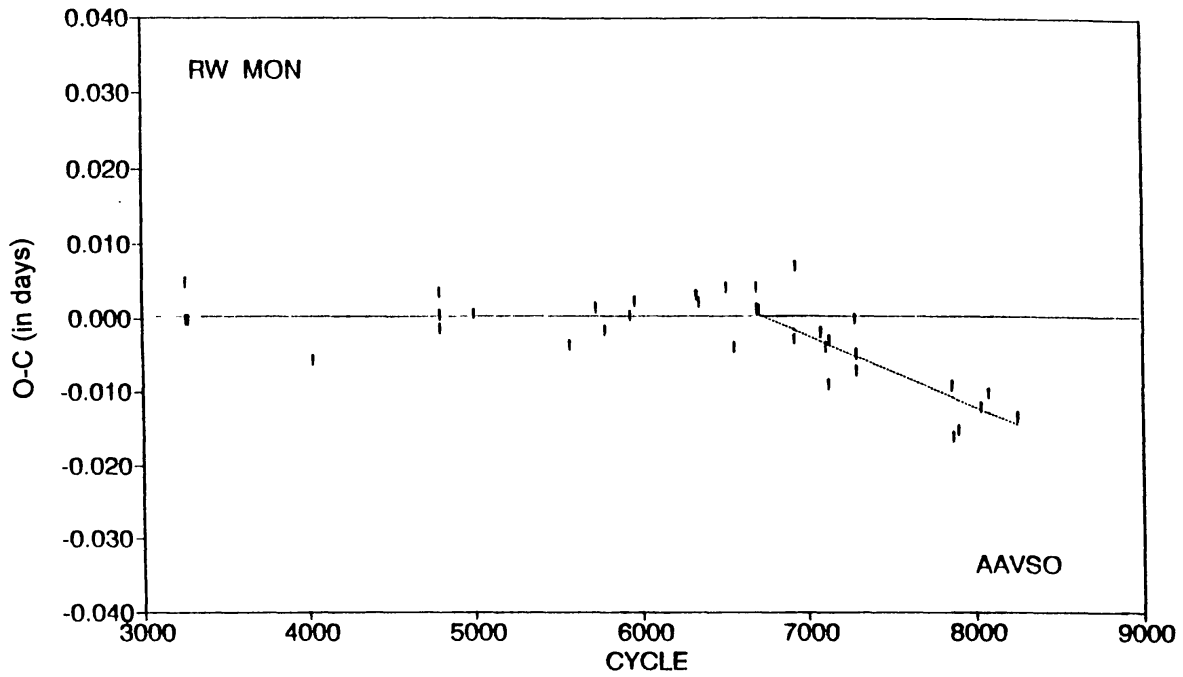


Figure 7. O-C plot of RW Mon based on the GCVS elements. The diagonal line represents equation (9).

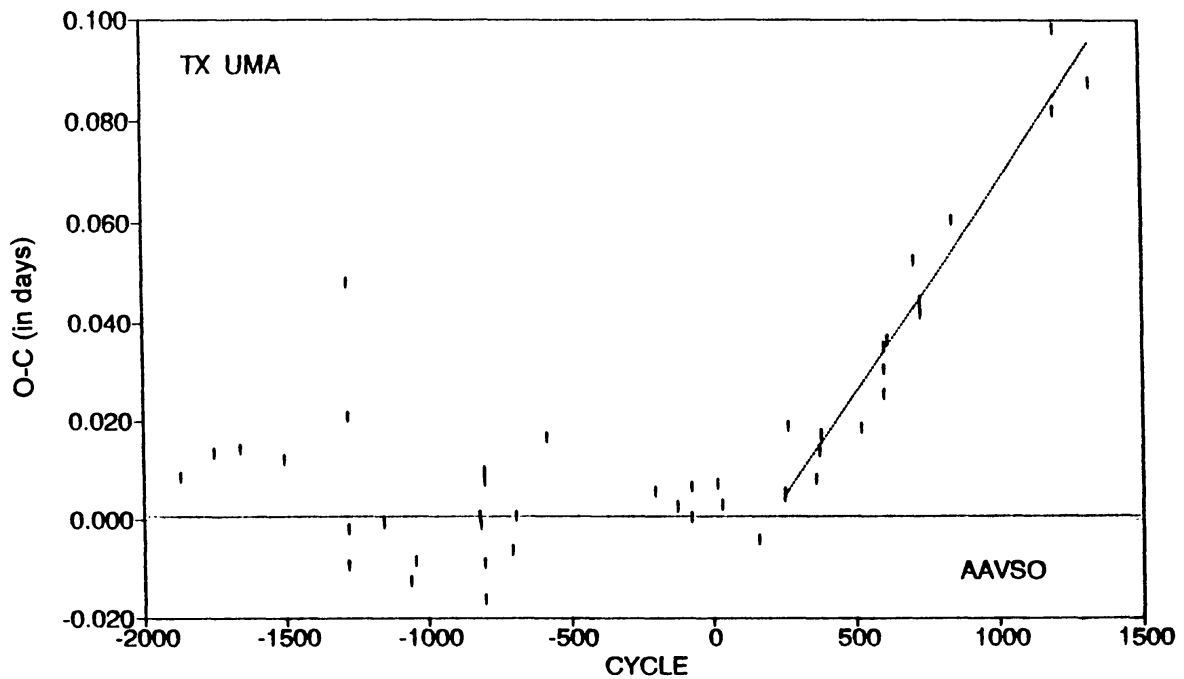


Figure 8. O-C plot of TX UMa based on the GCVS elements. The diagonal line represents equation (10).