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A NEW EPHEMERIS FOR UZ For

UZ For (EXO 033319-2554.2) is a member of the AM Her class of close binaries (c.f. Cropper 1990) and shows a narrow eclipse caused by the secondary star occulting the white dwarf (Beuermann, Thomas & Schwope 1988, Allen et al., 1989). This eclipse was observed on 5 separate occasions using the ROSAT X-ray satellite (0.1-2.0 keV). The eclipse ingress and egress is very rapid, taking $\leq$10 secs in X-rays (similar to that in the blue part of the optical spectrum; Bailey & Cropper, 1991).

The results of Allen et al. (1989) and Bailey & Cropper (1991) suggest that recent eclipse timings are not well described by a linear ephemeris, with residuals in excess of ϕ=0.006. Bailey & Cropper suggest a quadratic fit may improve the residuals. The eclipse timing of Allen et al. is not in good agreement with the other data. This is due to a typographical error in their paper (Allen, private communication). The true timing of the eclipse center in the data of Allen et al. is HJD=2447437.91927.

The new data obtained using ROSAT provide an oppurtinity to improve the ephemeris. Table 1 shows the eclipse timings used in the analysis[1]. A linear and quadratic fit were made to the data, the results of which are shown in Table 2. These show that the new linear function is a much better fit to the data than the linear ephemeris of Allen et al. (1989). Further, an F-test shows the quadratic fit is better than the new linear fit at the 97.7% confidence level. The residuals for the linear and quadratic fit are shown in Figure 1. Although the quadratic ephemeris gives a significantly better overall fit compared with the linear function, improving the fit to the first data point, it actually increases the residuals to the data obtained from the ROSAT timings.

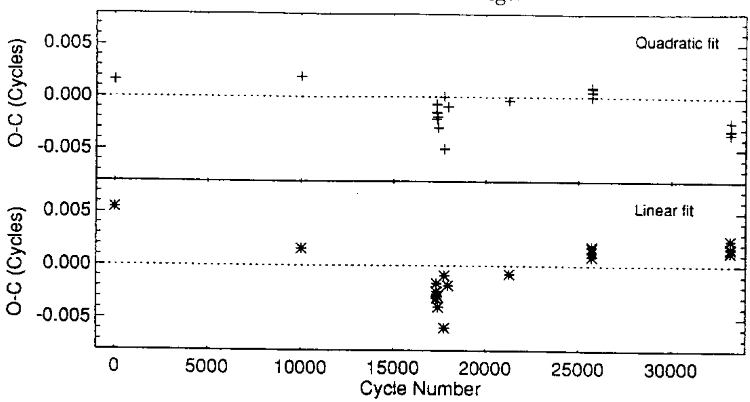

Figure 1. UZ For: the residuals to the linear and quadratic ephemerides.

[1] The eclipse timing of 7132.936(1) (Ferrario et al., 1989) is not used due to its large error.

Table 1. UZ For: the eclipse timings used in the ephemeris determination. The error in the last digit is shown in brackets.

HJD+2440000.0	Reference
5567.17697(16)	Osborne et al. (1988)
6446.97317(16)	"
7088.74191(30)	Beuermann, Thomas & Schwope (1988)
7089.70837(30)	"
7090.58715(12)	"
7091.55360(23)	"
7094.71672(23)	"
7097.79192(25)	"
7127.13880(30)	Ferrario et al. (1989)
7127.22710(30)	"
7145.06370(6)	"
7437.91927(3)	Allen (private comm)
7827.95413(6)	Bailey & Cropper (1991)
7828.04199(6)	"
7828.12987(6)	"
7829.00844(6)	"
7829.09635(6)	"
7829.18421(6)	"
8482.72727(20)	This work
8482.90310(20)	"
8483.34236(20)	"
8483.43023(20)	"
8483.60595(20)	"

Table 2. UZ For: the periods determined from a linear and quadratic fit along with the period of Allen et al. (1989) for comparison.

Fit	Ephemeris	χ^2_ν
Linear	2445567.17649(14) + 0.087865429(6)E	3.07
Quadratic	2445567.17683(15) + 0.087865375(13)E + 1.7(3) $\times 10^{-12}E^2$	1.23
Allen et al. (1989)	2445567.17622(13) + 0.087865458(7)E	25.6

If the quadratic term is significant, then it implies that the orbital period of the system is increasing on a timescale of $P/\dot{P}=\sim 1\times 10^8$ years. Secular changes in the orbital period of CV's have been seen in a number of other systems (Pringle 1975, Bond & Freeth, 1988 and Warner, 1988). These have shown a decreasing orbital period on a timescale of similar magnitude (but opposite sign) to that implied for UZ For in this study. Warner (1988) attributes cyclic changes in the orbital period seen in these CVs to the solar-type magnetic cycle in the secondary star. It is more difficult to account for an apparent increase in the spin period of UZ For. The ephemeris of UZ For needs to be monitored further to determine the shape of the period variation more securely.

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