PERIOD INCREASE FOR XZ CYGNI

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Abstract

A large increase in primary periodicity for XZ Cygni is identified and a tentative ephemeris offered.

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It appears that the RR Lyrae variable, XZ Cygni, has surprised us once again. In my recent paper (Taylor 1978) I described the decrease in primary period that occurred circa 1975. That decrease has been further documented by the addition of some fourteen new times of visual maxima garnered through the AAVSO RR Lyrae program. A simple least-squares analysis again returns the value for primary period given in the paper (i.e., $P_I = 0^d.466438$).

However, around the end of 1978 the possibility of an increase in P_I, of far greater magnitude, became apparent. The reality of that increase has now been confirmed through AAVSO observations and I have calculated a tentative ephemeris based on that very recent data (Table I), namely,

$$\text{JD (hel)primary max.} = \underset{\pm.002}{2444142.650} + \underset{\pm.000020}{0^d.466649}E \qquad (1)$$

TABLE I

Cycles (E) and O-C Residuals Computed from Equation (1)

JD hel.max 2440000+	E	O-C	JD hel.max 2440000+	E	O-C
4049.785	-199	-.002	4105.786:	-79	.001:
4077.775	-139	-.011	4127.709	-32	-.008
4083.851	-126	-.001	4128.650	-30	-.001
4092.722	-107	.003	4140.777	-4	-.006
4093.655:	-105	.003:	4141.723	-2	.006
4098.795	-94	.010	4142.650	0	.000
4099.729	-92	.011	4143.583	2	.000

Figure 1 depicts the star's performance from the onset of erratic behavior in 1965 to 1979.8. From the larger scale inset it appears that a time-frame of somewhat under 1.5 years was required for the change, if we assume that the period stabilized in mid-1979. Full stabilization is not certain at this time.

After enough new data have been collected, it should be possible to approximately test relation (2) (c.f. Tsesevich 1973)

$$\frac{1}{P_i} - \frac{1}{P_I} = \frac{1}{P_{II}} , \qquad (2)$$

where P_{II} is the secondary (Blazhko) period, and P_i is a postulated period which, according to theory, interferes with P_I thereby giving rise to P_{II}. If a constant P_i combines with a changed primary period, equation (3) is valid:

$$\Delta \frac{1}{P_I} + \Delta \frac{1}{P_{II}} = 0. \qquad (3)$$

H. A. Smith (1975) found that visual observations of XZ Cygni were insufficient to evaluate (2) and consequently (3), although predicted values did approximate the empirical evidence.

For our case, with P_I and P_{II} equal to $0^d.466438$ and $59^d.6$ initially, we would expect [if (1) is correct and P_I remains stable] an average length of $56^d.3$ for secondary cycle magnitude maxima after 1979.5. The possibility that such a shortening had already commenced was raised in my previous paper.

It should be noted that persistent observation of XZ Cygni by Marvin Baldwin has been absolutely invaluable in pinpointing the activity of this star for almost fifteen years. His continuing contribution is gratefully acknowledged.

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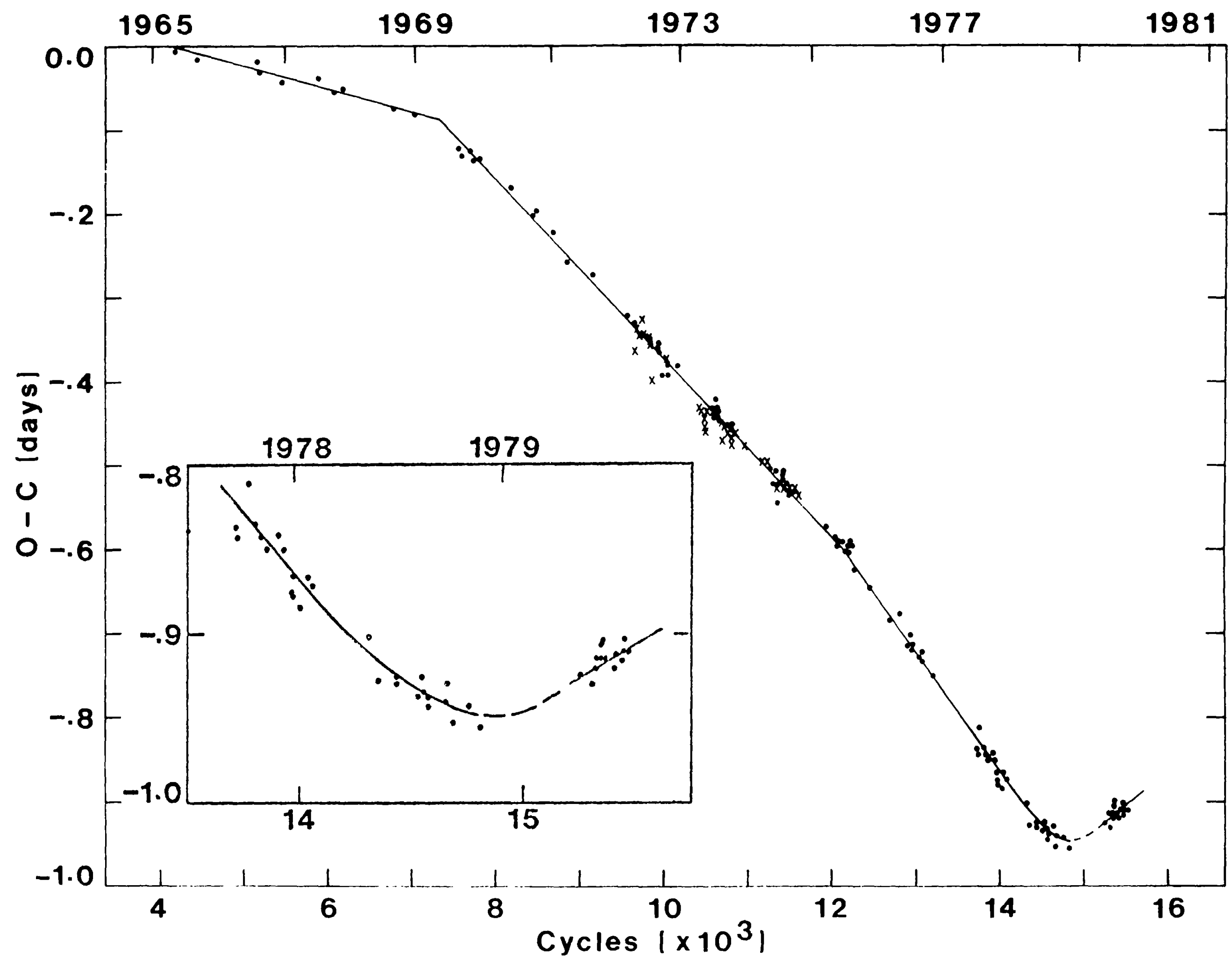

Figure 1. O-C diagram for XZ Cygni plotted according to the 1969 GCVS elements: JD(hel.) primary max. = 2433693.981 + 0^{d}466579E. Solid lines are derived from equally-weighted least-squares analyses. X's are photoelectric maxima (Fop 1975); all others represent visual maxima reduced by the author from AAVSO observations.