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A V801 CYGNI UPDATE

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Abstract

From newly collected data at the Maria Mitchell Observatory, a new ephemeris of V801 Cygni is derived.

The RR Lyrae-type variable star V801 Cygni was previously described by Yarlott (1981). From measurements of plates taken at the Maria Mitchell Observatory, data from 1981-1991 were added to Yarlott's data. The maxima of the light curves fell close to, but mostly later than those predicted by Yarlott's linear and parabolic ephemerides.

The O-C values of V801 Cyg were obtained through a non-linear least squares program that is designed to take an assumed curve and fit it to a set of points by minimizing the sum of the squares of the residuals. All O-C values are given with respect to the ephemeris given by Miller and Wachman (1958). Miller and Wachman describe V801 Cyg as having a period of 0.51603470 day and an epoch of maximum at JD 2434180.6664 (1958). Miller and Wachman's ephemeris was found using only the O-C values before the year 1957. The choice to calculate all the O-C values with respect to Miller and Wachman's ephemeris was made to remain consistent with Yarlott. The average light curve used as the assumed curve in the non-linear least squares program was the same average light curve used by Yarlott to obtain her O-C values.

The O-C plot in Figure 1 shows the complete data set through 1991, but contains the best-fit parabola as found by Yarlott (1981) using the O-C values obtained only by Miller and Wachman and by Yarlott. Figure 2 shows the same data set, with the best-fit line and parabola as given by a least squares method using the O-C values used to calculate the ephemeris in Figure 1 and the new O-C values found in this work. Both figures show all the O-C values obtained from Miller and Wachman (1958), Yarlott (1981), and this work.

A least squares method was incorporated to calculate the best-fit line and parabola through a minimization of the sum of the squares of the residuals of the data points. A weight is given to each point according to the length of the error bar corresponding to that point. The error bars for each of the O-C values after 1981 correspond to a confidence interval of 95%, chosen to maintain consistency with Yarlott's analysis of earlier data. The linear ephemeris found with the addition of the O-C values between 1981 and 1991 is:

$$JD_{max} = 2440626.015 + 0.51604116\ E,$$
$$\phantom{JD_{max} = 2440626.01}{\pm 0.003}\quad {\pm 0.00000030} \tag{1}$$

and the parabolic ephemeris is:

$$JD_{max} = 2440625.984 + 0.51604172\ E + 2.72 \times 10^{-10}\ E^2.$$
$$\phantom{JD_{max} = 2440625.98}{\pm 0.003}\quad {\pm 0.00000015}\quad {\pm 0.24 \times 10^{-10}} \tag{2}$$

In the calculation of the updated ephemerides, one O-C point (JD 2443028.6) was removed due to a discrepancy of unknown origin in the true values of the point.

The parabolic ephemeris fits the data better than the linear ephemeris and implies an increasing period of approximately 0.385 $\pm$ 0.034 day per million years or 0.747 + 0.066 cycle per million years.

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References

Miller, W. J., and Wachman, A. 1958, *Spec. Astron. Vaticana Richerche Astronomiche,* **6**, 86.

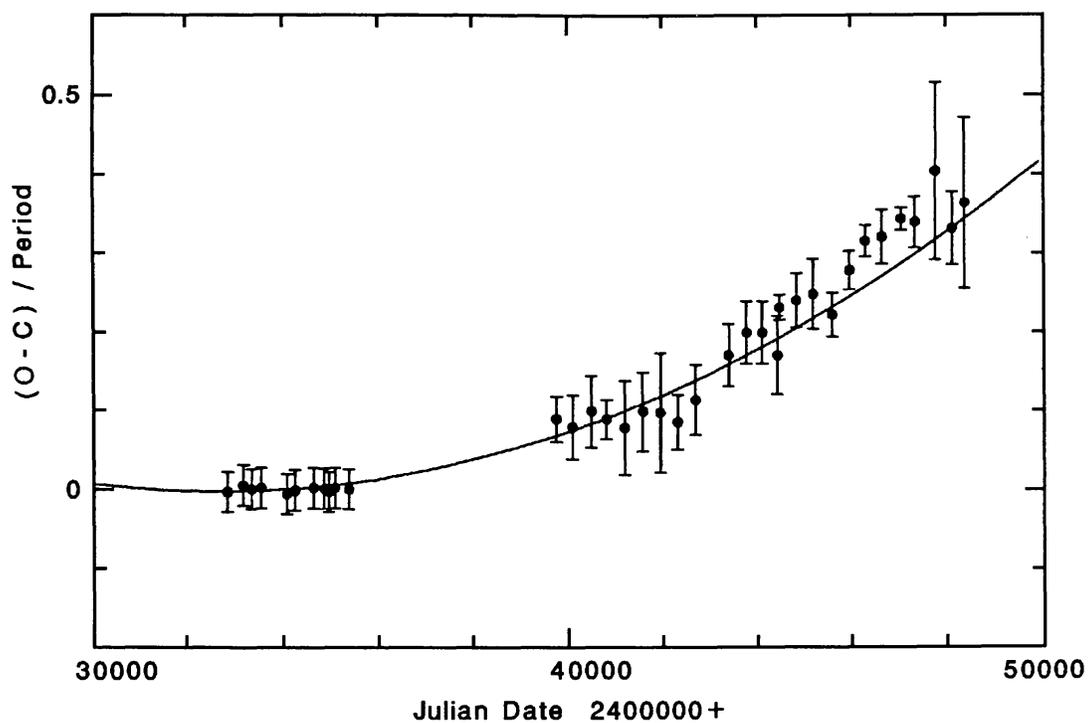Yarlott, M. 1981, *J. Amer. Assoc. Var. Stars Obs.,* **10**, 9.

Figure 1. O-C diagram of V801 Cyg for data through 1991. The solid line gives the parabolic ephemeris as calculated by Yarlott (1981) using the O-C values before 1981.
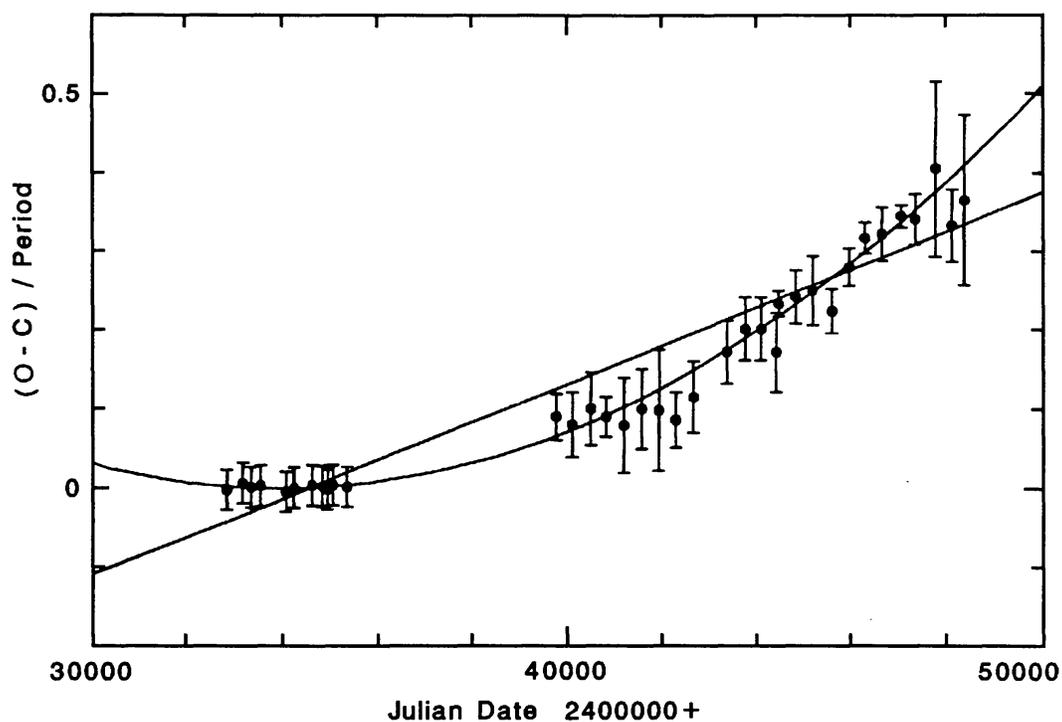

Figure 2. O-C diagram for all data, showing both the parabolic and linear ephemerides as calculated from all O-C values.