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VW CEPHEI TIMES OF MINIMA FROM VISUAL OBSERVATIONS

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Abstract

268 visual observations of the eclipsing binary VW Cephei were made during the period 28 March 1999–2 February 2001. These data were used to find 21 times of minimum for this system, obtained using artificial neural networks computer programs written by A. Gaspani. The O-C graph is made using the Eclipsing Binaries Minima Database of the Cracow Observatory. A new ephemeris is suggested:

$$JD_{minI} = 2445914.41317 + 0.27830721 \ E$$
$$\pm 0.01142 \pm 0.00000013$$

1. Introduction

VW Cephei (HIP 101750, BD +75°752, HD 197433, SAO 9828) is a W UMa-type eclipsing binary with an orbital period of 0.27831460 day (Kholopov *et al.* 1985) and magnitude range of 7.30–7.84 *V*. It consists of chromospherically-active components of spectral types G5V and G8V. The light curve of VW Cep is frequently asymmetric, and the orbital period varies due to the presence of a third body (Hensey 1975) and intrinsic physical processes in the eclipsing binary such as large starspots covering significant fractions of the stars' surfaces.

2. Observations

268 visual observations of VW Cep were made during the period 28 March 1999 -2 February 2001 by the author using 10 × 50 and 20 × 80 binoculars from Milano and Cicognola. The comparison stars used were HIP 101824 (7.1v, BD +76°809, HD 197665, SAO 9836) and HIP 100504 (7.8v, BD +75°739, HD 195191, SAO 9753).

3. Minima

Seventeen times of primary minimum and four times of secondary minimum were computed from the observational data using the Tintagel computer program (Gaspani 1995). Minima timings are listed in Table I, where *H. J. D.* is the Heliocentric

Julian Date of minimum, *Error* is the estimated standard deviation in the time of minimum, *Cycle No.* is the cycle number of minimum as calculated from the ephemeris published by Kholopov *et al.* (1985):

$$JD_{minI} = 2444157.4131 + 0.27831460 \; E, \tag{1}$$

O-C is the difference between the observed and the computed time of minimum. Thanks to the availability of the Eclipsing Binaries Minima Database of the Cracow Observatory (Kundera 2000) and *Information Bulletin on Variable Stars* No. 4117 (Aluigi *et al.* 1994), No. 4511 (Jay and Guinan 1997), and No. 4847 (Pribulla *et al.* 2000), it was possible to determine the graphical evolution of the *O-C* values from 1966 (Cycle 6313) through Cycle 27976.0. As shown in Figure 1, the period has changed since 1985 and a new ephemeris is necessary. A least squares linear regression applied to the trend of *O-C* values versus Cycle Number gives the equation for the following ephemeris:

$$JD_{minI} = 2445914.41317 + 0.27830721 \; E. \tag{2}$$
$$\pm 0.01142 \quad \pm 0.00000013$$

4. Acknowledgements

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Table 1. VW Cep times of minima obtained by the author.

| H. J. D. 2400000 +	Error [day]	Cycle No. [days]	O-C
51266.3996	0.0007	25543.5	-0.1425
51273.3507	0.0006	25568.5	-0.1493
51334.4590	0.0023	25788.0	-0.1310
51361.4308	0.0018	25885.0	-0.1558
51446.3382	0.0017	26190.0	-0.1342
51448.2806	0.0007	26197.0	-0.1400
51453.2858	0.0012	26215.0	-0.1446
51483.3440	0.0016	26323.0	-0.1400
51490.2999	0.0019	26348.0	-0.1462
51495.3138	0.0025	26366.0	-0.1421
51518.4155	0.0019	26449.0	-0.1405
51519.2530	0.0021	26452.0	-0.1379
51519.3885	0.0115	26452.5	-0.1415
51551.2569	0.0034	26567.0	-0.1401
51594.2542	0.0010	26721.5	-0.1425
51655.3487	0.0012	26941.0	-0.1380
51722.4208	0.0016	27182.0	-0.1398
51732.4381	0.0009	27218.0	-0.1418
51879.3749	0.0003	27746.0	-0.1551
51895.2402	0.0014	27803.0	-0.1537
51943.3779	0.0008	27976.0	-0.1644
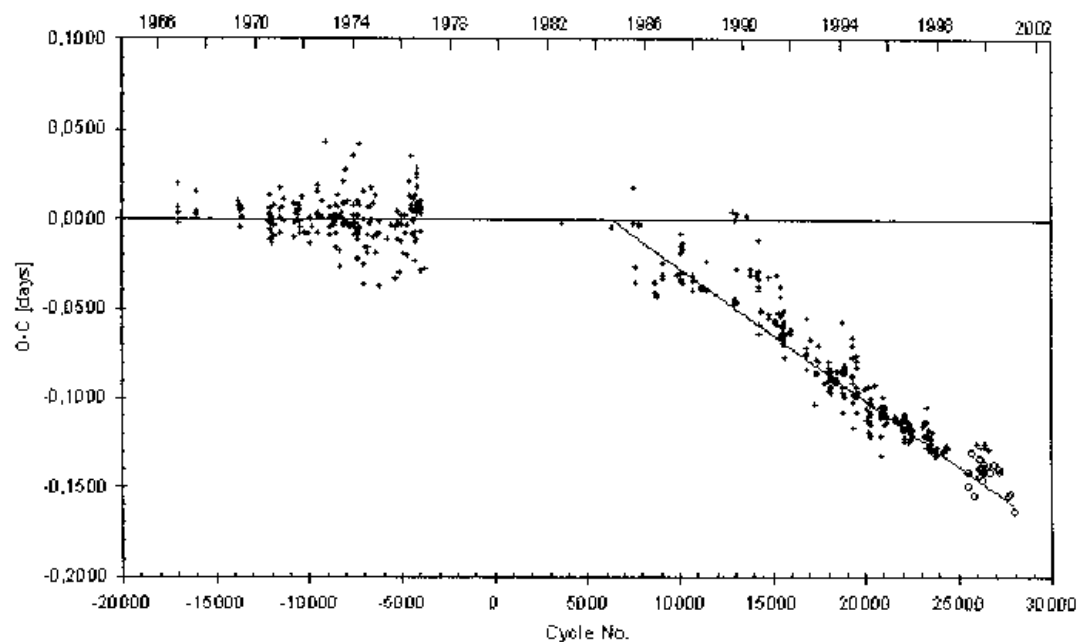
Figure 1. O-C values of VW Cep. Open circles are from the author; all other data were calculated from times of minimum in the Cracow Observatory Eclipsing Binaries Minima Database.