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# GG Vel: MORE TIMES OF MINIMA AND A PERIOD STUDY

MIGUEL ANGEL CERRUTI

IAFE, CC 67 - Suc 28, 1428 Buenos Aires, Argentina, e-mail: miguelan@iafe.uba.ar

We present new photoelectric (hereafter pe) determinations of minima of the detached binary GG Vel = GSC 7690:2681 = HD 79459, V $\simeq 8\overset{m}{.}5$, Sp. T. = A0V. Other available minima are photographic (Strohmeier and Patterson 1967); these elements were also listed by Strohmeier and Knigge (1969). The first pe elements were given by Cerruti (1981). With these minima, covering approximately 4000 cycles, a study of the period showed that it is double that found previously. As shown in IBVS 2052 and later confirmed by the light curves, the system is composed of stars of nearly the same temperature which produces the approximately equal depths of primary and secondary minima.

The observations reported here were made in 1983 and 1997. The first were performed at Cerro Tololo Interamerican Observatory[1] in Chile with the Lowell telescope, refrigerated phototube EMI 2070, UBV standard filters and associated single-channel photon counting techniques. The 1997 data were obtained at the Sutherland site of the South African Astronomical Observatory (SAAO) using the 0.5m telescope and single-channel photometer. The latter employs a cooled Hamamatsu R943-02 GaAs photomultiplier and standard UBV(RI)$_C$ filters. The comparison star was GSC 7690:0284 = HD 79415(A0V) that is ten arcminutes from the variable and the check star was GSC 7690:0911 = HD 80055(A0V).

The resulting times of minimum light were determined by the polynomial line method (Guarnieri et al. 1975, Ghedini 1982) and are the last entries in Table 1 (JD 244 5435, 245 0501 and 0504). Also included in this table are the photographically determined times of minima and the earlier pe minima, calculated with the new period. The dispersion for each minimum is in brackets following the minimum itself; for the photographic minima, this was estimated from a linear solution with equal weights, taking the residuals of the respective points. The Table also contains the associated cycle number, E, and in the final column the corresponding residual, O−C.

We made a least squares weighted linear solution taking into account all available minima to derive an improved ephemeris and a possible period variation.

The linear solution is:

$$\begin{aligned} \text{Min I} = \text{HJD } 2443973.5778 &+ 2\overset{d}{.}9504549 \times E \\ \pm\, 0\overset{d}{.}0019 &\pm 0\overset{d}{.}0000019 \text{ m.e.} \end{aligned} \qquad (1)$$

[1] Operated by AURA Inc. under cooperative agreement with the NSF.

Table 1: Times of minima and residuals for GG Vel

| Ref. | Min. | Band | HJD (sigma) 2400000+ | E | O−C |
|---|---|---|---|---|---|
| 1 | I | pg. | 38379.5420(0.0100) | −1896.0 | 0.0268 |
| 1 | I | pg. | 38382.5450(0.0400) | −1895.0 | 0.0793 |
| 1 | I | pg. | 38385.5430(0.0900) | −1894.0 | 0.1269 |
| 1 | I | pg. | 38441.3990(0.1100) | −1875.0 | −0.0758 |
| 1 | II | pg. | 38490.2720(0.0800) | −1858.5 | 0.1147 |
| 1 | II | pg. | 38841.2920(0.0100) | −1739.5 | 0.0306 |
| 1 | II | pg. | 38844.2930(0.0400) | −1738.5 | 0.0811 |
| 1 | I | pg. | 38869.2330(0.1000) | −1730.0 | −0.0577 |
| 1 | I | pg. | 38872.2270(0.0500) | −1729.0 | −0.0142 |
| 1 | II | pg. | 39118.5430(0.1000) | −1645.5 | −0.0612 |
| 1 | II | pg. | 39198.3130(0.0100) | −1618.5 | 0.0466 |
| 1 | II | pg. | 39201.3110(0.0600) | −1617.5 | 0.0941 |
| 1 | I | pg. | 39232.2370(0.0100) | −1607.0 | 0.0403 |
| 1 | I | pg. | 39235.2300(0.0500) | −1606.0 | 0.0829 |
| 1 | II | pg. | 39862.1010(0.0600) | −1393.5 | −0.0178 |
| 1 | I | pg. | 39907.9640(0.0800) | −1378.0 | 0.1131 |
| 2 | I | U | 43899.8161(0.0012) | −25.0 | −0.0003 |
| 2 | I | B | 43899.8180(0.0006) | −25.0 | 0.0016 |
| 2 | I | V | 43899.8150(0.0013) | −25.0 | −0.0014 |
| 2 | I | U | 43902.7623(0.0008) | −24.0 | −0.0046 |
| 2 | I | B | 43902.7610(0.0013) | −24.0 | −0.0059 |
| 2 | I | V | 43902.7628(0.0006) | −24.0 | −0.0041 |
| 2 | I | U | 43908.6744(0.0011) | −22.0 | 0.0066 |
| 2 | I | B | 43908.6721(0.0017) | −22.0 | 0.0043 |
| 2 | I | V | 43908.6737(0.0010) | −22.0 | 0.0059 |
| 2 | I | U | 43973.5725(0.0007) | 0.0 | −0.0053 |
| 2 | I | B | 43973.5706(0.0011) | 0.0 | −0.0072 |
| 2 | I | V | 43973.5714(0.0012) | 0.0 | −0.0064 |
| 2 | I | U | 44306.9778(0.0009) | 113.0 | −0.0014 |
| 2 | I | B | 44306.9798(0.0007) | 113.0 | 0.0006 |
| 2 | I | V | 44306.9765(0.0008) | 113.0 | −0.0027 |
| 3 | II | U | 45435.5147(0.0022) | 495.5 | −0.0135 |
| 3 | II | B | 45435.5145(0.0012) | 495.5 | −0.0137 |
| 3 | II | V | 45435.5151(0.0030) | 495.5 | −0.0131 |
| 4 | II | B | 50501.4748(0.0018) | 2212.5 | 0.0154 |
| 4 | II | V | 50501.4730(0.0020) | 2212.5 | 0.0136 |
| 4 | II | R | 50501.4739(0.0023) | 2212.5 | 0.0145 |
| 4 | II | I | 50501.4753(0.0032) | 2212.5 | 0.0159 |
| 4 | II | B | 50504.4085(0.0017) | 2213.5 | −0.0013 |
| 4 | II | V | 50504.4071(0.0015) | 2213.5 | −0.0027 |
| 4 | II | R | 50504.4086(0.0010) | 2213.5 | −0.0012 |
| 4 | II | I | 50504.4104(0.0020) | 2213.5 | 0.0030 |

References: 1) Strohmeier and Patterson;
2) Cerruti; 3) 1983 minimum; 4) 1997 minima.

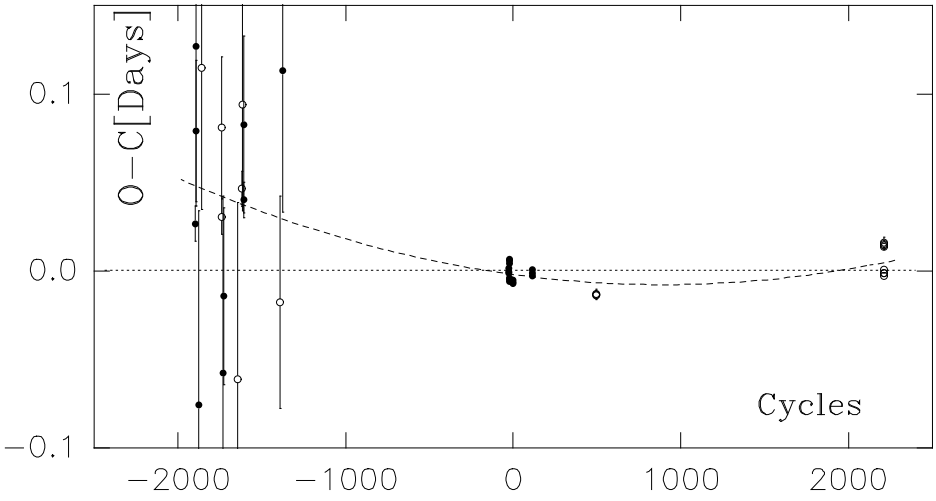


**Figure 1.** Behavior of the O−C residuals for GG Vel from Formula (1). Hollow circles stand for primary minima.

We conclude that the period has not changed significantly over the 4000 revolutions (cycles) covered by the available observations. The behaviour of the O−C residuals is depicted in Figure 1.

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