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A POSSIBLE PERIODIC TERM IN THE PERIOD OF THE ECLIPSING BINARY V701 Sco

MAYER, PAVEL; WOLF, MAREK

Astronomical Institute, Charles University Prague, V Holešovičkách 2, 180 00 Praha 8, Czech Republic, e-mail: mayer@mbox.cesnet.cz

The early-type (B1) eclipsing binary V701 Scorpii (also HD 317 844, HIP 85985, CD −32 12924), due to its membership in the open cluster NGC 6383, was studied several times: spectroscopically by Andersen et al. (1980) and photometrically e.g. by Bell & Malcolm (1987). Its period is apparently variable, as found already by Andersen et al. (1980). These authors invoked large mass transfer to explain the variability; however, Bell & Malcolm (1987) did not confirm any large period change and noted that there is some evidence of small-scale period changes only.

One of us (MW) recently measured a part of a minimum using the 0.84-m telescope at San Pedro Mártir Observatory (Baja California, Mexico). Only the rising part of the minimum was catched, nevertheless the time of the minimum can be estimated when the data are compared with measurements by Bell & Malcolm (1987) or Lorenz et al. (1991). In Table 1, all available times of minimum light are collected; in agreement with previous studies, the minimum time published by Bruton & Chambliss (1985) is not considered. In the column $O - C_1$ the values calculated using the ephemeris by Bell & Malcolm are given:

$$\text{Pri.Min.} = \text{HJD } 2446199.5059 + 0\overset{\text{d}}{.}76187645 \cdot E,$$

and in the column $O - C_2$ are values according to a somewhat arbitrary ephemeris

$$\text{Pri.Min.} = \text{HJD } 2446199.4850 + 0\overset{\text{d}}{.}7618728 \cdot E.$$

The $O-C_2$ values are displayed in Fig. 1. It can be observed that there might be a periodic term in $O - C$ values, and a sine curve is also shown. Its semiamplitude is $0\overset{\text{d}}{.}028$, period 67 years, phase zero at JD 2442390; these values are however constrained only weakly. In case the periodic change is due to a third body, the mass function is 0.0256 $M_\odot$ and the minimum third body mass is 2.2 $M_\odot$ (a better fit would be obtained assuming nonzero eccentricity of the third body orbit). If the periodic behaviour is confirmed, no assumption of mass exchange is necessary.

Table 1: Times of minima of V701 Sco

HJD−2400000	Error [days]	Epoch	$O-C_1$ [days]	$O-C_2$ [days]	Source
27943.5114	0.010	−23962	0.0890	0.0224	1
28545.3648	0.012	−23172	0.0600	−0.0037	1
39330.0455	–	−9016.5	−0.0014	−0.0134	2
39331.9516	–	−9014	0.0000	−0.0120	2
39341.8572	–	−9001	0.0012	−0.0107	2
43574.8358	0.0002	−3445	−0.0057	0.0026	3
46199.5059	0.0003	0	0.0000	0.0209	4
46201.4110	0.0005	2.5	0.0004	0.0213	4
46569.3960	0.0003	485.5	−0.0009	0.0218	4
46598.3489	0.0003	523.5	−0.0007	0.0235	4
48070.6727	0.0002	2456	−0.0018	0.0281	5
48071.8152	0.0002	2457.5	−0.0021	0.0278	5
48072.5777	0.0002	2458.5	−0.0015	0.0284	5
48704.1699	0.0011	3287.5	−0.0048	0.0281	6
48704.5510	0.0018	3288	−0.0047	0.0282	6
52385.9046	0.0035	8120	−0.0381	0.0125	7

Source 1: from the data by Plaut (1948) two groups were formed and their mean values are listed, 2: Leung (1974), 3: Andersen et al. (1980), 4: Bell & Malcolm (1987), 5: Lorenz et al. (1991), 6: HIPPARCOS; ESA (1997); a time is given in the Hipparcos Catalogue, here we give times calculated from two minima covered by HIPPARCOS photometry, 7: this paper.

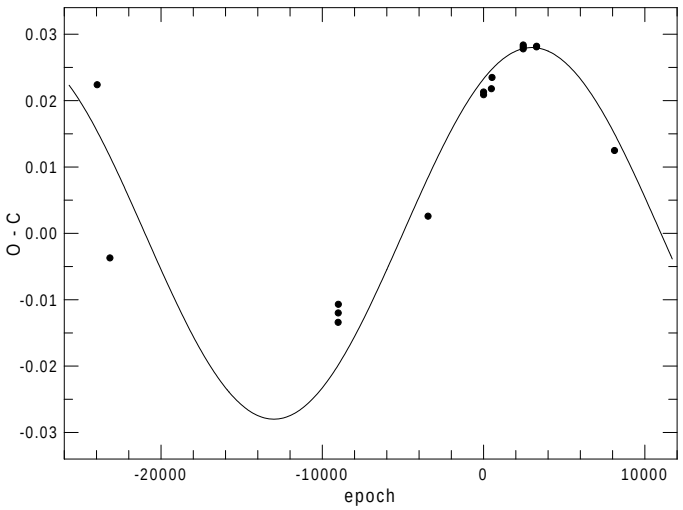

Figure 1. $O-C$ graph of V701 Sco.

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