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Photometric orbit of the triple system DI Pegasi

The Algol-type eclipsing binary DI Peg is a relatively well observed system. Rucinski (1967) was the first who pointed out that the light curve solution of this close binary needs a relatively large amount of third light (24 % of total luminosity), therefore DI Peg belongs to a triple system. Recently, Lu (1992) presented detailed spectroscopic and photometric analysis of the system and confirmed the existence of the third body from cross-correlation spectra. He also noted that light time effect may be present in the *O-C* diagram.

The aim of the present study was to estimate the parameters of the absolute orbit of the close pair around the centre of mass of the triple system from the *O-C* diagram. Only the times of minima obtained from photoelectric photometry were used (for the list of references, see Lu (1992)). The ephemeris derived by Lu (1992) was adopted:

$$\text{Min I HJD} = 24\ 25918.3597 + 0^{d}.71181663\ E \qquad (1)$$

A Keplerian orbit was assumed for the wide system. The orbital equations were fitted to the *O-C* diagram (see e.g. Mayer, 1990) with the method of least squares. Note that the dynamical perturbation discussed by Mayer (1990) is negligible in this case because of the long third-body period. The results of the orbital

solution are summarized in Table I. The given parameters are the projected semi-major axis, the eccentricity, the longitude of the periastron, the time of periastron passage, the orbital period and the mass function, respectively.

Table I

Orbital elements of the triple system DI Peg

$a \sin i$ (10^6 km)	115	± 31
e	0.66	± 0.2
ω (rad)	2.5	± 0.4
τ (JD)	2440612	± 400
P_{orb} (days)	8070	± 500
$f(m_2)$ ($M_\odot$)	0.001	± 0.001

Fig.1. shows the *O-C* diagram with the fitted curve (top panel) and the calculated orbital radial velocities of the close pair around the common centre (bottom panel).

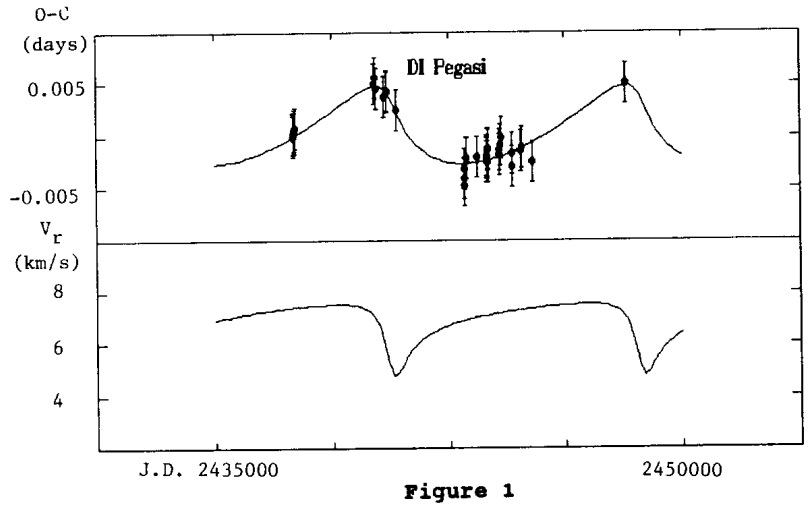

Figure 1

O-C diagram and the fitted orbital curve

Since the 3rd star is roughly as luminous as the components of the close pair, the mass of the visual companion must be close to 1 $M_\odot$ if it is a main-sequence star (the masses in the eclipsing pair are 1.2 and 0.7 $M_\odot$, (Lu,1992)). This means that the inclination of the wide orbit should be 12° ± 2°, which gives about 10 AU as the absolute value of the semi-major axis of the relative orbit of the close pair and the 3rd body.

The orbital parameters derived here are quite uncertain, because of the shortness of the observed time interval. Further observations may lead to more precise and complete analysis of this system.

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