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A NOTE ON THE REVISED PHOTOMETRIC ELEMENTS OF THE R CMa SYSTEMS

In a recent paper by Cester et al. (1979), the light curves of several R CMa systems have been analyzed in order to obtain homogeneous photometric elements using Wood's computer model,WINK. As a result of this important rediscussion, it has been shown that these systems could well be considered normal semi-detached ones, with only S Vel retaining anomalous properties. Therefore, as expected since some years ago by some authors (e.g. Sahade,1963), there exists no evidence left supporting the reality of a homogeneous group of R CMa stars.

The anomalies of S Vel, moreover, are based on very doubtful spectroscopic elements (as Cester already pointed) and we have attempted a different approach to the absolute parameters of this particular system.

In our analysis, preliminary values of the unperturbed elements r_h, k and i were determined together with the limb darkening coefficients of the hotter component through a frequency-domain analysis of the primary minimum of the light curve from Sisteró (1971) following the method of Kopal. Taking the temperatures from the scale given by Johnson (1966) and using the computer model of D.B. Wood (1972), the photometric elements of S Vel were determined from the mean of the V and B solutions independently obtained. U filter was not included because of the known existence of ultraviolet excess and the stronger distortion of the light curve. The comparison of the secondary size with the corresponding Roche lobe allowed us to estimate the value of the mass ratio, q, by trial and error using the tables of Tsesevich (1973) in 0.14 ± 0.01.

Table I, gives the determined photometric elements for the system S Vel. Symbols and units are equal to those used by Cester et al.

Table I

i	86.55 ± 0.12
r_h	0.080 ± 0.001
a_c	0.278 ± 0.002
b_c	0.226 ± 0.002
c_c	0.207 ± 0.002
T_h(eq.)	8260 (assumed)
T_h(pol.)	8262
T_c(eq.)	4160
T_c(pol.)	4228
L_h(V)	0.722
L_h(B)	0.860

Now, for the determination of the absolute elements, instead of assuming that the radial velocity curve is an exact representation of the orbital velocities of the components, we suppose that the hotter star is actually in the main sequence.This hypothesis is quite fair if we have assumed a value of T_h in our analysis from a calibration for main-sequence stars. Moreover, it is strongly supported not only by the fact of the observed spectral type (A5V) but also by the measurements in Hβ photometry by Sisteró (1971). The value of β for the primary component is in fact of 2.898, which is in very good agreement with the expected absolute magnitude in the calibration of Crawford (1973). On the other hand, the luminosity determined by Cester for the hotter star does not coincide with the observed value of β.

Then, if we take bolometric corrections and M_b is equal to $2^m.1 \pm 0.1$, using the mass-luminosity relation by McCluskey and Kondo (1972), we have that m_h= 1.9 solar massses and thence m_c=0.27. The mass function deduced from these values is of 0.0041 solar masses which implies a K_1 of 19 km/sec, well within the probable errors of the observed radial velocity curve.

The combination of the above mentioned parameters with equations 4-6 in Cester's paper, results in the absolute elements collected in Table II.

Table II

	h	c
Mass	1.9	0.27
Radius	1.4	4.2
Luminosity	8.5	4.8

Conclusion

The position of S Vel in the mass-luminosity and mass-radius planes as well as in the HR diagram (see figures 1,2 and 3 of Cester's paper) is consistent with the theory of semi-detached binaries and with the revised photometric elements of the so-called group of R CMa systems. It is deduced from the present note that anomalous properties of S Vel are not strongly supported by observations and that peculiarities indicating the existence of a homogeneous R CMa group of stars can be definitely ruled out, although further spectroscopic observations are highly desirable.

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