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THE LIGHT CURVE AND ELEMENTS FOR EM CEPHEI

The variable star EM Cephei was observed at Bucharest Observatory with the 50-cm telescope in 1979 and 1980. The photometer was equipped with an unrefrigerated EMI-6256B photomultiplier and the standard UBV filters. The star BD $+62^{\circ}1994$ has been used as comparison star. About 478 individual observations in each colour have been obtained and with them 45 normal points have been derived. The mean light curve in B colour is represented in Figure 1, together with the r.m.s. error of each normal point. The phase has been computed with the elements:

$$\text{Phase} = (\text{J.D.hel.} - 2440134.7374)/0^{d}.8061876$$

Filter B

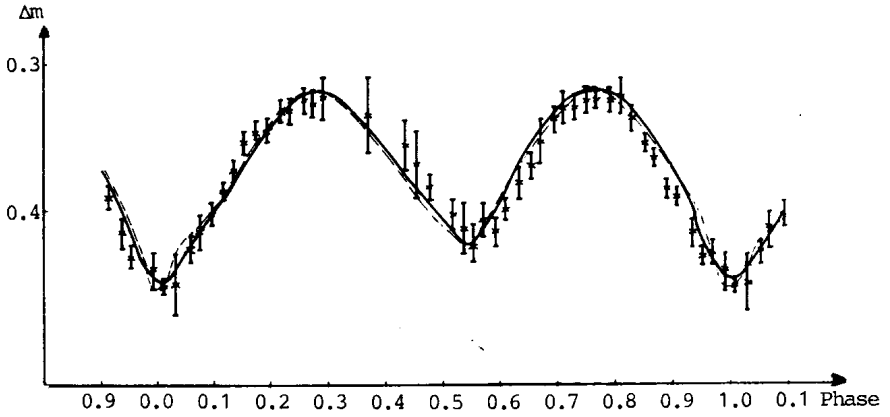

Figure 1

given in SAC No. 52 (1980), the whole light curve has been shifted by adding 0.015 to the phase. The large r.m.s. errors are due to the scatter in the light curve, mentioned also by other authors (see Breinhorst and Karimie 1980). An important jump was present sometimes at phases 0.25 - 0.35.

Assuming that EM Cephei is a binary system, we tried to determine its elements. The approximate solution resulted from a Horak-type model. Afterwards the improved solution has been obtained with the WINK-model by Wood (1972). Several variants of solutions have been tried: the imprecision of the light curve does not allow the simultaneous variation of all elements. Therefore, first the radii r, inclination i, temperature of the cooler star T_c and the ellipticity of the orbit (e and ω) have been allowed to vary, the other elements being kept constant. For example, the temperature of the hotter star T_h and the limb darkening coefficients u_h, u_c, have been chosen according to the spectral class B1 IV of the star EM Cephei, for the other constants as, for example, the mass ratio q, the reflectivity coefficients w etc., several assumptions have been made.

Table I

	Model 1	Model 2		Model 1	Model 2
	Variable parameters			Auxiliary parameters	
r_h	0.5266	0.3908	a_h	0.5843	0.4219
r_c	0.1183	0.1099	b_h	0.5266	0.3869
i	$59^{\circ}.743$	$67^{\circ}.181$	c_h	0.4689	0.3636
T_c(eq)	13994°K	12092°K	a_c	0.1188	0.1101
e	0.087	0.087	b_c	0.1182	0.1098
ω	$10^{\circ}.361$	$10^{\circ}.361$	c_c	0.1180	0.1097
	Fixed parameters		L_h(norm)	0.9826	0.9839
T_h(eq)	23800°K	23800°K	L_c(norm)	0.0174	0.0161
u_h	0.31	0.31	L_h(ap)	0.7869	0.4332
u_c	0.60	0.60	L_c(ap)	0.0139	0.0071
w_h	0	0	r.m.s.error		
w_c	2.0	1.0		0.00899	0.01009
q	0.5	1.0			

Then the obtained value for the ellipticity was fixed, and a new solution has been obtained by changing the mass ratio q and the reflectivity coefficient w_c. In Table I two selected solutions, with the smallest r.m.s. error are given. The theoretical light curves obtained with these elements are also represented in Fig.1 (Model 1 - full line, Model 2 - dotted line). One can see that both theoretical models are situated in the error limit of observations.

The complete solutions including the filters V and U will be given elsewhere.

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