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RADIUS VARIATION OF TEN CLASSICAL CEPHEIDS

In a recent paper by Caccin et al. (1980) a method has been presented which, under essentially the same physical assumptions than the Baade-Wesselink one (Wesselink, 1946), allows a more accurate and unique determination of the mean radius of classical cepheids, through a global treatment of light, colour and velocity curves. We have used this method to determine the radii of ten well observed cepheids of various period. For the light and colour curves we have used the V and B-V data from the Tonantzintla Catalogue by Mitchell et al. (1964), whereas for the radial velocity u we used data from different authors (see note).

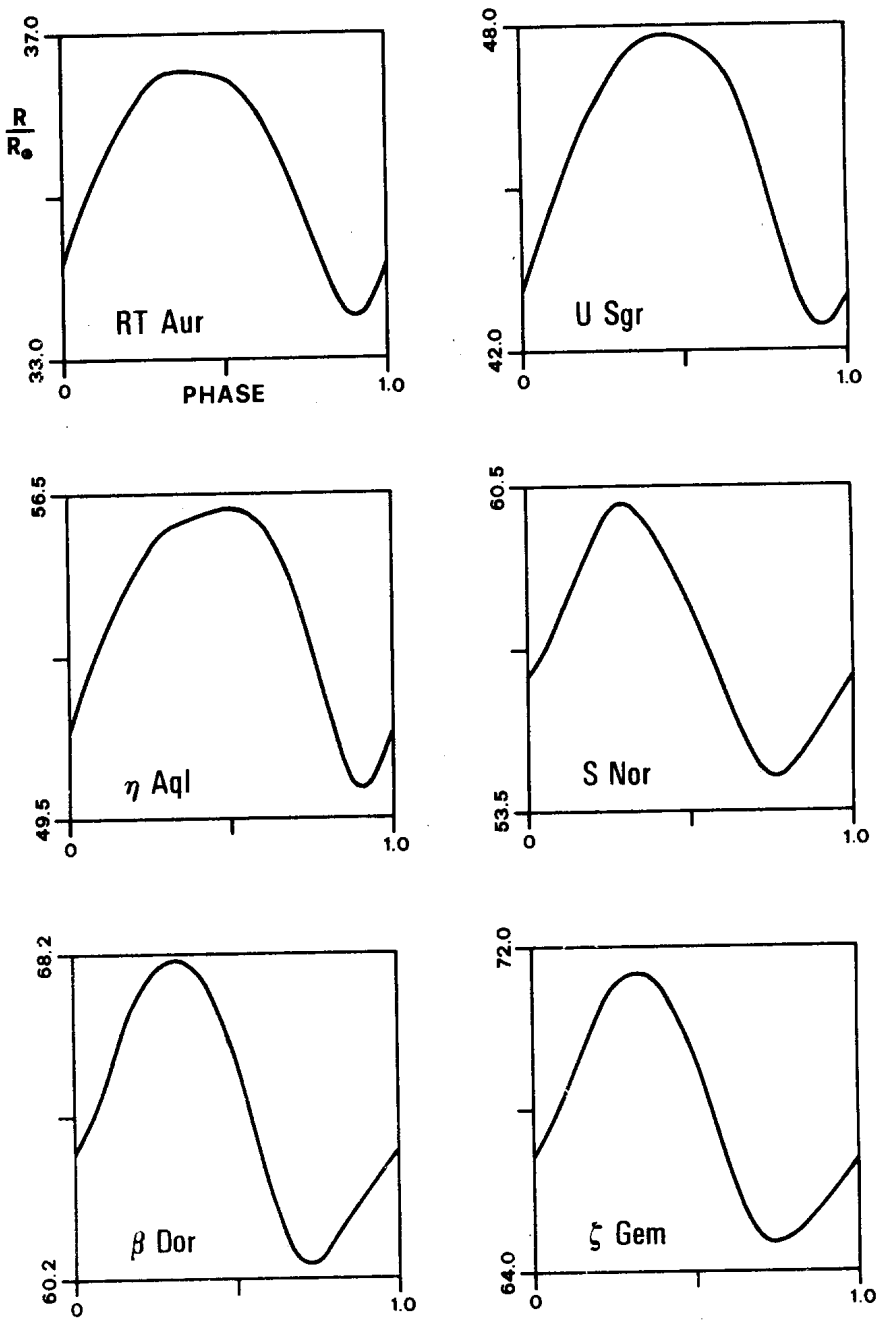
Following the procedure described by Caccin et al., Fourier series have been fitted to these data, and the radius R_o at the phase ϕ_o of minimum radial velocity has come out from numerical solution of the equation

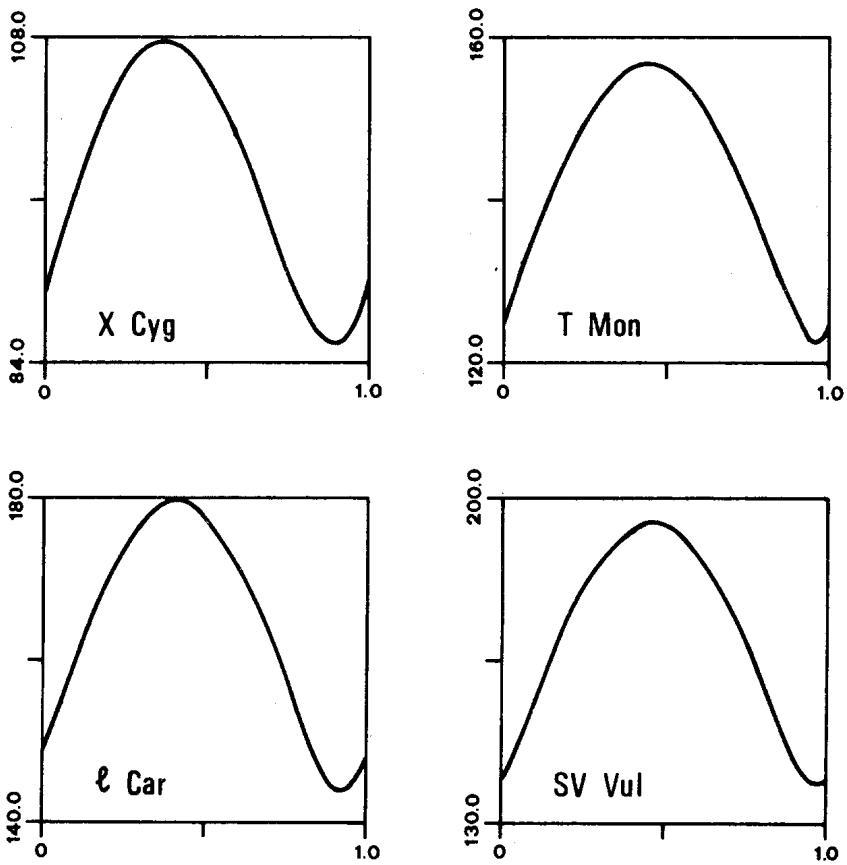
$$2.1715 \cdot \int_0^1 \left\{ \log_{10} \{R_o - KP \int_{\phi_o}^{\phi} u(\phi')d\phi'\} \frac{d(B-V)}{d\phi} \right\} d\phi - \int_0^1 \frac{dV(\phi)}{d\phi} (B-V) d\phi = 0$$

using the value K = 1.31 (Parsons, 1972) for the conversion factor from radial to pulsational velocity. The mean radius <R> then comes out from numerical integration of the radial velocity curve:

$$\langle R \rangle = - KP \int_0^1 u(\phi) d\phi$$

We have also computed the slope "b" of the relation surface brightness vs. colour index. In Table I we give, for each star, the ephemeris used for reducing the observations (P, T_o); the mean radius <R>; the order N1, N2, N3 of the Fourier series for light, colour and velocity curves, respectively; the area B of the loop (V,B-V) and the coefficient b defined


37.0
R/R⊙
33.0
RT Aur
0
PHASE
1.0
48.0
42.0
U Sgr
0
1.0
56.5
49.5
η Aql
0
1.0
60.5
53.5
S Nor
0
1.0
68.2
60.2
β Dor
0
1.0
72.0
64.0
ζ Gem
0
1.0



above. In Figure 1 we present, for each star, the function $R(\phi)$.

The radius determination presented here have been used in the paper by Caccin et al.(1980) to determine a new period-radius relation, whose slope seems in agreement with theoretical computations by Cogan (1978).

Table I

Name	TO	Period	<R>	N1	N2	N3	B	b
RT Aur	20957.466	3.728261	36.2	3	4	4	0.047	2.113
U Sgr	36761.956	6.744925	45.7	5	5	3	0.057	2.283
Eta Aql	33292.674	7.176641	53.3	4	4	4	0.067	2.106
S Nor	36849.51	9.75494	56.5	5	5	3	0.048	1.858
Beta Dor	26013.93	9.844235	63.9	5	5	7	0.051	2.040
Zeta Gem	33442.665	10.153507	67.6	6	6	6	0.036	2.050
X Cyg	32573.990	16.3861	97.0	4	4	7	0.159	1.874
T Mon	28193.08	27.018	146.8	5	7	7	0.174	2.221
l Car	35619.7	35.5412	163.2	5	5	3	0.124	2.121
SV Vul	29020.87	45.145	170.0	4	4	3	0.262	1.949

Note: the sources of radial velocity.

RT Aur - Bappu, M.K.W. and Raghavan, N.: 1969, M.N.R.astr.Soc.142,245.

U Sgr - Jacobsen, T.S.: 1970, Ap.J. 159,569.

η Aql - Schwarzschild, M., Schwarzschild, B. and Adams, W.S.: 1948, Ap.J.,108,207

S Nor - Breger, M.: 1970, A.J., 75,239.

β Dor - Parsons, S.B.: 1970, A.J., 76,562.

ζ Gem - Scarfe, C.D.: 1976, Ap.J., 209,141.

X Cyg - Becker, W. and Strohmeier, W.: 1942, Zeit.Astr.,21,295.

T Mon - Sanford, R.F.: 1956, Ap.J., 123,201.

l Car - Dawe, J.A.: 1969, M.N.R. astr.Soc.145,377.

SV Vul - Sanford, R.F.: 1956, Ap.J. 123,201.

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I-80131 Napoli - Italy

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Cogan,B.C.: 1978, Ap.J. 221,635

Mitchell,R.I., Iriarte,B., Steinmetz,D. and Johnson, H.L.: 1964, Bol. Obs. Tonantzintla Tacubaya, 3,153

Parsons S.B.: 1972, Ap.J. 1974,57

Wesselink, A.J.: 1946, Bull. Astr.Inst.Netherl. 10,468