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ON THE PERIOD LUMINOSITY RELATION OF MIRA TYPE VARIABLES

M.L.CLAYTON and M.W.FEAST (1969), by means of statistical parallaxes, have derived visual absolute magnitudes for Mira type variables of spectral class M, both for mean maxima M_m, and for mean light intensity M_l. In spite of a considerable scattering of the group values, a smooth slope of intrinsic brightness is indicated for periods longer than 150 days.

Now, the present author has found that hyperbolic interpolation fits the results just mentioned very well. For the visual absolute magnitudes of mean maxima the following formula may be used:

$$M_m = - \frac{200}{P - 100} - 0.32 , \qquad (1)$$

whilst the absolute magnitudes of mean light intensity are represented by another formula:

$$M_l = - \frac{680}{P - 15} + 2.75 . \qquad (2)$$

From the table given below it is evident that the approximation attained is in most cases quite satisfactory taking into account the great uncertainty resulting from the statistical parallaxes, especially in groups containing less than 20 stars. Formula (1) may be used safely within the whole range of periods between 160 and 500 days. Formula (2) holds equally well up to 400 days, but there remain some doubts as to its reliability beyond this limit.

The mean values of periods in the first columne of the present table differ slightly from those given by CLAYTON and FEAST, since they have been re-calculated in such a way that, if inserted into the above formulas, exactly the same values of $200/(P - 100)$, and $680/(P - 15)$ might result, as if the respective mean values over the individual stars of each group, or over all 35 stars with periods greater than 400 days, had been taken. But even in this latter case the alteration with respect to the direct arithmetical mean of the periods does not exceed -5 days.

Finally, it should be mentioned that twice the difference between formulas (2) and (1) represents something like a computed mean amplitude, i. e. mean minima minus mean maxima.

$$A_m = 2\,(M_l - M_m)\ . \qquad (3)$$

The computed mean amplitudes have a shallow minimum of $2^m.8$ at about P = 200 days.

Table

Comparison between the data of CLAYTON and FEAST, and the interpolation formulas (1) and (2). Computed values for the presumable limit of validity at P = 160 days are given in the first line. N = number of stars included in the original data. The data for P = 452 (in brackets) are weighted means of the preceding and following lines. Standard errors of original data always exceed $\pm 0^m.2$.

P	Mean Maxima				A_m	Mean Light Intensity			
days	Data	(1)	O - C	N		Data	(2)	O - C	N
160	...	$-3^m.66$	...	..	$3^m.4$	...	$-1^m.95$	...	..
174	-3.0	-3.02	+.02	22	3.0	...	...	...	..
175	...	...	...	..		-1.5	-1.50	.00	22
225	-1.8	-1.92	+.12	51	2.9	-0.5	-0.49	-.01	48
274	-1.6	-1.47	-.13	54	3.2	+0.2	+0.13	+.07	52
324	-1.3	-1.21	-.09	66	3.5	+0.5	+0.55	-.05	65
376	-0.85	-1.04	+.19	34	3.8	+0.9	+0.87	+.03	32
418	-1.0	-0.95	-.05	19	4.0	+0.4	+1.06	-.66	17
452	(-1.0)	-0.89	-.11	(35)	4.2	(+1.22)	+1.19	+.03	(33)
500	-1.0	-0.82	-.18	16	4.3	+2.1	+1.35	+.75	16

Literature:

M. L. CLAYTON and M. W. FEAST, Absolute Magnitudes of Mira Variables. Monthly Not. R. A. S. 146, 411-421 (1969).

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