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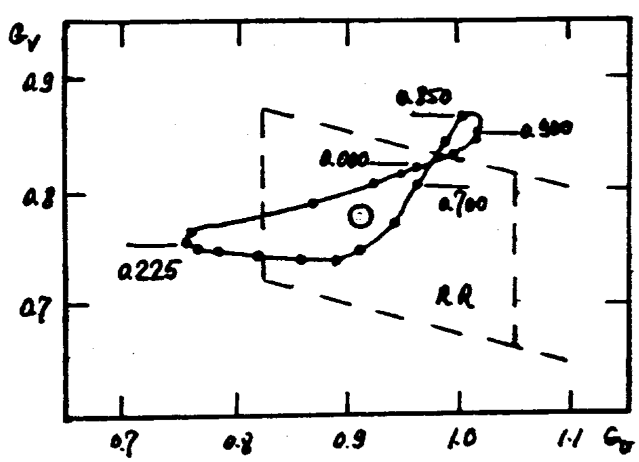
RADII VARIATIONS IN RZ LYRAE WITH THE BLASHKO-EFFECT

Light gradients $G_U$=dU/dB and $G_V$=dV/dB for RZ Lyrae have been determined for different phases of the Blashko-effect from observations obtained by Romanov in the system close to that of UBV (IBVS 205, 1967; AZ 612, 1971). The gradients obtained for nearly whole ascending and descending branches of the light curve of primary period proved to be similar though the instantaneous values of $G_U$ in the middle of the ascending branch may have great variations. Thus, each phase of the Blashko-effect ($\Psi$) has corresponding definite values of the gradients. Mean gradients for different phases $\Psi$ which have been selected in such a way as to allow for peculiarities of the light amplitude variations, $G_U$, $G_V$ and (B-V) are given in Table 1.

The position variation of RZ Lyrae with phase $\Psi$ in the two-gradients diagram is shown in Fig.1.




The mean position of RZ Lyrae calculated from all 527 observations is indicated by a circle at $G_U$=0.913±0.008 , $G_V$=0.784±0.006 and the correlation coefficients $r_B^U$=0.980±0.017, $r_B^V$=0.987±0.011.

Table 1

| $\psi$ | $G_U$ | $G_V$ | $(B-V)_{max}$ | $(B-V)_{min}$ | $\Delta B_T$ |
|---|---|---|---|---|---|
| 0.000 | 0.961 | 0.822 | $0^m.083$ | 0.512 | 1.774 |
| 0.020 | 0.950 | 0.815 | 0.080 | 0.510 | 1.786 |
| 0.050 | 0.925 | 0.810 | 0.081 | 0.500 | 1.754 |
| 0.100 | 0.872 | 0.790 | 0.110 | 0.492 | 1.594 |
| 0.200 | 0.760 | 0.765 | 0.175 | 0.485 | 1.227 |
| 0.225 | 0.755 | 0.757 | 0.185 | 0.482 | 1.177 |
| 0.250 | 0.767 | 0.750 | 0.200 | 0.480 | 1.106 |
| 0.300 | 0.785 | 0.748 | 0.205 | 0.475 | 1.080 |
| 0.350 | 0.820 | 0.745 | 0.195 | 0.472 | 1.117 |
| 0.400 | 0.860 | 0.740 | 0.185 | 0.470 | 1.141 |
| 0.450 | 0.890 | 0.740 | 0.180 | 0.467 | 1.165 |
| 0.500 | 0.910 | 0.750 | 0.175 | 0.470 | 1.190 |
| 0.600 | 0.940 | 0.775 | 0.165 | 0.482 | 1.258 |
| 0.700 | 0.960 | 0.810 | 0.150 | 0.500 | 1.394 |
| 0.800 | 0.985 | 0.845 | 0.130 | 0.510 | 1.535 |
| 0.850 | 1.000 | 0.868 | 0.115 | 0.520 | 1.640 |
| 0.900 | 1.012 | 0.850 | 0.105 | 0.525 | 1.713 |
| 0.910 | 1.015 | 0.848 | 0.100 | 0.525 | 1.740 |
| 0.950 | 0.995 | 0.837 | 0.090 | 0.520 | 1.766 |

Table 2

| $\psi$ | $(R_1/R_2)_U$ | $(R_1/R_2)_B$ | $(R_1/R_2)_V$ | $\psi$ | $(R_1/R_2)_U$ | $(R_1/R_2)_B$ | $(R_1/R_2)_V$ |
|---|---|---|---|---|---|---|---|
| 0.000 | 1.157 | 1.214 | 1.164 | 0.450 | 1.134 | 1.136 | 1.147 |
| .020 | 1.167 | 1.216 | 1.168 | .500 | 1.127 | 1.139 | 1.143 |
| .050 | 1.182 | 1.212 | 1.168 | .600 | 1.120 | 1.148 | 1.139 |
| .100 | 1.199 | 1.191 | 1.165 | .700 | 1.123 | 1.165 | 1.135 |
| .200 | 1.207 | 1.144 | 1.141 | .800 | 1.121 | 1.183 | 1.128 |
| .225 | 1.200 | 1.138 | 1.138 | .850 | 1.120 | 1.197 | 1.123 |
| .250 | 1.181 | 1.129 | 1.132 | .900 | 1.117 | 1.206 | 1.141 |
| .300 | 1.169 | 1.126 | 1.131 | .910 | 1.117 | 1.210 | 1.145 |
| .350 | 1.159 | 1.130 | 1.135 | .950 | 1.133 | 1.213 | 1.156 |
| .400 | 1.144 | 1.133 | 1.141 | | | | |

From considering the cepheid sequence in the gradient diagram by Kolesnik it was found (Astrom.Astrph.Nos 12,13, 1971.Kiev) that light gradients may be represented by the linear relationship

$$G_V = G_V^T / G_U^T \, \frac{(1 - P_2 G_U)}{P_1} \qquad (1)$$

where for condition of a general zero-point of all the straight lines

$$P_1 = 0.934 \; G_T^V / G_U^T$$

or for condition of parallel straight lines

$$P_2 / P_1 = 0.316 \; G_U^T / G_V^T$$

Here $G_U^T$ and $G_V^T$ are light gradients defined by the temperature variations in the star. $G_U^T = 0.912$ and $G_V^T = 0.815$ have been obtained for de C.Jager's atmosphere models with lg g=3. The conditions of general zero-point and parallel straight lines give similar results.

Therefore let us consider only the condition of a general zero-point. In this case the relationships for calculating the relative variations of effective UBV-radiation levels of the star may be represented by the expressions

$$a_U = G_U^T\ n_U\ B_T, \quad a_B = n_B\ B_T, \quad a_V = G_V^T\ n_V\ B_T, \qquad (2)$$

where

$$a_Q = 5 lg (R_1/R_2)_Q, \quad \Delta B_T = 6.75 \Delta \Theta, \quad \Theta = 5040/T_e$$

and

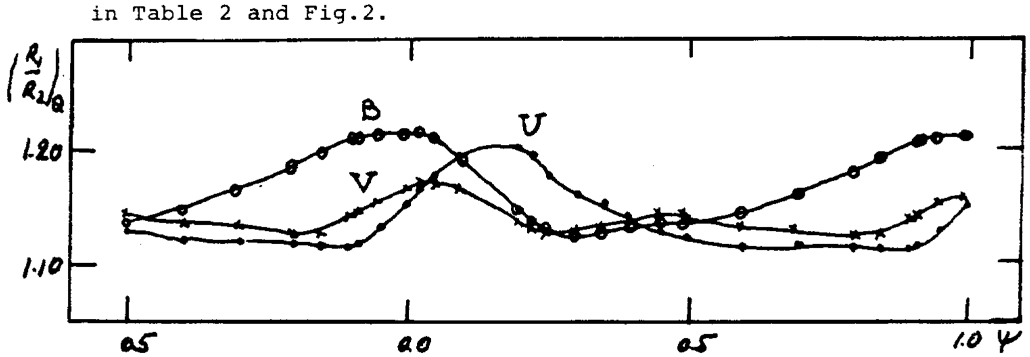
$$n_U = 1 - p_A\ G_U, \quad n_B = 1 - p_A\ G_U^T, \quad n_V = p_2\ G_U \qquad (3)$$

On the basis of known determinations of spectral types near to the light maximum (Alanija, Abastumani Bull.No.23,1958) and to our mean values of $(B-V)_{max}$ we must assume rather precisely for further calculations that (B-V) are not effected by interstellar absorption.

Then, using the Johnson calibration (Ann.Rev.Astr.Astrph. 4,193,1966) maximum(2) and minimum (1) of the light of a primary period, we could determine $T_e$ and calculate $\Delta B_T$ given in Table 1.

To determine $T_e$ in the light minimum we have taken (B-V) with the phase of the primary period $\varphi$=0.5.

The estimated results of radii relationships are given in Table 2 and Fig.2.



One can see that the relative radius amplitude for each range UBV is maximum near the maximum of the Blashko-effect with different phase shift. The minimum amplitude of radius variations is obtained in the V range.

A more detailed scope of information on the investigation will be published in "Astrometry and Astrophysics", No 18,Kiev, "Naukova Dumka", 1972.

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