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V 68 IN THE GLOBULAR CLUSTER M 3 (NGC 5272) IS A DOUBLE
MODE RR LYRAE TYPE STAR

We failed to confirm Szeidl's (1965) 10.9 day Blazhko effect period of V 68 in M 3 by our 437 observations based on Moscow collection of plates. These observations show sometimes the full variation of amplitude of the star from night to night. We have tested these observations on double mode pulsation using the theoretical suggestion by Christy (1966) that the beat period in this case is equal to four first overtone periods. This test gave positive result and only small correction was made to obtain the precise beat period $\Pi = 1.^d395426$. Final value of the fundamental period P_F was obtained from the formula:

$$\frac{1}{P_F} = \frac{1}{P_H} - \frac{1}{\Pi}$$

where $P_H = 0.^d3559732$ - the first overtone period derived by Szeidl (1965).

We represent our observations in Figure 1 like it was made by Stobie (1970) and Efremov and Kholopov (1975) for double mode cepheids VX Pup and V 367 Sct. The upper light curve in Figure 1 is constructed with elements by Szeidl the initial J.D. moment of which is corrected:

$$\text{Max. J.D. hel.} = 2425000.189 + 0.^d3559732 \cdot E$$

The deviations from mean light curve excluding several points are well represented by the following elements:

$$\text{Max. J.D. hel.} = 2435602.441 + 0.^d4778805 \cdot E$$

The middle light curve in Figure 1 is the "pure" curve for fundamental mode oscillation. The less dispersed "pure" first overtone light curve can be obtained by subtracting the mean deviation light curve from original observations. The lower light curve in Figure 1 represents our observations with elements by

Szeidl excluding fundamental mean periodic variation. Scattering of light curves shows that the oscillations are not additive in the observed light curve but suppress one another and have lower amplitudes in anti-phase.

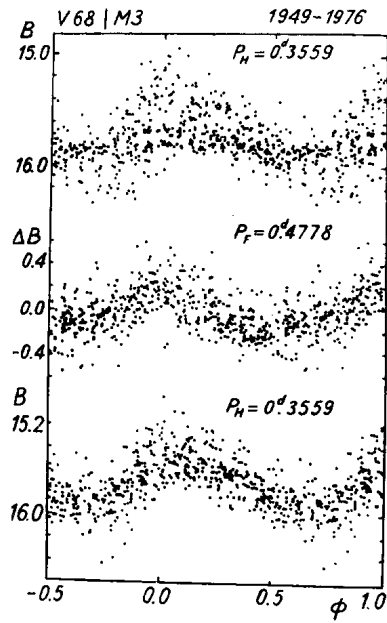


Figure 1

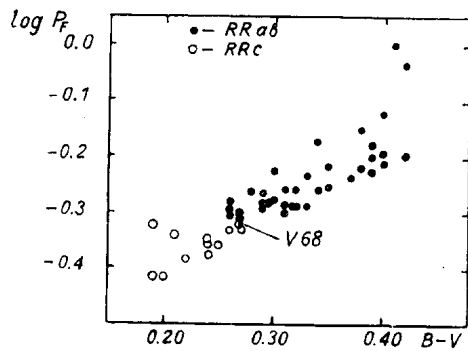


Figure 2

Amplitudes of oscillations are $0^m.42$ B in the fundamental and $0^m.45$ B in the first overtone.

To determine the location of the star in the instability strip we have used P,V observations by Roberts and Sandage (1955) and their relation with B,V magnitudes by Sandage (1959). The following colour indices were obtained: $P - V = 0.08$ and $B - V = 0.27$. This puts the star just on the boundary between fundamental and first overtone regions. The regions in M 3 occupied by variable stars oscillating in different modes do not overlap (Figure 2). The first overtone periods of RRc stars were transformed in Figure 2 to fundamental ones using the formula $P_F = 1.340 P_H$ to remove the gap between first overtone and fundamental pulsators in the diagram.

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References:

- Christy, R.F. 1966, *Ap.J.*, 144, 108.
Efremov, Yu.N., Kholopov, P.N. 1975, *Variable Stars*, 20, 133.
Roberts, M., Sandage, A. 1955, *A.J.*, 60, 185.
Sandage, A. 1959, *Ap.J.*, 129, 596.
Stobie, R.S. 1970, *Observatory*, 90, 20.
Szeidl, B. 1965, *Mitt. Sternw. ung. Akad. Wiss.*, Nr. 58, Budapest