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W VIRGINIS STARS WITH PROPERTIES OF RV TAURI STARS

In the present paper the notion of properties of RV Tauri stars includes first of all a typical feature of their light curves, i.e. the interchange of deep and shallow minima as well as the instability of light curves. Many investigators pointed to the light curve changes mainly as possible ones. Generally these changes referred to the form. The knowledge on the difference of the light curves between odd and even cycles, i.e. the alternation is much scantier. For the first time this phenomenon was detected by Arp (1955, 1957) for two out of four observed Cepheids of globular clusters with periods more than 17 days. Later on Vasiljanovskaja and Erleksova (1966, 1969) considered the question if it is possible to explain the photoelectric observational scatter of W Virginis stars in the galactic field by the alternation. We found that explanation to be acceptable for three stars. However, the scantness and the small interval of observations left certain doubt in the reality of the alternation and did not enable to clear up its character. Finally Stobie (1970) and Lloyd Evans (1970) demonstrated clearly that SZ Mon, a classical cepheid according to GCVS 1969, showed the alternation of the light curve. This alternation was expressed in the difference of minimum magnitudes about $0^m.1$ in V and the form in two halves of the double period. These authors classified SZ Mon as a unique Type II Cepheid, possessing properties of the RV Tauri stars. Publications on the W Virginis star alternation are confined to the above works, as far as I know.

Our study of SZ Mon showed that during the whole observing interval J.D. 2426710-43248 the light curve must be considered

with a double period. For all the 10 mean light curves the alternate minima differ by $\sim 0.15 m_{pg}$ in depth. The average amplitude is $1.4 m_{pg}$. No systematic difference between the maximum magnitudes has been observed, but on average the maximum following a deeper minimum is fainter than the other one by $\sim 0.05 m_{pg}$. In certain rare cycles it is possible to level of the minimum magnitudes. Asymmetry is about 0.16 of the double period in both halves. SZ Mon should be considered as a W Virginis star both by a peculiar light curve and a remarkable period change, as well as by a wide loop (V, B-V) and moderate radial velocity.

It turned out that SZ Mon is not an exception. Another W Virginis star MZ Cyg must also be considered as having twice its previous period. MZ Cyg observed for a long time and rather intensively, hid its alternation, i.e. the interchange of minimum depths because on small telescopes its brightness is always measured together with two neighbouring stars. This reduces the amplitude and distorts the real minimum magnitudes. Only the 40cm Zeiss photographic observations, representing estimates of the brightness of the variable together with the South neighbour which was fainter than 15^m enabled to detect the alternation. Six mean light curves in J.D. 2436730-43761 interval showed that as in the case of SZ Mon the deep minimum fell on one and the same phase and was deeper than the other one by $0.5-0.9 m_{pg}$. The amplitude of the light curve is $2.4 m_{pg}$. The maximum following the deep minimum is fainter than the other one by $0.2 m_{pg}$. Thus the relation between the maximum magnitude in MZ Cyg is contrary to that most frequently found in RV Tauri stars. Asymmetry in both halves is about 0.15 of the double period. Sometimes the successive cycles can have equal maxima and equal minima.

The preliminary conclusions considering the light curves of MZ Cyg and SZ Mon are the following.

1. The alternation is of lasting character.
2. The resemblance of the RV Tauri light curve is restricted to the difference of the minimum depths without their mutual transposition. The distinction becomes apparent in the shape and greater stability as a whole.
3. The instability of individual cycles is sometimes possible up to levelling successive cycles.

The companions of MZ Cyg and SZ Mon seem to be found among the insufficiently studied W Virginis stars with large periods. V420 Cen, RX Lib, CC Lyr, RS Pav and others can be supposed as companion candidates. The presence of W Virginis stars with the properties of RV Tauri stars agrees with the contemporary theoretical conception on the closeness of the evolutionary stages of these stars.

It is proposed to publish the detailed analysis of MZ Cyg and SZ Mon light curves in Collected Articles "Variable Stars".

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