TWO NEW VARIABLE STARS IN M 13

We have investigated five stars for variability in the glob-
ular cluster M 13 = NGC6205 with Nos. 66, 526, 598, 761 and 1067
in Ludendorff's (1905) catalogue on 60 plates taken with the
60-cm reflector of Belogradchik Astronomical Station (Bulgaria)
during .eight years, from 1974 to 1982 (J.D.2442299-2445090).
The photometric system is near the B one (Russev and Russeva,
1979). All these stars are physical members of the cluster
according to their proper motions, position in the colour-
magnitude diagram (Cudworth and Monet, 1979) and radial velocity
measurements (for L598, Strom et al., 1970).

The analysis of the available observational material has
shown that L66 and L598 are undoubtedly variable stars, but we
have not found any evidence of variability of the other three
stars - L526 ($\bar{B} = 14\overset{m}{.}34$, $\bar{B}-\bar{V} = +0\overset{m}{.}52$, the magnitudes V are by
Cudworth and Monet, 1979), L761 ($\bar{B} = 14\overset{m}{.}91$, $\bar{B}-\bar{V} = +0\overset{m}{.}11$) and
L1067 ($\bar{B} = 14\overset{m}{.}76$, $\bar{B}-\bar{V} = +0\overset{m}{.}14$). It should be mentioned that the
stars L66 and L598 were suggested to be variable in brightness
by Cudworth and Monet (1979). The average B magnitudes of the
two stars are given in Table I with the numbers of observations
per night (n).

The star L66 (No.306 in Kadla's catalogue, 1966, or No.11-72
in Arp's list, 1955) was measured on 48 plates taken on 29
nights. The observations were explained with the following
elements:

$$\text{Max} = \text{J.D. } 2442305.389 + 21\overset{d}{.}165 \cdot \text{E}$$

The light curve of L66 is shown in Figure 1a.

From the average light curve we obtained for the amplitude

Table I

JD 24...	L66	n	L598	n	JD 24...	L66	n	L598	n
42 299.31	$\overset{m}{-}$	–	$13\overset{m}{.}64$:	1	43 366.35	$14\overset{m}{.}75$	1	$13\overset{m}{.}66$	3
303.31	14.82	1	13.86	1	368.33	14.80	3	13.82	3
306.32	14.84	1	13.73	2	667.39	14.81	3	13.63	3
311.28	14.87	1	–	–	669.39	14.82	1	13.60	2
324.27	14.81	1	14.00	1	993.53	–	–	13.55	3
332.25	14.90	1	13.89	1	994.50	14.81	5	13.72	5
338.25	14.92	1	13.93	1	995.48	14.75	5	13.76	5
340.23	15.12:	1	13.93	1	996.49	14.76	1	13.82	1
985.43	14.74	2	13.78	2	44 137.37	14.86	1	13.83	1
988.50	14.75	1	13.72	1	754.53	14.80	1	13.84	1
43 304.52	14.85	1	13.83	1	755.45	14.79	3	13.79	3
305.48	14.81	1	13.82	1	759.39	14.64	1	13.69	1
308.51	14.91	1	13.58	2	760.54	14.65	1	13.71	1
310.40	14.93	2	13.60	2	787.43	14.69	1	13.86	1
338.36	14.82	3	13.79	3	788.37	14.74	1	14.12:	1
365.34	14.71	2	13.64	4					

$A_B = 0\overset{m}{.}24$ and $\bar{B} = 14\overset{m}{.}80$. Since $\bar{V} = 14\overset{m}{.}10$ (Cudworth and Monet, 1979) the colour index of the star is $\bar{B}-\bar{V} = +0\overset{m}{.}70$. So that L66 lies between the red boundary of the instability strip and the asymptotic giant branch (AGB) on the colour-magnitude diagram. The period of L66 is typical for the W Virginis stars, but the amplitude is unusually small for this kind of variables. It is possible that the star is in a phase of evolution on the AGB, when with the definite combination of parameters and a number of the relaxation cycle in the helium shell, for a short time, it may behave as a quasi periodical variable, without coming into the instability strip (Mengel, 1973).

Additional comprehensive photometry of L66 might yield new information on the nature of this star.
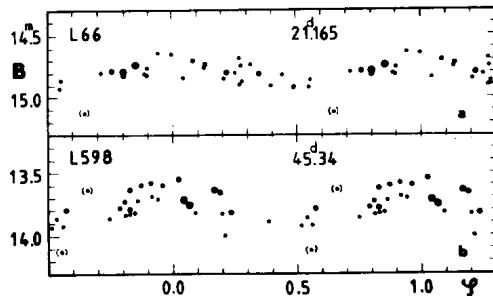

Figure 1: Light curves of L66 (a) and L598 (b). The size of the dots is proportional to the numbers of observations per night.

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The star L598 is one of the brightest $(\bar{B} = 13\overset{m}{.}72)$ and reddest $(\bar{B}-\bar{V} = +1\overset{m}{.}58)$ stars in M 13. Our 58 observations on 30 nights permitted the construction of the light curve, which is shown in Figure 1.b. The light curve elements are:

$$\text{Max} = \text{J.D.}\ 2442269.50 + 45\overset{d}{.}34\cdot E$$

The comparison with the other red variable stars in M 13 (Russeva and Russev, 1980) has shown that the star L598, according to its period, amplitude $(A_B = 0\overset{m}{.}32)$ and infrared magnitude $(\bar{I} = 10\overset{m}{.}10$, from three image tube observations), belongs to the smaller amplitude group with periods of 35-45 days. On the period-amplitude and period-magnitude diagrams (see Fig. 3 in the same paper) the star falls on the sequences for the AGB stars.

Details of our studies on L598 and other red variables in M 13 will be published in Per. Zvezdy.

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