

APPEARANCE OF A NEBULA NEAR Y ORI

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The results of photographic and photoelectric observations for the star Y Ori are presented. During these observations a red nebulosity was appeared around the star Y Ori near the maximum of brightness. The optical sizes of the nebulosity are comparable with the OH sizes of long period variables and OH/IR stars. A real brightness increase on the decreasing branch of light curve was detected in U band of spectrum.

1. *Introduction.* Mira Ceti type long-period variables show variations in the optical range of the spectrum with amplitudes more than 2^m and periods from 200 to 500 days. These stars are red giants of late spectral classes, characterized by the presence of emission lines in their spectra. The variable stars catalogue [1] contains about 5800 Mira variables.

The star Y Ori is known as a long period variable and has a spectrum M3-M5 [1]. During the photographic UBV observations of flare stars in the Orion region in 1980 brightness variations of Y Ori were detected accidentally, near the maximum of the light curve [2].

On the base of our photographic observations the light curve of Y Ori is constructed, using the photographic material obtained during more than 20 years in Byurakan and Abastumani Observatories. The star Y Ori has a period $P=271.3$ days [1]. On the base of our observations the period (P), rise time (T_r) and decay time (T_d) of light variations have been determined with a sufficiently high accuracy [2], using the method suggested by Lafler and Kinman [3].

$$P=270.5, \quad T_r=83.9, \quad T_d=186.6.$$

Photoelectric observations have been done in 1989, during more than 3 months [4]. These observations show that the brightness of Y Ori in BVR colours monotonically

cally decreases after the maximum, while in the U band the brightness increase with an amplitude $\Delta U=0.7$ is detected in 48 days after the maximum.

It is known from the results of multicolour photoelectric observations of Mira Ceti type stars, that the colour $U-B$ has a minimum value near the minimum of brightness [5,6]. Our photographic and photoelectric observations show the same results [2,4].

In this report the results of our observations of Y Ori are presented.

2. *Observations.* The photographic observations were carried out in Byurakan and Abastumani Observatories, while the photoelectric observations - at high mountain Maydanak station of Tashkent Astronomical Institute. For the photographic observations the 40" (Byurakan) and 70cm (Abastumani) telescopes were used. The photoelectric observations were carried out with the 60cm telescope of the Maydanak station. The photoelectric observations have been obtained in $UBVR$ bands, the photographic observations - in $UBVRI$.

More detailed information on these observations was already published [2,4].

3. *Nebulosity around the star Y ORI.* During the photographic observations a red nebulosity was detected around Y Ori on the photographic plates near the maximum of brightness obtained from 2 to 11 of February in 1983 [2]. The plates obtained in ultraviolet (U) and red (R) bands 50 days before show the absence of this nebulosity.

Thus, one can see the nebulosity only near the maximum.

The nebulosity has an elliptical form. The rough estimation gives for angular sizes of this ellipse a value of the order of $23'' \times 16''$. At Orion association distance (~ 450 pc) it corresponds to linear dimensions about 0.05×0.035 pc. So the nebulosity originated during less than 50 days.

It is already known that around Mira Ceti type stars gas shells exist, which extend with velocities of the order of 10-40 km/s. Usually the sizes of these shells are unknown. Deutsch [7] was the first who has measured the external radius of gas shell around α Her to be at least 200000 times larger than the radius of the Sun.

The results of radio observations show, that a high percentage ($>30\%$) of Mira Ceti type stars have H_2O maser emission [8]. 1667MHz OH- emission is observed for 34% of these stars [9]. The typical values are of the order of 8×10^{15} cm for the radii of Mira Ceti variables, and 5×10^{16} cm for the OH/IR stars [10]. These results are in a good accordance with our estimation of the sizes of nebulosity around the Y Ori.

4. *Conclusion.* It is necessary to point out that Orion region was observed systematically in Byurakan and Abastumani observatories in the period 1974-1985. The analysis of these photographic observations did not show any trace of nebulosity

around Y Ori, in spite of the fact, that this star was registered repeatedly near the maximum of brightness.

The mean absolute magnitude of a normal red giant of a spectral class M4 is $M_V = -0.8$. The visual magnitude of Y Ori is $M_V = 14.7$. If one assumes that this star is at Orion association distance we obtain for the interstellar absorption $A_V = 7.24$, while according to spectral observations, carried out for more than 100 stars in Orion region by Cohen and Kuhi [11], the highest value of interstellar absorption is $A_V = 3.68$ for the star Haro 4-255.

On the other hand, using the spectral slopes (a_{12} , a_{25}) Weintraub [12] has classified more than 300 stars. Particularly he comes to a conclusion, that if both spectral slopes accept negative values simultaneously, it means that the star is surrounded by a very cold absorptive matter. We have for the star Y Ori $a_{12} = -3.64$, and $a_{25} = -0.88$. Thus, in all probability the star Y Ori is surrounded by a cold absorption material.

The main results for the star Y Ori on the base of our observations can be summarized as follows:

1. Near the maximum of brightness in red light a nebulosity was discovered around the star. The optical sizes of this nebulosity are comparable with OH sizes of long period variables. Such a formation has been observed for the first time not only for the star Y Ori, but for long period variables in general.

2. It should be noticed, that in 48 days after the maximum on the decreasing branch of light curve an increase of brightness has been detected which was registered in U band only.

3. Near the maximum brightness $U-B = 1.4$, and two months later $\dot{U}-B = +0.3 - +0.7$ [2,3].

ПОЯВЛЕНИЕ ТУМАННОСТИ ВОКРУГ ЗВЕЗДЫ Y ORI

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Приводятся результаты фотографических и фотоэлектрических наблюдений звезды Y Ori. Во время наблюдений вблизи максимума блеска зарегистрирована туманность в красных лучах. Такое образование вокруг звезд типа Миры Кита зарегистрирована впервые. Оптические размеры туманности сравнимы с OH размерами долгопериодических переменных звезд типа Миры Кита и OH/IR звезд. В период фотоэлектрических наблюдений на нисходящей ветви кривой блеска зарегистрировано

повышение блеска через 48 дней после максимума только в ультрафиолетовых лучах с амплитудой $\Delta U=0.7$.

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