

## ON THE SUDDEN DECREASES IN THE BRIGHTNESS OF NOVA HR DEL AT THE MINIMUM.

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Extensive photometric observations of Novae HR Del 1967 at the brightness minimum showed that in addition to the orbital minima [3,5], 82 second ultrashort periodic changes in the brightness [10] and secondary minima in the light curve for the first time there are sudden decreases of the brightness.

New Delphina 1967=HR Del for the first time was observed as Nova on June 15, 1967. According to the form of its brightness change it was determined as ultra-slow Nova [1]. Stefanson observed this star seven months before the flare. At that time it had magnitude  $m_v=11^m.8 \pm 0^m.5$  and its spectral class was determined as late *O* or early *B*. In 1981 it had magnitude of  $12^m.5$  [3]. Regular observations showed that all the phases of the flare were proceeding very slowly: just after 4 weeks after the discovery the magnitude reached the value of  $5^m.0$  after which during 5 months its brightness remained constant and just December 6-13, 1967 the brightness suddenly increased up to the value of  $m_v=3^m.5$ . As it can be seen, the evolution of the flare of HR Del proceeded very slowly, which made possible to observe this Nova by many astronomers. Systematic observations of HR Del showed a number of phenomena never observed in other Nova. After the first maximum, after which usually the decrease of the brightness is expected, in the case of HR Del another two flares with intensities comparable with the intensity of main flare were detected [4]. These events took place after fluctuations of the brightness of HR Del 1967 about some level. The reason of such brightness fluctuations of the typical Novae still remains unclear [5].

The results of investigations of line and continuous spectra and the change of the brightness of HR Del 1967 have been published in many works. The light curve of HR Del 1967 which is built up by using enduring photometric observations (June, 1967 - December, 1971) is presented in [4]. By using this light curve we have found periodical changes which are in a good agreement with the epoch calculated by us [5].

So, HR Del is a cataclysmic variable with some peculiarities, which justifies future intensive investigations.

With the aim to detect sudden decreases of the brightness of the Nova HR Del 1967 we have observed them photometrically for one night 2-3.08.1994. Photoelectrical observations of HR Del were carried out with the telescope ZEIS - 600 at Shamakha Astrophysical observatory with the help of photometer AFM - 6 by the method of photon counting. Fast photometric observations were carried out in the UBVR filters with diaphragm of  $43''$ . FEA-79 has been used as light receiver. The observations were carried out by a differential method using very close stars for comparison. The results of observations were received in a digital form by using EUM-23. The accumulation time for each point of measurement was taken 10 sec. As the standard star was taken star N1 ( $m_v=13^m.83$ ) from the list of [6].

Using the data of the star of comparison the root mean square errors of one measurement, making on the average

$\pm 0^m.002$ , and sometimes not exceeding  $\pm 0^m.005$ , were determined. To construct the light-curve average values of the difference  $\Delta m = m_{st} - m$ , made on 3 or 4 measurements of  $\Delta m$ , consisting each of them of 15 measurements with accumulation time of 10 sec were used.

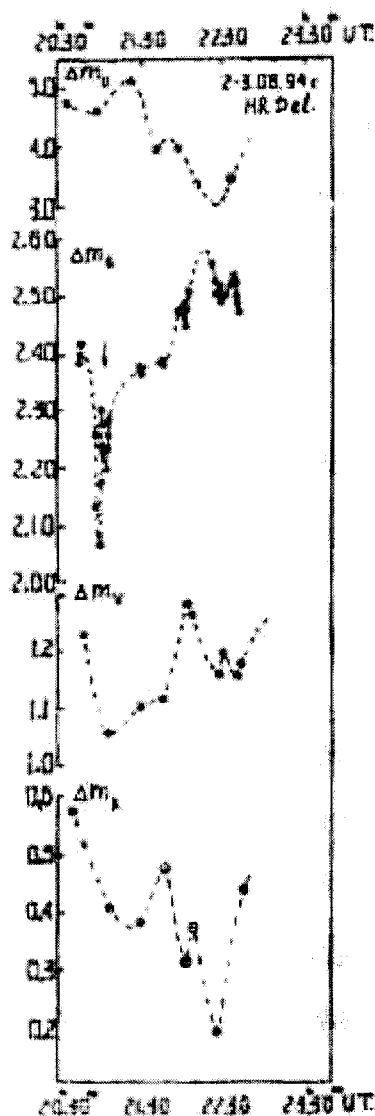


Fig.1. Part of the differential light curve of Nova HR Del 1967 in UBVR-filters

Fig.1 shows the part of the light curve of HR Del measured relative to the standard star, on observations on August 2-3, 1994. These observations gave us an opportunity to find for the first time a complete picture of sudden falls of

the brightness of HR Del 1967 in filter B, identical for Polars - flare Nova-like stars such as TT Ari and other [7].

2.1 hour parts of orbital period is covered by measurements and in each filter it is found narrow -4-5 minute sudden falls of the brightness, which have different depth depending on the wave length.

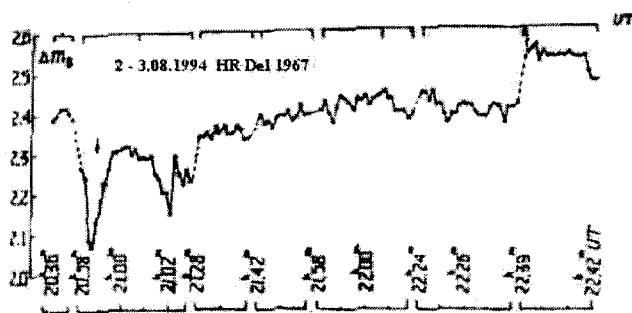


Fig.2. Light curve of HR Del 1967 in B-filter with sudden falls of the brightness.

Such sudden decreases of the brightness are well visible in the filter B (fig. 2). In this filter plenty of measurements was carried out. In fig. 2 bifurcation, amplitude of changes and duration of sudden falls of the brightness of HR Del 1967 are well appreciable.

For the time for an explanation of such effect being it is supposed, that the sudden falls of the brightness is the result of absorption of emission of the source, being near to the white dwarf, by falling flow of matter. Such simple eclipse of the emitting source cannot explain the observing falls of the brightness. The picture is more complex. Probably it is necessary to attract for this purpose short-term amplifications of intensity of the gas flow, the change of the structure of the flow, the change of its density and direction or different combinations of these phenomena. It seems more likely, that such sudden falls of the brightness, especially in the filter B, are caused by eclipse in the field of radiation by non-stationary clouds in equator ring around binary system and by the jet of accreting matter.

Thus, observations carried out in 1994 showed that except some peculiarities in the brightness change of the Nova HR Del, revealed earlier, sudden falls of the brightness characteristic for Polars - flaring nova-like stars as TT Ari are took place. These phenomena do not depend on the phase. The purpose of present paper is to attract the attention of observers to short-term sudden falls in the brightness in the minimum of Nova. Extensive observations could confirm similarity of characteristic changes of the brightness of Polars and typical Novae and could confirm the presence of patchy formations in the disk environments and jets of accreting matter.

Summarizing all photometric data we can conclude that for Nova HR Del 1967 6 basic types of small amplitude changes of the brightness are typical:

1) 32-day quasi-periodic changes observed during a maximum and further [3,5,6]

2)  $0^d.17 - 0^d.21$  periodic changes ( $\Delta m=0^m.15$ ) connected, apparently, with the orbital motion of the star [3,8,9].

3)  $0^d.13 - 0^d.14$  periodic changes ( $\Delta m=0^m.06$ ) connected, apparently, with the non-uniform brightness distribution in circumstellar disk [3,8].

4) 82 second ultra-short periodical changes ( $\Delta m=0^m.05$ ), precisely observed in an orbital light maximum, where the fluctuations of brightness are very small [10]

5) Quasi-periodical changes of the brightness as secondary minima, not depending on orbital motions, which have variable form and amplitude. Apparently, these minima are due to the presence of circumstellar disk and clots of matter, which form common envelope around the Nova.

6) Finally, in observations carried out in 1994 in different filters, especially in the filter B, in Nova HR Del 1967 sudden falls of the brightness, characteristic for Polars - flaring nova-like stars are revealed.

Thus, our photometric observations, carried out on different telescopes at the Shamkha Astrophysical observatory showed that slow Nova HR Del 1967 is a binary system, which has 6 types of small amplitude fluctuations of the brightness.

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## YENİ HR DEL ULDUZUNUN MİNİMUM AFZALINDA PARLAQLIĞININ QƏFLƏTƏN DÜŞMƏSİ

Ardıcıl fotometrik müşahidələrin tədqiqi göstərdi ki, Yeni HR Delfin ulduzunun parlaqlığının dəyişmə orbital, əlavə udulma minimumları və 82 saniyəlik qısa periodik dəyişkənliyi ilə yanaşı, onun parlaqlığının qəfil düşməsi ilk dəfə müşahidə edilmişdir.

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## ВНЕЗАПНЫЕ ПАДЕНИЯ БЛЕСКА НОВОЙ HR DEL В МИНИМУМЕ

Продолжительные фотометрические наблюдения Новой HR Del 1967 г в минимуме блеска показали, что помимо орбитальных минимумов, 82-секундных ультракоротко периодических изменений побочных минимумов, в орбитальных кривых блеска впервые обнаружены внезапные кратковременные падения блеска Новой.

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