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**NEW DEEP MINIMUM OF THE CATAclysmic BINARY KR Aur
IN 1994-1995**

KR Aur, whose variability was discovered by Popova (1960), is a member of the nova-like subclass, known as anti-dwarf novae. Its spectroscopic observations revealed that it is a close binary system, consisting of a white dwarf ($0.7 M_{\odot}$) and a red dwarf ($0.48 M_{\odot}$) with orbital period of 3.907 hours and inclination angle smaller than 40 degrees (Shafter, 1983). The brightness of KR Aur is usually between 12-14^m (predominant value 13^m5), with occasional decreases to 15^m5, but it drops to 18^m episodically. Rapid variations with amplitude up to 0^m4 and time-scales seconds and minutes (flickering) are typical for the star in its bright state. The last deep minimum was observed in 1981-1982, when the star dropped to approximately 17^m (Popov, 1982; Popova et al., 1982).

We present photometric and spectral observations of KR Aur in the period September 1993-November 1995.

The photometric observations were carried out through B-filter, using 60cm Cassegrain telescopes with identical one-channel photoelectric photometers at the National Astronomical Observatory - Rozhen (NAO) and at the Astronomical Observatory - Belogradchik (AOB), and the 50/70cm Schmidt telescope at NAO with ZU 21 plates and B-filter. The integration time was 10 seconds and the exposure time was 20 minutes for all observations, respectively. The magnitudes of the variable were estimated on the basis of the standards, published by Popova (1965). The accuracy was $\leq 0^m1$ for the photoelectric observations and $\leq 0^m3$ for the photographic ones. U-monitoring for flickering search was carried out for 8 nights. The observational data are presented in Table 1 and Figure 1.

One spectrum with 4 Å resolution was obtained on February 9, 1994 in the region 3460 - 5470 Å (Figure 2). The 6m telescope of the Special Astrophysical Observatory of the Russian Academy of Sciences with 1000 channel TV-scanner was used (Afanas'ev et al., 1991). The data processing was done by means of the package ETAM (Knyazev & Lipovetskii, 1994).

Our observations revealed that KR Aur underwent a minimum again. We think a pre-drop state of the star has appeared since January 1994. The star displayed an unstable brightness – from 13^m8 in December 1993 to 14^m6 on January 20, 1994 (Antov & Popov, 1994). On January, 1994 KR Aur was fainter than 15^m. In all observations up to January 20, 1994 flickering was present, however, on January 22, 1994 it seems to be absent. The last measurement is a little bit uncertain, because the object was too faint then.

An interesting fact is that in the beginning of February 1994 KR Aur increased its brightness to maximum light again (13^m1 average value) and our estimates showed fast changes in B-light up to 0^m42 amplitude. Our measurements in this period are in an agreement with the visual estimates of Verdenet & Mizner (1994).

Table 1

Date	H.J.D. (2440000+)	m_B	Obs.	Telescope	Flickering
21/22.09.1993	9252.544	13.2	AOB	Cassegrain	
22/23.09.1993	9253.549	13.0	AOB	Cassegrain	
23/24.09.1993	9254.541	12.9	AOB	Cassegrain	Yes
27/28.10.1993	9288.510	13.3	AOB	Cassegrain	
17/18.12.1993	9339.467	13.8	AOB	Cassegrain	
18/19.12.1993	9340.458	14.0	AOB	Cassegrain	
19/20.12.1993	9341.429	13.9	AOB	Cassegrain	Yes
19/20.01.1994	9372.526	14.6	NAO	Cassegrain	Yes
22/23.01.1994	9375.385	≥ 15	NAO	Cassegrain	No?
01/02.02.1994	9385.260	13.1	NAO	Cassegrain	
01/02.02.1994	9385.265	13.1	NAO	Cassegrain	
01/02.02.1994	9385.271	12.8	NAO	Cassegrain	
03/04.02.1994	9387.381	13.2	NAO	Cassegrain	
03/04.02.1994	9387.389	13.4	NAO	Cassegrain	
03/04.02.1994	9387.397	13.0	NAO	Cassegrain	
04/05.02.1994	9388.400	12.8	NAO	Cassegrain	
04/05.02.1994	9388.408	13.2	NAO	Cassegrain	
04/05.02.1994	9388.415	13.0	NAO	Cassegrain	
10/11.03.1994	9422.316	14.7	AOB	Cassegrain	
12/13.03.1994	9424.317	14.7	AOB	Cassegrain	No
15/16.03.1994	9427.293	15.2	AOB	Cassegrain	No
13/14.04.1994	9456.292	14.0	AOB	Cassegrain	
14/15.04.1994	9457.316	14.3	AOB	Cassegrain	
09/10.10.1994	9635.484	14.7	AOB	Cassegrain	
12/13.10.1994	9638.489	14.6	AOB	Cassegrain	
15/16.10.1994	9641.490	14.4	AOB	Cassegrain	
04/05.12.1994	9691.492	15.0	AOB	Cassegrain	No
28/29.12.1994	9715.304	14.9	NAO	Cassegrain	
02/03.02.1995	9751.519	15.5	NAO	Schmidt	
01/02.03.1995	9778.416	18.1:	NAO	Schmidt	
27/28.09.1995	9988.585	18:	NAO	Schmidt	
19/20.10.1995	10010.508	19:	NAO	Schmidt	
24/25.11.1995	10046.692	14.5:	NAO	Schmidt	
25/26.11.1995	10047.477	14.8	AOB	Cassegrain	Yes

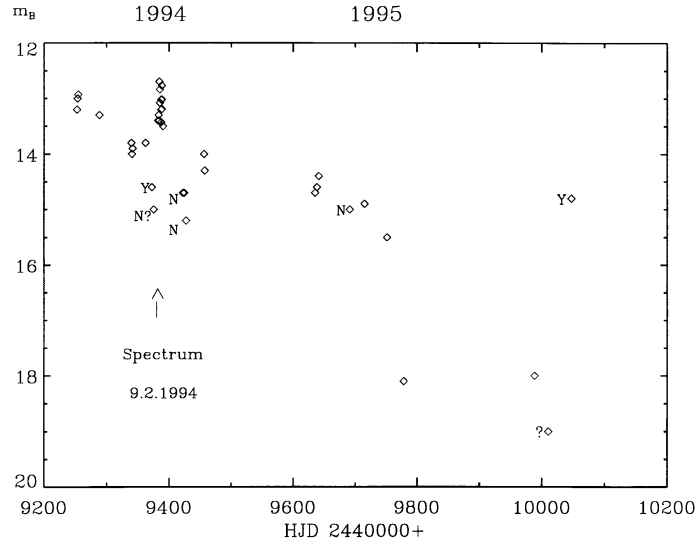


Figure 1. The photometric behaviour of KR Aur. “Y” denotes presence of flickering with amplitude $\geq 0^m.15$, “N” - absence of it.

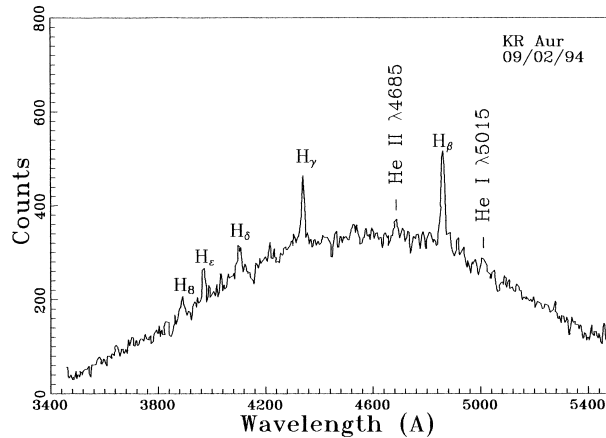


Figure 2. The spectrum of KR Aur, obtained on February 9, 1994 with the 6m telescope of the Special Astrophysical Observatory.

In a month the star dropped again to $14^m.7$. Its spectrum, obtained on February 9, 1994 is closer in time to the maximum light state, and resembles those observed with the same equipment by Popov & Kraitcheva (1990). The detected Balmer emission lines – H_β , H_γ , H_δ and H_ϵ – have a two-component structure with a redward-shifted second component. In so far as these lines are considered to originate from the accretion disk material (Shafter, 1983) we suggest that the disk still exists in the system.

In the period March 1994 - October 1994 KR Aur varied in the interval $14^m.0$ - $15^m.2$. The star has begun to decrease its brightness since October 1994 and approximately in 4 months (March 1, 1995) reached $18^m.1$, which is in an agreement with the observations of Honeycutt & Robertson (1995).

The deep minimum state lasted approximately 8 months. The faintest magnitude of the star, detected on October 20, 1995, was 19^m. However, this measurement is uncertain because the object was near the plate limit. From October 20, 1995 to November 25, 1995 KR Aur became 4^m brighter and a flickering with an amplitude of 0^m.15 in U-filter was detected again on November 25, 1995.

We think, that the star had an unusually unstable mass transfer in a period 10 months before its fading to a deep minimum. It is possible, that a pre-minimum state exists for KR Aur. A slow decrease of the mass transfer followed and it seems, the object spent a long time in an intermediate state. KR Aur faded from its intermediate state to the minimum for 4 months. It spent 8 months in minimum state. The star went out of the minimum relatively quickly – for a little more than a month.

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