

LOW STATE OF KR AURIGAE (2008 – 2010)

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Abstract. We report data from the present deep minimum of cataclysmic variable KR Aur, lasted more than 2 years. We present multicolor (UBV) simultaneous light curves obtained with the telescopes available at NAO Rozhen and AO Belogradchik. We detected strong flickering activity in the faint state during all observations.

1. INTRODUCTION

KR Aur is well known cataclysmic variable star, discovered by M. Popova in 1960 (Popova, 1960). It is interacting binary system, consisting of a white dwarf and a secondary red dwarf with orbital period 3.907 hour (Shafter, 1983). This object is classified as anti-dwarf novae or VY Scl type star: usually the brightness of KR Aur is about 13 mag (with variations of 1 mag), but occasionally mass transfer from the late-type star to the white dwarf fades and magnitude drops to 15–16 mag (intermediate state) or rarely to 18–19 mag (low state). The previous minimum of KR Aur was too long and too deep: it continued from 1994 (Antov et al., 1996) to 2001 (Boeva et al., 2006). The behavior of its light-curve was very unsteady: the brightness varied between intermediate and weak values. In 2008 started another one deep state of KR Aur. Our data are from this new minimum lasting until now.

2. OBSERVATIONS

The observational data is received with the following telescopes at NAO-Rozhen and AO-Belogradchik:

- 2m reflector with optical system Ritchey-Chretien-Coude at NAO-Rozhen with corresponding equipment:

1. A dual channel focal reducer FoReRo2 (Jockers et al., 2000) with a CCD camera Photometrics (1024x1024) for the blue channel and a camera VersArray (512x512) for the red channel.

2. A CCD camera VersArray 1300B – 1340x1300, px size 20 μm at the direct telescope's focus.

- 50/70 Schmidt telescope at NAO-Rozhen with a CCD camera SBIG STL-11000M, 4008x2672 px, 9 μm and FLI PL 16803, 4096x4096 px, 9 μm .
- 60 cm telescope Cassegrain at NAO- Rozhen with FLI PL 9000, 3056x3056 px, 12 μm .
- 60 cm telescope Cassegrain at AO-Belogradchik with CCD cameras SBIG ST8, 510x340px, 27 μm and FLI PL 9000, 3056x3056 px, 12 μm .

We present observations from 24 nights in the period from January 5, 2008 to April 4, 2010. We obtained estimates of the brightness of KR Aur in V band as well as light curves in one or more bands lasted from 1 to 6 hours.

3. RESULTS AND DISCUSSIONS

Fig. 1 shows the long-term light curve of KR Aur between January 2008 (when the system was in high state) and April 2010 in V- filter.

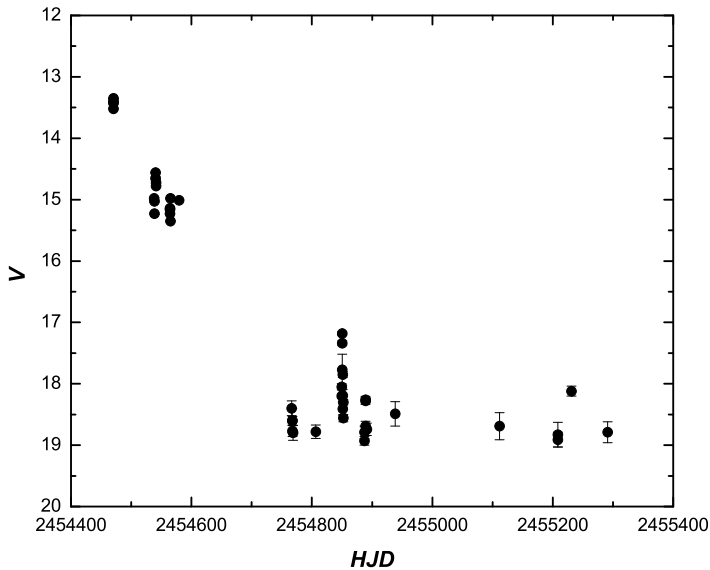


Figure 1. The light curve of KR Aur in V from January 2008 to April 2010.

In March - April 2008 we registered a decrease of the brightness – V magnitude was about 15. The V magnitude dropped down in the next month when the variable was not visible for observations. In October KR Aur was in low state with a typical magnitude 18-19. In January 2009 we registered a weak increase in the brightness up to 17 mag and until now we obtained V magnitudes in the range 18-19 mag with strong fast changes.

Fig. 2 presents the short-term variations (flickering) in April 2008. It is about 1 hour lasting light curve with brightness variations of about 0.5 mag in V band.

In Fig. 3 and Fig.4 we present UBVR simultaneous observations obtained with 2 telescopes – 2 m at NAO Rozhen using dual channel focal reducer FoReRo2 for U and V bands and 50/70 cm Schmidt telescope at NAO-Rozhen for B band. The behavior of the brightness in these 3 different bands is similar with flickering amplitudes for U of about 1.5 and 0.9 mag respectively for January 20, 2009 and February 26, 2009, for B – 1.3 and 0.6 mag, and for V – 1.3 and 0.7 mag. The color indices are $U-B \sim 1.0$, $B-V \sim 0.0$. According to our observations the flickering activity of KR Aur never stopped completely as it has been observed for the similar variable MV Lyr (Robinson et al., 1981 and our observations) at low state. Thus KR Aur seems to be one of most active members of VY Scl sub-class variables.

KR Aur is unique object because only for these two VY Scl stars have been observed deep minima with duration of years. Additional observations of this variable are necessary to study the rare deep states.

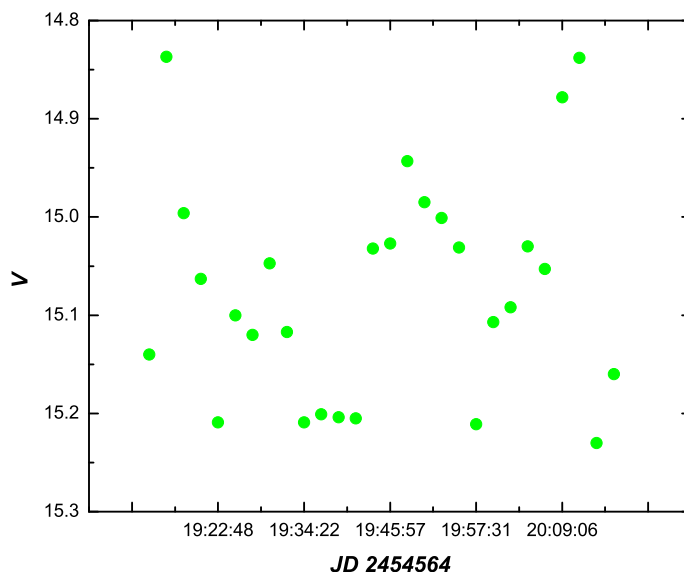


Figure 2. The fast variations of KR Aur on April 7, 2008 when the brightness decrease (intermediate state).

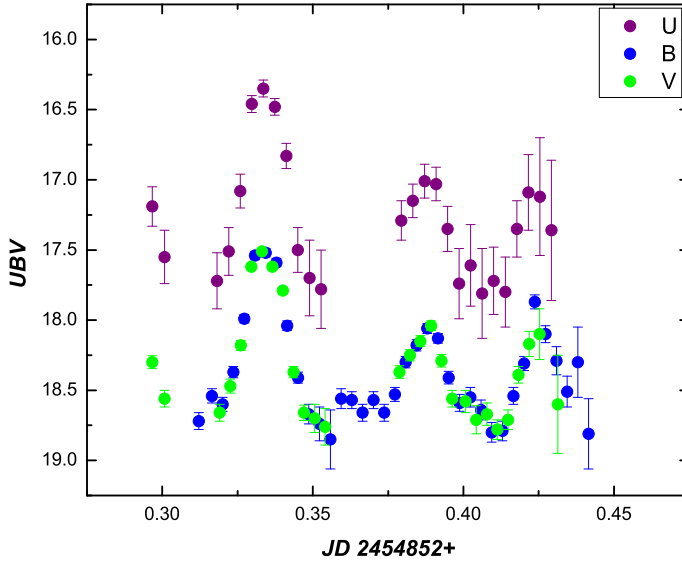


Figure 3. The simultaneous 3:15 hours lasting observations of KR Aur on January 20, 2009 in UB.

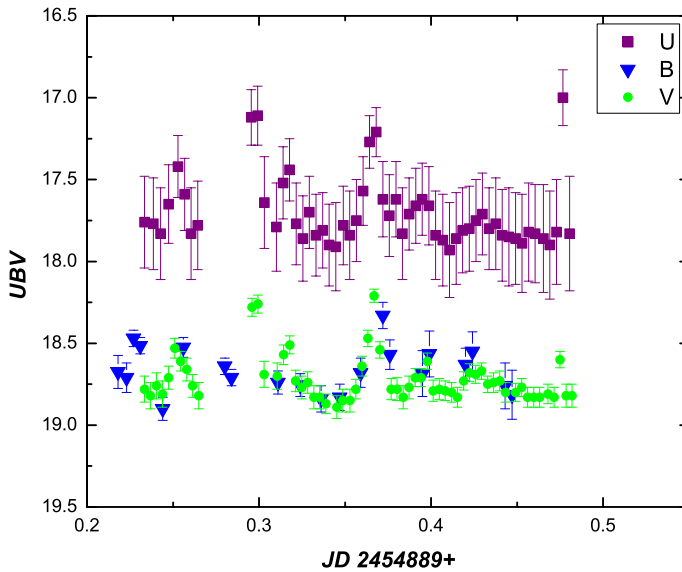


Figure 4. The simultaneous about 6 hours lasting observations of KR Aur on February 26, 2009 in UB.

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