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CCD photometry of dwarf nova RXSJ053234 during superoutburst in July 2006

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Abstract:
In this paper we report CCD observations of the dwarf nova RXSJ053234 during long lasted outburst in July 2006. We found variations of light curve after maximum and we detected superhumps with periodicity 0.05707 ± 0.0012 days and amplitude about 0.3 mag.

1. Introduction

Dwarf nova (DN) *RXSJ053234* (1RXS J053234.9+624755) was discovered by Bernhard et al. (2005) during optical identification of X-ray sources from the ROSAT all-sky survey. ROTSE light curve of DN is available from the Northern Sky Variability Survey (NSVS) website (Woźniak et al., 2004). It shows at least two large outbursts from magnitude R ~16.0 to 12.9. Analysis of the photograpic plates from Sonneberg archive revealed four other oubursts. Bernhard et al. (2005) estimated that object is a U Gem cataclysmic variable with a recurrence time scale of ~133 days. A superoutburst was detected in March 2005 independently by four observers (see Bernhard et al., 2005). A normal outburst was also detected in February 2006 and went again in outburst on June 30, 2006 (Kriebel, private communication). He also reported that this outburst could be eihter superoutburst or just a longer normal outburst.

The superhumps with periodicity of 0.0574 days were observed during 2005 March superoutburst by Vanmunster[1]. Poyner & Shears (2006) independently detected superhumps with period 0.0561 days observed during the same outburst. Kapusta & Thorstensen (2006) reported spectroscopical observations of DN in the quiescent state and determined orbital period of 0.0562 days.

2. Observations and Data Reduction

Our observations of this DN were obtained in seven nights from July 05 to July 17, 2006 at Kolonica Observatory, which is located in north-east part of the Slovak Republic. Measurements were performed through 300/2400mm Ritchey-Chrétien and 265/1360 mm Newton type telescopes. The both instruments are

1 See: http://www.cbabelgium.com/

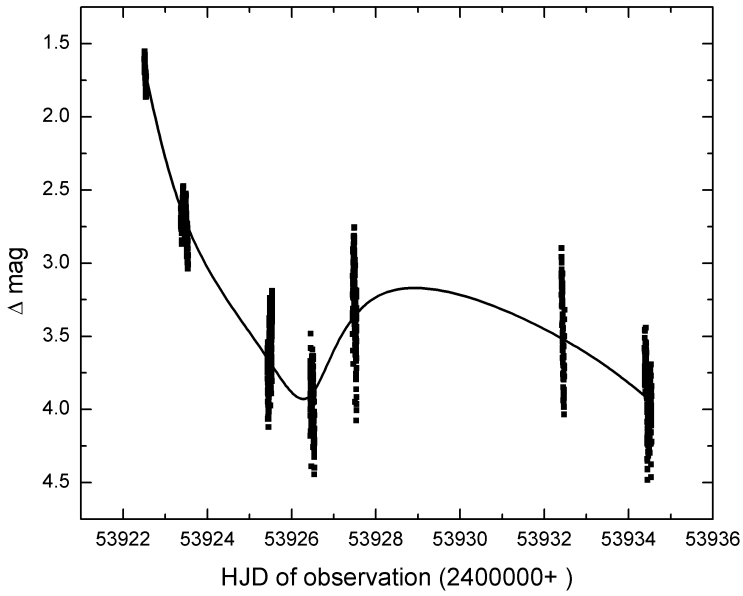

Figure 1: Light curve of *RXSJ053234* during outburst in July 2006.

equiped by DSI Pro CCD camera with Sony's ExView HAD Monochrome CCD Image Sensor. The resolution of this camera is 508 x 489 pixels. The observations were obtained with no filter and were not transformed into the international system. We present only magnitude difference between *RXSJ053234* and comparison star. We used 30s integrations. The standard reduction of CCD frames (dark frame substraction, flat-fielding) and optimal aperture photometry were performed by software package SPHOTOM developed by the first author (for details see Parimucha, 2006). GSC 04085-02448 and GSC 04085-2857 were used as comparison and check star respectively. These stars were found to be stable within 0.05 mag during all nights (see Figure 2).

3. Results

In Figure 1 we present light curve of *RXSJ053234* obtained from all our observations together with cubic spline (solid line) fit. It is evident that brightness of the object decreased during about 2 mag in four days. But than a little increase about 0.5 mag was detected and than slowly decline began. We have carefully examined our measurements (stability of the comparison and check stars), but it seems that this behaviour is real. Its interpretation is out of the purpose of this paper, beacause it needs confirmation from other observations of this or some next outburst.

In Figure 2 we present light curves of the object during all seven nights together with variations of check stars. The superhumps were clearly detected in two nights (July 6 and 8) and possibly in three other nights (July 9, 10 and 17) however observations are affected by relatively poor weather conditions. No superhumps were detected in July 5 and 15 because of short observation interval. The amplitude of the observed superhumps is about 0.3 mag. All these data could be obtained in electronical form from authors, by request.

We used the observations from five nights when superhump were observed to estimate superhumps periodicity. After removing decreasing trend, data were analysed by phase dispersion minimization (PDM) method (Stellingwerf, 1978). For period analysis we used 10 bins and 5 covers structure. The periodogram (Θ - statistics) is presented in Figure 3. The period 0.05707 ± 0.0012 days was found to be most significant. Its statistical significance was tested by means of randomization of the data (Linell Nemec & Nemec, 1985). Our

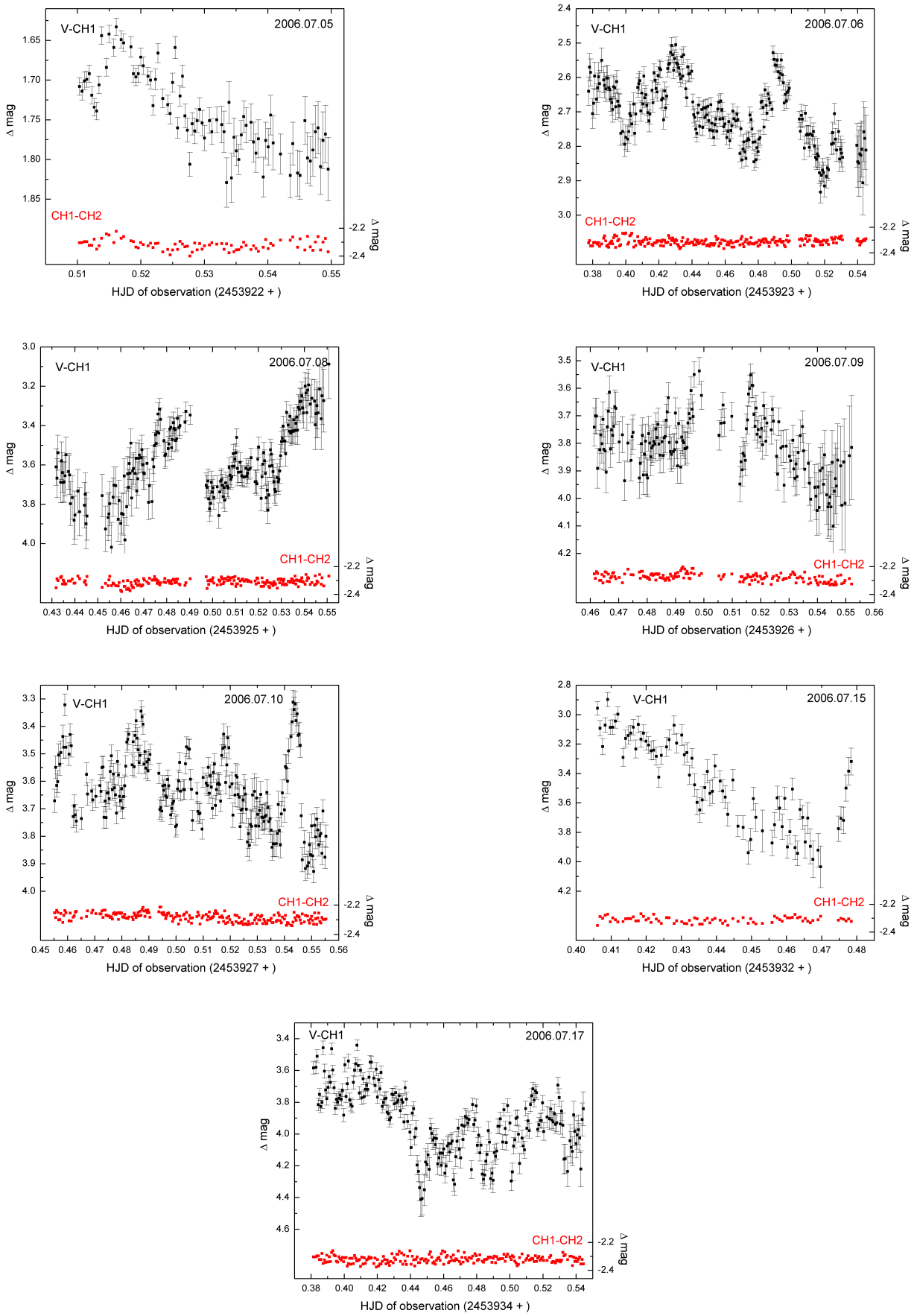

Figure 2 : Differential light curves of *RXSJ053234* and variations of check stars.

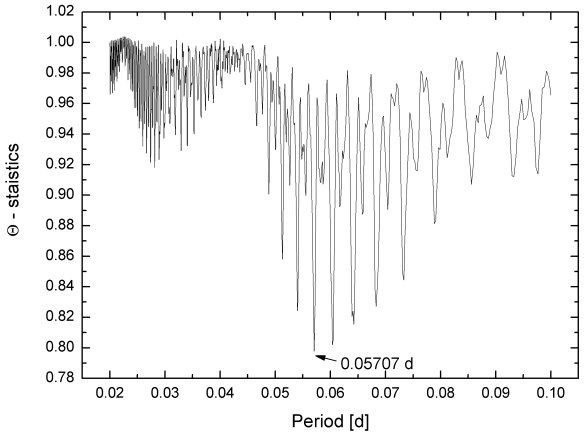

Figure 3 : Periodogram of light curve residuals of *RXSJ053234*.

superhump period is close to period detrmined by Vanmunster.

In Table 1. we present times of superhump maxima, which are useful for analysis of changes of their periodicity on longer time scales. Maxima were determined by Kwee & van Woerden (1956) method.

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Table 1: Times of maxima of superhumps and its errors.

T_{max} [HJD]	*error*
2453923.43633	0.00013
2453923.49348	0.00009
2453925.49319	0.00018
2453927.48835	0.00006
2453927.54539	0.00005