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The two accretion states of the polar 1RXS J184542 in 2012

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We present the photometric investigation of the newly discovered magnetic cataclysmic variable (polar) 1RXS J184542 during four months in 2012. We used the CCD observations in R-band obtained with the 0.5-m ARCSAT telescope at the Apache Point Observatory. It was found that during this time the object changed its relatively high accretion state to the low one. There was a two-pole accretion at the high state and one-pole accretion at the low state.

Key words: stars: close binaries, cataclysmic variables, polars, 1RXS J184542

INTRODUCTION

Magnetic cataclysmic variables (CVs) are close binary systems at the late stage of evolution. They consist of the late type component which loses its matter onto the magnetic white dwarf via inner Lagrangian point.

The majority of magnetic CVs has been discovered via their strong X-ray emission. The X-ray source 1RXS J184542.4+483134 (USNO-B1.0 1385-0291789 18:45:42.622 +48:31:30.84, J2000) was identified as magnetic eclipsing CV using optical observations at the Crimean Astrophysical Observatory and X-ray Swift observations [1]. Before that Denisenko and Smirnov [2] believed that 1RXS J184542.4+483134 is non-magnetic CV with strong reflection effect.

OBSERVATIONS AND RESULTS

In our research the photometric investigation of the newly found magnetic cataclysmic variable (polar) 1RXS J184542 is presented. The CCD R observations were obtained with 0.5-m ARCSAT telescope of the Apache Point Observatory. The reference star USNO-B1.0 1385-0291764 ($R = 17^m.4$) was used.

The photometry was conducted from 10.02.2012 to 27.05.2012. The total exposure of observations was about 47.5 hrs (see Journal of observations in Table 1 and Table 2).

During this time the object was discovered to change its relatively high accretion state to the low one. Its brightness varied from $17^m.6$ to $20^m.4$ at high state and from $18^m.1$ to 21^m at low state. The transition from high state to the low one occurred within eight days (see Fig. 1).

We calculated the phases of 1RXS J184542 using ephemeris [1] as:

$$\mathrm{HJD} = 2455684.5149 + 0.054908 \cdot E,$$

where E is the number of epochs.

The mean phased curves for the high and low states are shown in Fig. 2. It is evident that the mean lightcurve for the high state has smooth long-term brightness increase during the 0.6 P and more rapid decline during 0.4 P. The mean light curve for the low state has sharply defined profile with duration ~ 0.6 P.

Comparing the lightcurves for these two states we could conclude that there was the two-pole accretion at high state: the radiation from the second pole superposed on the radiation from the first pole producing the profile asymmetry described above.

CONCLUSION

Here we present for the first time the evidences of the high and low state of 1RXS J184542 which were accompanied by the two-pole and one-pole accretion.

REFERENCES

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[2] Denisenko D. & Smirnov E. 2011, Peremennye Zvezdy Prilozheni, 11, 10

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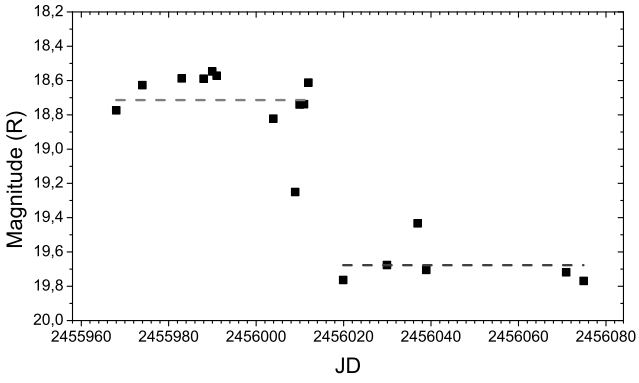

Fig. 1: The long-term light curve.

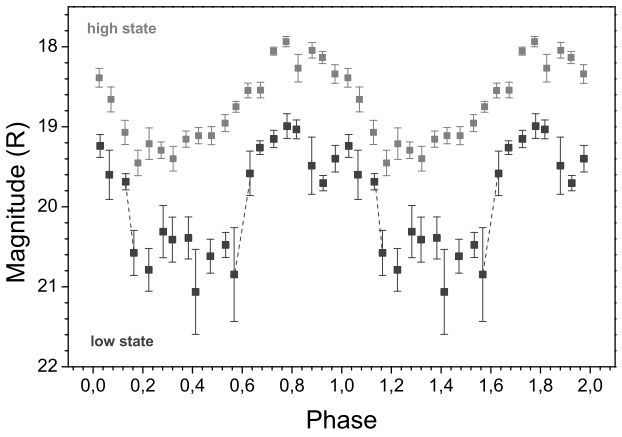

Fig. 2: The mean phased curves.

Table 1: Journal of observations. High state.

date	number of image	HJD (start)	HJD (end)	mean magnitude	standard error	max magnitude	min magnitude
10.02.2012	15	2455967.96234	2455968.03946	18.773	0.17	17.654	19.851
16.02.2012	18	2455973.95273	2455974.02855	18.627	0.128	17.809	19.67
25.02.2012	18	2455982.92617	2455983.01302	18.588	0.156	17.72	19.661
01.03.2012	23	2455987.92178	2455988.01975	18.589	0.13	17.699	19.521
03.03.2012	22	2455989.91063	2455990.00554	18.547	0.113	17.715	19.743
04.03.2012	23	2455990.91082	2455991.01617	18.572	0.113	17.843	19.561
17.03.2012	29	2456003.87793	2456004.00258	18.823	0.109	17.794	19.945
22.03.2012	30	2456008.86370	2456008.99330	19.25	0.121	18.132	20.408
23.03.2012	28	2456009.87502	2456009.99550	18.74	0.102	17.864	19.656
24.03.2012	34	2456010.85040	2456010.99994	18.738	0.115	17.718	19.987
25.03.2012	30	2456011.86680	2456011.99584	18.612	0.112	17.606	19.821

Table 2: Journal of observations. Low state.

date	number of image	HJD (start)	HJD (end)	mean magnitude	standard error	max magnitude	min magnitude
02.04.2012	30	2456019.83394	2456019.97717	19.763	0.107	18.869	20.893
12.04.2012	37	2456029.79331	2456029.99744	19.676	0.11	18.252	20.811
19.04.2012	29	2456036.84450	2456036.97496	19.433	0.116	18.408	20.55
21.04.2012	25	2456038.85134	2456038.96711	19.704	0.143	18.685	20.97
23.05.2012	19	2456070.84379	2456070.95032	19.718	0.161	18.122	20.659
27.05.2012	16	2456074.86609	2456074.95517	19.768	0.164	18.797	20.764