Two Cataclysmic Variables Identified from ROSAT Bright Sources

Jiang-Hua Wu[1,2]⋆, Yang Chen[3], Xiang-Tao He[3], Xi-Zhen Zhang[1,2] and Wolfgang Voges[4]

[1] Beijing Astronomical Observatory, Chinese Academy of Sciences, Beijing 100012
[2] National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012
[3] Department of Astronomy, Beijing Normal University, Beijing 100875
[4] Max-Planck-Institut für Extraterrestrische Physik, D-85740 Garching, Germany

Abstract   This paper presents the results of optical spectroscopic observations of two ROSAT bright sources, 1RXS J020928.9+283243 and 1RXS J042332.8+745300. The low-dispersion spectra suggest the cataclysmic variable classification for the two objects. Further photometric observations are expected to reveal the variable features and to confirm the classifications.

Key words: X-rays: stars – stars: cataclysmic variable – X-rays

1   INTRODUCTION

Cataclysmic variable (CV) is a subtype of binary system. It usually consists of a primary white dwarf and a low-mass companion star, the former accretes matter from the latter and X-ray flux is radiated from this process (Warner 1974, Nather & Robinson 1974). So X-ray observations offer a means to explore the accretion process that powers these systems.

CVs are mainly discovered and identified in optical waveband. Since the launch of several X-ray satellites that go around the Earth, many CVs have been isolated from X-ray sources (Thomas et al. 1998). The recently published CV catalog (Downes et al. 1997) contains many CVs identified from the X-ray sources. During a program of identifying the ROSAT bright sources with no apparent counterparts in any other existing catalogs, we found that 1RXS J020928.9+283243 and 1RXS J042332.8+745300 have the typical optical spectral features of CVs. This paper presents the results of low-dispersion spectroscopic observations on these two sources.

2   OBSERVATIONS AND RESULTS

The low-dispersion spectra of 1RXS J020928.9+283243 and 1RXS J042332.8+745300 were taken by the 2.16 m telescope at Xinglong Station, Beijing Astronomical Observatory in 1999. We used the grating with 195 Å/mm and CCD detector Tektronix 1024 × 1024. The spectral
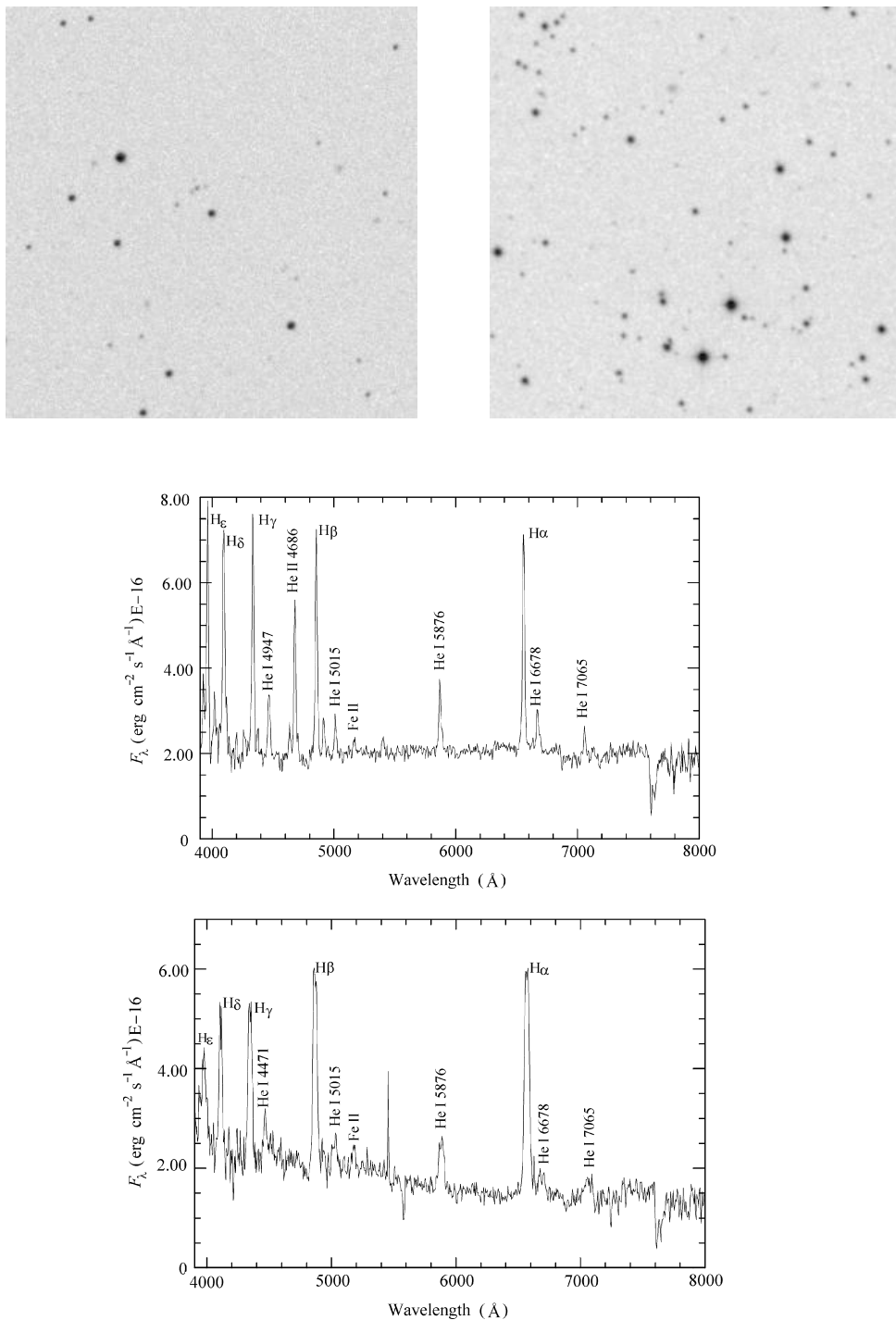

⋆ E-mail: jhwu@bao.ac.cn

Fig. 1   Finding charts and Spectra of 1RXS J020928.9+283243 (left) and 1RXS J042332.8+745300 (right). The finding charts, size $5' \times 5'$, are centered on the optical positions. East is to the left and south to bottom.

coverage is 4,000 ∼ 8,500 Å with a resolution of about 13 Å. The observation journal is given in Table 1. Data reduction was done with IRAF. Fig. 1 gives the spectra and the finding charts.

Table 1 Observation Journal

ROSAT Name	Obs. Date	Exposure (s)
1RXS J020928.9+283243	1999–11–02	3000
1RXS J042332.8+745300	1999–12–12	3600

1RXS J020928.9+283243 has a typical spectrum of CVs. In addition to the strong hydrogen Balmer lines, the He I λ 4471, 4922, 5015, 5876, 6678, and 7065 lines are clear. There is also a strong He II λ 4686 line. From the finding chart we can see four faint objects located northeast to the CV and form an arc-like structure surrounding the CV. Further observations are needed to know whether there is any physical connection between the four objects and the CV and whether the connection relates to the accretion process in the CV.

1RXS J042332.8+745300 has double-peaked emission lines. The strong hydrogen lines show the Balmer decrement. The He I λ 4471, 5015, 5876, 6678, and 7065 lines are also clear, confirming the CV classification of this object.

Table 2 summarizes the basic data of the two sources. The optical positions and magnitudes were taken from the USNO-A2.0 catalog. The magnitudes are scanned values of Palomar Digitized Sky Survey plates. They are, of course, not accurate and are not the maximum and minimum magnitudes of the two stars. Further observations are needed to reveal the variable features of the two stars.

Table 2 Basic Data of the Two Sources

ROSAT Name	Optical Position (J2000)		Magnitudes		Count Rate	HR1
(1RXS J)	R.A.	DEC	B	R	(cts/s)	
020928.9+283243	02:09:29.81	28:32:30.5	18.4	18.7	0.0542	0.54
042332.8+745300	04:23:32.64	74:52:49.4	16.8	17.2	0.0604	1.00

References

Downes R. A., Webbink R. F., Shara M. M., PASP, 1997, 109, 345

Nather R. E., Robinson E. L., ApJ, 1974, 90, 637

Thomas H.-C,, Beuermann K., Reinsch K. et al., A&A, 1998, 335, 467

Warner B., IAU Symp., No. 73, 1974, 985