

A Very Active T Tauri Star in NGC 7129

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1 Introduction

The star forming region NGC 7129 was first studied by Herbig (1960), who discovered two bright (BD+65°1637 and LkH α 234) and some weaker H α emission stars. Subsequent investigations in this region led to the detection of five Herbig-Haro objects (Strom et al. 1974, Gyulbudaghian et al. 1978, Eiroa et al. 1992) and one T Tauri star, V350 Cep (Gyulbudaghian & Sarkissian 1977). Some non-stable stars in NGC 7129 are surrounded by reflection and cometary nebulae.

Our H α -emission survey (Semkov & Tsvetkov 1986) revealed an interesting irregular variable star in the dark clouds near the emission nebulae. On objective prism plates the star shows very strong H α -emission and was included in our list of such stars as No. 7. An identification chart and the coordinates can be found in Semkov (1993a). The observations reported here include long-time photographic photometry and CCD spectroscopic and photometric observations.

2 Observations

The photographic UB V observations (Semkov 1993a) were made with the 50/70/172cm Schmidt telescope of the Rozhen Astronomical Observatory of the Bulgarian Academy of Sciences. The star brightness ranges from 14^m9 to 17^m0 in B -light (Fig. 1) with periods of enhanced activity. The colour index $B - V$ varies around the value 1^m5 and $U - B$ around -0^m6 , hence the star has a strong ultraviolet excess.

Spectroscopic CCD observations of star No. 7 were made in September 1992 with the Focal Reducer and P8603/B camera of the Max-Planck-Institute for Aeronomy attached to the Rozhen 2m RCC telescope. The spectra were taken with a grating prism at a dispersion of 0.47 nm/pixel (Fig. 2). They exhibit strong emission lines of H I, O III, Fe II, Mg I and other metals (Semkov 1993b). H α is very intense and surpasses the frame of Fig. 2.

Photometric CCD observations of the star were made with the SBIG ST-6 camera installed in the RC focus of the 2m RCC telescope. This camera was

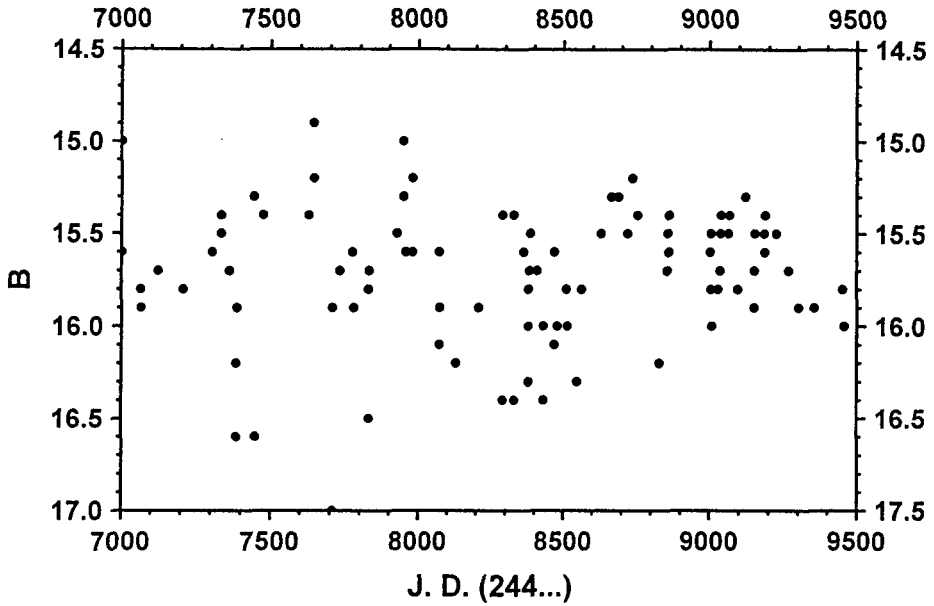


Fig. 1. Light curve of the new T Tau star during the period July 1987 – April 1994 in *B*-light.

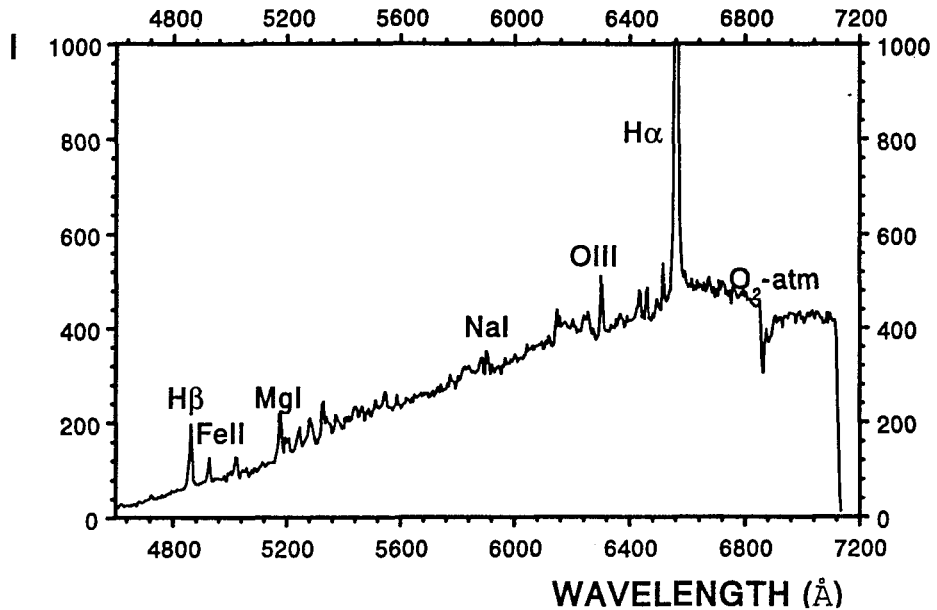


Fig. 2. CCD spectrum of the new T Tau star.

given as a present to the Rozhen Astronomical Observatory from the European Astronomical Society. The observations were made in the period August 1993 – August 1994 in the standard *BVRI* system (Table 1). The CCD photometry suggests that the star is now in a period of decreasing activity (the amplitude is about $0^m.3$). CCD frames through broad band filters *I* and *R*, obtained on December 18, 1993, are given in Fig. 3a and 3b. In both figures North is at the top, East is on the left and the scale is 0.5 arcmin on a side. The CCD observations showed that there is a small cometary nebula around the star, which is not visible on the Palomar Observatory Sky Survey prints. To the East from the star a compact object is allocated which is visible better on the infrared frame and is absent on the *B* and *V* frames. Preliminary photometry leads to a colour index $R - I = 1^m.3$ for this object.

Table 1. CCD photometry of No. 7a.

Date	J.D. (244000+)	<i>V</i>	<i>B - V</i>	<i>V - R</i>	<i>V - I</i>
12/13.08.1993	9212.425	14.34	1.30	0.85	
13/14.08.1993	9213.378	14.38			
14/15.08.1993	9214.369	14.33			
18/19.12.1993	9340.322	14.39	1.26	0.86	1.82
19/20.12.1993	9341.267	14.41	1.22	0.81	1.69
7/8.08.1994	9572.398	14.53		0.98	1.83
8/9.08.1994	9573.435	14.42	1.11	0.97	1.79
10/11.08.1994	9575.436	14.21	1.13	0.88	1.70

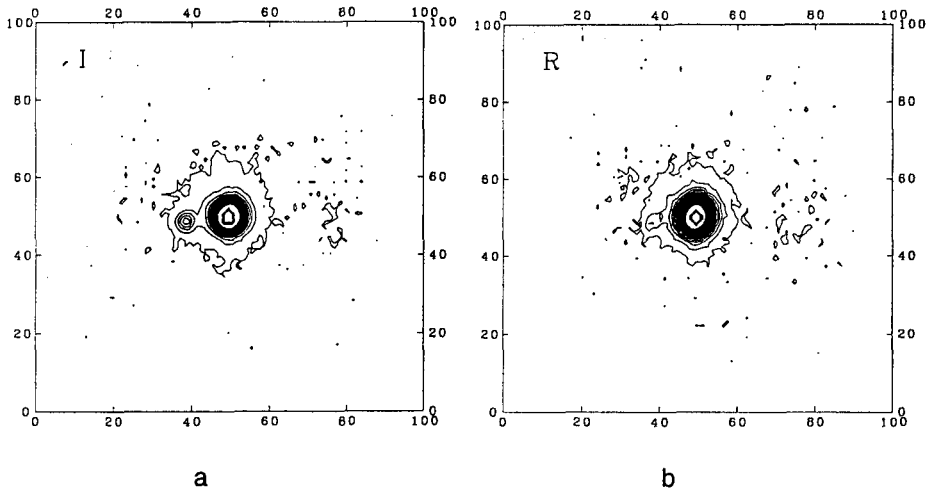


Fig. 3. CCD frames of the new T Tauri star.

3 Discussion

The spectral observations confirm our preliminary assumption that the star has T Tau type variability: such a spectrum is typical for very active T Tau stars connected with nebulae according to Herbig's classification (1962). The distance between the two components of star No. 7 is about 3". If we assume that the object is at a distance of 1 kpc (Racine 1968), the real distance between the two components must be at least 3000 AU. For the second object (No. 7b) we must reject our first assumption that it is a jet from the star or a Herbig-Haro object. The $R - I$ colour index is typical only for deeply embedded infrared sources (for very young stars). Our conclusion is that No. 7a and 7b are members of a wide double system of pre-main sequence stars in different stages of evolution.

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