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FLARE STAR OBSERVATIONS IN THE NGC 7000 - IC 5070 REGION

As part of a programme of flare star search in stellar aggregates of different ages, 11 monitoring plates of the NGC 7000 - IC 5070 region, taken with the 0.53/0.53/1.80 m Schmidt telescope of the Byurakan Astrophysical Observatory during the period June 1976 - July 1978, were analyzed. The field centre is the same as in the investigation of Erastova and Tsvetkov (1974). The observational material with an effective time of observations 10^h50^m in Pg-light (emulsion ORWO ZU2 or ORWO ZU21, without filter) contains 65 exposures of 10 minutes duration. By visual inspection two flares were discovered (see Table 1).

Table 1. New flare events discovered in the NGC 7000 - IC 5070 region

Designation	R.A. (2000)	D. (2000)	V min	B-V min	U-B min	Date of flare up	Δm Pg
B 59	$20^h50^m58^s.2$	$43^\circ58'05''$	$16^m.36$	$1^m.4$	$-0^m.24$	22 June 1977	$2^m.97$
V 1497	21 00 09.1	43 31 19	16.52	2.14	-	22 June 1977	2.35

B 59 is a new flare star (a finding chart is presented in Fig. 1), whose current designation is in accordance with the accepted one for flare stars discovered at the Byurakan Astrophysical Observatory in the investigated region. The star is listed with this designation also in the Catalogue of Flare Stars in the Cygnus Region (Tsvetkov and Tsvetkova, 1990).

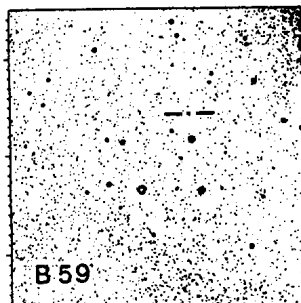


Figure 1. Finding chart for B 59 as a two-dimensional contour plot from a Byurakan 1 m Schmidt telescope B-plate with 10 minutes exposure. The size of the frame is $10' \times 10'$. North is up, East is to the left.

The registered flare-up of V1497 Cyg is the fifth one detected in this flare star, which was discovered as Tonantzintla No.5 (T5) by Haro and Chavira (1973). The Julian Date of the moment of maximum light of both flare events is $JD = 2443317.4583$.

The coordinates of the flare stars in the Table 1 were determined with an accuracy of 1 arcsec from the direct V-plate with the 1.0/1.3/2.1 m Byurakan Schmidt telescope using the astrometric package "SCHMIDT" of the Astronomical Institute of the Muenster University (AIM) which makes use of the PPM Catalogue (Bastian and Röser, 1990). The photometric data for the flare stars at minimum and maximum brightness (Table 1 and Table 2) were obtained by an automatic processing of the direct UBV plates with the PDS 2020 GM^{plus} of the AIM using the photometric programme "HMAG". The photometric value for V 1497 Cyg at minimum brightness according to Tsvetkov (1976) is given.

Table 2. Photometric data for the flare events observed in B 59 and V 1497 Cyg

Intervals of monitoring (U.T.) (26 June 1977)	B 59		V 1497	
	max Pg	Δm Pg	max Pg	Δm Pg
22 ^h 45 ^m 00 - 22 ^h 55 ^m 00	17 ^m 4:	0 ^m 11:	17 ^m 4:	1 ^m 3:
22 55.25 - 23 05.25	14.63	2.97	16.31	2.35
23 05.50 - 23 15.50	17.09	0.52	16.98	1.86
23 15.75 - 23 25.75	17.22:	0.39:	17.4:	1.3:
23 26.00 - 23 36.00	>17.4	-	>17.4	-

In Fig. 2 the two-dimensional contour plots and density tracings of the flare events of B 59 and V 1497 Cyg are shown. The photometric data of V 1497 Cyg show that the star is rather red and probably has a spectral type M5 or later ($B-V = 2^m.14$). The suggestion that this star is a member of the aggregate Cyg T1 (the distance to the front part of this aggregate is estimated to be about 600 pc, Tsvetkov, 1976), is in contradiction with its photometric parallax ~ 70 pc. The comparatively high flare frequency of the star (5 detected conspicuous flare events) leads us also to the conclusion that it is a foreground star.

From the position of B 59 in the U-B/B-V - and V/B-V diagrams for flare stars in the region of NGC 7000 - IC 5070, we derive a spectral type G8-K0. B 59 has thus one of the earliest spectral types for flare stars in this aggregate with an age estimated to be 10^6 years (Tsvetkov, 1976). This is in good agreement with the conclusion of Haro (1968) for the spectral type of the brightest flare star for a given aggregate correlating with its age. Assuming that the star has a spectral type K0, its photometric parallax is about 750 pc, thus it probably belongs to

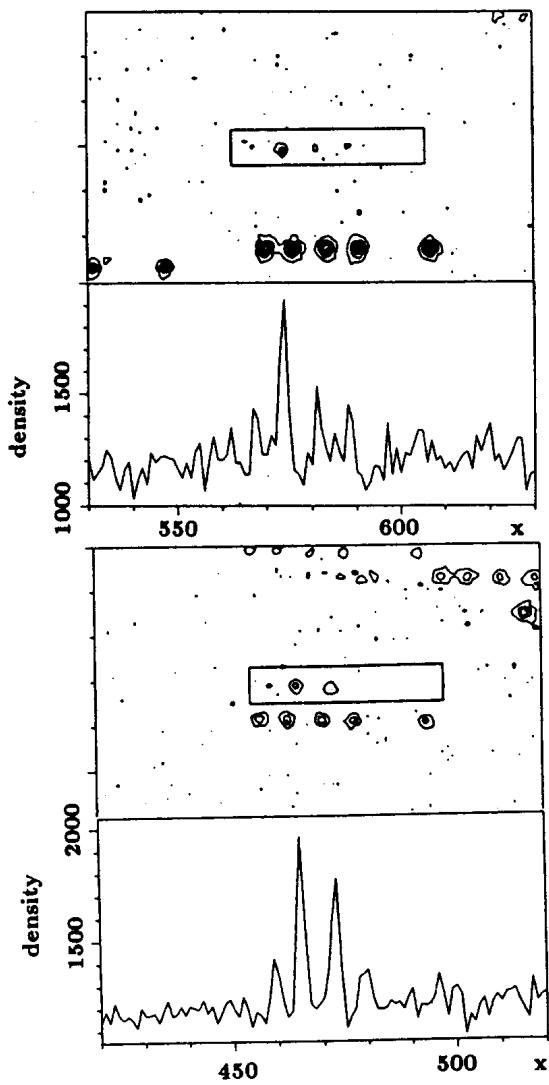


Figure 2. The flare events in chains of B 59 and V 1497 shown as two-dimensional contour plots and density tracings.

the aggregate Cyg T1. B 59 is situated in the nebula IC 5070 which contains a relatively large number of young objects - H α - and T Tauri stars; the investigated star, however, was not listed as a H α -emission star in the deep H α -surveys of this field made by Herbig (1958), Tsvetkov (1975, 1979) and Marcy (1980). Our new check for H α -emission in this star showed that there is an overlap of its objective prism spectrum by a spectrum of a bright star in the H α -region. Thus the question of H α -emission is still not settled. In order to determine more accurately the spectroscopic parallax of both stars and to check the presence of H α -emission in B 59, more detailed spectroscopy is needed.

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