

CATALOG OF FLARE STARS IN ORION NEBULA REGION

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ABSTARACT. A Catalog of flare stars of the region around the Orion Trapezium is compiled. The results of photographic patrol observations of flare stars in this region carried out at the observatories: Abastumani, Asiago, Byurakan, La-Silla, Rojen, Tonantzintla and Uppsala, up to 1986 year are used. The Catalog contains infomation for 491 flare stars and their 654 flares. It is compared with the Catalog of flare stars in the Pleiades region.

1. INTRODUCTION

The association T2 Ori (a stellar complex around the Orion Trapezium) is the richest stellar system by abundance of flare stars. This system is one of the youngest ones containing flare stars.

The first flare stars in the association T2 Ori were discovered in 1953 by Haro and Morgan [1]. Since that time extensive photographic observations on searching and studying the flare stars in stellar systems were begun. It was established by Haro [2,3] and Ambartsumian [4,5] that the stage of a flare star is an evolution stage, one of the early ones in the life of red dwarfs.

2. CATALOG

Our catalog is based on the results of patrol observations of the flare stars in the Orion region performed at the Abastumani, Asiago, Byurakan, La-Silla, Tonantzintla and Uppsala Observatories till 1986 [6]. It contains 491 flare stars known by the beginning of 1986.

For each flare star the catalog provides: number in the catalog, designation according to the determination of the observatory where it was discovered, number according to the

General Catalog of Variable Stars [7], right ascension and declination for 1950.0 (mainly by our determinations), data of discovery, magnitude in the light minimum, amplitude of the first flare, quantity of registered flares, number of the remark, number of the identification chart and references.

The data available on the spectrum of the star and the number in Parenago's Catalog [8] are given in the notes.

3. THE SUMMARY DATA ON STELLAR FLARES IN THE ORION REGION

The summary data on the flare stars and stellar outbursts found in the Orion region up to early 1986, based on the catalog data, are listed in the Table 1, showing the number of single flare stars and occurrence of their outbursts: total and separately according to the observatories.

The successive columns of the Table 1 give: name of the observatory where the flare stars in the Orion region were discovered, number of flare stars having k ($k=1,2,3\dots$) flares, total number of flare stars discovered in the given observatory, total number of registered flares. The last two lines of the Table 1 list the summary numbers of the corresponding columns.

4. COMPARISON WITH THE CATALOG OF FLARE STARS IN THE PLEIADES REGION

Comparison of the present catalog of flare stars in the Orion region with that by Haro et al [9] for the Pleiades region is of a certain interest, as in these cases we deal with two complexes of flare stars of essentially different ages.

Comparison shows that the luminosities of the Orion flare stars, in average, are significantly higher than in the Pleiades, unlike these latter objects they coexist with T Tauri type stars and diffuse matter. A mean frequency of "slow" flares seems to be higher [10] etc.

It should be noted that when speaking on the whole complex of flare stars, we assume that all flare stars discovered in the Orion and Pleiades regions, in their overwhelming majority, are physical members of the appropriate systems. There are reasonable grounds for assuming this. The observations indicate that a relative number of flare stars in the galactic field, which could be found during photographic observations both in Pleiades and Orion, is small—about 10% [11].

Between the complexes of flare stars under study there are also differences of other nature. A total time of patrol photographic observations of the Pleiades region exceeds

3000 hours [12], meanwhile for the Orion region it is about 1600 hours [6]. The complex of flare stars in the Orion is at least twice as rich as the complex in the Pleiades [6, 12]. The Orion association is four times farther than the Pleiades cluster.

In spite of the fact that the Orion region was observed half as much as the Pleiades region, the number of flare stars found in both regions differs slightly. This can be explained due to the fact that the mathematical expectation of observing a flare in the Orion is twice as large: there are more flare stars in this system, the distance effect is compensated by the fact that the luminosities of the flare stars are higher there (by $\propto 2^m$) than in the Pleiades.

Table 1. Number of Orion Flare Stars and Incidence of Flare-Ups

Observatory	No. of Flares								Total No. of F.S.	Total No. of Flares
	1	2	3	4	5	6	7	86*		
Tonantzintla	178	54	19	6	1	1	2		261	392
Abastumani	113	10	2						125	139
Asiago	43	6	1						50	58
Byurakan	20	4		1					25	32
Uppsala	9	2	1					1	13	16
Rojen	10								10	10
La-Silla	7								7	7
Total Number of Flare Stars	380	76	23	7	1	1	2	1	491	
Total Number of Flares	380	162	69	28	5	6	14			654

* These Flares refer to the star FS461=TZ Ori detected in Uppsala are not included into the last column of the Table 1

Based on the comparison of the two catalogs it can be concluded as well that the frequency functions in the Orion and Pleiades systems differ significantly. For example, in the Orion region the number of flare stars showing repeated flares is markedly less than in Pleiades.

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