THE FLARE ACTIVITY OF YZ CMI IN 1999 – 2004

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YZ CMi is a spotted flare star dM4.5e/M4.5 at a distance of 5.9pc (4). Flares on YZ CMi have been detected in the optical, radio and X-ray wavebands. Chugainov (1) and Pettersen et al. (3) determined the photometric period from spot light curves, which is ~ 2.77 days. It is generally assumed that light variations of the quiescent star are due to rotational modulation of spotted star i.e. the 2.77 days period is the period of rotation.

YZ CMi was a part of a flare star monitoring program at the Rozhen National Astronomical Observatory, using the 60cm telescope and the UBV photon-counting, computer controlled photometer. The monitoring was carried out in the U band with 1s integration (73.72 hours) and with 0.1s integration (2.90 hours). In Table 1., data are presented for each year 1999 – 2004. Altogether, 97 flares have been recorded in 76.620 hours of monitoring.

Table 1

Year	T [hours]	Flares
1999	7.825	5
2000	1.764	2
2001	2.403	3
2002	6.223	12
2003	36.689	49
2004	21.716	26
Total:	**76.62**	**97**

Fig 1 shows some of the flares observed, where the flare amplitude is:

$$\frac{I_f}{I_0} = \frac{I_{0+f} - I_0}{I_0}$$

The flare energies in the U-band were obtained by the relation:

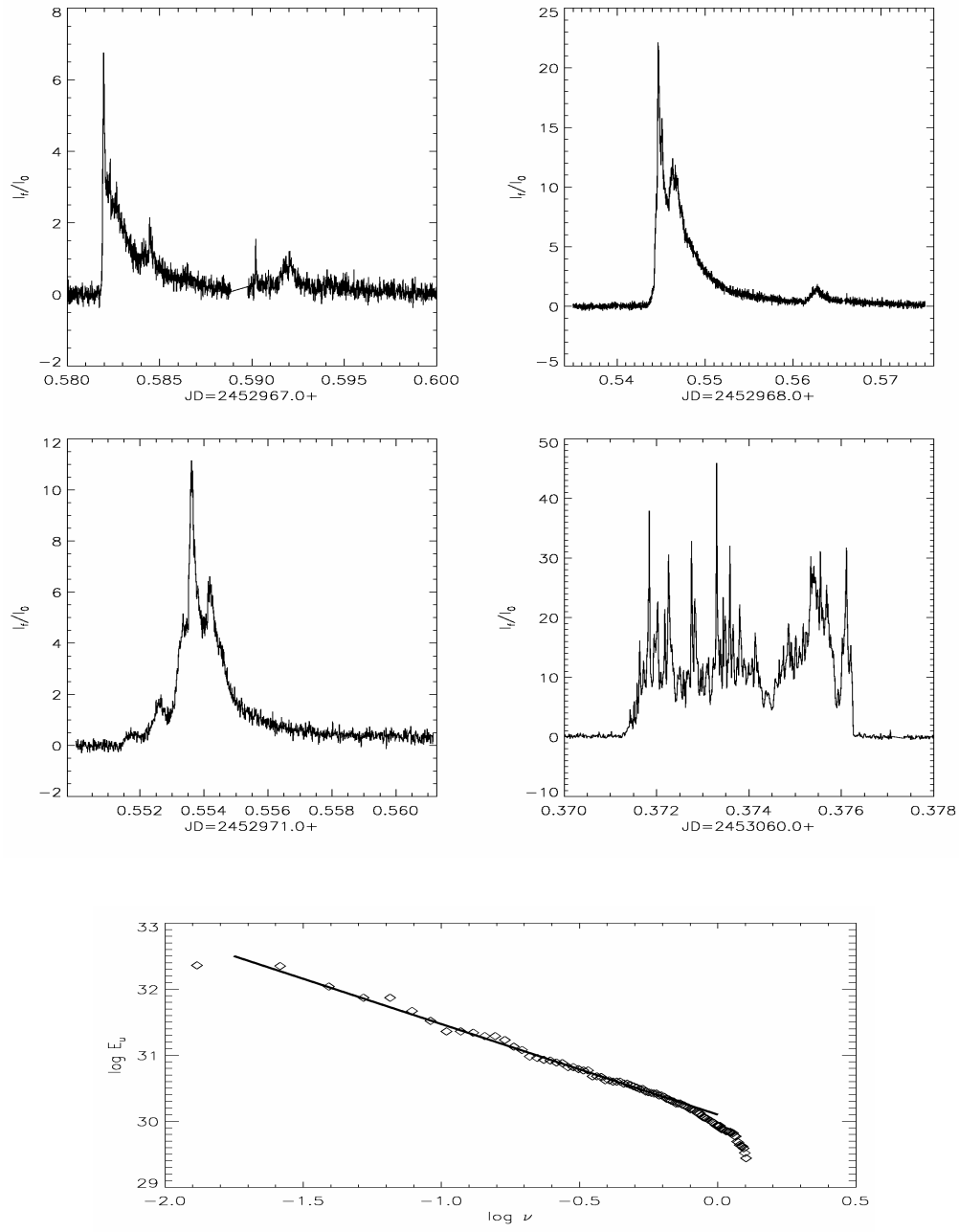


Fig 1. Light curves in the U-band of some large YZ CMi flares.

$$\log E_f = \log ED + \log E_q^U$$

and:

$$ED = \int_{flare} \frac{I_f(t)}{I_0} dt$$

E_a^U

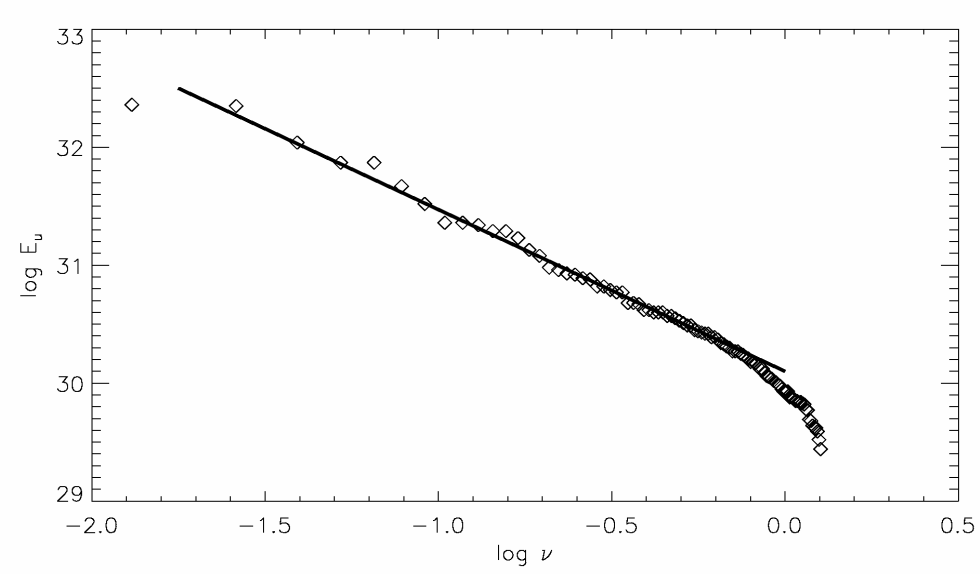


Fig 2. Cumulative flare energy distribution of YZ CMi for the sample in Table 1.

is the equivalent flare duration. The is the quiescent star luminosity of YZ CMi,

$$E_q^U = 4.11x10^{28} ergs.s^{-1}$$ Panov et al. (5)

The shape of the flare JD = 2453060.374 is very unusual, showing many spikes superposed on a ~7.2 min flare.

Gershberg and Shakhovskaya (2) showed that the flare activity is described with a relation:

$$\log \nu = a - b.\log E_U$$

where $\nu = N/T$ is the cumulative flare frequency, E_U is the flare energy in the U band, and ***a*** and ***b*** are constants. From our flare sample we get:

$$(1) \qquad \log \nu = 22.1 - 0.73 \log E_U$$

The mean frequency of flaring from our sample is:

$$(2) \qquad \frac{N}{T} \pm \frac{\sqrt{N}}{T} = 0.78 \pm 0.10$$

Comparing our values from (1) and (2) with the respective values from Gershberg and Shakhovskaya (2), we find statistically significant agreement. Thus, we find no evidence for a variability of the flare activity of YZ CMi, over the time – period 1972 - 2003

References:

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3. Pettersen B., G. Kern, D. Evans, A&A **123**, 1983, 184
4. Gershberg R., M. Katsova, M. Lovkaya, A. Terebizh, N. Shakhovskaya, A&AS **139**, 1999, 555
5. Panov K., Yu. Goranova, V. Genkov, 2000, IBVS No **4917**