

# ABOUT THE FLASHES' ACTIVITY OF A0535+26 IN OPTICAL BAND

N.I. Dorokhov, T.N. Dorokhova, Yu.V. Beletskiy  
Astronomical Observatory, Odessa State University  
Shevchenko Park, Odessa 270014 Ukraine

**ABSTRACT.** After the great multipulse outburst of Oct. 1995 (JD 2450019) was recorded we followed the optical activity of Be/neutron star binary system A 0535+26. The information on optical flares during 25 years of photoelectric observations was replenished by the photovisual observations of the 7-camera astrograph collection of Odessa Astronomical Observatory during 24 years. The particularities of each from 10 revealed flashes are given.

**Keywords:** Stars: Binaries: Individual: V 795 Tau

A pulsar A 0535+26 (V 725 Tau, HDE 245770) belongs to a small group of the recurrent transient X-ray source. This Be/neutron star binary system is actively observed in a range from X-ray to infrared (see, for example, Giovannelli & Graziati, 1992; Gnedin et al., 1988, Motch et al., 1991). The X-ray outbursts of the system occur with period 111.4 day (Priedhorsky & Terrel, 1983; Motch et al., 1988) and go on from 2-4 to 50 days. Photometric behaviour of V 725 Tau (V=8.<sup>m</sup>8, reddened B0 IIIe) is described using the authors' and all published photoelectric observations during many years in the papers by Lyutiy et al. (1989), Giovannelli & Graziati, 1992, Hao et al. (1996).

We observed A 0535+26 taking part in the Program "Monitoring of Unique Astrophysical Objects" of Russian Ministry of Science. The 2-3 hours' observational runs were made with dual channel photometer attached to 0.8 m Ritchey-Chretien telescope at the Mt. Dushak-Erekdag observational station of Odessa Astronomical Observatory (Dorokhov et al., 1994)

The great multipulse outburst was recorded in the night 28/29 Oct. 1995 (JD 2450019) during 1.7 hour (Dorokhov & Dorokhova, 1996). The outburst light curve in relative magnitudes is presented in Fig.1. This consists of a great number of transitory individual pulses. The intensity at the burst's peak was about five times as large as that on the bottom level on this night ( $\Delta m=1.<sup>m</sup>74$ ). On an average A 0535+26 became brighter by 0.<sup>m</sup>2-0.<sup>m</sup>25.

We are interested in how often optical flashes occur in A 0535+26 and what their character is. The similar pulses are described in the article by Urasin and Sha-

imukhametov (1987). They reported about short-time optical flashes with amplitudes 2<sup>m</sup>-3<sup>m</sup> and durations 0.2-0.3 sec.

Besides some observers mention optical flares with large ( $\Delta V \geq 0.<sup>m</sup>15$ ) amplitudes. The observers usually did not present light curves and durations of the flares. It was only Maslennikov (1986) reported that the star returned to initial level of the brightness after 40 min.

The data on flares were so scanty, and we replenished these by the photovisual ones (close to Johnson's V) of the 7-camera astrograph collection of Odessa Astronomical Observatory. An exposition for each plate was 30 min. HD 36893 ( $m_{pv}=8.<sup>m</sup>34$ , B8), HD 246370 ( $m_{pv}=8.<sup>m</sup>89$ , G5), sometimes in addition HD 245562 ( $m_{pv}=9.<sup>m</sup>14$ , K5), were used as comparison stars. The photovisual magnitudes were obtained by applying photoelectric standards of square Champ 13 (Kazanasmas et al., 1981).

It should be noted that the photo plates data were presented in the papers by Rößiger (1979) for Sonneberg's archives and Stier & Liller (1976) for Harvard's archives, but the individual data were integrated for observational seasons in long-term light curves. We are interested in the transitory brightenings above the common light curve by 0.<sup>m</sup>2-0.<sup>m</sup>3. Five of such brightenings were found during 24 years' (from 1968 to 1992) observational interval. An accuracy of such observations is not higher than 0.<sup>m</sup>05.

In Table 1 all the data on the optical flashes' activity of A 0535+26 are collected. In remarks under the table we noted particularities of each flash.

For imaging the photometric behaviour of the system we take off the data from the graphs in the papers by Lyutiy et al. (1989) and Hao et al. (1996). In Fig.2 this light curve and the 7-camera astrograph data are presented. The flashes are marked by arrows.

What are the reasons of these processes? What is their influence on the Be/neutron star system? Why did the outburst of 28 October so much like the X-ray outbursts of similar objects occur in the optical band? We cannot answer these questions yet. In conclusion we request to the observers of V 725 Tau: please inform us, if you have got any unpublished data on the optical flashes.

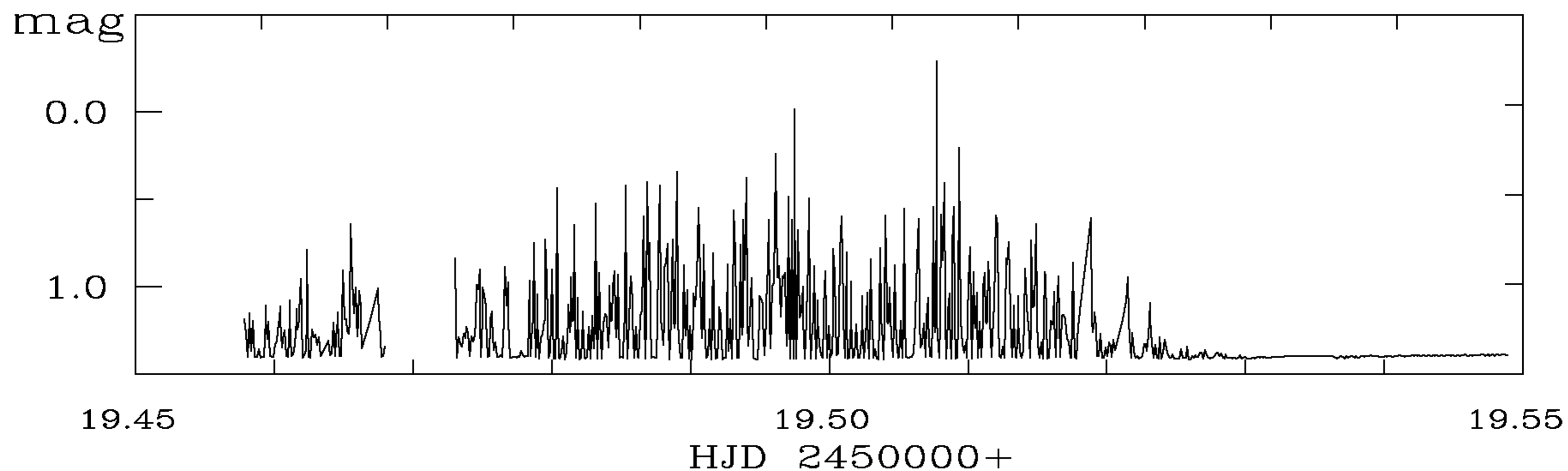


Fig. 1. The magnitude variable-comparison star differences of dual-channel observations of 28/29 Oct. 1995 outburst.

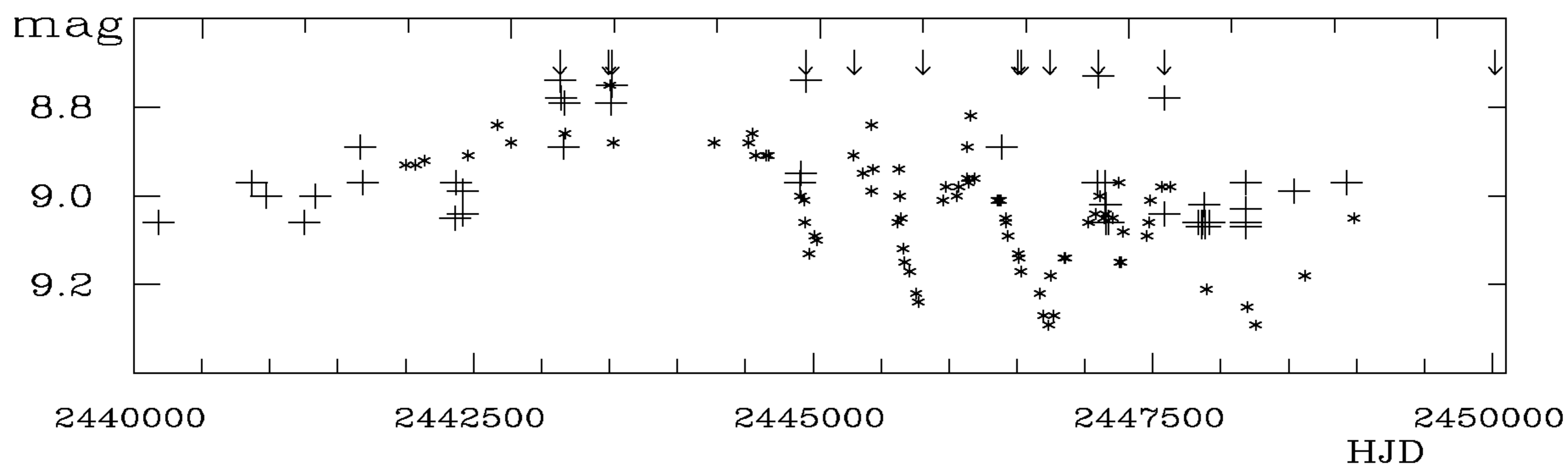


Fig. 2. The secular light curve of HDE 245770 in Johnson's filter V: by asterisks are shown the data taken off the graphs in the papers by Lyutiy et al. (1989) and Hao et al. (1996), cross - photovisual data of the 7-camera astrograph collection of Odessa Astronomical Observatory. The arrows on the graph mark the optical flashes.

Table 1. The data of the optical flashes' activity of A0535+26

JD	Date	Source
43135.39	22.12.76	7-camera astrograph OAO <sup>1</sup>
43496.41	19.12.77	Rößiger (1978)
43519.35	10.01.78	7-camera astrograph OAO <sup>1</sup>
44943.43	04.12.81	7-camera astrograph OAO
45300.00	26.11.82	Gnedin et al.(1988) <sup>2</sup>
45807.13	16.04.84	Maslennikov (1986) <sup>3</sup>
46507.25	17.03.86	Urasin et al. (1987) <sup>4</sup>
46530.25	09.04.86	Urasin et al. (1987) <sup>4</sup>
46740.33	05.11.86	Berdnik et al. (1990)
47097.53	28.10.87	7-camera astrograph OAO
47581.24	23.02.89	7-camera astrograph OAO <sup>5</sup>
50019.50	28.10.95	Dorokhov & Dorokhova(1996)

<sup>1</sup> common brightening of the light curve rather than flares;

<sup>2</sup> the date of the flash may be approximate;

<sup>3</sup> the star returned to initial level of the brightness after 40 min;

<sup>4</sup> transitory optical pulses with amplitudes  $2^m - 3^m$  and durations 0.2-0.3 sec.;

<sup>5</sup> the most certain "photo" flash, on the next day the brightness returned to initial level,  $\Delta m = 0.^m26$ .

## References

- Berdnik E.V., Gorshanov D.L., Maslennikov K.L., Somsikov V.V.: 1990, *Pis'ma Astron Zh.*, **16**, 1099
- Dorokhov N.I., Dorokhova T.N., Komarov N.S., Mukhamednazarov S.: 1994, *Odessa Astronomical Publ.*, **7**, 167
- Dorokhov N.I., Dorokhova T.N.: 1996, *IBVS*, N 4357
- Giovannelli F., Graziati L.S.: 1992, *Sp. Sci.Rev.*, **59**, 1
- Gnedin Yu.N., Zaitseva G.V., Larionov V.M., Lyutiy V.M., Khozov G.V., Sheffer E.K.: 1988, *Astron. Zh.*, **65**, 1196
- Hao J.-X., Huang L., Guo Z.H.: 1996, *As.Ap.*, **308**, 499
- Kazanymas M.S., Zavershneva L.A., Tomak L.F.: 1981, *Atlas and Catalog of photoelectric standards' magnitudes*, Kiev, Naukova Dumka, p.37;132
- Lyutiy V.M., Zaitseva G.V., Latysheva I.D.: 1989, *Pis'ma Astron Zh.*, **15**, 421
- Maslennikov K.L.: 1986, *Pis'ma Astron Zh.*, **12**, 458
- Motch C., Stella L., Janot-Pacheco E., Mouchet M.: 1991, *Ap.J.*, **369**, 490
- Priedhorsky W.C., Terrell J.: 1983, *Nature*, **303**, 681
- Rößiger S.: 1979, *Die Sterne*, **55**, 76
- Urasin L.A., Shaimukhametov R.R.: 1987, *Astron. Circ.*, N1492