COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5346

Konkoly Observatory
Budapest
27 November 2002

HU ISSN 0374 – 0676

DRAMATIC CHANGE OF OUTBURST PROPERTIES IN LX And

KATO, TAICHI

Dept. of Astronomy, Kyoto University, Kyoto 606-8502, Japan; e-mail: tkato@kusastro.kyoto-u.ac.jp

LX And was originally discovered as an RV Tau star during a survey for RR Lyr-type stars (Kinman et al. 1982). Uemura et al. (2000) revealed that the object actually shows dwarf nova-type outbursts. Following this new classification, Morales-Rueda and Marsh (2002) spectroscopically confirmed the dwarf nova-type nature. Although the orbital period has not been established, the outburst characteristics (Uemura et al. 2000) and infrared colors (Hoard et al. 2002) make a classification of an SS Cyg-type dwarf nova likely.

The mean periods of LX And have been reported to be 36.469 d (Kinman et al. 1982) or 21–30 d, most likely ∼26 d (Uemura et al. 2000). The object has been closely monitored by visual observers around the world since the discovery of the dwarf nova-type nature. From the recent outburst detections, we noticed a dramatic change of the outburst properties of this object.

Figure 1 shows the long-term light curve based on the observations reported to VSNET (`http://www.kusastro.kyoto-u.ac.jp/vsnet/`) and Uemura et al. (2000). The accuracy of the visual observations are usually 0.2–0.3 mag, which would not affect the following discussion. Table 1 shows the list of outbursts. The initial date of the outburst detections and the observed maxima are given. When there are sufficient data around the peak brightness, we took an average of the observations.

Table 2 shows the mean outburst intervals of the continuous segments of the light curve (there are unavoidable gaps in observation around the solar conjunction). The mean intervals and the errors were determined by using a linear fit to the observed times of the outbursts.

The data clearly demonstrate that this object shows a large variation (16–36 d) of the outburst mean intervals (Figure 2). We have ruled out, by a close inspection of the entire data, a possibility that a period doubling (30–36 d and 16 d) is not a result of missed outbursts. A dense CCD light curve by Uemura et al. (2000) also rejects this possibility.

The ratio between the maximum mean interval $\Delta T_{\rm max}$ and the minimum mean interval $\Delta T_{\rm min}$ is 2.2, which far exceeds the typical values (1.2–1.5) reported in other SS Cyg-type dwarf novae (Bianchini 1990). LX And is thus shown to be a rare system with a huge variation of long-term outburst intervals. Although it was not clearly demonstrated, a report of a long-term variation of mean magnitudes (Kinman et al. 1982), which originally classified the object to be an RVb type star, may have been a result of a similar long-term trend.

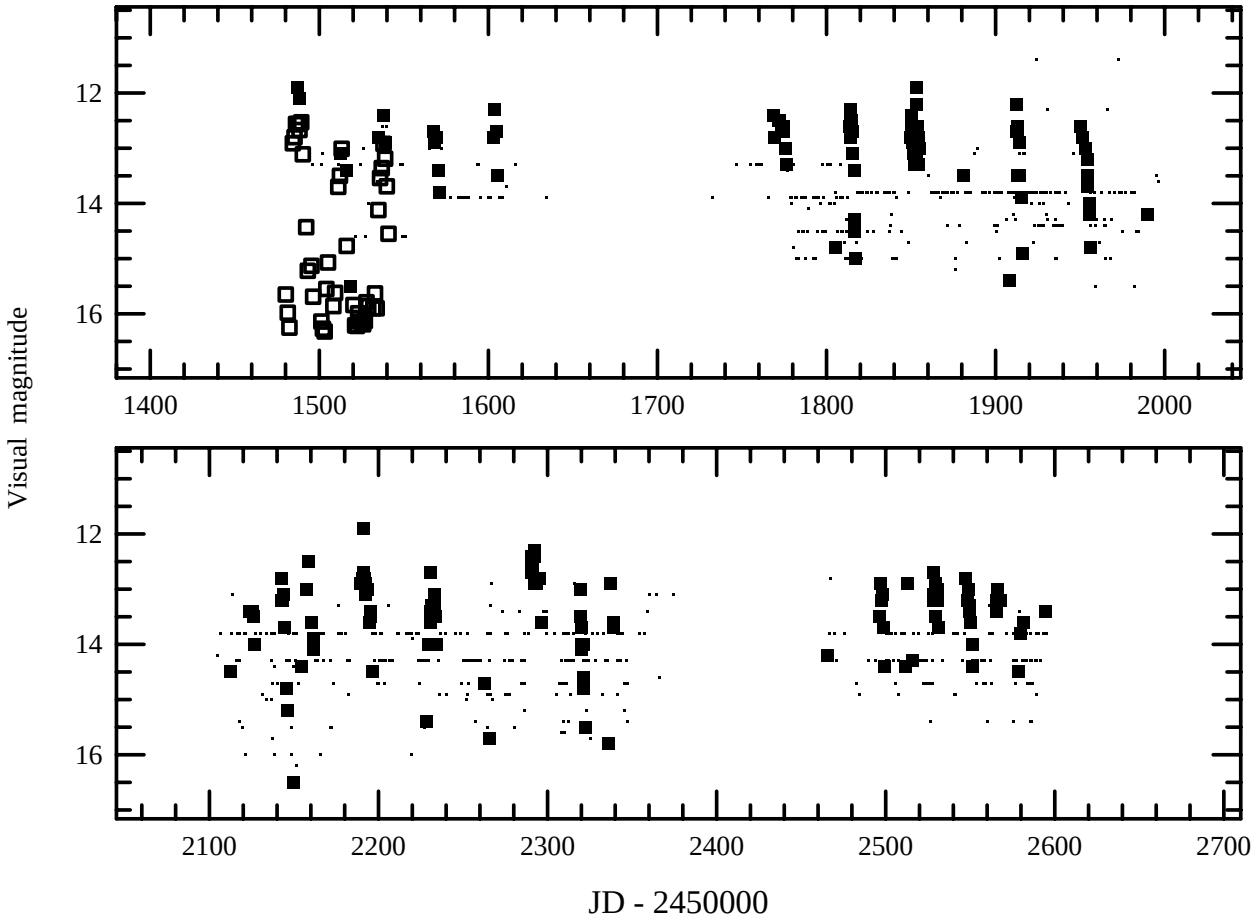

Figure 1. Light curve of LX And based on VSNET observations and Uemura et al. (2000). The large and small symbols, and open squares represent positive and negative (upper limit) visual observations, and CCD observations, respectively.

Table 1. Outbursts of LX And.

JD[a]	Max	JD[a]	Max	JD[a]	Max
51484	12.2	51950	12.6	52337	12.9
51511	13.0	51990	14.2[b]	52466	14.2[b]
51535	12.8	52123	13.4	52496	12.9
51567	12.7	52142	13.0	52512	12.9
51603	12.3	52155	12.5	52528	13.1
51769	12.4	52189	12.3	52547	12.8
51814	12.5	52229	13.0	52565	13.1
51850	12.4	52263	14.7[b]	52578	13.6
51881	13.5	52290	12.5	52594	13.4
51912	12.2	52319	13.2		

[a] JD−2400000.
[b] True maximum probably missed.

Table 2. Mean outburst intervals.

Start JD−2400000	End	Period (d)	Error (d)
51484	51603	29.4	1.4
51769	51990	35.6	0.8
52123	52155	16.0	1.7
52155	52337	31.0	1.4
52496	52594	16.5	0.3

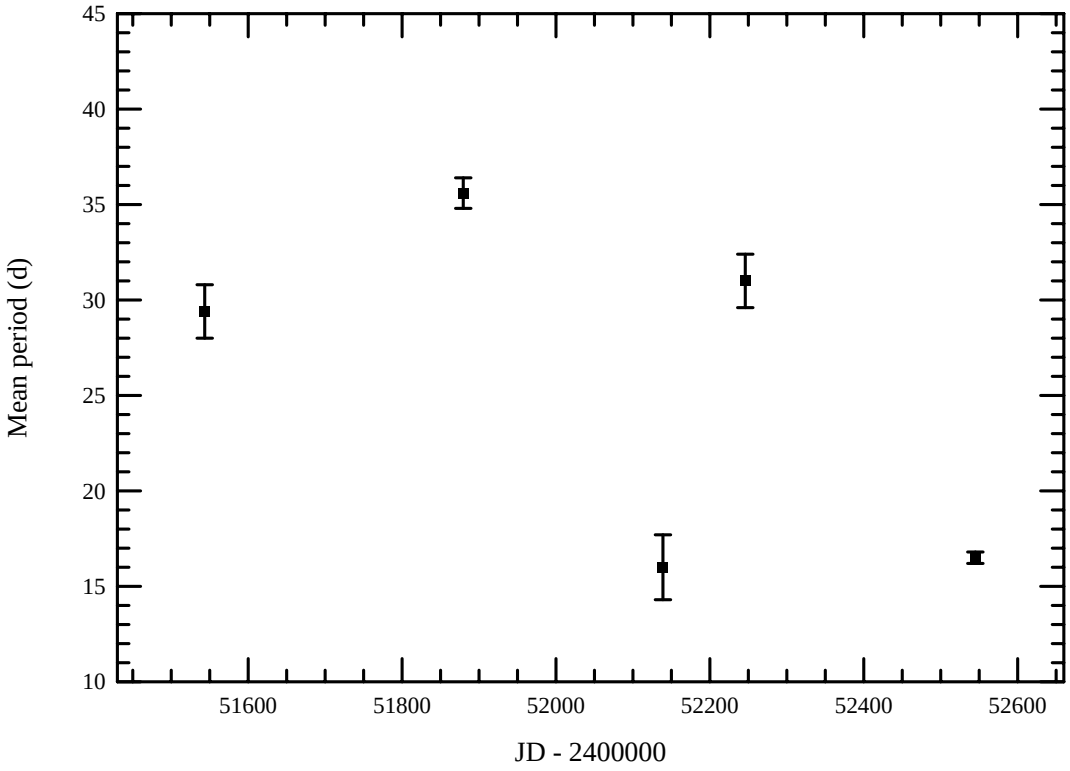

Figure 2. Variation of the mean outburst intervals of LX And.

As suggested by Bianchini (1990) and Ak et al. (2001), such a long-term variation can be attributed to solar-type activity cycle in a cataclysmic binary. LX And would be a promising target for a future more comprehensive work in search of a further signature of a solar-type activity cycle.

An alternative explanation is the dramatic change of the state of the accretion disk, as demonstrated in the SU UMa-type dwarf nova V503 Cyg by Kato et al. (2002). In this case, we do not necessarily require a variable mass-transfer rate, but would require a still unidentified mechanism causing the state changes in the accretion disk.

We are grateful the members of VSNET for reporting crucial observations. This work is partly supported by a grant-in-aid (13640239) from the Japanese Ministry of Education, Culture, Sports, Science and Technology.

References:

Ak, T. and Ozkan, M. T. and Mattei, J. A., 2001, *A&A*, **369**, 882
Bianchini, A., 1990, *AJ*, **99**, 1941
Hoard, D. W., Wachter, S., Clark, L. L., Bowers, T. P., 2002, *ApJ*, **565**, 511
Kato, T., Ishioka, R., Uemura, M., 2002, *PASJ*, in press (astro-ph/0209233)
Kinman, T. D., Mahaffey, C. T., Wirtanen, C. A., 1982, *AJ*, **87**, 314
Morales-Rueda, L., Marsh, T. R., 2002, *MNRAS*, **332**, 814
Uemura, M., Kato, T., Watanabe, M., 2000, *IBVS*, No. 4831