

COMMISSION 27 OF THE I. A. U.
 INFORMATION BULLETIN ON VARIABLE STARS

Number 3266

Konkoly Observatory
 Budapest
 23 November 1988
 HU ISSN 0374-0676

A NEW PERIOD CHANGE OF BX And

The short period eclipsing binary BX And (=BD+40^o442=HD13078) is the brighter component of the visual binary ADS 1671. It was announced as a variable star by Soloviev (1945). Its light elements and times of minima have been published by various authors (see references to Table I).

BX And was observed at the Ege University Observatory. The observations were made in B and V bands using the 48 cm Cassegrain reflector with a photoelectric photometer equipped with an unrefrigerated photomultiplier tube EMI 9781A. BD+39^o476 and BD+39^o484 were used as comparison and check stars, respectively.

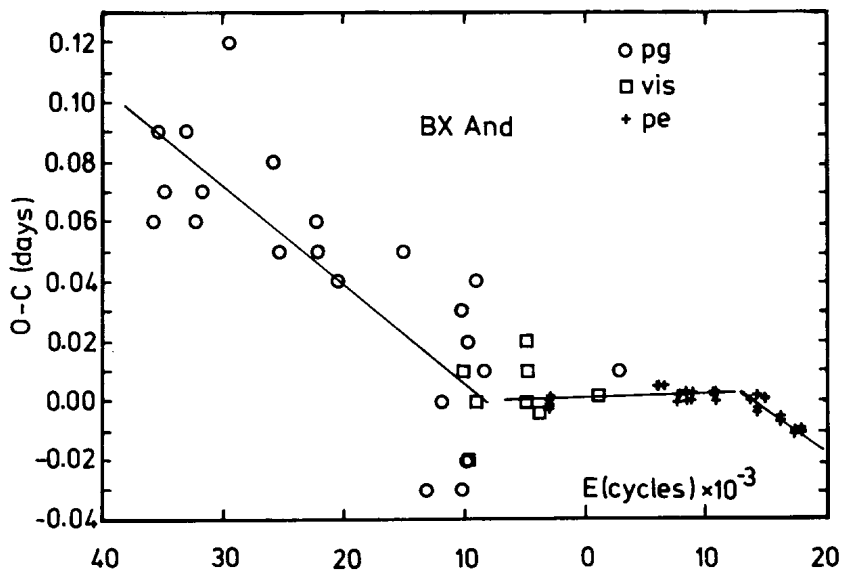


Figure 1 : The O-C diagram for BX And. (Ephemeris: Chou, 1959).

Table I. Times of minima of BX Andromedae

J.D. Hel.	min	method	E	O-C ₁	O-C ₂	Ref.
2414688.54	I	pg	-35797	0.06	-0.03	1
966.78	I	pg	-35341	0.09	0.00	1
15282.80	I	pg	-34823	0.07	-0.02	1
16371.88	I	pg	-33038	0.09	0.01	1
860.55	I	pg	-32237	0.06	-0.02	1
17168.67	I	pg	-31732	0.07	-0.01	1
18542.70	I	pg	-29480	0.12	0.05	1
20751.89	I	pg	-25859	0.08	0.03	1
803.74	I	pg	-25774	0.08	0.02	1
21089.86	I	pg	-25305	0.05	-0.01	1
22942.79	I	pg	-22268	0.06	0.01	1
23019.65	I	pg	-22142	0.05	0.00	1
24064.77	I	pg	-20429	0.04	0.00	1
27357.88	II	pg	-15031.5	0.05	0.03	1
28502.68	I	pg	-13155	-0.03	-0.05	1
29274.51	I	pg	-11890	0.00	-0.01	1
30306.79	I	pg	-10198	-0.03	-0.04	1
324.54	I	pg	-10169	0.03	0.02	1
339.17	I	vis	-10145	0.01	0.00	1
594.82	I	pg	-9726	0.02	0.02	1
597.83	I	pg	-9721	-0.02	-0.02	1
647.25:	I	vis	-9640	-0.02	-0.02	1
996.25:	I	vis	-9068	0.00	-0.01	1
31076.52	II	pg	-8936.5	0.04	0.03	1
438.60	I	pg	-8343	0.01	0.01	1
33541.65	I	vis	-4896	0.00	0.00	1
571.57	I	vis	-4847	0.02	0.02	1
582.54	I	vis	-4829	0.01	0.01	1
34242.672	I	vis	-3747	-0.004	-0.004	2
699.6515	I	pe	-2998	-0.0004	-0.0014	4
699.6525	I	pe	-2998	0.0006	-0.0004	4
710.6325	I	pe	-2980	-0.0015	-0.0024	4
710.6350	I	pe	-2980	0.0010	0.0001	4
735.6475	I	pe	-2939	-0.0012	-0.0022	4
735.6495	I	pe	-2939	0.0008	-0.0002	4
743.5780	I	pe	-2926	-0.0022	-0.0032	4
743.5815	I	pe	-2926	0.0013	0.0003	4
36528.7777	I	pe	0	0.0000	-0.0013	5
538.540	I	pe	16	0.000	-0.001	5
37180.688	II	vis	1068.5	0.002	0.001	6
38269.447	I	pg	2853	0.010	0.009	7
40100.398	I	pe	5854	0.005	0.003	8
103.448	I	pe	5859	0.005	0.003	8
133.344	I	pe	5908	0.005	0.003	8
496.363	I	pe	6503	0.005	0.003	8
41186.4006	I	pe	7634	0.0024	0.0002	9
210.805	I	pe	7674	0.002	0.000	10
213.853	I	pe	7679	0.000	-0.003	10
276.697	I	pe	7782	0.002	-0.001	10

Table I (cont.)

J.D. Hel.	min	method	E	O-C ₁	O-C ₂	Ref.
2441618.3634	I	pe	8382	0.0035	0.0012	11
679.371	I	pe	8442	0.000	-0.003	11
900.538	II	pe	8804.5	0.000	-0.003	11
951.484:	I	pe	8888	0.001	-0.001	11
951.486:	I	pe	8888	0.003	0.001	11
43012.4755	I	pe	10627	0.0021	-0.0005	12
033.8307	I	pe	10662	0.0032	0.0007	13
034.7460	II	pe	10663.5	0.0034	0.0008	13
098.8043	II	pe	10768.5	-0.0004	-0.0030	13
099.7228	I	pe	10770	0.0029	0.0003	13
44868.4446	I	pe	13669	0.0003	0.0000	14
45213.4622	II	pe	14234.5	-0.0023	-0.0011	15
217.4266	I	pe	14241	-0.0037	-0.0024	15
218.3475	II	pe	14242.5	0.0021	0.0033	15
220.4784	I	pe	14246	0.0024	-0.0012	15
576.484:	II	pe	14829.5	0.001	0.004	16
638.411	I	pe	14931	0.001	0.004	16
46348.5782	I	pe	16095	-0.0059	0.0005	17
359.5598	I	pe	16113	-0.0064	0.0001	17
366.577	II	pe	16124.5	-0.005	0.001	17
47040.4438	I	pe	17229	-0.0111	-0.0015	18
043.4947	I	pe	17234	-0.0108	-0.0012	18
062.4079	I	pe	17265	-0.0111	-0.0015	18
063.3246	II	pe	17266.5	-0.0096	0.0001	18
439.460:	I	pe	17883	-0.010	0.001	18
440.3766	II	pe	17884.5	-0.0089	0.0025	18
455.3223	I	pe	17909	-0.0110	0.0005	18

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The times of minima obtained in 1985 (two primary and one secondary) and in 1987 (three primary and one secondary) implied a new sudden period change in the system. Therefore, the observations were continued in 1988 and two additional primary and one more secondary minima were also obtained. These minimum times, clearly confirming a sudden decrease in the period, and all the other ones from the literature are given in Table I. The $O-C_1$ and E (number of cycles) values were calculated with following light elements which are given by Chou (1959):

$$\text{Hel Min I JD} = 2436528.7777 + 0.61011534 \cdot E \quad (1)$$

The $O-C_1$ residuals versus E values are shown in Figure 1. As it is clearly seen in the figure, the first period change occurred between JD 2431500 and JD 2433500 (between 1945 and 1950). A new change in the period occurred recently around 1981. These two occurrences of the period change divide the time axes into three parts for BX And. Therefore, the new light elements are separately calculated by weighted least squares method for these three parts as follows:

$$\text{Hel Min I JD} = 2424064.773 + 0.61011214 \cdot E \quad (2)$$

$\begin{matrix} +24 & \pm 49 \end{matrix}$

for the first part (up to JD 2431500),

$$\text{Hel Min I JD} = 2436528.7790 + 0.61011546 \cdot E \quad (3)$$

$\begin{matrix} +28 & \pm 5 \end{matrix}$

for the second part (between JD 2431500 and JD 2444700),

$$\text{Hel Min I JD} = 2446359.5597 + 0.61011255 \cdot E \quad (4)$$

$\begin{matrix} +17 & \pm 15 \end{matrix}$

for the last part (after JD 2444700).

The last ephemeris clearly shows a decrease in the period about 0.25 sec with respect to ephemeris (3). The $O-C_2$ values in Table I are calculated with the new light elements according to the time interval in which the observations were made.

This work has been partly supported by Research Foundation of the Ege University with a project number 1987/066.

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