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BX DRACONIS : NEW EPHEMERIS AND LIGHTCURVE

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In this paper we report on our photographic and CCD photometry on the β Lyrae variable BX Dra.

BX Dra = BV 228 = GSC 4192.0448 was announced as a short period variable by Strohmeier (1958) with a brightness range between $11^{m}_{.}5$ and $12^{m}_{.}2$. Strohmeier et al. (1965) classified the star as an RR Lyrae type variable, gave 7 times of maximum light, calculated from them an ephemeris as

$$\mathrm{Max} = \mathrm{HJD}\,2427216.410 \;+\; 0^{d}_{.}561192 \times \mathrm{E} \tag{1}$$

and published a first photographic light curve. With these data BX Dra was included in the GCVS (Kholopov et al. 1985). Satyvaldiev (1966) also investigated this variable on photographic plates and gave 150 estimates of brightness, but was not able to determine the period or the type of variability.

The rather long period for an RRc-type variable and the lack of further observations made BX Dra an interesting object to us. One of us (MD) investigated this variable on 227 plates of the Sonneberg Sky Patrol. The observations by the other were made with an SBIG ST6 camera without filters attached to a 20cm SC telescope. His minima times were calculated using the Kwee–van Woerden (1956) method. GSC 4192.516 was used as comparison star. From these measurements we found the variable to be of β Lyrae type (see Figure 1) and got a first period of $0^{d}_{.}578$. This result is independently confirmed by Schmidt et al. (1995) who give one further minimum based on their CCD photometry.

Instantaneous elements, computed from CCD measured minima only, are

$$\begin{array}{rl} \mathrm{Min\,I} = \mathrm{HJD}\,2449810.5924 + & 0^{d}_{.}57902552 \times \mathrm{E} \\ \pm 1 \qquad\quad & \pm 6 \end{array} \tag{2}$$

Using all available times of maxima by Strohmeier et al. (1965) we calculated the times of the subsequent minima by adding P/4. The resulting O$-$C's seem to confirm the period found (Table 1). The best description is a least squares fit to quadratic elements which led to the following ephemeris :

$$\begin{array}{rll} \mathrm{Min\,I} = \mathrm{HJD}\,2449810.5925 + & 0^{d}_{.}5790282 \times \mathrm{E} \;+ & 5.56 \times 10^{-10} \times \mathrm{E}^2 \\ \pm 11 \qquad & \pm 12 & \pm 42 \end{array} \tag{3}$$

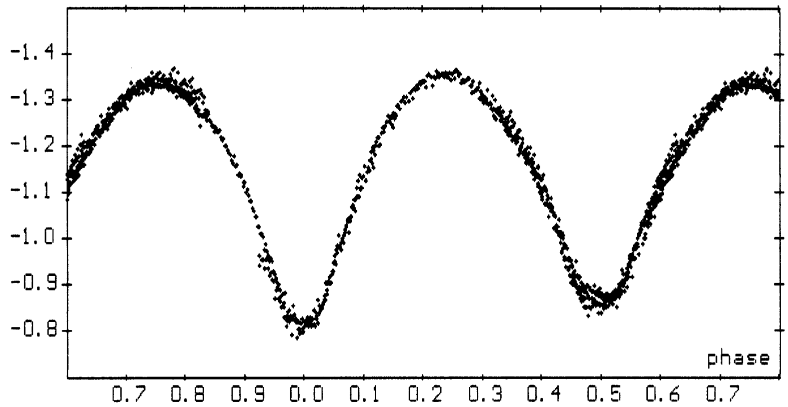

Figure 1: Differential light curve of BX Dra against GSC 4192.516 phased with the new ephemeris (2).

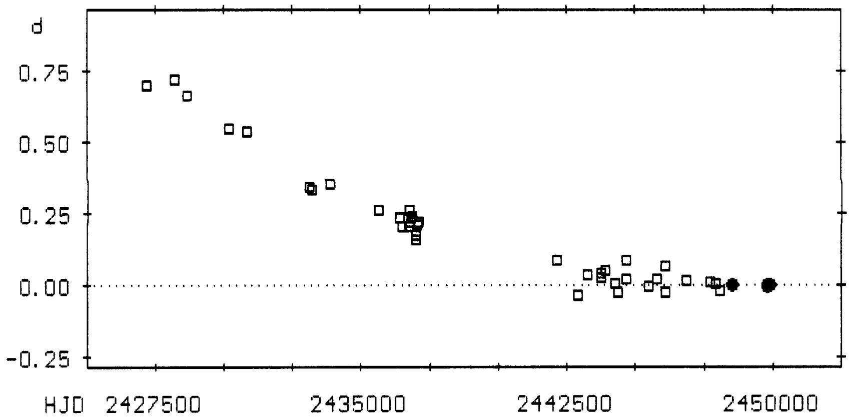

Figure 2: O–C diagram for BX Dra computed with respect to the new ephemeris (2) using all available minimum timings. • represents photoelectric, and □ photographic plate minima.

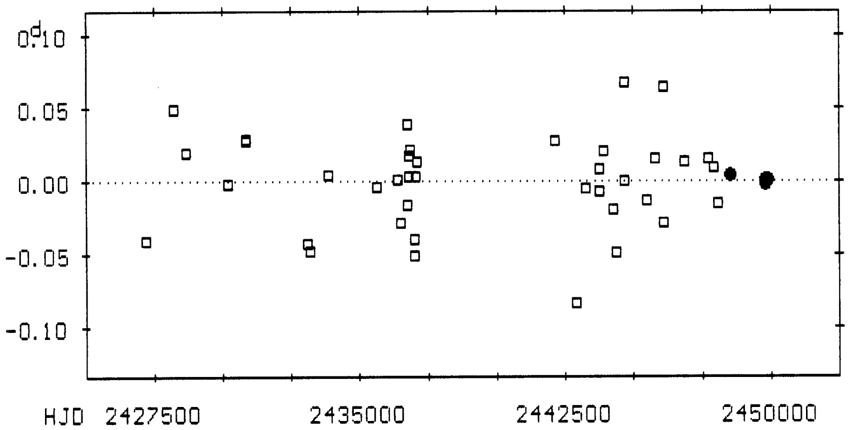

Figure 3: O–C diagram for BX Dra computed with respect to the new ephemeris (3).

Table 1. Observed times of minima for BX Dra, epochs and residuals computed with respect to the ephemeris (3) derived in this paper.

N	JD hel. 2400000+	W	T*	Epoch	O−C	Lit	N	JD hel. 2400000+	W	T*	Epoch	O−C	Lit
1	27216.560	2	P	−39022.0	−0.041	[1]	24	43250.558	2	P	−11329.5	−0.006	[3]
2	28245.797	2	P	−37244.5	+0.049	[1]	25	43776.318	2	P	−10421.5	+0.008	[3]
3	28656.558	2	P	−36535.0	+0.019	[1]	26	43789.331	2	P	−10399.0	−0.007	[3]
4	30195.2	2	P	−33877.5	−0.0	[2]	27	43926.585	2	P	−10162.0	+0.020	[3]
5	30842.253	2	P	−32760.0	+0.028	[2]	28	44289.589	2	P	−9535.0	−0.020	[3]
6	30871.203	2	P	−32710.0	+0.028	[2]	29	44371.491	2	P	−9393.5	−0.049	[3]
7	33114.444	2	P	−28835.5	−0.043	[2]	30	44693.474	2	P	−8837.5	−0.000	[3]
8	33179.286	2	P	−28723.5	−0.049	[2]	31	44702.516	2	P	−8822.0	+0.067	[3]
9	33858.212	2	P	−27551.0	+0.003	[2]	32	45488.454	2	P	−7464.5	−0.013	[3]
10	35654.26	2	P	−24449.0	−0.00	[2]	33	45816.497	2	P	−6898.0	+0.015	[3]
11	36394.229	2	P	−23171.0	+0.000	[2]	34	46113.584	2	P	−6385.0	+0.064	[3]
12	36485.103	2	P	−23014.0	−0.029	[2]	35	46121.597	2	P	−6371.0	−0.029	[3]
13	36763.326	2	P	−22533.5	−0.017	[2]	36	46850.628	2	P	−5112.0	+0.013	[3]
14	36773.224	2	P	−22516.5	+0.038	[2]	37	47717.428	2	P	−3615.0	+0.015	[3]
15	36815.166	2	P	−22444.0	+0.002	[2]	38	47945.557	2	P	−3221.0	+0.009	[3]
16	36821.26	2	P	−22433.5	+0.02	[2]	39	48067.417	2	P	−3010.5	−0.016	[3]
17	36837.187	2	P	−22406.0	+0.021	[2]	40	48528.63	20	E:	−2214.0	+0.00	[4]
18	37017.775	2	P	−22094.0	−0.040	[1]	41	49810.5926	40	E	0.0	+0.0001	[5]
19	37026.738	2	P	−22078.5	−0.051	[1]	42	49811.4614	40	E	1.5	+0.0004	[5]
20	37080.639	2	P	−21985.5	+0.002	[1]	43	49812.3275	20	E:	3.0	−0.0021	[5]
21	37107.573	2	P	−21939.0	+0.013	[1]	44	49840.4122	40	E	51.5	−0.0003	[5]
22	42152.49	2	P	−13226.0	+0.03	[3]	45	49866.4682	40	E	96.5	−0.0005	[5]
23	42891.49	2	P	−11949.5	−0.08	[3]	46	49888.4720	40	E	134.5	+0.0002	[5]

[1]: Strohmeier et al. (1958) P/4 added, [2]: Satyvaldiev (1966) [3]: Dahm: this paper, [4]: Schmidt et al. (1995), [5]: Agerer: this paper.
* P denotes pg plate min. and E CCD measured min. Those marked with ':' got reduced weight.

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ERRATUM

In IBVS No. 4230, the spectral type of ST Mon was incorrectly given due to an unfortunate typographic error. The new spectral type of ST Mon is M5e.

The editors