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PHOTOMETRIC PERIODICITY OF BZ Cam DURING THE 1999 FADING

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BZ Cam is a well-known cataclysmic variable of novalike (NL) category, which does not show dwarf nova-type outbursts. BZ Cam is renowned for its surrounding bow shock nebula (Krautter et al. 1987; Hollis et al. 1992), and highly variable appearance of P Cyg profiles in its spectra (originally discovered by J. R. Thorstensen and presented in Patterson et al. 1996; Ringwald and Naylor 1998). BZ Cam has been playing an important role in understanding the formation of high-speed winds from cataclysmic variables. The binary nature of BZ Cam was studied by Lu and Hutchings (1985) and Patterson et al. (1996). The best determined orbital period is $0^{\mathrm{d}}.153693(7)$.

Another noteworthy characteristic of BZ Cam is its occasional fadings, which makes BZ Cam as one of VY Scl-type novalike variables. The first historical fading was discovered on Harvard Plates by Garnavich and Szkody (1988). The second ever-observed fading was in 1999 (Watanabe 2000, 2001). We performed CCD observations during this fading.

The CCD observations were done using an unfiltered ST-7 camera attached to the Meade 25-cm Schmidt–Cassegrain telescope. The exposure time was 30 s. The images were dark-subtracted, flat-fielded, and analyzed using the Java$^{\mathrm{TM}}$-based aperture photometry package developed by one of the authors (TK). The magnitudes were determined relative to GSC 4362.125 (V = 12.87, $B-V$ = +0.78) which constancy was confirmed using GSC 4362.861 (V = 14.00, $B-V$ = +0.67). The magnitudes of the comparison and check stars are taken from Henden and Honeycutt (1995). A total of 957 observations between 1999 October 3 and 1991 December 8 were obtained. Our observations were done at the bottom of the fading. Barycentric corrections were applied to the observed times before the following analysis.

The resultant light curve is shown in Figure 1. The object showed short-term variations but little long-term variation, which is consistent with that the observations were done at the bottom of the fading. The period analysis using the Phase Dispersion Minimization (PDM) method (Stellingwerf 1978) has revealed a clear (more than 5-sigma) periodicity close to the reported orbital period (Figure 2). The strongest period is $0^{\mathrm{d}}.15634(1)$, which is 1.7% longer than the orbital period. The averaged amplitude at the orbital period is less than $0^{\mathrm{m}}.03$, which excludes the orbital period as the origin of variations.

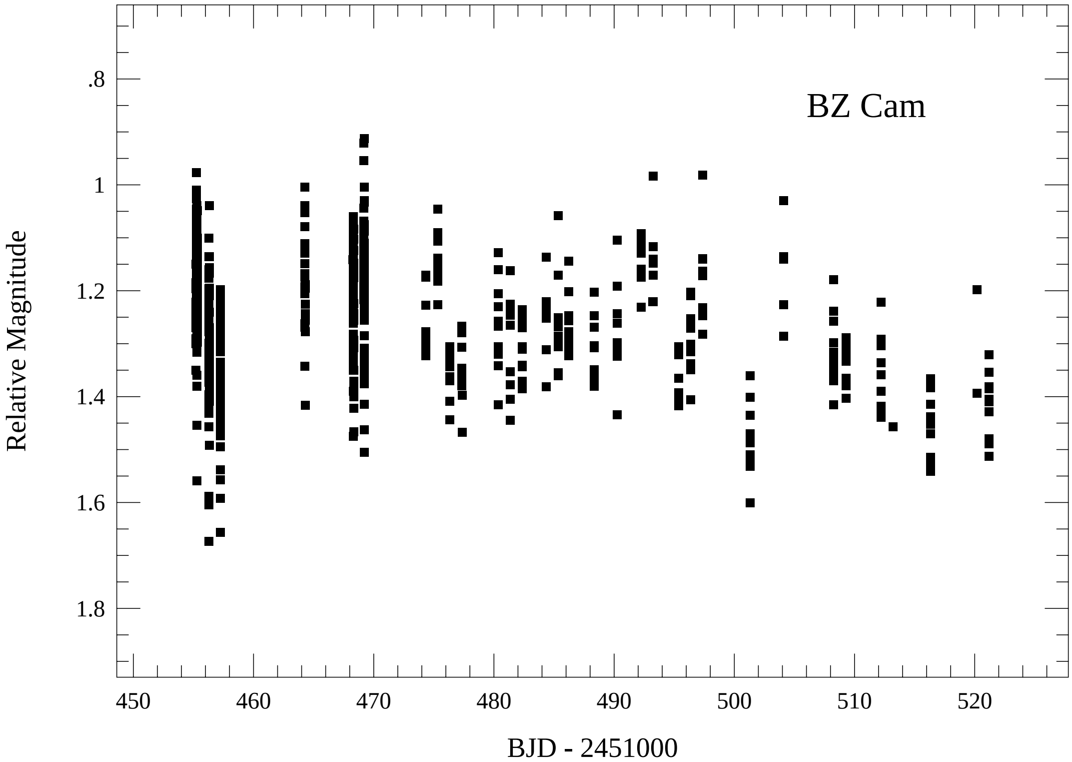

Figure 1. Light curve of BZ Cam

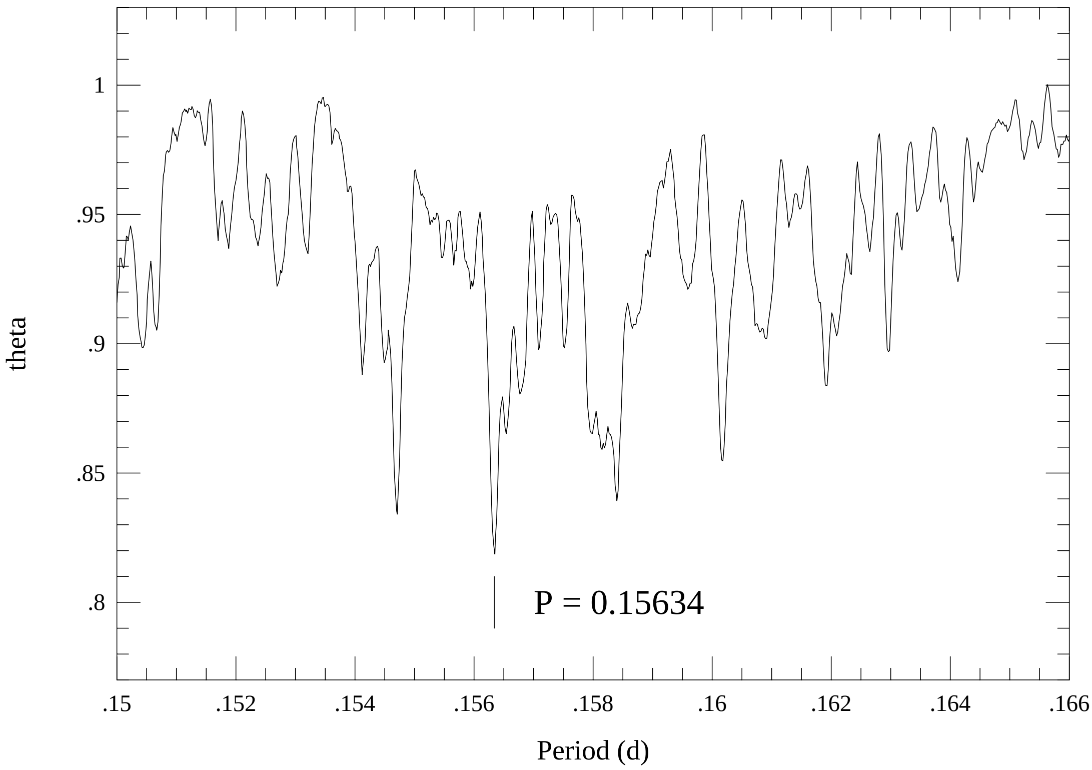

Figure 2. Periodogram of BZ Cam

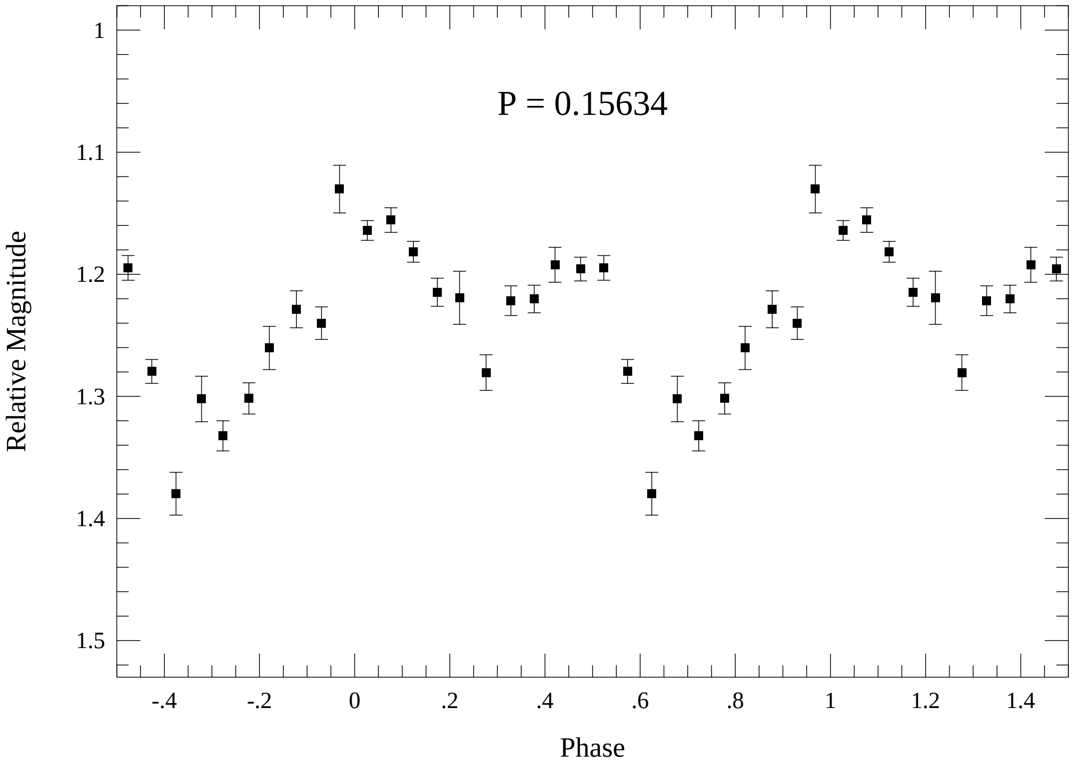

Figure 3. Phase-averaged light curve at $P = 0\overset{d}{.}15634$

The detection of a strong period slightly longer than the orbital period strongly suggests the presence of superhumps. Observations in the high state by Patterson et al. (1996) also suggested the presence of signals close to, but slightly different from the orbital period, but the amplitude of present observation (slightly larger than $0\overset{m}{.}2$) is much larger than those ($0\overset{m}{.}03$) suspected by Patterson et al. (1996). The profile of the light curve (Figure 3) is also characteristic to those of usual superhumps, but has a shoulder on the fading branch, which is reminiscent of some of low-amplitude superhump candidates reported by Patterson et al. (1996). Our observation suggests that superhumps in BZ Cam is enhanced during its low state (*transient* permanent superhumps?), phenomenologically contrary to SU UMa-type dwarf novae, which usually show superhumps during superoutbursts. The fractional superhump excess of 1.7% is relatively small for objects of this orbital period (e.g. Patterson 1999). Different excitation mechanisms may be responsible for superhumps in BZ Cam, from other novalike systems with permanent superhumps.

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References:

Garnavich, P., Szkody, P., 1988, *PASP*, **100**, 1522
Henden, A. A., Honeycutt, R. K., 1995, *PASP*, **107**, 324
Hollis, J. M., Oliversen, R. J., Wagner, R. M., Feibelman, W. A., 1992, *ApJ*, **393**, 217
Krautter, J., Radons, G., Klaas, U., 1987, *A&A*, **181**, 373
Lu, W., Hutchings, J. B., 1985, *PASP*, **97**, 990

Patterson, J., 1999, in: Disk Instability in Close Binary Systems, eds. S. Mineshige and J. C. Wheeler (Universal Academy Press, Tokyo), p. 61

Patterson, J., Patino, R., Thorstensen, J. R., Harvey, D., Skillman, D. R., Ringwald, F. A., 1996, *AJ*, **111**, 2422

Ringwald, F. A., Naylor, T., 1998, *AJ*, **115**, 286

Stellingwerf, R. F., 1978, *ApJ*, **224**, 953

Watanabe, T., 2000, *VSOLJ Variable Star Bull.*, **37**, 1

Watanabe, T., 2001, *VSOLJ Variable Star Bull.*, **38**, 1