COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 4631

Konkoly Observatory
Budapest
9 September 1998
HU ISSN 0374 – 0676

CCD PHOTOMETRY OF UZ CrB, XX CrB AND V864 Her

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Recently Wetterer et al. 1996 (hereafter, W96) published the results of a search for RR Lyrae variable stars in the CCD/Transit Instrument (CTI) survey. Some of these stars were flagged as needing additional observations to confirm their type and/or period. This paper presents the results of observations of three of these stars using the 0.61 m telescope at the US Air Force Academy (USAFA) and a liquid nitrogen cooled 512x512 Photometrics CCD. Table 1 lists the name, star number from W96, right ascension and declination (epoch 1987.5), the number of CTI, the number of Capilla Peak (CAP), and the number of USAFA Observatory (AFA) observations through the V filter for each star. Figure 1 shows finder charts made from scans of the Palomar Digitized Sky Survey and identifies the variable stars and comparison stars.

Table 1: Variable Stars

Star	W96	α	δ	CTI	CAP	AFA
UZ CrB	27	$15^h16^m28^s.1$	$28°00'42''$	46	7	21
XX CrB	28	16 23 17.6	27 58 29	13	9	146
V864 Her	30	16 58 30.7	28 06 01	20	5	75

Table 2: Photometry results

Star	V_{Max}	V_{Min}	V_{Mean}	ΔV	B−V	m−M	Period	HJD	Type
UZ CrB	17.3	18.2	17.86	0.9	0.39	0.2	0.571895	988.6707	RRab
XX CrB	15.12	15.38	15.243	0.26	0.56	0.4	0.146620	989.7977	δ Sct
V864 Her	14.56	15.13	14.793	0.57	0.39	0.3-0.5	0.375362	983.7688	RRc (B)

Table 2 summarizes the results. After the star's name, the next five columns list the maximum, minimum, and flux averaged standard V magnitudes; the amplitude of variation in V (ΔV), and; the B−V at minimum light (from W96). W96 details the transformation from instrumental to standard magnitudes and how the flux averaged magnitude was calculated. The final four columns list the rise time as a fraction of a period (m−M); the period in days; the heliocentric Julian Date of maximum light (minus 2450000 days), and; the variability type for each star.

UZ CrB was listed in W96 as an RRab type variable with a period of 0.57190 days, although several other sidereal day aliased periods were possible. The period found combining the previous observations with the new observations (0.571895 $\pm$ 0.000006 days)

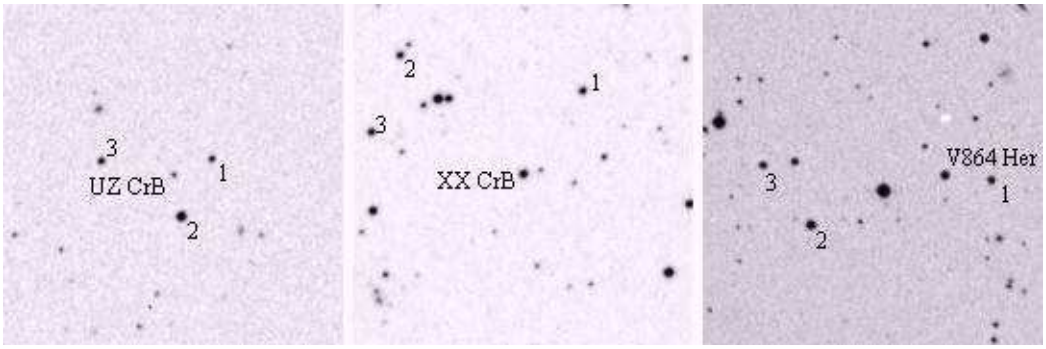

Figure 1. Finder charts (5′ x 5′) for the program stars

is very close to the originally calculated period. Due to the scatter in the data caused by UZ CrB's faintness, the sidereal day alias period at 0.363462 days can't be entirely ruled out. It is clear from the shape of UZ CrB's lightcurve (Figure 2), however, that its current designation as an RRab type variable star is appropriate and thus the 0.571895 day period is most likely correct.

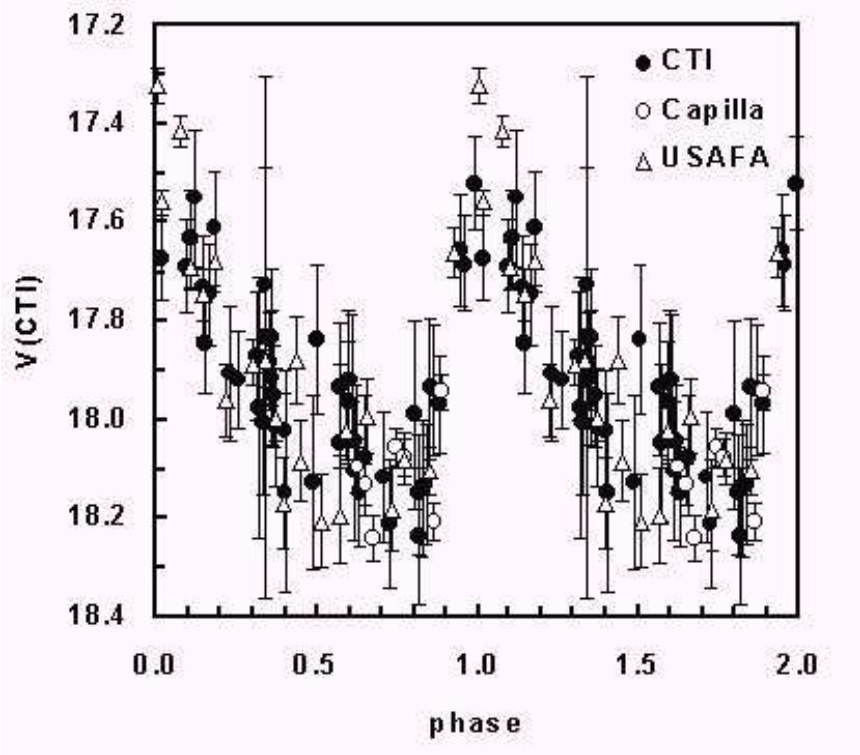

Figure 2. Lightcurve of UZ CrB. P = 0.571895 days

XX CrB was listed in W96 as a W UMa type variable with a period of 0.343670 days, although several other short periods were equally possible. Combining the previous observations with the new observations indicate that XX CrB is not an eclipsing variable and the period (0.146620 ± 0.000001 days) is a sidereal day alias of half the originally calculated period. XX CrB's period, amplitude and lightcurve (Figure 3) are now more

consistent with a δ Sct type variable star and should be reclassified as such. The 0.146620 day period is undoubtedly the fundamental pulsation, although due to the variations in minimum and maximum light from cycle to cycle, other pulsational modes with lower amplitudes are likely to be present as well. The minimum and maximum magnitudes and the amplitude of $\Delta V = 0.26$ in Table 2 correspond to the full range of magnitudes observed neglecting outliers. Of the over 250 δ Sct type variable stars listed in the General Catalog of Variable Stars (Kholopov et al. 1985-88) and subsequent name-lists (Kholopov et al. 1985, 1987, 1989; Kazarovets and Samus 1990, 1995, 1997; Kazarovets et al. 1993), less than a quarter have amplitudes greater than this.

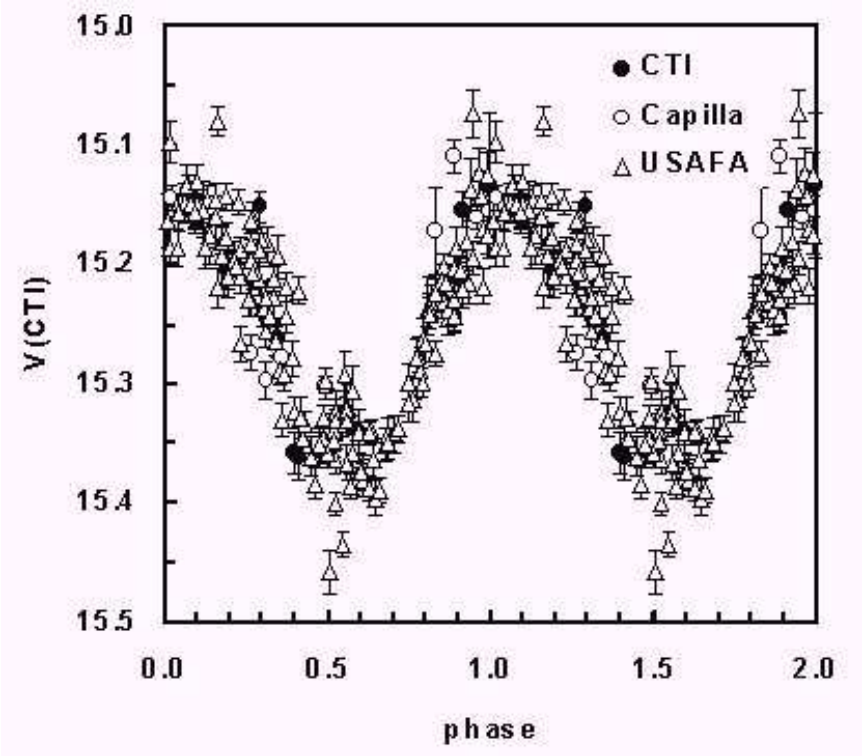

Figure 3. Lightcurve of XX CrB. P = 0.146620 days

V864 Her was listed in W96 as a possible RRc type variable star with a period of 0.272711 days, although other sidereal day aliased periods were possible. Combining the previous observations with the new observations indicate that V864 Her's period (0.375362 $\pm$ 0.000002 days) is indeed a sidereal day alias to the originally calculated period. V864 Her's period, amplitude, the asymmetry of its lightcurve (Figure 4), and the fact that the CTI observations through the B filter indicate the amplitude for this star in B is significantly greater than its amplitude in V ($\Delta B = 0.8$ from W96), are all consistent with its current designation as an RRc type variable star. Additionally, as can be seen in the lightcurve, this star displays the Blazkho effect with the ascending portion of its lightcurve changing in phase over time.

Acknowledgements. The Digitized Sky Surveys were produced at the Space Telescope Science Institute under U.S. Government grant NAG W-2166. The images of these surveys are based on photographic data obtained using the Oschin Schmidt Telescope on Palomar

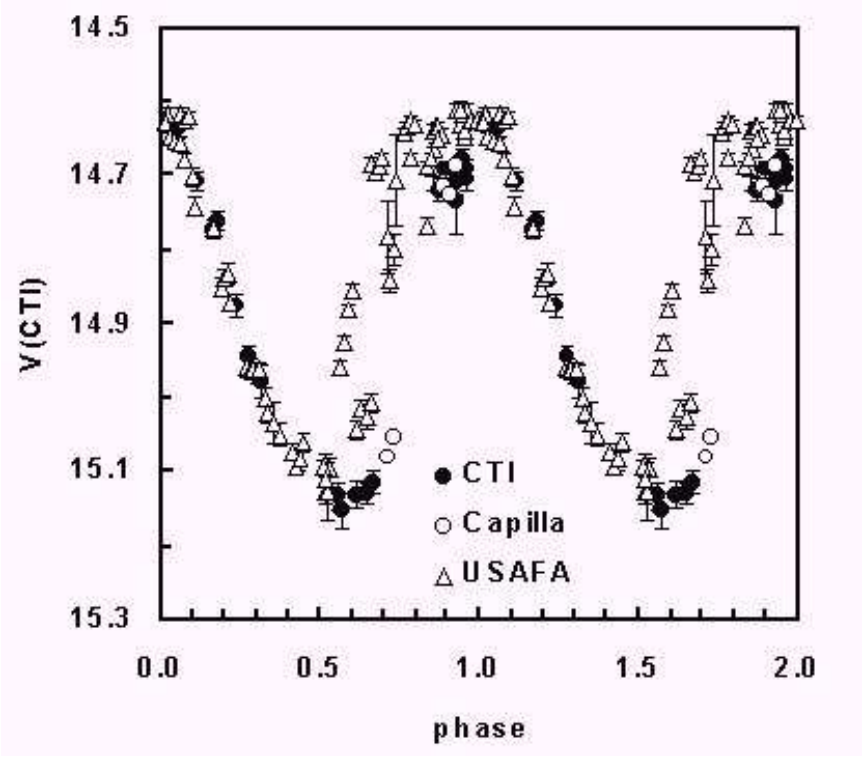

Figure 4. Lightcurve of V864 Her. P = 0.375362 days

Mountain and the UK Schmidt Telescope. The plates were processed into the present compressed digital form with the permission of these institutions. The author also wishes to thank Jim Kunkle for providing his additional Capilla Peak observations of XX CrB and Cadet Cory Naddy for help with some of the USAFA observations.

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