

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

Number 2924

Konkoly Observatory
Budapest
15 August 1986
HU ISSN 0374 - 0676

UBV PHOTOMETRY OF YZ Cas

The bright ($V_{\max} = 5.66^m$), northern hemisphere eclipsing binary YZ Cas (HD 4161, V0042+746 (1950.0), BS 192, BD+74^o27, 21 Cas, ADS 624A) lends itself favourably to differential photometry with small telescopes. When we started our joint observing program in 1983, only one published set of photoelectric measurements was known to us, namely the data of Kron (1939, 1942). Since Kron's observations, depicted in Figure 1 of Lacy (1981), were marred by night-to-night variations in the observational set-up (see Lacy, 1981), we decided to secure a new set of two-colour BV photometry (Johnson system), in order to facilitate the determination of the photometric elements of this eclipsing binary. All determinations of these elements up to that point by various authors (Kron, 1942; Kitamura, 1965; Cherepashchuk et al., 1968; Budding, 1973; Shulberg and Murnikova, 1974; Demircan, 1978; Kurutac, 1978; Mezzetti et al., 1980) have rested on Kron's data.

In the meantime, an extensive set of observations in the four colours of the Utrecht photometric system has been published by de Landtsheer (1983) together with a thorough discussion of the physical properties of YZ Cas.

We obtained 305 differential measurements in B and V as well as 135 differential observations in U, B and V (Johnson system) with two small telescopes. RL used an uncooled 1P21 photomultiplier tube along with a standard UBV filter set on his 52 cm Cassegrain reflector, while RD employed a commercial Starlight-1 photometer (EMI 9924A tube) with appropriate BV filters on a 35 cm Schmidt-Cassegrain type reflector. Each observation consists of at least three deflections in each colour and is corrected for differential extinction and transformed to the standard Johnson UBV system by the usual reduction procedures. Our data has been deposited in the I.A.U. archives of unpublished observations as file no. 194 (Breger, 1985).

The primary comparison star used by both observers was HD 4382 (23 Cas: $V = 5.42^m$, $B - V = 0.01$ (97 obs.)) situated very close to the variable and of similar

spectral type. HD 6163 served as check star, RL determined the brightness of the comparison and check star given in Table I from numerous differential observations with HD 3366.

From our data, the time of minimum light of two primary and one secondary eclipse was determined employing the method of Kwee and van Woerden (1956). Table II contains the information on these minima, where the $O-C_1$ values refer to the elements

$$JD_{hel} = 2445561.4545 + 4^d.467224 * E \quad (1)$$

while the $O-C_2$ values are calculated from the elements of de Landtsheer (1983):

$$JD_{hel} = 2444632.2685 + 4^d.4672234 * E \quad (2).$$

No appreciable change of the period over the last 50 years is apparent.

In Figure 1, we have plotted our V and B-V measurements according to the elements (1). The agreement of this light curve with the ones given by Kron (1939, Figure 1 of Lacy, 1981) and de Landtsheer (1983) is very good, as expected for this well detached binary system (see Figure 4 of Lacy, 1981). Nevertheless, the out-of-eclipse light curve shows more scatter than expected from the observational statistics of this bright star. A similar behaviour was noted by Kron (1939) and interpreted as nightly variation in the optical path. De Landtsheer (1983) also found larger scatter than expected ($\pm 0^m.025$) in his data, and this fact was assigned to the atmospheric conditions at the observing site. We believe, that both these arguments are not sufficient to account for the scatter in our data, especially not for the observations of RL, which comprises the bulk of the current material, and a secondary source of variability remains as possible alternative. Either the comparison star (HD 4382=23 Cas) or one of the components of the binary system might show slight variability at the $0^m.03$ level.

In order to check these possibilities, RL observed the primary comparison star frequently against the check star HD 6163, finding no variation exceeding the observational scatter.

This leaves a slight variability of one of the binaries components as most probable source of the excessive scatter, and the metallic line characteristics of the primary (B9.5 IVm, de Landtsheer, 1983) might point to this source. Unfortunately, the accuracy of our data does not lead to a positive result. More observations with a simultaneous two-channel photometer might clarify the question.

An analysis of our data was not attempted, as the currently available photometric elements (Lacy, 1981; de Landtsheer, 1983) show excellent agreement

Table I: BV data for the comparison
and the check star

Star	V [mag]	B-V [mag]	n
HD 4382	5.42	+0.01	97
HD 6163	6.82	+0.11	9

Table II: Times of minimum light of YZ Cas

JD _{hel} [d]		n	Col	Type	O-C ₁ [d]	O-C ₂ [d]	Obs
2445583.7863 ± 0.0009		12	V	p	-0.0043	+0.0092	RL
.7867	0.0004	12	B	p	-0.0039	+0.0096	
2445621.748	0.005	26	V	s	-0.014	-0.010	RL
.756	0.004	26	B	s	-0.006	-0.002	
2445990.297	0.004	7	V	p	-0.011	-0.007	RD
.305	0.006	7	B	p	-0.003	+0.001	

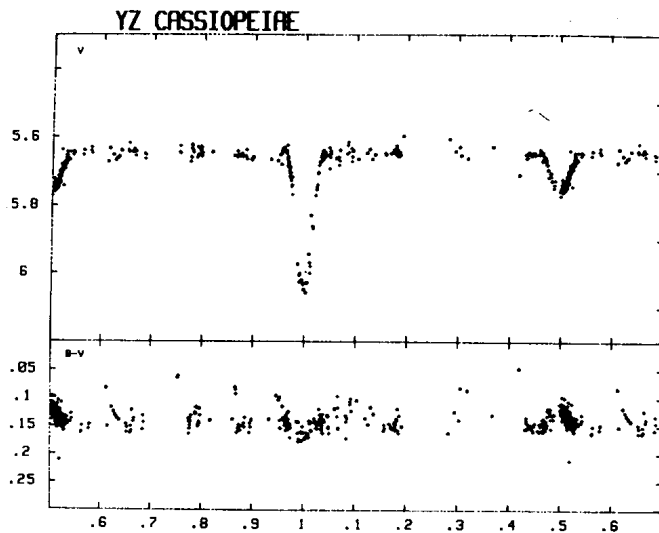


Figure 1

and could hardly be enhanced with our data,

Acknowledgements; RD would like to express his gratitude towards the Swiss National Science Foundation for partial support of this investigation.

R. DIETHELM

Astronomisches Institut der Universitaet Basel
Venusstrasse 7, CH-4102 Binningen, Switzerland

R.D. LINES

Lines Observatory, Mayer, Arizona USA
6030 North 17th Place, Phoenix, Arizona 85016, USA

References:

- Breger, M.: 1985, *Publ. Astron. Soc. Pacific* 97, 85
 Budding, E.: 1973, *Astron. Astrophys.* 22, 87
 Cherepashchuk, A.M.; Goncharskii, A.V., Yagola, A.G.: 1968, *Astron. Zh.* 45, 1191
 Demircan, O.: 1978, *Astrophys. Space Sci.* 56, 389
 Kitamura, M.: 1965, *Adv. Astron. Astrophys.* 3, 27
 Kron, G.E.: 1939, *Lick. Obs. Bulletin* 19, 59
 Kron, G.E.: 1942, *Astrophys. J.* 96, 173
 Kurutac, M.: 1978, *Astrophys. Space Sci.* 57, 71
 Kwee, K.K., van Woerden, H.: 1956, *Bull. Astron. Inst. Neth.* 13, 327
 Lacy, C.H.: 1981, *Astrophys. J.* 251, 591
 de Landtsheer, A.C.: 1983, *Astron. Astrophys. Suppl. Ser.* 53, 161
 Mezzetti, M., Predolin, F., Giuricin, G., Mardirossian, F.: 1980, *Astron. Astrophys. Suppl. Ser.* 42, 15
 Shulberg, A.M., Murnikova, V.P.: 1974, *Perem. Zvedy* 19, 421